The International Alliance
of Leading Education Institutes

Climate Change and Sustainable Development:

The Response from Education

Climate Change and Sustainable Development: The Response from Education

NATIONAL REPORTS

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The International Alliance of Leading Education Institutes

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Preface

Together, the ten reports presented here provide a broad international overview of the initiatives taken and the problems involved in achieving the goals of the United Nations Decade of Education for Sustainable Development 2005-2014 here at the midway point. Compiled by research teams spanning ten different countries and six continents, they also provide a timely survey of the ways in which education can contribute to tackling the challenges of climate change. The reports are part of the project 'Climate Change and Sustainable Development: The Response from Education' conducted under the auspices of the International Alliance of Leading Education Institutes.

The International Alliance of Leading Education Institutes was founded at a meeting in Singapore on 21st August 2007. Made up of ten leading institutions in the field of teacher education and education research (São Paulo joined in 2008 and Cape Town in 2009), the Alliance acts as a think-tank which draws together existing expertise and research in education to generate ideas and identify trends, to serve as a collective voice on important educational issues and thus influence policy and practice in education. It aims to inform governments, international agencies, funding bodies and the public at large, to influence policy and practice in education and thus to enhance the profile and quality of education internationally.

The Alliance comprises representatives from the following member institutes:

- Graduate School of Education, The University of Melbourne, Australia
- Faculty of Education, University of São Paulo, Brazil
- Ontario Institute for Studies in Education, University of Toronto, Canada
- School of Education, Beijing Normal University, People's Republic of China
- Danish School of Education, University of Aarhus, Denmark
- National Institute of Education, Nanyang Technological University, Singapore
- School of Education, University of Cape Town, South Africa
- College of Education, Seoul National University, South Korea
- Institute of Education, University of London, United Kingdom
- Faculty of Education, University of Wisconsin-Madison, USA

The core reason for the founding of the International Alliance of Leading Education Institutes was the recognition that education needed a "voice", a group that would seek to offer well-considered and balanced advice on important educational issues. The group would be mindful of the views of academic researchers, of what evidence and practice had to say, as well as the needs for action on the policy front.

Each year the Alliance partners agree on an issue for a common research project in order to provide the basis for the think tank to formulate recommendations for the policy and practice level on how to qualify their efforts on this issue.

In August 2008, *Climate Change and Sustainable Development*: *The Response from Education* was chosen as the issue for the following year and, as the Danish School of Education held the Alliance chair position, a research team from here was chosen to lead the project.

Research teams were likewise established at the nine other universities and national reports were compiled on the basis of a set of common guidelines. The ten resultant national reports are presented here.

These reports formed the basis for a cross-national analysis, the results of which were discussed when the Alliance partners met at Seoul National University in South Korea, August 2009. On this basis, eight recommendations have been formulated to inform and qualify policy initiatives regarding climate change and education. These recommendations will be presented to the public at a press conference in connection with the Copenhagen Climate Change Summit, December 2009.

For the other documents from the project and for further information, please visit http://dpu.dk/RPEHE or http://edusud.dk/

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Melbourne Graduate School of Education,
University of Melbourne

SUSTAINABLE DEVELOPMENT: THE RESPONSE FROM EDUCATION

AUSTRALIAN COUNTRY REPORT

From AuSSI WA (Australian Sustainable Schools Initiative, Western Australia)
http://www.sustainableschools.wa.edu.au/toolkit/aussi/index.html

"Through information and awareness, but more importantly by building people's capacity to innovate and implement solutions, education for sustainability is essential to re-orienting the way we live and work and to Australia becoming a sustainable society."

p3, Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability
Australian Government Department of the Environment, Water, Heritage & the Arts. April 2009.

Dianne Chambers, Melbourne Graduate School of Education, May 2009

Executive Summary

Australia has recently released it second National Action Plan *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (April 2009) and this document continues strong support for the central role of education in Australia's response to the challenges of sustainability. This document is the first major paper regarding Education for Sustainability since the change of government in Australia in November 2007.

In Australia the term 'Education for Sustainability' (EfS) is currently used more than the term 'Education for Sustainable Development' (ESD). This field has been developing in Australia since the 1970s and has its roots in environmental education and, until recently, terminology has tended to include 'environmental'.

As a legacy of Australian history, school education is a responsibility of Australian states and territories, and not a Federal Government responsibility. This means that there are many responses to any Federal policy or National Action Plan, and that any reforms or changes need to be taken on by the various states and territories. This leads to variability across the country and, generally, a delay as the states formulate their response and implement it. Over the past few years there has been encouraging progress in cooperation of state and federal education ministers, and education for sustainability is an area of success.

The Australian Sustainable Schools Initiative (AuSSI) is a major success in the area of ESD in Australai. AuSSI is a national initiative with over 2000 participating schools (over 570,000 students). This is the chief Australian ESD initiative in schools and the new National Action Plan continues support for AuSSI, which had been established and funded under the previous government.

AuSSI is a systemic approach that seeks to support schools and their communities to become sustainable. The initiative 'involves participants in a whole-of-school approach, to explore through real-life learning experiences, improvements in a school's management of resources and facilities including energy, waste, water, biodiversity, landscape design, products and materials. It also addresses associated social and financial issues'. This holistic and systemic approach encompasses school curriculum and pedagogy and school operations, governance, design, management and grounds. Connections with and influencing the community is another key aspect of AuSSI.

0 INTRODUCTION

0.1 ABOUT AUSTRALIA

Australia is a young nation and an ancient continent. It is the largest island and the sixth largest country in terms of land area. Australia has landforms that have existed for many millions of years and includes some of the oldest rocks on earth, some more than 3,500 million years old. Australia has been inhabited by humans for at least 40,000 years, with some estimates being 100,000 years. Australian Aboriginal culture is one of the world's oldest surviving cultures. Because of its ancient soils and its geology, much Australian soil is low in nutrients, in particular phosphorus. Poor soil and imported European farming practices, practices that were developed on richer soils with very different climates, have together led to the degradation of many Australian environments. Australia has 10 per cent of the world's biodiversity and a great number of its native plants, animals and birds exist nowhere else in the world.

Australia as a nation came into existence on 1 January 1901, when six British colonies federated to become the Commonwealth of Australia. British colonisation of Australia began in 1788 with the arrival of 11 ships of crew, convicts, marines, and a small number of free settlers (the families of some marine officers) in what was to become Sydney. Australia follows a Westminster system of government and its common law system is inherited from its British colonisers.

Australia is a multicultural and multiracial nation, which is reflected in the lifestyles, cuisines and cultural practices of Australians. Migrants from about 200 countries are now Australians. Since 1945 the Australian population has tripled and 6.5 million people have migrated to Australia. English is Australia's official language, but over 3 million Australian speak another language at home.

0.1.1 Basic facts & figures

(Source: Australian Bureau of Statistics)

Land area:

7 692 024 sq km

Coastline:

59 736 km

Climate:

About three quarters of Australia is arid to semiarid (in the interior); temperate in south and east; tropical in north. Australia is the second driest continent (after Antarctica), with an annual average mean rainfall below 600 mm over 80% of the continent. Soils in the arid areas are typically very infertile compared to other deserts of comparable aridity.

Population:

Australia's estimated resident population (ERP) at 30 June 2006 was 20.7 million

Life expectancy at birth:

Total population	
Males	76.6 years
Females	82.0 years
Indigenous Australians	
Males	59.4 years
Females	64.8 years

Reducing the substantial difference in life expectancy between indigenous and non-indigenous Australians is a current focus of the Federal Government.

0.2 A BRIEF OVERVIEW OF THE AUSTRALIAN POLITICAL SYSTEM

The Australian Federal Government was formed in 1901 from the federation of six British colonies. There are now six states and two mainland territories, each with its own State or Territory government and Education Department. Suffrage is universal and compulsory from 18 years of age. When the colonies federated, through the agreement of the colonies, some responsibilities were taken on by the Federal Government, while some were retained by the States, including water management, education, and healthcare. There is also a third level of government, local government, that manages local issues such as rubbish collection & disposal, recycling, and planning. Since the 1990s there has been a major shift in some states to the privatisation of what had previously been State resources. In the State of Victoria, for example, public transport, electricity and gas supply, and water provision have been privatised. The private ownership of essential services leads to some tensions around conserving resources *vs* company profits.

Australia's beginnings as a federation of colonies in 1901 still impacts on some aspects of Australian life, with this historical legacy disappearing in some ways (such as the standardisation of railway gauges across the country), still being very present (such as differing road rules in different States), and becoming more prominent in others. Two key aspects of Australia's history of six colonies uniting to become a nation that are particularly relevant to sustainability are water and education.

0.2.1 Education

Education remains the responsibility of Australian State & Territories, leading to multiple responses to any National curriculum documents or plans. This has major implications for Education for Sustainability, and indeed all areas of curriculum reform. Australia has good policies in the area of Education for Sustainability (a range of terms are used), but these policies are then interpreted by each State or Territory for their own education system. This leads to delays and variability across the country.

Progress in this area is occurring, but is sometimes slow as states interpret and integrate national policies into their education systems. A significant agreement was made in 1999 when all States, Territories and the Commonwealth signed *The Adelaide Declaration on National Goals for Schooling in Twenty-First Century*. This is a national framework for schooling and established cooperation between governments as the means of benefiting Australian students. This was followed up in 2007 by the *Future of Schooling in Australia* (Council for the Australian Federation, 2007), which identified sustainability as a current challenge: 'Education is critical to both understand and address emerging environmental challenges' as one of the six key challenges (pp16). Further agreements between State and Federal Education Ministers have followed and progress is being made, but a truly National education school system appears to be some way off.

0.2.2 Water

The impact of water being a state, rather than national, responsibility became increasingly evident through the current drought, which south-eastern Australia has been enduring for more that a decade. The major water system of Australia is the Murray-Darling basin, which covers an area of 1,061,469 square kilometres and thus is about the size of France and Spain combined. The Murray-Darling basin drains four states and a territory and, although only about 14% of Australia's land mass, supports about 70% of the total area of irrigated crops and pastures in Australia and is the major source of Australia's food production. This is clearly a key Australian resource. Yet it was only in mid-December 2008 that management of this crucial national resource shifted from State to Federal governments. Previous to this, each state managed water and allocated water to irrigation, sometimes leading to unhappiness in

downstream states and accusations that upstream states had over-allocated water to irrigation. Water for environmental flow seemed to get little consideration for a long time.

Management of this drainage basin is now undertaken by the Murray Darling Basin Authority (see http://www.mdba.gov.au). That it took a crisis on the scale of the current drought to bring this about gives an idea of tensions between State and Federal roles and responsibilities with regard to the scarce resource of water, but the formation of the Murray Darling Basin Authority is also indicative of the potential for even substantial challenges to be overcome and for states to collaborate for the national good.

Figure 1 The Murray-Darling Basin (from kids.mdbc.gov.au/__data/page/75/Basin_Map.pdf).

0.3 THE AUSTRALIAN EDUCATIONAL SYSTEM: AN OVERVIEW

Compulsory schooling starts at approximately 5 years of age, with most children having attended kindergarten or preschool (the term used differs between states) at age 4 years. Primary schooling is the first seven years of schooling, followed by secondary schooling, which is the next six years of school. It is compulsory for children aged 6-15 years (age 16 in some states) to attend school.

Post-school education is in the Vocational Education and Training sector ('VET sector') or at university ('higher education sector'). Higher education participation rates in Australia compare favourably with other OECD countries.

0.3.1 Values for Australian schooling

Nine 'values for Australian schooling' have emerged from Australian school communities and from the *National Goals for Schooling in Australia in the Twenty-First Century* (Department of Education, Employment & Workplace Relations (2004):

- care and compassion
- doing your best
- fair go
- freedom
- honesty and trustworthiness
- integrity
- respect
- responsibility
- understanding/tolerance/inclusion

Department of Education, Employment & Workplace Relations (2004)
http://www.curriculum.edu.au/values

0.4 EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD) IN AUSTRALIAN SCHOOLS

In Australia ESD has grown from Environmental Education, which has a long history in Australia. The fluidity of language around education and sustainability (for example, 'Education for Sustainable Development', 'Education for Sustainability', 'Environmental Education', 'Environmental Education for Sustainability', *etc*.) emerges from this history and from the desire to respect and value the major contribution that those in the field of Environmental Education have made. [See pp5-6 *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* for more.] A goal is that students will become citizens who have knowledge, values, and critical thinking skills and who will be able to make a difference, and so terminology has not been a major issue and terms are often used interchangeably.

A recent shift in language from 'Environmental Education' towards 'Education for Sustainability' is evident in the recently released *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (April 2009) and in the renaming of bodies, for example, the *National Environmental Education Council* has become the *National Council on Education for Sustainability* and the *National Environmental Education Network* is now the *National Education for Sustainability Network*. The term 'Education for Sustainable Development' is not widely used in Australia, but is understood. It will be used in this document for consistency with international practice.

A brief timeline of development of policy and the establishment of the *Australian Sustainable Schools Initiative* (AuSSi) and the *Australian Research Institute in Education for Sustainability* (ARIES) summarises the major steps for ESD in Australia:

Date	Key Policy papers/statements (or developments)
1999	***Today Shapes Tomorrow: Environmental Education for a Sustainable Future – A Discussion Paper*** published. Paper stresses the lack of any national attempt to implement commitment to Agenda 21, and places environmental education at the top of the sustainability agenda.
2000	***Environmental Education for a Sustainable Future: National Action Plan*** published (Department of Environment and Heritage). Published following consultation on the *Today Shapes Tomorrow* discussion paper.
2003	**Australian Research Institute in Education for Sustainability (ARIES)** established.
2004	**National Sustainable Schools Initiative (AuSSI)** launched
2005	***Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium*** (July 2005)
2005	***An Australian Government Perspective on the United Nations Decade of Education for Sustainable Development.*** Woods, Peter. Address to the National Symposium on the DESD. Australian Government Department of the Environment and Heritage.
2005	***National Environmental Education Statement for Australian Schools - Educating for a Sustainable Future*** published. This was the first time that the Australian Government and State, Territory governments approved a document that expressed a national approach to environmental education in schools.
2007	***Caring for Our Future: The Australian Government Strategy for the United Nations Decade of Education for Sustainable Development*** published.
2009	***Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability***. Released April 2009. *Note*: This document was released by the Rudd Labor Government, whereas previous documents had been released by the Howard Liberal Government which was in power 1996-2007.

0.5 KEY DOCUMENTS & RESOURCES

0.5.1 Australian Government site for Education for Sustainability

This is the major site for the Australian Federal Government's response to Education for Sustainability.

http://www.environment.gov.au/education/index.html

- *Today Shapes Tomorrow: Environmental Education for a Sustainable Future - A Discussion Paper* (January 1999)
  - This set the scene for future developments. The terminology of Environmental Education was used here, and is echoed in later documents, though there is a general shift to terms that include 'sustainability'.
- *Environmental Education for a Sustainable Future: National Action Plan* (2000)
  - http://www.environment.gov.au/education/publications/nap/pubs/nap.pdf
  - The major policy document that has guided developments from 2000 to 2009 when a new National Action Plan was released.
- *Educating for a Sustainable Future: A National Environmental Education Statement for*

Australian Schools (2005)
    - http://www.environment.gov.au/education/publications/sustainable-future.html
- *Australian Sustainable Schools Initiative*
    - http://www.environment.gov.au/education/aussi/index.html
    - This is the major ESD initiative for Australian schools
- *Comparative Assessment: Australian Sustainable Schools Initiative Pilot Programme in NSW and Victoria* (2006)
    - http://www.environment.gov.au/education/publications/pubs/comparative.pdf
- *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability (2009)*
    - http://www.environment.gov.au/education/publications/pubs/national-action-plan.pdf

0.5.2 Australian Government & the UN Decade for ESD

This is the major site for the Australian response to the UN Decade for ESD.

http://www.environment.gov.au/education/decade/index.html

- *Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium* (Melbourne 7 July 2005)
    - http://www.environment.gov.au/education/publications/pubs/undesd-report.pdf
- *An Australian Government Perspective on the United Nations Decade of Education for Sustainable Development.* Woods, Peter. Address to the National Symposium on the DESD. Australian Government Department of the Environment and Heritage. (2005)
    - http://www.environment.gov.au/education/publications/undesd.html
- *Caring for Our Future: The Australian Government Strategy for the United Nations Decade of Education for Sustainable Development* (2007)
    - http://www.environment.gov.au/education/publications/pubs/caring.pdf

0.5.3 Australian Research Institute in Education for Sustainability (ARIES)

This is the major site to find Australian research in the area of Education for Sustainability.

http://www.environment.gov.au/education/aries/index.html

> "The Department of the Environment, Water, Heritage and the Arts has commissioned the Australian Research Institute in Education for Sustainability (ARIES) at Macquarie University to conduct research into how to move beyond simply raising awareness to achieve the attitudinal and behavioural changes necessary to live sustainably. Priorities are set by the Department, in consultation with the National Environmental Education Council (NEEC) and the National Environmental Education Network (NEEN). Research projects are identified and managed by the Department."
>
> from http://www.environment.gov.au/education/aries/index.html

- A National Review of Environmental Education and its Contribution to Sustainability in Australia
    - http://www.aries.mq.edu.au/project.htm
    - Volume 1: Frameworks for Sustainability
        - http://www.aries.mq.edu.au/pdf/Volume1_Final05.pdf
    - Volume 2: School Education
        - http://www.aries.mq.edu.au/pdf/Volume2_Final05.pdf
    - Volume 3: Community Education
        - http://www.aries.mq.edu.au/pdf/Volume3_Revised05.pdf
    - Volume 4: Business & Industry Education
        - http://www.aries.mq.edu.au/pdf/Volume4_Final05.pdf

- Volume 5: Further & Higher Education
  - http://www.aries.mq.edu.au/pdf/Volume5_Final05.pdf

- Whole-School Approaches to Sustainability: An international review of whole-school sustainability programs
  - http://www.aries.mq.edu.au/pdf/international_review.pdf
- Whole-school approaches to sustainability: A review of models for professional development in pre-service teacher education
  - http://www.aries.mq.edu.au/pdf/TeacherEduDec06.pdf
- Developing ESD indicators to assess progress during the Decade of ESD
  - http://www.aries.mq.edu.au/pdf/ESDIndicators_Feb07.pdf
- Guidelines for developing national ESD indicators for the Asia-Pacific region
  - http://www.aries.mq.edu.au/pdf/Guideline2.pdf
- Mainstreaming Education for Sustainability into Pre-Service Teacher Education
  - http://www.aries.mq.edu.au/pdf/TeacherEd2projectSheet.pdf
- Development of a National Approach to Monitoring, Assessment and Reporting on the Decade of Education for Sustainable Development. Stage 1: Identification of National Indicators.

0.5.4 Reviews of ESD in Australia

Australia has been a case study for a number of international comparison studies for ESD/SDE/etc.

- A Situational Analysis of Education for Sustainable Development in the Asia-Pacific Region□Bangkok: UNESCO Bangkok, 2005, 114 p. (2nd edition) Australia is pp73-78
  - http://www2.unescobkk.org/elib/publications/ESD_situation_analysis/situational_analysis_2ed.pdf
- SEDA International Case Studies
  - http://sustainabilityedu.files.wordpress.com/2008/05/seda-case-studies-international.pdf□□
  - Sustainability and Education Academy (SEDA) is based at York University Canada
  - Australian case study is pp 1-8.
- Sustainable Development Education: an international study
  - Learning & Teaching Scotland
  - http://www.ltscotland.org.uk/Images/SDELG%20international_tcm4-306104.pdf
  - Australia is pp3-7
- Rising to the Challenge: Education for Sustainability in Australia
  - Daniella Tilbury
  - *Australian Journal of Environmental Education*, 20(2), 2004
  - http://www.unescobkk.org/fileadmin/user_upload/esd/documents/Article_Tilbury.pdf

1 THEME 1: ESD OVERALL CONCEPTION

This section looks at the concept of Education for Sustainable Development (ESD) in Australian policy and research.

1.1 THE CONCEPT OF ESD IN AUSTRALIA AND ITS INTERPRETATION IN NATIONAL PLANS FOR PROMOTION OF ESD

In Australia Education for Sustainable Development (ESD) is seen as having a broad scope, including challenging and changing both content and curriculum, pedagogy and assessment. Culture and values are also seen as important aspects of ESD. Goals of ESD/EfS in Australia include preparing citizens who understand sustainability issues, have values and capabilities to address the challenges, and participate in decision making. For many Australians 'sustainability' would most likely first be associated with environmental issues and, because of the extended drought that south-eastern Australia is experiencing, water-related issues and climate change, are likely to be central to these thoughts.

In summary in Australia ESD includes:

- An holistic approach — environmental, economic, social & cultural sustainability are the key areas, though environmental sustainability is what most people outside the field would first probably associate with the term
- A broad based approach
- Developing processes & skills, not just content knowledge
- Values
- Cultural influences
- Actions and outcomes, not just content knowledge
- Inclusive – everyone needs to play a part.

Principles of ESD espoused by the Australian Government include the ability to embrace change and adapt to new circumstances to secure Australia's future, and the role of ESD is seen as central in achieving this goal. The single goal stated in the document *Caring for our Future: The Australian Government Strategy for the UN Decade of ESD 2005-2014* (2006) is:

> *To mainstream sustainability across the community through education and lifelong learning.* (p4)

The educational framework around ESD in Australia is summed up in *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (2005) by the statement:

> *Effective environmental education for sustainability is not just a curriculum issue; it requires the involvement of the whole school.* (p7)

This whole-school approach underpins ESD initiatives in Australia, the whole-school includes the leadership team, teachers, grounds staff, canteen staff, parents, students and the local community. This framework is summarised below (from p7 *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools*).

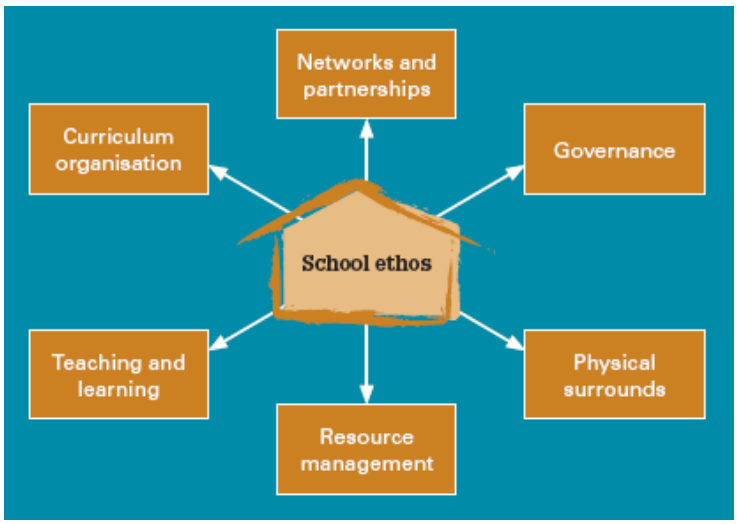

Figure 2 A framework for environmental education for sustainability (from *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools*)

In the second National Action Plan *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (April 2009) this holistic approach has been continued, and the newly stated principles (see below) address education in its broadest sense and goes well beyond the curriculum and beyond formal schooling.

PRINCIPLES OF EDUCATION FOR SUSTAINABILITY

Education for sustainability is based on the following principles:

Transformation and change

Education for sustainability is not simply about providing information but involves equipping people with the skills, capacity and motivation to plan and manage change towards sustainability within an organisation, industry or community.

Education for all and lifelong learning

Education for sustainability is driven by a broad understanding of education and learning that includes people of all ages and backgrounds and at all stages of life and takes place within all possible learning spaces, formal and informal, in schools, workplaces, homes and communities.

Systems thinking

Education for sustainability aims to equip people to understand connections between environmental, economic, social and political systems.

Envisioning a better future

Education for sustainability engages people in developing a shared vision for a sustainable future.

Critical thinking and reflection

Education for sustainability values the capacity of individuals and groups to reflect on personal experiences and world views and to challenge accepted ways of interpreting and engaging with the world.

Participation

Education for sustainability recognises participation as critical for engaging groups and individuals in sustainability.

Partnerships for change

Education for sustainability focuses on the use of genuine partnerships to build networks and relationships, and improve communication between different sectors of society.'

Box 2, p9
Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability (2009)
http://www.environment.gov.au/education/publications/pubs/national-action-plan.pdf

1.2 ESD AND RELATED FIELDS

As stated earlier, in Australia ESD has grown from Environmental Education, and language used reflects this history. There do not appear to be strong links between ESD and health education or peace education in Australia. Climate change education is not a well-defined or developed field in Australia as climate change is seen as a central aspects of sustainability, and thus climate change education is a major aspects of Education for Sustainability.

A goal of ESD is to develop 'informed and involved citizens' who can actively participate in decision-making and actions for sustainable development, so it overlaps with aspects of citizenship education, but is not explicitly part of it.

1.3 RHETORIC *VS* POLICY ON ESD

There is a good connection between what is said in Australian policy documents and the initiatives that have been put in place. Peter Woods, the Assistant Secretary of Knowledge Management and Education with the Australian Government Department of the Environment and Heritage (2005), in his address (quoted below) outlines initiatives and funds allocated to them.

> "One of the aims of the *National Action Plan* has been to go beyond raising awareness and educating about the environment, to focus on equipping people and organisations with the necessary values and skills to be able to take positive action to address a range of sustainability issues.
>
> The Australian Government's commitment to this aim is reflected in initiatives such as:
>
> • the establishment of the National Environmental Education Council and National Environmental Education Network;
>
> • the $2.3 million applied education research programme through the Australian Research Institute in Education for Sustainability (ARIES) at Macquarie University;
>
> • the $2 million Australian Sustainable Schools Initiative;
>
> • the development of the first National Environmental Education Statement for Australian Schools that was endorsed in May this year by all of Australia's Education Ministers;
>
> • the $255,000 allocated under the 2004-05 Environmental Education Grants Programme, including funding to hold this National Symposium; and
>
> • funds allocated under other Australian Government programmes such as the $200 million Australian Community Water Grants programme, under which a total of $1 million has already been allocated to demonstration projects, including $356,000 to ten schools around the country.
>
> These initiatives are very much about capacity building and finding ways of integrating sustainability thinking into all sectors of the Australian community."

Woods, Peter. (2005) *An Australian Government Perspective on the United Nations Decade of Education for Sustainable Development.* Address to the National Symposium on the DESD. Australian Government Department of the Environment and Heritage. http://www.environment.gov.au/education/publications/undesd.html

1.4 CHALLENGES TO ESD IN AUSTRALIA

A review of school education and Environmental Education (Tilbury, Coleman & Garlick, 2005) concluded that the major challenges to ESD in Australia are resistance to change by schools; the decentralisation of education to States and Territories; and, the costs involved in

reorienting school education. They called for "a fundamental shift in current practice" (p1). Other educational challenges included an already crowded curriculum, and a resistance among some to use education as 'an instrument of policy'.

Environmental Education is a compulsory subject in only one state of Australia (New South Wales), but has a presence in other states' curriculum; they also found that the focus was *about* the environment and few opportunities for education *for* the environment. However, since this study there has been a shift toward education for sustainability.

1.5 KEY ESD INITIATIVES IN AUSTRALIA

The two key ongoing initiatives in ESD in Australia are the **Australian Sustainable Schools Initiative** (AuSSI) and **Australian Research Institute in Education for Sustainability** (ARIES), which is funded by the Australian Government Department of the Environment, Water, Heritage and the Arts.

Major initiatives that have framed other developments include: the establishment of the *National Environmental Education Council* and the *National Environmental Education Network*; and, developing the *National Environmental Education Statement for Australian Schools* (endorsed 2005 by all Australian Ministers of Education). These have recently been renamed to reflect the shift from using the term 'environmental education' toward 'education for sustainability'

To find information about the Australian Government's response to Sustainability Education go to http://www.environment.gov.au/education/index.html

1.5.1 Australian Sustainable Schools Initiative (AuSSI)

(http://www.environment.gov.au/education/aussi/index.html)

The **Australian Sustainable Schools Initiative** (AuSSI) is a whole school approach that is the flagship initiative for ESD in Australian schools. More than 2000 schools and 570,000 students are now participating in AuSSi (http://www.environment.gov.au/education/aussi/publications/pubs/aussi-factsheet-may07.pdf). AuSSI is a partnership of the Australian Government and the States and Territories that "supports schools and their communities to become sustainable". The Australian Government committed AUD$2 million over four years to this initiative. State based versions of AuSSi, such as AuSSiVic (http://sustainability.ceres.org.au/schoolProjects.php) in Victoria and Queensland Environmentally Sustainable Schools Initiative (QESSI http://education.qld.gov.au/schools/environment/outdoor/aboutqessi.html), and AuSSi- SA (http://www.decs.sa.gov.au/efs/pages/default/27395/?reFlag=1) are the various states' implementation of AuSSI. In 2003 a pilot AuSSI program was undertaken in the states of New South Wales and Victoria (see Larri (2006) http://www.environment.gov.au/education/publications/comparative-assessment.html for report on the pilot) and it was found that there were educational, environmental, social and professional benefits. From this pilot study core guiding principles that could be applied nationally were identified and by 2004 the national AuSSI initiative had been launched. By 2005 AuSSi was being implemented in 600 schools and is now in over 2000 schools.

AuSSI's vision is 'For all Australian schools and their communities to be sustainable'.

What is the AuSSI?

The Australian **Sustainable Schools Initiative** (AuSSI) is a partnership of the Australian Government, the States and Territories that seeks to support schools and their communities to become sustainable.

The AuSSI involves participants in a whole-of-school approach, to explore through real-life learning experiences, improvements in a school's management of resources and facilities including energy, waste, water, biodiversity, landscape design, products and materials. It also addresses associated social and financial issues. The Initiative's vision is for all Australian schools and their communities to be sustainable.

The AuSSI in schools

With the support from AuSSI partners, schools are offered best practice and quality curriculum support, audit tools to manage resources, ideas for on-ground projects and ways to involve the local community and encourage a shift in the broader community towards more sustainable practices and processes.

The AuSSI provides networking and clustering opportunities for schools and supports schools in their growth from awareness through to leadership in environmental education for sustainability and sustainable living. It fosters school ownership and empowerment and focuses on student involvement and learning.

From http://www.environment.gov.au/education/aussi/about.html

Guiding principles of the AuSSI

The Australian Sustainable Schools Initiative:

- Seeks to develop a school culture committed to the principles of sustainable development;
- Seeks to go beyond awareness raising to action learning and integration with school curricula;
- Encourages the involvement of the whole school;
- Encourages the involvement of a school's local community and encourages a shift in the broader community towards more sustainable practices and processes;
- Seeks to develop relationships with other areas that impact on the organisation and management of a school;
- Is founded on a sound basis of theory and practice in schools and school systems, quality teaching and learning, environmental education for sustainability, and
- Encourages schools to achieve measurable social, environmental, educational and financial outcomes.

Goals

AuSSI seeks to achieve the following goals:

- Learning and teaching for sustainability as an integral component of school curricula
- Schools actively engaged in a continuous cycle of planning, implementing and reviewing their approach to sustainability as part of their everyday operations
- Schools using natural resources, including energy, water, waste and biodiversity in more sustainable ways
- Schools and school authorities reporting on changes towards sustainability
- Young people sharing ownership of sustainability initiatives and decision making
- Schools working towards sustainability in partnership with their local communities
- Schools and school authorities implementing governance practices that support effective environmental education for sustainability
- Individuals supported to make effective sustainability decisions and choices
- Schools and communities developing values that support a sustainability ethos."

from http://www.environment.gov.au/education/aussi/about.html

The most recent National Action Plan (2009) continues the Government's support for AuSSI.

Achievements of the Australian Sustainable Schools Initiative

Achievements include:

- More than 2000 schools are now participating in the AuSSI,
- Participating schools have reported reductions in waste collection of up to 80%, reductions in water consumption of up to 60%, and savings on energy consumption of 20% with commensurate reductions in greenhouse gas emissions.
- The following quote illustrates the type of educational and social benefits being

achieved, '*A systematic approach through the curriculum following a comprehensive audit exposes children to all elements of sustainability. They are increasingly accepting responsibility for actions within the program and are the leading edge in attitude change as these practices are transferred to home and the community*'

• Family members across Australia have been influenced by the Initiative.

From http://www.environment.gov.au/education/aussi/about.html

"Australia's overriding policy objective is systemic change: 'That is our core business,' declares Mr. Woods. 'We want to achieve lasting change by integrating ESD into mainstream education.' To this end, the policy framework has provided the charter to proceed, as well as a recognized national structure and agenda. It has also been accompanied by significant funding allocations that provide a compelling incentive for collaboration and participation. Since 2000, the national government, in partnership with key stakeholders, has invested over $AUD2 million in AuSSI, $AUD4 million in applied research, and about $AUD250,000 per year in grants to education projects by community organizations."

p3

SEDA. (2007). *Policy, Research and Partnerships for ESD in Australia.* Sustainability and Education Academy, York University http://sustainabilityedu.files.wordpress.com/2008/05/seda-case-studies-international.pdf

1.5.2 Australian Research Institute in Education for Sustainability (ARIES)

ARIES is based at Macquarie University (Sydney, NSW) and was commissioned by the federal Department of the Environment, Water, Heritage and the Arts to conduct research into "how to move beyond simply raising awareness to achieve the attitudinal and behavioural changes necessary to live sustainably". Priorities are set by the Department and the research program of ARIES is to "identify key factors and impediments influencing education for sustainability, evaluate existing approaches, and develop effective educational materials and programs to promote behaviour change towards the sustainable use of Australia's resources." (from http://www.environment.gov.au/education/aries/index.html). Thus, ARIES is playing a key role in ESD in Australia. Many ARIES documents are included in the Key Documents section (Section 0.5.3).

"**What is ARIES?**

ARIES is the Australian Research Institute in Education for Sustainability based at Macquarie University, Sydney. ARIES is primarily funded by the Australian Government Department of the Environment, Water, Heritage and the Arts.

Its core business is to undertake research that informs policy and practice in Education for Sustainability across a range of sectors including: business and industry, school education, community education, further and higher education.

ARIES adopts an innovative approach to research with a view to translating awareness of sustainability issues into action and change. ARIES is concerned with how we inform, motivate and manage structural change towards sustainability."

From http://www.aries.mq.edu.au/index.htm

1.6 ESD RESEARCH IN AUSTRALIA

1.6.1 Concepts of ESD reflected in ESD Research

Much of the funded research into ESD in Australia has been through ARIES, based at Macquarie University in Sydney. ARIES' research has looked at many aspects of ESD, including in school education, teacher education and business education, as well as a range of

other areas. In the area of school education much has been documenting ESD programs and projects and strong themes have been (i) supporting a whole school approach, (ii) changing values and teaching approaches, rather than just teaching content, and (iii) mainstreaming the approach. Listed below are titles of ARIES' projects (from http://www.aries.mq.edu.au/project.htm).

ESD & School Education

- Whole-School Approaches to Sustainability: An international review of whole-school sustainability programs
- Mainstreaming Education for Sustainability into Pre-Service Teacher Education
- Whole-school approaches to sustainability: A review of models for professional development in pre-service teacher education
- A National Review of Environmental Education and its Contribution to Sustainability in Australia
    - Volume 1: Frameworks for Sustainability
    - Volume 2: School Education
    - Volume 3: Community Education
    - Volume 4: Business & Industry Education
    - Volume 5: Further & Higher Education
- Guidelines for developing national ESD indicators for the Asia-Pacific region
- Monitoring and Assessing Progress during the UNDESD in the Asia-Pacific Region: A Quick Guide to Developing National ESD Indicators
- Developing ESD indicators to assess progress during the Decade of Education for Sustainable Development

ESD & Business Schools

- Education About and For Sustainability in Australian Business Schools
- Education about and for Sustainability in Australian Business Schools: □Stage 2
- Summary report of evaluation by Molino Stewart of the ARIES project Education about and for sustainability in Australian business schools: Stage 2
- Education about & for sustainability in Australian business schools: Stage 3: Partnering business schools with corporations

Other

- Mentoring Local Government in Education for Sustainability
- Sustainability in Supply Chains
- Assessing the effectiveness of coastal management education
- Promoting organisational change for sustainability within the public sector
- Lowering environmental stress on the Great Barrier Reef
- Education for Climate Change Adaptation in the Built Environment Sector
- Sustainability in Noosa: A Living Change Case Study
- Industry Sustainability Project
- Industry Sustainability Toolkit Project - A review of sustainability resources for industry
- Industry Research Forum on Education for Sustainability
- Vocational Education & Training (VET) Research Forum on Education for Sustainability

For a summary of ESD research in Australia see *Setting the Stage for a Strategic Research Agenda for the UNDESD* (Woods, 2006; http://www.environment.gov.au/education/publications/esd-research.html).

An example of a major initiative whose beginnings were based in research is the major ESD initiative in schools, AuSSI, which was first piloted in NSW and Victoria before it went national. This linking of policy development and research has been acknowledged by external reviews of Australian progress in ESD, see for example quotes in SEDA review of 2007.

> "In Australia, education for sustainable development (ESD) is firmly planted in a national policy framework, a national research program and a national sustainable schools initiative. A strong synergy among these three elements puts Australia at the forefront internationally of efforts to lead and nurture ESD."

p1

> "Closely intertwined with policy development, research has played a vital role in promoting ESD in Australia. Advocates recognize the need for a strong research base in order to understand the effectiveness of ongoing education efforts and to determine

how best to proceed in the future."

p4, SEDA (2007) *Policy, Research and Partnerships for ESD in Australia.* Sustainability and Education Academy, York University, Canada. http://sustainabilityedu.files.wordpress.com/2008/05/seda-case-studies-international.pdf

Below is a summary of key developments in the ESD story so far in Australia. This information is abridged from p3-4 *Sustainable Development Education: An international study*. Learning & Teaching Scotland, 2005, from http://www.environment.gov.au/education/aussi/about.html and recent developments). This timeline illustrates the basis of ESD in Australia in research, as well as the political necessities of trying to get a national policy implemented across the States and Territories.

1992	Agenda 21 – Australian government is a signatory.
1999	Publication of *Today Shapes Tomorrow: Environmental Education for a Sustainable Future – A Discussion Paper*, Department of the Environment and Heritage (DEH). This paper stresses the lack of any national attempt to implement commitment to Agenda 21, and places environmental education at the top of the sustainability agenda.
2000	*Environmental Education for a Sustainable Future: National Action Plan* published (Department of Environment and Heritage). Published following consultation on the *Today Shapes Tomorrow* discussion paper.
2000	National Environmental Education Council (NEEC) is established to raise the profile of environmental education and to provide expert advice to the Australian government on environmental education issues.
2001	*Environmental Education Policy for Schools* published (NSW Department of Education & Training)
2001 May	National Environmental Education Network (NEEN) is established.
2002 July	The Commonwealth Minister for the Environment and Heritage announces funding to support a pilot Sustainable Schools Initiative programme in NSW and Victoria. NSW and Victoria governments match funding.
2002 Sept	A review of nationwide curriculum documents to analyse environmental education content and to identify national priority areas recommends development of a national environmental education policy, and the implementation of a national environmental education programme.
2003 Jan	Pilot Sustainable Schools programmes begin in NSW and Victoria
2003 June	A National Sustainable Schools Workshop is held in Canberra to incorporate all States and Territories not currently trialling the programme. All States and Territories agree that a National Sustainable Schools Initiative is worth pursuing.
2003 Dec	Australian Research Institute in Education for Sustainability (ARIES) is established.
2004 May	Education Directors-General of all States and Territories agree to the development of the first *National Environmental Education Statement* for Schools (NEES).
2004	Australian government funding given to Western Australia and South Australia to develop and implement a Sustainable Schools Initiative.
2004	National Sustainable Schools Initiative launched with funding for four years.

	ARIES given grant for further research projects.
2004	Minister for the Environment and Heritage approves National Sustainable Schools Initiative funding for the Northern Territory and the Australian Capital Territory.
2005	The Australian Government releases *the National Environmental Education Statement for Australian Schools - Educating for a Sustainable Future*. This was the first time that the Australian Government and State, Territory governments approved a document which expressed a national approach to environmental education in schools.
Jun 2006	The Australian Government approves AuSSI funding for Tasmania, ongoing funding for the expansion and consolidation of the Initiative in South Australia.
Sep 2006	The Australian Government approves AuSSI funding for the expansion and consolidation of the Initiative in Western Australia.
Dec 2006	The Australian Government approves AuSSI funding for the development of three sustainability resources to support the expansion and consolidation of AuSSI in Victoria
June 2007	The Australian Government approves AuSSI funding for the expansion and consolidation of AuSSI in South Australia, the Northern Territory and Australian Capital Territory.
July 2007	The Australian Government approves AuSSI funding to the Catholic Education Office.
April 2008	Environment Protection and Heritage Council (EPHC) resolved to endorse the draft AuSSI partnership statement between the Australian Government and the States and Territories, and Ministers undertook to work together on education for sustainability in schools.
April 2009	*Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability*. Released April 2009 by Rudd Labor Government.

National policies and initiatives, which are then implemented at States and Territories, are informed by educational research and ARIES, the major body in ESD research in Australia, is funded by the Federal Government. ARIES is commissioned by the federal Department of the Environment, Water, Heritage and the Arts to conduct research into "how to move beyond simply raising awareness to achieve the attitudinal and behavioural changes necessary to live sustainably". This intertwining of educational research into ESD and policy development is very encouraging.

However, it should be noted that much of the work of ARIES is descriptive rather than analytical. That is, while what is being done in a range of ways is documented by ARIES, the *effectiveness* of programs to lead to changed attitudes or behaviours is less well understood. This is somewhat unsurprising, as making causal links between an educational program and behavioural change is challenging.

2 THEME 2: EDUCATION AND THE CHALLENGES OF SUSTAINABLE DEVELOPMENT & CLIMATE CHANGE

The role of education in relation to the challenges of sustainable development and climate change respectively.

2.1 THE ROLE OF EDUCATION IN NATIONAL SUSTAINABLE DEVELOPMENT STRATEGIES AND ACTION PLANS

Principles of sustainable development espoused by the Australian Government include the ability to embrace change and adapt to new circumstances to secure Australia's future, and the role of education is seen as central in achieving this goal. The single goal of the key document *Caring for our Future: The Australian Government Strategy for the UN Decade of ESD 2005-2014* (2006) sums this up:

> *To mainstream sustainability across the community through education and lifelong learning.* (p4)

The following quote further supports this central role of education in Australia's response to the challenges of sustainability. Integration of ESD into education systems is seen as important.

> "Thus, the goal of the DESD in Australia is:
>
> To integrate sustainability into national, state/territory and institutional education using appropriate but multiple methods at all levels across all sectors by 2014 in order to enhance and transform societal capacity for sustainability in order to achieve tangible improvements in the:
>
> • *conservation of Australia's natural resources, biodiversity and ecosystem health;*
> • *vitality and prosperity of Australian business and industry while respecting the capacity of the earth's natural systems; and*
> • *active participatory involvement of citizens of all ages for harmony within Australia's social and cultural diversity."*
>
> p16
>
> Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium (Melbourne 7 July 2005)
> http://www.environment.gov.au/education/publications/pubs/undesd-report.pdf

2.2 CLIMATE CHANGE STRATEGIES & MITIGATION AND EDUCATION

There does not appear to be a strong connection between policy documentation on climate change and education on the website of the Department of Climate Change (http://www.climatechange.gov.au). This could, however, be because the Department of Climate Change is a newer department than the Department of the Environment, Water, Heritage and the Arts, which has already taken on funding research and actions in schools about ESD and has a large section on ESD on its website. Keeping ESD efforts in a single government website, rather than doubling up ESD efforts across government departments, has thus been avoided.

A major ESD initiative that has climate change mitigation as an element is the *National Solar Schools Initiative* (http://www.environment.gov.au/settlements/renewable/nationalsolarschools/). This initiative began in July 2008 and replaced the similar 'Green Vouchers' scheme.
Through the National Solar Schools Initiative, schools are eligible to apply for grants of up to AUD$50,000 for a range of energy and water efficiency measures including:

- installation of a minimum 2 kilowatt solar panels

- energy efficient lighting
- sky lights
- shade awnings
- solar hot water systems
- rainwater tanks (see http://www.resourcesmart.vic.gov.au/for_educators_2436.html)

The objectives of the scheme are to:

- allow schools to:
  - generate their own electricity from renewable sources
  - improve their energy efficiency and reduce their energy consumption
  - adapt to climate change by making use of rainwater collected from school roofs
  - provide educational benefits for school students and their communities
- support the growth of the renewable energy industry.

(from http://www.environment.gov.au/settlements/renewable/nationalsolarschools/guidelines/pubs/nssp-guidelines.pdf)

Under the *Solar Schools Initiative* schools that install a 2KW solar power system can get a grant up to AUD$50,000, and smaller grants if smaller solar power systems are installed. A goal is for all Australian schools to be 'solar schools' by 2016.

As can be seen from the objectives, educational outcomes are seen as an important aspect of this initiative, in addition to the environmental benefits of reduced greenhouse gas production and the benefits that can be realised by the nation through stimulating the renewable energy industry.

Regarding the operations of schools, it has been claimed that "while green schools cost two per cent more to build, the financial benefits were far greater than this initial cost and that green schools are extraordinarily cost effective in enhancing student learning and reducing health and operational expense" (from http://www.gbca.org.au/media-centre/media-releases/back-to-school-in-better-buildings/1883.htm).

Australian Sustainable Schools Initiative

The Australian Sustainable Schools Initiative (AuSSI) integrates existing environmental education initiatives into a holistic program with measurable environmental , economic, social and curriculum outcomes. The initiative implements efficiencies in a school's management of resources (*e.g.,* energy, waste, water, products and materials) and the management of school grounds (*e.g.,* biodiversity, landscape design, soil, noise, and human and vehicular traffic) and integrates this approach into the existing curriculum and daily running of the school. The incorporation and involvement of the school's local community is a critical element of the initiative.

From http://www.deh.gov.au/education/ sustainable-schools/index.html

cited in *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (2005)

2.2.1 Climate Change Adaptation and Actions

Australia's priorities for climate change adaptation can be found at http://www.climatechange.gov.au/about/publications/fs-overview.html. In the two page brochure *Australian Government Action on Climate Change*, education is not mentioned. This, however, is perhaps because ESD has been taken on, as a responsibility of the more established Australian Government Department of the Environment, Water, Heritage and the Arts, rather than by the newer Australian Government Department of Climate Change. In Australia climate change is seen as one element of sustainability, rather than a separate field. This may be because of the strong focus on climate in Australia as it endures a more than decade-long drought—for most Australians the issues of climate change and sustainability are

inextricably linked.

2.3 NATIONAL ESD POLICY AND RESEARCH

National policy about ESD is grounded in research (see earlier sections) and scientific (and to a lesser extent social) research also informs ESD, by identifying and investigating challenges, which then allows priorities to be set. The role of environmental science research in ESD is demonstrated in the 1999 discussion paper from the Department of Environment, Water, Heritage and the Arts entitled *Today Shapes Tomorrow: Environmental Education for a Sustainable Future* in Section 1 'The Importance of Environmental Education'. In this section the importance of education is emphasised — '…vital to resolving our domestic environmental challenges, and also to achieving sustainability on a global scale' — and then the major environmental challenges facing Australia (including climate change) are outlined.

Climate change education is still a relatively new field in Australia. In July 2008 the Australian Association for Environmental Education applied pressure to the federal government to improve its practices to educate people about climate change. Climate change education is generally incorporated into ESD and not treated as a separate field.

3 THEME 3: RELATIONSHIPS BETWEEN EDUCATION FOR SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE EDUCATION

3.1 CLIMATE CHANGE AS AN ELEMENT OF SUSTAINABILITY AND CLIMATE CHANGE EDUCATION AS AN ASPECT OF ESD

South-eastern Australia has been in the grip of a sustained and widespread drought for over a decade and this drought is perceived by many as an marker of climate change. Water restrictions have been a reality for many years and in much of Australia using a lawn sprinkler or washing a car using a hose are only distant memories and many feel that they will never return. This response in the general public's perception is seen through a shift by many home gardeners' (and public gardens) from 'keeping plants alive through the drought', to changing the plants in the gardens to low water use plants. That is, in Australia there is growing acceptance of, and adaptation to, new climate conditions by many in the general public. Thus, in Australia climate change is seen as a key issue in sustainability and because of this tight association in Australia between climate change and sustainability, climate change education is seen as a key aspect of ESD.

Possibly because of the assumption that climate change education is one aspect of ESD, there is not a well developed field of climate change education, and in the report *A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education* (Tilbury & Cooke, 2005) climate change education is not specifically referred to.

That climate change education is one aspect of ESD is demonstrated in where material about climate change education appears on government websites. For example, there is not an Education section of the website of the government's Department of Climate Change (http://www.climatechange.gov.au), while there are many references to climate change in the Sustainability Education section of the website of the Department of Environment & Heritage (http://www.environment.gov.au/education/index.html).

The strong link between ESD and climate change education, and climate change education being one aspect of ESD, is also indicated by the closing statement in the Forward of the document *Caring for Our Future - the Australian Government Strategy for the United Nations Decade of Education for Sustainable Development* (2007):

> *"As the world steps up the climate change battle, it has never been more important to ensure we have the knowledge, values and skills needed for a sustainable future."* (p1)

Yet, despite this placing climate change as a central challenge of sustainability, it is mentioned specifically only once in the body of the document. This does not mean that climate change is not seen as important, but rather it is seen as an aspect of sustainability, not separate from it. [It should perhaps be noted that the previous Australian government was not a signatory to the Kyoto Protocol, while the one of the first acts of the current government was to sign the Kyoto Protocol.] Climate change was not mentioned in the first National Action Plan *Environmental Education for a Sustainable Future* (2000), but is addressed numerous times in the most recent National Action Plan *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* (2009), which is the first major ESD document published by the more recent government.

4 THEME 4: ESD AND THE CURRICULUM

Including evaluation, assessment, success-criteria, and the question of the relationships between ESD and the (academic) disciplines.

4.1 REORIENTING THE SCHOOL CURRICULUM

In the early ESD document *Today Shapes Tomorrow: Environmental Education Sustainable Future - A Discussion Paper* (1999) Environmental Education is defined broadly to encompass:

- raising awareness;
- acquiring new perspectives, values, knowledge and skills; and
- formal and informal processes leading to changed behaviour in support of a sustainable environment.

The Principles of Environmental Education outlined in this paper were:

1. Environmental Education must involve everyone.
2. Environmental Education must be lifelong.
3. Environmental Education must be holistic and about connections.
4. Environmental Education must be practical.
5. Environmental Education must be in harmony with social and economic goals

A review of school education and Environmental Education (Tilbury, Coleman & Garlick, 2005) called for 'a fundamental shift in current practice' (p1). A whole school approach that incorporates all aspects of the school operation, curriculum, community) is the one that is the basis of the AuSSI initiatives that is now having increasing impacts across Australian schools.

The need for appropriately trained teachers and a whole school approach is stated in the 1999 discussion paper *Today Shapes Tomorrow: Environmental Education Sustainable Future*. It is pleasing to see that some of the challenges identified ten years ago, such as the rareness of a whole school approach, have been addressed through the AuSSI program (see 1.5.1 Australian Sustainable Schools Initiative) in the decade since then.

> "**School education**
>
> Environmental education is established in the school sector as a part of the curriculum in each State and Territory. In 1989 the then Australian Education Council adopted a series of Common and Agreed Goals for Schooling in Australia. Among these goals were: 'To develop in students … an understanding of, and concern, for balanced development and the global environment.' These goals were reflected in the development of a series of national curriculum statements and profiles of achievement in eight curriculum areas including Studies of Society and the Environment. Issues related to sustainability also appear in statements and profiles related to Science, Technology, Health and Physical Education and The Arts. These national statements and profiles now guide state based curriculum provision in many Australian schools. A wide range of field centres, extension programs and centres and environmentally focussed programs exist to support environmental education. Despite these initiatives, evidence suggests that the existence of education in, about and for the environment in schools is contingent on the presence of committed and sometimes isolated individuals and that whole school coordinated approaches are rare."
>
> *Today Shapes Tomorrow: Environmental Education Sustainable Future*
> A Discussion Paper. Section 3: Providers of Environmental Education in Australia
> Environment Australia, January 1999
>
> http://www.environment.gov.au/education/publications/discpaper/ack.html

The first National Action Plan *Environmental Education for a Sustainable Future* was published in 2000, and guided much Australian government ESD policy until the release of the second National Action Plan *Living Sustainably: The Australian Government's National Action Plan for Education for Sustainability* in 2009.

The principles espoused in the first National Action Plan are consistent with those espoused by UNESCO. In 2005 Peter Woods, Assistant Secretary - Knowledge Management and Education, Department of the Environment and Heritage, stated that:

> One of the aims of the National Action Plan has been to go beyond raising awareness and education about the environment, to focus on equipping people and organisations with the necessary values and skills to be able to take positive action to address a range of sustainability issues.

and that:

> all its [the *National Action Plan*'s] key initiatives have been implemented.

(from *An Australian Government Perspective on the United Nations Decade of Education for Sustainable Development*
Peter Woods, Address to the National Symposium on the DESD Melbourne, 7 July 2005
http://www.environment.gov.au/education/publications/undesd.html)

In this address, 5 years after the first National Action Plan was released, Woods outlined the major funding that had been spent on sustainability initiatives at that time, including AUD$2 Million for AuSSI, which was: 'already producing financial, social and educational, as well as environmental, benefits in the 600 schools in which it is currently operating' and the substantial work of ARIES in research in the field. In 2007 in the *Caring for our Future* document, the achievement of the first National Action Plan were also affirmed:

> "…Australia has been quick to recognise the role of education and learning in achieving sustainable development. It is one of the few countries to have already developed and implemented a national policy on environmental education, or 'education for sustainability' and 'education for sustainable development' (ESD) as it is increasingly known. The National Action Plan, *Environmental Education for a Sustainable Future*, was released in July 2000. All of the major structural initiatives of the plan are now in place, providing a firm foundation for further action. "

Caring for Our Future - the Australian Government Strategy for the United Nations Decade of Education for Sustainable Development (2007)
http://www.environment.gov.au/education/publications/pubs/caring.pdf

In the Key Findings document on environmental education and sustainability in Australian schools, Tilbury , Coleman & Garlick (2005) emphasised the need for not only new content in the curriculum, but also changes to teaching and learning practices, and the need to build capacity in all teachers:

> "**What needs to be done?**
>
> Increasingly it is being recognized that learning for sustainability is not simply an add-on, or cross-curricula theme, it requires a significant shift in current curriculum practice. Learning for sustainability is not solely about integrating new content into the curriculum, it is also about challenging teaching and learning approaches. This provokes the question of what capacity building is required to shift the integration of learning for sustainability, from the hands of a few dedicated enthusiasts, to being integrated across whole-school communities?"

Tilbury, Coleman & Garlick (2005) *A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education.* Canberra: Australian Government Department of the Environment, Water, Heritage and the Arts.

http://www.aries.mq.edu.au/project.htm#volume2

> A key element in the National Action Plan is a move from an emphasis on awareness raising to an emphasis on providing people with the knowledge, values and skills to actually make a difference to the protection and conservation of Australia's environment.
>
> p5 *National Action Plan Environmental Education for a Sustainable Future* (2000)

This quote from the document *Environmental Education for a Sustainable Future: National Action Plan* (2000) for sums up much of the thrust of ESD in Australia. The other key emphasis of this document includes mainstreaming EE/ESD. Not in this document, but emerging later, is the emphasis on a whole school approach to ESD.

4.1.1 Primary (K-6) *vs* Secondary Schools (Yrs 7-12) and ESD integration

In Australia ESD has both a discipline and interdisciplinary orientation, though it is reasonable to say that it is frequently more often taught within discipline areas in secondary schools. In the state of New South Wales (NSW) Environmental Education is mandated, but in other states it is incorporated into other discipline areas, such as Science, and Studies of Science & the Environment (SOSE). In the state of Victoria, sustainability is not a specific discipline area, but rather was deliberately spread across curriculum areas. This latter approach aspires that sustainability should be incorporated into all learning areas, but risks it being marginalised and not adequately addressed.

That ESD should be multidisciplinary and holistic is stated by Woods (2005), but this is not always a reality in schools. In primary schools (K-6) an integrated curriculum approach is often implemented. Primary schools children in Australia spend most of the teaching week with the same teacher (with the exception of classes such as music and physical education) and schools tend to be reasonably small (<1000 students, often many less) and have as single staffroom, so all teachers are together. In addition most primary teachers have Education as their major study at University, rather than a discipline area. This leads to teachers who are generally willing and able to work across discipline areas.

In Australian secondary schools interdisciplinary studies are less frequent, though it is seen in years 7-9 in some schools. Secondary teachers generally have a degree in a discipline area followed by education studies, leading to an affiliation to their specific discipline and staff rooms are often organised around discipline areas. Students in Australian secondary schools go from room to room and teacher to teacher as they move through their daily timetable. The strong discipline-base of secondary teachers, the timetabling issues in secondary schools, and the pressure applied from external examinations in Years 11 and 12 combine to impede interdisciplinary studies, and thus blocking effective interdisciplinary studies around ESD.

That multi- and interdisciplinarity is needed in ESD is stated in many places and aspired to, but the reality of ESD being addressed largely within curriculum areas, particularly at secondary schools, should be acknowledged. As stated earlier, ESD is more often addressed in a more interdisciplinary way in primary (K-6) schools than in secondary schools. In secondary schools ESD is more often seen in environmental education, science, or 'Studies of Science & the Environment' (SOSE) subjects.[1]

The importance of interdisciplinarity in higher education and research training institutions to educate professionals who can respond to the challenges of climate change was made clear in a submission by the Australian Commonwealth Scientific and Research Organization

[1] Observation suggests that this may be changing as sustainability as a critical issue is becoming higher in teachers' awareness. For example, in 2008 in a teacher education subject *Teaching for a Sustainable World*, at the University of Melbourne, the 50 prospective secondary teacher candidates who selected this elective subject came from a very wide range of subjects, with science teachers being underrepresented as compared to, for example, art and language teachers.

(CSIRO, the major scientific research body in Australia) to a Senate Inquiry in 2008 into 'the Effects of Climate Change on Training and Employment Needs'. CSIRO's submission on 'the ability of universities and other research and training institutions to meet current and future demand for climate change professionals' emphasised the need for interdisciplinarity to tackle research into sustainability issues.

> "Demand for current skills in particular disciplines will probably not change radically. However, the research emphasis and deployment of those analytical and engineering skills will continue to take new directions. An overarching message that emerges is of the importance of interdisciplinarity. The most effective people will be those who can deploy their skills across disciplinary boundaries in non-traditional ways, as well as those who can understand and analyse systems in the presence of uncertain risk. Not everyone needs to operate across disciplines, but Australia would significantly benefit by building a much stronger core of research professionals who can. The key problem in the domain of climate change is the shortage of people with the ability to focus disciplinary expertise on the science most likely to support mitigation and adaptation, and to embed these skills in the decision making, policy and social processes necessary to induce action."

CSIRO's submission can be found at http://www.aph.gov.au/Senate/committee/eet_ctte/employ_climate/submissions/sub09.pdf

4.1.2 Outcomes for students of ESD

A goal of ESD in Australia is to develop informed and involved citizens who can actively participate in decision-making and actions for sustainable development. A stated goal is 'active participatory involvement of citizens of all ages for harmony within Australia's social and cultural diversity' (p16, *Initiating the United Nations Decade of Education for Sustainable Development in Australia*, 2005).

This was reinforced in 2007 in *The Future of Schooling in Australia* (Council for the Australian Federation, 2007) a report from the Council for the Australian Federation that was prepared by Steering Committee comprising the senior official from each of the State and Territory education departments, a representative from the senior officials of State and Territory Premiers' and Chief Ministers' departments, and a representative from the Australasian Curriculum Assessment Certification Authorities. In this report, which was endorsed by all states & territories, one of the new challenges for education was the critical role of education in understanding and addressing emerging environmental problems (p16). One of the attributes that is seen as critical when students leave school (year 12) is that they "have an understanding of, and concern for, stewardship of the natural environment, and the knowledge and skills to contribute to ecologically sustainable development" (p27).

This is not to say that the future role of students as part of the economic system is ignored, another goal is for students to "have employment-related skills and an understanding of the work environment, career options and pathways as a foundation for, and positive attitudes towards, vocational education and training, further education, employment and life-long learning".

4.1.3 ESD in the curriculum

ESD in Australia aspires to develop students who have both knowledge and values, and who are empowered to be active citizens. This requires both a development of content knowledge, developing values that support sustainability, and developing critical thinking skills to tackle complex and novel problems. In addition, students need to recognize that they can 'make a difference' so that they are empowered to be active citizens and participate in their community to contribute to efforts towards sustainability.

In *Caring for our Future: The Australian Government Strategy for the United Nations Decade of Education for Sustainable Development, 2005–2014* (2007) this aspiration of a

well-informed community that has the values and skills to address sustainability issues (p4) is described:

> 'At the end of the Decade, the Australian community will have the understanding, knowledge, skills and capacity to contribute to sustainable development and will embrace the intrinsic value of sustainability as a national aspiration. Our ultimate vision is a sustainable Australia.'

This broad approach to ESD is also underlined by the learning objectives outlined in *Educating for a Sustainable Future: A National Environmental Education Statement for Australian Schools* (2006), which are presented in three sections: Knowledge & Understandings, Skills & Capabilities, and Attitudes and Values, as quoted below.

> **Knowledge and understandings**
> This includes an understanding of:
> • the nature and function of ecological, social, economic and political systems and how they are interrelated;
> • the natural and cultural values intrinsic to the environment;
> • the impact of people on environments and how the environment shapes human activities, with particular reference to unique and distinctive Australian heritage traditions and settings;
> • the ways different cultures view the importance of sacredness in the environment;
> • the role of cultural, socioeconomic and political systems in environmental decision making;
> • the principles of ecologically sustainable development;
> • the responsibilities and benefits of environmental citizenship, including the conservation and protection of environmental values;
> • the importance of respecting and conserving indigenous knowledge and cultural heritage; &
> • how knowledge is uncertain and may change over time, and why we, therefore, need to exercise caution in all our interactions with the environment.
> **Skills and capabilities**
> The ability to engage in:
> • explorations of the many dimensions of the environment using all of their senses;
> • observations and recording of information, ideas and feelings about the environment;
> • identification and assessment of environmental issues;
> • critical and creative thinking about environmental challenges and opportunities;
> • consideration and prediction of the consequences (social, cultural, economic and ecological) of possible courses of action;
> • oral, written and graphic communication of environmental issues and solutions to others;
> • cooperation and negotiation to resolve conflicts that arise over environmental issues; &
> • individual and collective action to support desirable outcomes.
> **Attitudes and values**
> These are reflected in an appreciation and commitment to:
> • respecting and caring for life in all its diversity;
> • conserving and managing resources in ways that are fair to present and future generations;
> • building democratic societies that are just, sustainable, participatory and peaceful; and
> • understanding and conserving cultural heritage.

From *Educating for a Sustainable Future: A National Environmental Education Statement for Australian School*s (2006)
http://www.environment.gov.au/education/publications/pubs/sustainable-future.pdf

The main ESD initiative in Australian schools AuSSI takes a 'global-through-local' approach. That is, the school tackles sustainability issues through, for example, its operations and governance. This enables curriculum connections to be made for students as they are participating in sustainability activities in their daily life. These local initiatives can then be connected to global issues and global efforts towards sustainability. AuSSI facilitates a

holistic approach to sustainability and all aspects of the school, not just the curriculum, are included. This enables students to routinely see and take part in a community effort working toward sustainability — not just learn about it in lessons. This modelling and participation in sustainability efforts by students and the wider community is a deliberate and strategic aspect of the AuSSI initiative.

> 'Effective environmental education for sustainability is more than just a curriculum issue. The commitment to be an AuSSI school is spread throughout all aspects of the school's operations including:
> - Teaching and learning
> - Resource and school grounds management
> - Conserving biodiversity
> - Governance
> - Networks and partnerships'

From *Key Elements of AuSSI in Schools*
http://www.environment.gov.au/education/aussi/key-elements.html

The report *Development of a National Approach to Monitoring, Assessment and Reporting on the Decade of Education for Sustainable Development Stage 1: Identification of National Indicators* (ARIES, 2007) brings together what is happening in this field in a number of regions/nations. In 2005 in looking at Australia, it was acknowledged in the *Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium* (2005) that monitoring and evaluation of ESD is challenging (pp23-24). They propose that indicators selected for evaluation should distinguish between Outputs; Outcomes; and Impacts, as outlined below.

> • **Outputs** are the material products of an activity or programme. They normally do not have value in and of themselves but rather as tools for, or contributions to, the achievement of outcomes and impacts.
>
> • **Outcomes** are the achievements or changes brought about by an activity or programme that, although potentially short-term, provide knowledge, values and skills, as well as a supportive context, for longer-term cumulative effects or impacts.
>
> • **Impacts** are the longer-term cumulative effects of an activity or programme and embody lasting changes. These include both (i) positive personal and group changes in the ways in which people think and their life and work practices, and (ii) improvements in the sustainability status of an area or resource.

p23, *Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium* (2005)

This report proposed 'Appropriate outcomes and impacts for the objectives of the DESD in Australia' (p24) as possibly including:

Objective	**Outcome**	**Impact**
To clarify a common vision for ESD and DESD in Australia.	An agreed conception of the nature, scope and purposes of ESD across stakeholder groups.	Increasing integration of ESD into education and sustainable development activities across all sectors.
2. To promote understanding of ESD and DESD in Australia.	The Australian community has an increased level of understanding of ESD and DESD across the DESD.	ESD is taken into account by policy developers in education and sustainable development planning at all levels.
3. To promote innovative practice in ESD in formal, non-formal and informal learning situations.	ESD and DESD activities reflect learner-centred and participatory approaches. Curricula reflect the scope of learning required for ESD eg systems thinking.	Rising levels of personal, corporate and community, support of sustainability, and principles in daily activities.
4. To support educators to achieve the competence and	An increasing level of ability among Australian educators	Rising understanding of, and commitment to, sustainability

will to include sustainability learning as a central theme.	and sustainable development practitioners to include sustainability strategies in their learning activities and institutions.	across the community.
5. To ensure that dynamic and creative resources and materials for ESD are available to, and accessible by, learners in all education sectors and levels.	Learners in all education sectors and levels have access to an increasing level of dynamic and creative resources and materials for ESD.	Educators at all levels and all sectors are using a range of resources and materials for ESD that inspire understanding of, and commitment to, sustainability across the community.
6. To promote monitoring, evaluation and research on ESD and DESD activities.	All DESD activities are reported to appropriate bodies and evaluation strategies in place and understood by practitioners	Feedback and evaluation cycles inform planning to enhance ESD policies, programmes and activities.
7. To strengthen partnerships for ESD at all levels across state/territory borders.	An increasing level of partnerships for ESD at all levels across state/territory borders.	Reduced levels of duplication of activities and increased levels of collaborative activities across state/territory borders.
8. To encourage Australian participation in international DESD activities, especially in Asia and the Pacific.	An increasing level of Australian participation in international DESD activities, especially in Asia and the Pacific.	Australia recognised regionally and internationally as a learning partner in ESD.

p24 *Initiating the United Nations Decade of Education for Sustainable Development in Australia: Report of a National Symposium* (2005)

4.2 RESEARCH

There appears to be limited research on the impacts of ESD initiatives, impact being defined as 'the longer-term cumulative effects of an activity or programme and embody lasting changes'. Such studies would need to be longitudinal and complex, and separating out the influences of specific initiatives at school would be difficult. That said, though, a strong emphasis has been on not what is taught, but also *how* it is taught. That is, that teaching & learning strategies need to be reviewed, not just content changed. In addition a strong emphasis has been on a whole-school approach.

What is Needed

Increasingly it is being recognised that learning *for* sustainability is not simply an add-on, or cross-curricula theme, it requires a significant shift in current curriculum practice. Learning *for* sustainability is not solely about integrating new content into the curriculum, it is also about challenging teaching and learning approaches. This provokes the question of what capacity building is required to shift the integration of learning *for* sustainability, from the hands of a few dedicated enthusiasts, to being integrated across *whole-school communities?* Schools, educators and policy makers need to understand best practice in learning *for* sustainability. This will allow us to evaluate the effectiveness of existing programs and our progress towards long-lasting change for sustainability. This knowledge could also be used in the design and delivery of future innovative Environmental Education programs for the sector.

A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education - Key Findings (ARIES 2005)

Much has been written about what should be covered in ESD in schools , but an in depth review of what *is* being covered is not evident. A brief summary of state-by-state EE Policy & Guidelines can be found on p4 of *A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education* (ARIES 2005).

The shift from *about* to *for* sustainability has been underpinned by educational research. Educational research in this area by ARIES was commissioned by a department of the federal government, and so findings have informed policy development.

5 THEME 5: ESD & PEDAGOGICAL TRADITIONS AND DEVELOPMENT TENDENCIES

ESD and school development; ESD and what happens in the classroom; ESD and teaching methodologies.

5.1 POLICY

This is also discussed in the previous section.

The concept of transformative learning is linked to ESD and understanding, action and empowerment are valued. ESD has brought with it an increased focus on interdisciplinary teaching and an increased focus on problem solving and informed and responsible decision-making.

In primary schooling (K-6) implementing interdisciplinary teaching and learning tends to be unproblematic as the children generally have a single class teacher, but secondary schools (years 7-12) generally teach within discipline areas, with a different teacher, and, often, classroom, for each subject. This tends to make it more difficult for interdisciplinary teaching in secondary schools, though, more is occurring, in particular in the earlier years of secondary schooling, as these years are seen as more flexible than the later years of secondary schooling when there is a strong focus on state-wide examinations.

> "ESD demands a different skill set of teachers – skills associated with the desire to nurture critical thinking, experiential learning, ethical and active citizenship, self-directed learning and student empowerment. In other words, to be effective, teaching and learning pedagogies must be 'congruent with the principles and processes of learning for sustainability'. In this regard, ARIES research indicates that interdisciplinarity poses one of the greatest difficulties for educators:
>
> *This is no doubt because very strong disciplinary boundaries exist and are reinforced through the structure of many pre-service teacher education institutions. Not only do embedded boundaries exist around disciplinary content, disciplines also have quite different approaches to knowledge and processes of inquiry. These 'silos' of knowledge make it very difficult for meaningful engagement to easily occur across and between disciplines."*
>
> p6
>
> SEDA (2007) *Policy, Research and Partnerships for ESD in Australia.* York University Canada.

There is a strong focus on both developing an understanding of issues and on developing the capabilities of problem-solving, decision-making and the like, so that students can understand the issues and be empowered to participate as informed and active community members.

Connection with the local community is an aspect of the Australian Sustainable Schools Initiative (AuSSI) and one of the Guiding Principles of AuSSI is 'to encourage the involvement of a school's local community and encourages a shift in the broader community towards more sustainable practices and processes' (http://www.environment.gov.au/education/aussi/about.html). The schools are hoped to become models for sustainability for the local community and family members of school children have been influenced by AuSSI .

In the latest (April 2009) National Action Plan (*Living Sustainably: the Australian Government's National Action Plan for Education for Sustainability*, 2009) the role of the community in sustainability is recognised as crucially important. One of the four strategies of the new action plan is 'Harnessing community spirit to act'. This strategy includes collaboration with the providers of education for sustainability (not just schools) to help improve community and practitioners' access to knowledge and tools.

5.2 ESD RESEARCH INFLUENCING CLASSROOM PRACTICES

Educational research in Australia does not appear to have contributed to creating methodological innovations in teaching and learning, but it has, however, brought some educational approaches to the fore and increased the uptake of these educational approaches. For example, problem solving, critical thinking and decision making are important aspects of both ESD and problem based learning (PBL). That is, the problem based learning approach to learning helps develop attributes and skills in students that are desired outcomes of ESD and so PBL is a suitable educational approach as part of ESD. Although PBL as a teaching and learning approach is not mentioned explicitly in ESD documentation, it fits well with much of what is advocated for ESD as transformational.

Most of research in ESD appears to be focused in ARIES, as this is where major funding has been directed. However, much good work has been done in other universities. ARIES' research has largely been documenting successes and practices rather than developing innovative approaches to teaching and learning.

As part of the UN Decade of ESD the Australian Government has been working with the Japanese to develop a model ESD strategy for use by other countries. The results of this do not appear to have been made public at this stage.

> "The Australian Government is involved internationally with the UN Decade of Education for Sustainable Development. In addition to UNESCO, current initiatives with other countries include a collaborative research project with the Japanese Institute for Global Environment Strategies looking at the Australian experience in education for sustainable development, as well as examining the possibility of developing a model ESD strategy for use by other countries in the Asia Pacific. Possible future work may involve Indonesia and the South Pacific Regional Environment Programme."
>
> p3
>
> *An Australian Government Perspective on the United Nations Decade of Education for Sustainable Development*.
> http://www.environment.gov.au/education/publications/undesd.html

Much of the work in Australia has documented what has been done or is being done in the area of ESD, rather than investigating the effectiveness, in terms of changed behaviours or attitudes of participants, of the programmes described. This is not a situation unique to Australia, in *A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education* the findings of a UK study "Learners and Learning in Environmental Education: A Critical Review of the Evidence" was summarised (see quote below), concluding that "there have been many more studies focussed on investigating the characteristics of school students than there have been exploring the process or outcomes of environmental learning."

> **Learners and Learning in Environmental Education: A Critical Review of the Evidence**
>
> The National Foundation for Educational Research in the United Kingdom undertook a review of over 100 journal articles, books and reports from around the world (dated between 1993 – 1999) that related to EE in schools. The review aimed to:
>
> • chart the nature of current evidence on learners and learnings in EE;
>
> • identify key messages emerging from this evidence base and assess limitations of these in terms of empirical underpinnings; and
>
> • raise questions about the nature, quality and accessibility of recent EE research and suggest priorities for future work.
>
> Major findings of the review included:
>
> • **Learners' environmental knowledge:** is generally low; understanding of environmental issues is more limited than their factual knowledge; environmental

knowledge is science-based and understanding of the complexities of environmental issues is more limited than factual knowledge about the environment.

• **Learners' environmental attitudes and behaviours:** views of the future amongst students reveal varying concerns and considerable pessimism; attitudes, behaviours and concerns appear to be affected by certain factors (eg. gender and socio-economic factors); scientific teachings about the environment can be disempowering.

• **Learners' environmental learning outcomes:** education can change learners' environmental knowledge, attitudes and actions; certain aspects of programs appear to facilitate positive outcomes. However, little is known about how and why programs are able to bring about certain kinds of learning outcomes.

• **Emerging evidence on learners' perceptions of nature, experiences of learning and influences on adults:** perceptions of nature vary and are influenced by a range of factors; action oriented programs are praised rather than specific content issue programs, which lack a practical element; students experience learning situations in active and individual ways and their views can conflict with their teachers'; students can influence the behaviour of their parents but this does not happen automatically.

These findings led Mark Rickinson to conclude that there have been many more studies focussed on investigating the characteristics of school students than there have been exploring the process or outcomes of environmental learning.

Possible work on future focus areas:

1. building upon the research and seeking to understand learning and the role learners play within this process;

2. more reviews in EE which approach the field as an evidence base and focus on the nature and quality of the empirical evidence; and

3. need for the development of user reviews focussing on specific issues of relevance to particular groups or users."

From p6

A National Review of Environmental Education and its Contribution to Sustainability in Australia: School Education

citing Rickinson, M. (2001) 'Learners and learning in environmental education: A critical review of the evidence', *Environmental Education Research*, 7 (3): 207 - 320.

6 CONCLUDING REMARKS

Australia has a relatively long history of engagement with what is now termed education for sustainability (EfS), dating to the 1970s as 'environmental education'. It is only recently that the terminology has shifted to EfS, and the term 'environmental education' is still a used and respected term, and the shift to include aspects of sustainability beyond environmental sustainability has crept in over recent years, but for most Australians 'environmental sustainability' and 'sustainability' would be seen as interchangeable terms.

Australia's first National Action Plan was released in 2000 (*Environmental Education for a Sustainable Future: National Action Plan*, 2000) and the current one (*Living Sustainably The Australian Government's National Action Plan for Education for Sustainability*) was released in April 2009. The change in terminology over this decade is evident in both the title and the content of the action plans. There has been a shift in focus from largely on school education in 2000 to a much broader focus of school, community and all aspects of education by 2009.

Although there have been national approaches and strategies around ESD for over a decade, due to state-based education there is not a single approach to ESD in Australia. However, over the past decade much progress has been made toward a national curriculum and progress is very encouraging, with a national curriculum planned to be introduced in 2011 for the four key subject areas of English, History, Maths, Science (see http://www.ncb.org.au/).

The major response to ESD in Australian schools is the Australian Sustainable Schools Initiative (AuSSI) which is a national program that is a whole of school approach to sustainability. AuSSi has much to recommend it as a model for others, as it encompasses sustainability in school operations, governance, curriculum, approaches to learning, and community involvement.

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The International Alliance
of Leading Education Institutes

Report from Brazil

Climate Change and Sustainable Development:
The Response from Education

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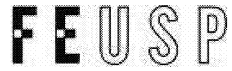

EDUCATION AND CLIMATE CHANGE IN BRAZIL

Report for the *IALEI Project* –
Climate Change and Sustainable Development:
The Response from Education in Brazil

Research Contribution by:

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Introduction

The Laboratory of Education and Environment[1] – TEIA-USP – located in the School of Education of the University of the State of São Paulo (FEUSP), was invited to carry out a survey on the state of the art of Education and Climate Change across the Brazilian territory. The final report will be included in the *IALEI Project.* The research group was coordinated by Prof. Pedro Roberto Jacobi[2] who developed this paper with Luciana Ferreira da Silva[3], Samia Nascimento Sulaiman[4], Tiago Nepomuceno[5] and Lesly Ratinho[6].

The present document aims to provide a preliminary mapping of policies, proposals, projects and activities related to education, sustainability and climate change in Brazil. Thus, its main goal is only to perform a compilation of existing information based on records and citations found in the researched sources. Therefore, the report reproduces data and information provided by these sources with no attempt to offer further analysis and problematization.

In order to fulfill this goal, the years 2003-2009 were considered as a strategic period for the data compilation process. This period is of great importance to Educational Policies concerning the environment due to the articulation between the Ministry of Education (MEC) and the Ministry of the Environment (MMA), through the Management Agency (MA) of the National Program for Environmental Education (PRONEA).

The recurrent terminology in the country that links education with sustainability and environmental issues, as proposed by the *IALEI Project*, is that of *Environmental Education.*

For the full understanding of the context of Brazilian Environmental Education public policies, in their commitment to Sustainability and Climate Change issues, there was a common agreement toward adopting procedures for recording and describing important aspects and documents that, either implicitly or explicitly, dwell on the theme. Especially with regard to the understanding of the types of actions employed for the target group suggested by the *IALEI Project*, that is, children and youngsters aged 6-14 years.

The elaboration of the present report was based on data provided by official documents, laws, policies, plans and projects with visibility, importance and substantial influence on actions of Environmental Education, as well as on

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[1] TEIA-USP is a space for interdisciplinary articulation among students, graduate researchers and faculty members of the University of the State of São Paulo, more specifically of the School of Education (FEUSP), Institute of Geosciences (IGC) and School of Arts, Sciences and Humanities (EACH). A full list of their activities is available on the site <www.teia.fe.usp.br>.

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information published on sites and in documents from institutions engaged in the Climate Change debate.

In an attempt to systematize the compiled information, this document is divided into the following topics:

1) Brazil: sociocultural and environmental diversity;
2) Education and Teaching Organization in Brazil;
3) Brazilian Environmental Education;
4) Sustainable Development and Brazil's Agenda 21;
5) Climate Change and Environmental Education in Brazil.

1. Brazil: sociocultural and environmental diversity

Prior to discussing Education and Climate Change, this section is presented to provide some information on the complexity, diversity and regional inequalities which characterize the Brazilian reality and that, ultimately, influence educational practices and politicies.

Brazil is a vast, densely populated country, permeated by significant particularities as illustrated in the chart below:

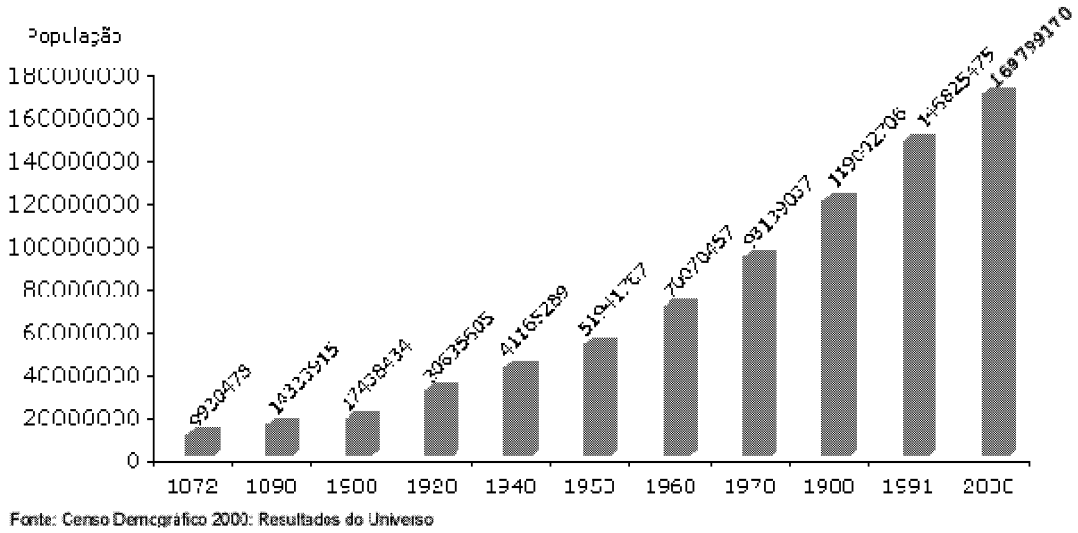
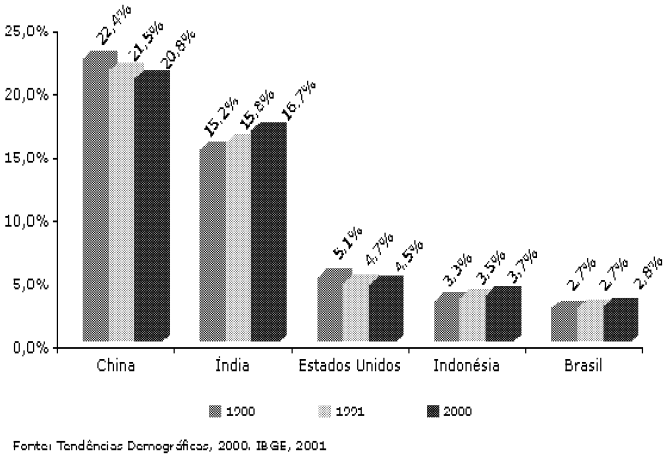


Chart 1. Total population of Brazil re-censused between the years 1872-2000.
***** Population**
Source: 2000 Demographic Census: universal findings

From the time of the first census in 1872 until the year 2000, the Brazilian population increased about 10 times. In 2007, the population reached the mark of 183,987,291 inhabitants, which means that our country had an annual population growth of 1.21% over the past 8 years (IBGE, 2007). As can be observed, according to data from the beginning of the 2000's, Brazil is the fifth most populous country in the world.



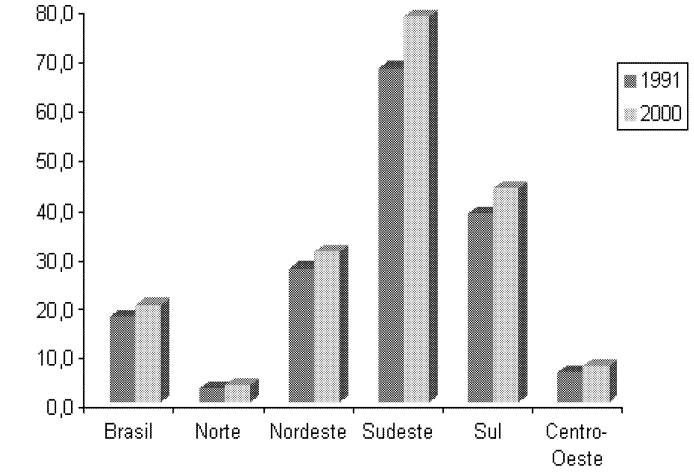
Fonte: Tendências Demográficas, 2000. IBGE, 2001

Chart 2. Demographic growth of the 5 most populous countries (%), 1980-2000.
Source: Demographic Tendencies, 2000. IBGE, 2001

This population densification, however, is not homogeneous once the 5 regions comprising the national territory are analyzed: North, Northeast, Mid-West, Southeast and South.

Figure 1. Organization of the Brazilian territory in five regions.
North – Northeast – Mid-West – Southeast – South

Populational data reveal, from a quantitative perspective, a great variety of demographic indicators as well as regional inequalities.



Fonte: IBGE, Censo Demográfico 2000, Resultados do Universo.

Chart 3. Demographic density of Brazil and its 5 regions (%), 1991/2000.
Brazil – North – Northeast – Southeast – South – Mid-West
Source: 2000 Demographic Census: universal findings.

However, once cultural and ethnic differences (for instance, indigenous and *quilombolas*[7]) are associated to social and economic inequalities, a singular and complex context is formed mainly due to the fact that this diversity is linked to needs for interaction with diverse forms, which is denominated "sustainability".

Variety is also a primordial characteristic in the environment. Brazil, despite the historical and continuous environmental degradation, still displays extensive and unmatched biodiversity, which is regarded as one of the richest on the planet. The country has the largest freshwater reserves and one third of the remaining tropical rainforests. It is estimated that one in 10 existing plant and animal species can be found in this country (WWF- Brazil, 2009). The main Brazilian biomes: the Amazon Rainforest, the *Caatinga* (arid scrublands), the subtropical grasslands of *Campos Sulinos*, the *Cerrado* (tropical savanna), the Atlantic Rainforest, *Pantanal* (floodplain, wetlands in Brazil's Mid-West) and the Coastal Zone. Such biomes have been gradually suffering increasing degradation and reduction.

[7] ***Indian*** is any recognized member of an indigenous community. ***Indigenous Community*** stands for all communities, founded either by blood relationship or members' closeness, that share historic cultural ties with Pre-Columbian indigenous social organizations. According to data estimates from the Instituto Socioambiental (ISA), the current indigenous population in Brazil is 600 thousand individuals in addition to isolated Indians. See: http://pib.socioambiental.org/pt. The word "*quilombo*" originated from the terms "*kilombo*" (Quimbundo) or "*ochilombo*" (Umbundo) and is also present in other languages. Remaining *quilombo* or *quilombolas* communities are social groups that currently exist in significant number with distinguishing ethnic identity from the rest of society. See the Pro-Indian Commission site: http://www.cpisp.org.br/

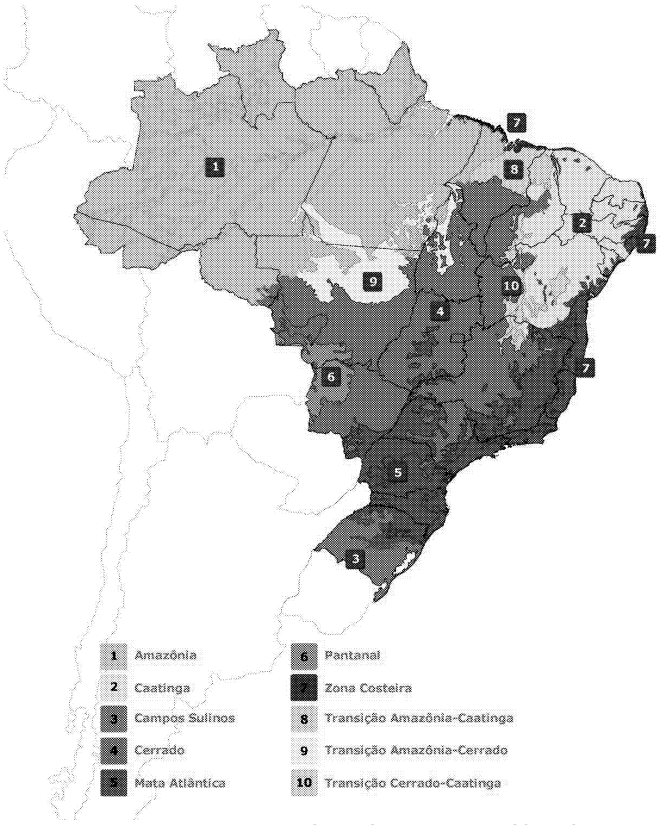


Figure 2. The ten Brazilian biomes
Source: WWF Brazil

***** 1. Amazon Rainforest, 2. Caatinga, 3. Campos Sulinos, 4. Cerrado, 5. Atlantic Rainforest, 6. Pantanal, 7. Coastal Zone, 8. Amazon Rainforest-Caatinga Transition, 9. Amazon Rainforest-Cerrado Transition, 10. Cerrado-Caatinga Transition.**

In relation to the urbanization process, there is a clear distinction between what happened in Brazil and in Europe from the 20th century on. In Europe, urbanization was triggered by the industrial revolution. In Brazil, the urbanization process only started in the 20th century and very swiftly. This was mostly due to internal and external migrations related to the job market.

Rapid urban growth is observed since 1920, when the urbanization rate was 6%. In 1940, the urbanization rate was 31%, in 1960 it went up to 45% and in 2005 it had already reached 85%, clearly indicating the overpopulation of territories.

On a regional scale, in the 1990's, the Southeast was already 88% urbanized, the Mid-West 81%, the South 74.1%, the Northeast 60.6% and the North 57.8%. Over the period of 60 years urban settlements were expanded in such a way as to shelter more than 125 million people. As we consider only the last decade of the 20th century, Brazilian cities had an increase of 22,718,968 inhabitants. This means more than half the population of Canada or one third of France's population. As can be noted from the data below, urban population is predominant in the country:

Table 1. Urbanization rates in all 5 Brazilian regions (%), 1950- 2000.

Region	1950	1970	2000
Southeast	44.5	72.7	90.5
Mid-West	24.4	48	86.7
South	29.5	44.3	80.9
North	31.5	45.1	69.9
Northeast	26.4	41.8	69.1
Brazil	**36.2**	**55.9**	**81.2**
Estatísticas históricas do Brasil: séries econômicas, demográficas e sociais de 1550 a 1998. 2ª Ed. Rio de Janeiro: IBGE, 1990, p. 36-7; Anuário estatístico do Brasil 2001. Rio de Janeiro: IBGE, 2000. p. 2-14 e 2-15.			

Table 2. Brazilian population in urban and rural areas (%), 2000.

Urban	Rural
81%	19%
Source: 2000 Demographic Census – Universal findings – IBGE	

In 1970, more than half of the urban population already lived in cities with more than a hundred thousand inhabitants, and one third, in cities with more than five hundred thousand people. In 2000, around 60% of the urban population lived in cities with more than one hundred thousand inhabitants, thus indicating that urbanization and population concentration in large cities were simultaneously processed in Brazil.

Table 3. Urban population distribution relative to the size of cities (%) and total urban population (absolute numbers), 1970-2000.

City Size	1970	1980	1991	2000
< 20,000 inhabitants	26.92	21.35	19.34	18.81
20,000 – 50,000	12.04	11.40	12.44	11.49
50,000 – 100,000	7.80	10.50	10.23	10.57
100,000 – 500,000	19.59	21.92	24.43	26.12
500,000 and more	33.65	34.83	33.56	33.01
Total urban population	52,097,271	80,436,409	110,990,990	137,953,959
Source: IBGE, 1970, 1980, 1991 and 2000 Demographic Censuses				

From the 1970's to the year 2000, concentration in metropolitan clusters intensified. Early in 1970, almost half of the Brazilian urban population lived in the metropolitan clusters listed below. As to the total population of the country, from 1980 on, approximately one third lived in those clusters. This indicates the migratory tendency from capitals to metropolitan peripheries.

Table 4. Total population in metropolitan clusters, 1970-2000.

Metropolitan clusters	1970	1980	1991	2000
Belém	669,768	1,021,486	1,401,305	1,795,536
Fortaleza	1,070,114	1,627,042	2,339,538	2,910,490
Recife	1,755,083	2,347,005	2,874,555	3,278,284
Salvador	1,135,818	1,752,839	2,474,385	2,991,822
Belo Horizonte	1,619,792	2,570,281	3,385,386	4,177,801
Rio de Janeiro	6,879,183	8,758,420	9,796,649	10,869,255
São Paulo	8,113,873	12,552,203	15,395,780	17,813,234
Campinas	644,490	1,221,104	1,778,821	2,219,611

Curitiba	809,305	1,427,782	1,984,349	2,635,436
Porto Alegre	1,590,798	2,307,586	3,029,073	3,498,322
Goiânia	424,588	807,626	1,204,565	1,609,335
Brasília	625,916	1,357,171	1,980,432	2,756,701
Total cluster (1)	25,338,728	37,750,545	47,644,838	56,555,827
Brazil's population (2)	93,134,846	119,002,706	146,825,475	169,799,170
(1) / (2)	27.21	31.72	32.45	33.31
Urban population (3)	52,097,271	80,436,409	110,990,990	137,953,959
(1) / (3)	48.64	46.93	42.93	41.00
Source: IBGE, 1970, 1980, 1991 and 2000 Demographic Censuses				

Other crucial aspects are social inequality and poverty. It is in this context that educational public policies take on a guiding role, in an attempt to control and standardize pedagogical practices, respecting and interacting with the existing diversity in the country.

Table 5. Poor population in metropolitan areas (%), 2000/2007.

Metropolitan area	2000	2007	Variation
Belém	32.49	33.63	0.5%
Belo Horizonte	19.61	20.52	0.6%
Curitiba	14.89	12.63	-2.3%
Fortaleza	38.12	40.69	0.9%
Porto Alegre	14.16	16.45	2.2%
Recife	35.59	40.66	1.9%
Rio de Janeiro	17.71	16.85	-0.7%
Salvador	32.34	33.19	0.4%
São Paulo	14.25	15.43	1.1%
Set of metropolitan areas	20.02	21.01	4.9%
Source: IBGE: PNAD 2007 and 1991/2000 Demographic Censuses – Atlas of Human Development in Brazil ** Individuals with average monthly family income per capita inferior to ½ minimum wage*			

As far as Environmental Education is concerned – the object of analysis of this report – due to the Brazilian social, economic, cultural and political context, the environmental concern is associated, in most practices and academic research, to social engagement, aiming at a more fair and egalitarian society as well as education for sutainability and citizenship.

The notion that Environmental Education is not separated from debates on social issues is one of the important recurring themes in the literature, congresses and pedagogical actions. The plurality of Environmental Education in Brazil is in the core of this debate, with lines of thoughts and actions interacting differently while probing into this theme.

In debates on Climate Change, social and economic issues have increasingly become the object of concern for further studies. This resulted in the creation, in the field of research and analysis, of the Climate Change Brazilian Forum of the Task Group "Climate Change, Poverty and Inequality", in March 2009. Their seminal cooperation was established in relation to the following line of research: "*Climate Change, Social Inequalities and Vulnerable Populations in Brazil: Building Capacities*"[8].

[8] This research is a partnership between COEP/IVIG, IPEA (Institute of Economics and Applied Research) and CERESAN/UFRRJ (Reference Center for Food and Nutritional Safetyl / Federal Rural University of Rio de Janeiro). See http://www.forumclima.org.br/default.asp?id=229

On one hand, it is unquestionable that Brazil has a significant environmental history with engaged individuals who conduct research and participate in debates on a series of environmental issues. On the other hand, it is noticeable that the theme Climate Change gained more visibility after the impact caused by the publication of reports by the Intergovernmental Panel on Climate Change (IPCC) in the early 2000's. And, more significantly, after the IPCC was awarded the Nobel Peace Prize in 2007 and gained worldwide recognition. In this context, educational policies that associate Environmental Education to Climate Change, despite being currently diffuse and incipient, are still promising.

2. Education and Teaching Organization in Brazil

In order to describe the teaching organization in Brazil, its levels and modalities, emphasis will be given to the articles of laws that paved its foundation, that is, the 1988 Federal Constitution and the 1996 Law of Basic Tenets and Guidelines of National Education (LDB). The Federal Constitution introduced a series of changes in the denominations previously employed to designate educational levels. Such changes resulted in a new structuralization of teaching described in the 1996 Law of Tenets and Guidelines (LDB).

2.1 The 1988 Federal Constitution and Education in Brazil

The 1988 Constitution of the Federative Republic of Brazil established, in Chapter II of Article 6, that education is a social right: *"Social rights comprise education, health, work, leisure, safety, social security, protection to maternity and childhood, assistance to the needy, in the form of this Constitution"* (BRAZIL, 1988).

Education is conceived as a necessary condition to benefit other constitutive rights of the statute of citizenship. This right is once again described in the law under Title VIII – Chapter III – Section I**,** Article 205 - *"Education, a right for all and a duty of the State and the family, will be promoted and encouraged with the colaboration of society, aiming at the full development of the individual, his capacitation to exercise citizenship and his qualification for the job market"* (BRAZIL, 1988). This article reasserts the responsibility of the State to educate, an attribution already described in the former 1969 Constitution. In Article 206, the basic principles of education in the country are listed: equality of conditions to have access and to remain in school; freedom to learn, to teach, to do research and publish; pluralism of ideas and of pedagogical conceptions; coexistence of public and private teaching institutions; free public education in official establishments; appreciation toward teaching professionals; democratic administration of public schooling; guarantee of quality standards. There is an article extension as far as public and free schooling is concerned in official institutions that provides access to all levels. It also includes the right for education among the physically impaired, daycare, regular evening courses and student aid, providing for school material, transportation, meals and health care. The obligation of the State toward schooling remains the same for those who do not enroll at the regular age. The

expression used in the 1988 Constitution is that of “teaching systems” that permeate the various administrative spheres: the Union, states, the Federal District (nation’s capital) and municipalities. The term “teaching systems” refers to the need for action in the articulation of policies offered in school institutions.

According to Article 211, it is the obligation of the Union to organize the federal teaching system as well as that of the territories, to finance federal teaching institutions and to perform the redistributive function to guarantee equality of access, opportunity and quality. It is worth stressing that, due to the directives of the 1988 Federal Constitution, the Statute of the Child and Adolescent (ECA) – Law nº 8069, of July 13, 1990, was passed. This statute regulates the rights of children and adolescents by internalizing a series of international normatives such as the Declaration of the Rights of the Child (United Nations Resolution 1386 of 20 November 1959); United Nations Standard Minimum Rules for the Administration of Juvenile Justice, the Beijing Rules (United Nations Resolution 40/33 of 29 November 1985); the United Nations Guidelines for the Prevention of Juvenile Delinquency. Therefore, by means of the statute, children and adolescents are regarded as having their own individual rights.

The 1988 Constitution promoted the following advances in education in Brazil:

a) Free education for all levels;
b) Guarantee of right of access to those who do not enroll at the regular age;
c) Prospective compulsory Middle-school education, substituted by its universalization with the Constitutional Amendment 14;
d) Special assistance to the physically impaired;
e) Access to daycare and pre-school for children aged 0-6 years;
f) Provision for regular evening courses;
g) Provision for supplementary school material programs;
h) Priority assistance to children and adolescents.

2.2 The 1996 Law of Basic Tenets and Guidelines of National Education (LDB)

The 1996 Law of Basic Tenets and Guidelines (LDB) – Law nº 9394 – is the organic and general law of the Brazilian education. As predicted by the terminology, it establishes tenets and guidelines for the organization of the educational system. The law was passed in fulfillment to constitutional principles and resulted from a long formal process initiated in 1988, the same year the Constitution of the Federative Republic of Brazil was promulgated. The procedural process in the National Congress lasted eight years and in December 1996 it was finally sanctioned and promulgated.

According to Article 1° of LDB *“Education encompasses the formative processes developed in family life, by social contact, in the job market, in teaching and research institutions, in social movements, in organizations of civil society and in cultural manifestations*”. The law regulates school education ministered in specific teaching institutions, that is, schools. In Article 8, the law deals with the general organization of teaching systems by several administrative spheres, that is, federal, state and municipal segments. Reaffirming the terms of the Federal Constitution, this article reinforces the duty

of the Union (the Federal Government) to coordinate Educational Policy. Therefore, the Ministry of Education (MEC) is the centralizing entity with normative competence over the other teaching systems. Thus, the Federal Government, through the Ministry of Education (MEC), is responsible for the elaboration, in cooperation with the State, the Federal District and Municipalities, of the National Education Plan (PNE). States and municipalities also design their state and municipal education plans. School levels in Brazil comprise the following: "**educação básica**" – umbrella term encompassing child education (preschool), "ensino fundamental" (elementary school/middle school) and "ensino médio" (high school) – and "**ensino superior**" (higher education).

Listing 1. Organization of school levels in Brazil

<table>
<tr><th colspan="2">Educação Infantil
(Preschool)</th><th>Ensino Fundamental
(Elementary School
/Middle School)</th><th>Ensino Médio
(High school)</th><th rowspan="2">Educação
Superior
(Higher
Education)</th></tr>
<tr><td>Daycare</td><td>Preschool</td><td rowspan="2">6 to 14 years of age</td><td rowspan="2">15 to 17 years of age</td></tr>
<tr><td>0 to 3 years of age</td><td>4 to 6 years of age</td></tr>
</table>

Nowadays, Pre-school in Brazil represents assistance in collective institutions to children aged 0 to 6 years. In general, the so-called "creches" (daycare centers) are characterized by assistance to children aged 0 to 3 years, though they also serve the age range 4 to 6 years. Daycare centers were first available as a result of volunteer work to assist low-income populations. However, many of them are offered by churches and philanthropic associations. For the age range 3 or 4 to 6 years, we have kindergartens and pre-schools which have always been connected to organs or educational systems --- therefore, they have an education project. The distinction between them lies in their assistance programs: the former is aimed at those with lower income and the latter, at the middle-class or more financially privileged layers of the Brazilian population.

"Ensino Fundamental" (Elementary School / Middle School) is a stage of Basic Education aimed at children and adolescents, with the duration of nine years, compulsory and free-of-charge, from the age of 6 years on. "Ensino Médio" (High School) lasts three years and must obey the common norms of Basic Education and other specifications. According to LDB, in a near future, "ensino médio" will also be available and guaranteed to all Brazilians.

In the Law of Basic Tenets and Guidelines (LDB) there are very few comments in relation to Environmental Education. References are made in article 32, clause II, according to which "Ensino Fundamental" (Elementary and Middle Schools) is required to convey the *"comprehension of the natural environment and social comprehension of the political system, of technology, of the Arts and of values that are fundamental to society"*; and article 36, § 1º, reads that the curricula of "ensino fundamental" and "médio" "*must cover, compulsorily, (...) knowledge of the natural and physical world and of the social and political reality, especially that of Brazil"*.

2.3 National Curriculum Parameters

The National Curriculum Parameters (PCNs) constitute a reference point for the promotion of a reflexive attitude toward state and municipal curricula. Their function is to guide and guarantee the effectiveness of policies for the improvement in the quality of teaching by offering socialized debates, research and recommendations, and by financing the participation of Brazilian technicians and teachers, specially for those who are more isolated due to less contact with the latest pedagogical production.

PCNs, by their own nature, configure an open and flexible proposal to be put into practice in local and regional decisions about curricula and about programs for the transformation of the educational reality promoted by government officials, by schools and by teachers. They do not consist, therefore, of a homogeneous and imposing curriculum model that would overrun the political-executive competence of states and municipalities, the cultural and political diversity of multiple regions of the country or the autonomy of teachers and pedagogical staff.

The set of propositions made in the PCN's has as a goal the establishment of references from which education may come to act decisively in the process of building citizenship, aiming at the ideal of increasing equality among citizens. They result from the understanding that parameters are necessary to organize the country's educational system. The ultimate intention is to assure that, beyond the cultural, regional, ethnic, religious and political diversities that permeate such a multiple and complex society like the one found in Brazil, all democratic principles that define citizenship are ensured to all.

The PCN's articulate various areas of knowledge such as the Humanities, the Exact Sciences and the Biological Sciences, with a specific segment devoted to the theme "Environment and Health". This document deals with issues relative to the environment we live in, considering its physical and biological elements and the ways man can interact with nature by means of the job market, the Sciences, the Arts and technology.

2.3 Basic Education in Brazil: some data and conclusions

In order to provide a brief overview of "*Educação Básica*" (preschool) in Brazil, the following table presents the results of the School Census[9]. These findings serve as a reference for the formulation of new public policies and the implementation of programs in the field of education, including the transfer of public resources to finance school meals and transportation, distribution of books and uniforms, creation of school libraries, installation of electrical power systems as well as Money Provided Directly to Schools (*Dinheiro Direto na Escola*) and Funding for Maintenance and Development of Basic Education and

[9] The School Census is conducted annually by the National Institute for Educational Research and Studies (INEP) with the partnership of municipal and state education councils, with the participation of all private and public schools of the country. (Source: http://www.inep.gov.br/basica/censo/).

Valorization of Education Professionals (FUNDEB). In the year 2007, the following scenario was presented:

Table 6. Qualitative and quantitative scenarios of the Brazilian education, 2007.

School-aged population attending school			
Ages 4 to 6 years	Ages 7 to 14 years	Ages 15 to 17 years	Ages 4 to 17 years
81.6%	97.5%	79.6%	90.6%
Pass rates			
4th grade (last year of Elementary School)	8th grade (last year of Middle School)	11th grade (last year of High School)	
85.8%	79.8%	74.1%	
Fail rates			
4th grade (last year of Elementary School)	8th grade (last year of Middle School)	11th grade (last year of High School)	
10.4%	10.9%	7.9%	
Dropout rates			
4th grade (last year of Elementary School)	8th grade (last year of Middle School)	11th grade (last year of High School)	
4.8%	9.4%	10.3%	
19-year-olds who finished High School			
44.9%			
16-year-olds who finished Middle School			
60.5%			
Students above the typical age-range enrolled in grades incompatible with their ages			
4th grade (last year of Elementary School)	8th grade (last year of Middle School)	11th grade (last year of High School)	
29.4%	36.4%	42.6%	
Sources: PNAD/IBGE 2007; MEC/INEP/DTDIE 2007			

According to the 2008 School Census, three major tendencies seem to re-occur in Brazilian Public-School Education:

- a decrease in enrollment in Elementary and Middle Schools;
- a lower rate of enrollment in the Northeast region;
- an increase in assistance to child education (from ages 0 to 5 years).

Table 7. Number of enrollments in Elementary and Middle Schools, 2008 Census

Child Education		Elementary and Middle School Education		High School Education
Daycare	Preschool	Initial years	Final years	Average
1,131,962	3,811,448	15,094,137	12,439,495	6,998,299

As far as the Brazilian education system is concerned, there are still great challenges ahead since quantitative improvements – annual public spending on elementary and middle school education represented 4.6% of the gross domestic product (GDP) in 2007 – were not at par with the elimination of chronic problems such as school flux, quality of teaching, school course repetition and school evasion. Some indicators of what the country still has to

accomplish in the field of education may be verified by means of the comparison of students' performances in the PISA[10] assessment.

Table 8. Brazil ranking in the Pisa (by area of knowledge), 2000-2006.

Year	Reading	Mathematics	Sciences
2000 (43 countries)	39th	42nd	42nd
2003 (41 countries)	38th	41st	40ieth
2006 (57 countries)	49th	54th	52nd

Since the focus of this report is on the confrontation of education with the challenges of sustainability and Climate Change, it is worth emphasizing the fact that in the last PISA (2006) 37% of Brazilian students displayed a minimum level of knowledge toward environmental issues.

Despite such results, it is necessary to acknowledge the fact that, over the past decades, Brazil went through, along with other countries in the region, an educational expansion that substantially improved its general indicators, as exemplified in the table below:

Table 9. Illiteracy rates among people aged 15 years or above (%), 1970 – 2007.

1970	1980	1991	1996	2007
33.6%	25.4%	20.1%	14.7%	10%

Table 10. Number of enrollments in Elementary and Middle Schools (universal access), 1970/1998.

1970	1998
16 million	35.5 million

3. Brazilian Environmental Education

3.1 History of the Brazilian Environmental Education

In Brazil, the environmental issue gained more prominence during the 1970's, while the country was still under the dictatorial rule of the military. In this very decade, Environmental Education (EE), although at its initial stages, already had institutional support with the creation of the Special Secretariat of the Environment (SEMA) by the Executive Branch.

In the 1980's, with the political transition and return to democracy, various forms of social movements, including those related to socio-environmental issues, became more effective and strengthened their impact. In this new political era environmental education gained national attention as an educational practice.

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[10] PISA (Program for International Student Assessment) is a triennial assessment promoted by OECD (Organization for Economic Co-operation and Development) among its member countries and other invited country partners. Its goal is to offer an international overview of skill and knowledge levels essential to everyday life acquired by youngsters who are about to finish the compulsory education period.

With the foundation of the National System for the Environment (SISNAMA) in 1981 and the National Council for the Environment (CONAMA), template directives and parameters were determined to guide Brazilian environmental policies now consisting of an institutionalized system divided vertically into different levels of action (federal, state and municipal governments).

Brazil's 1981 National Environmental Policy and (PNMA) and the 1988 Federal Constitution established the need to promote environmental education at all levels of teaching. A humanistic, holistic, democratic and participatory approach was developed through the interdependence between the natural, socio-economic and cultural environments.

With regard to the civil society, it was also in the 1980's that the first two state school networks were formed to provide environmental education: the State School Network of the State of São Paulo (REPEA) and the State School Network of the State of Espírito Santo (RECEA), which played an important role in the creation of the Brazilian Network for Environmental Education (REBEA) in 1992. Since then many other state and regional networks were formed.

Also in 1992, the Ministry of the Environment (MMA) and the Division of Environmental Education of the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) were created to implement environmental education policies within the National System for the Environment (SISNAMA).

Still in the context of the institutionalization of Environmntal Education in the country, it is worth mentioning the support to the establishment of environmental management systems by productive sections, in accordance with rules and norms, such as the ISO 14000 series.

However, the definitive consolidation of the environmental problematics in the Brazilian society effectively took place through the planning and realization of the Rio 1992 International Conference (UN Conference on Environment and Development) and the Global Forum when the Treaty on Environmental Education for Sustainable Societies and Global Responsibility was constituted.

During the conference, with the aid of the Ministry of Education and Culture (MEC), the Brazilian Statute for Environmental Education was promulgated. This document recognizes the decisive importance of Environmental Education for the sustainability of the planet and emphasized the lack of real commitment on the part of the Brazilian Public Administration to the issue and the delay in expanding the production of knowledge associated to this field of research.

The Treaty on Environmental Education for Sustainable Societies and Global Responsibility constituted another relevant landmark in environmental education since it set the values for the initial reflections on Agenda 21 in the country, by bringing together different perspectives. Examples of this are the attribution of power to community groups by means of the principle of delegation of authority, as well as the incentive to the creation of indigenous organizations based on the community of volunteer private organizations and other forms of non-governmental entities capable of contributing to the decrease of poverty and improvement in quality of life of low-income families. This document is of great importance in defining the political landmark for the pedagogical project of Environmental Education.

In the same year, the 1st National Meeting of Environmental Education Centers (CEAs) took place in Foz do Iguaçu, sponsored by the Ministry of Education and Culture (MEC).

Fernando Henrique Cardoso's Administration (1994-2002)

The legislative discussion on a National Environmental Policy started in the beginning of 1993 and, in the following year, on the onset of the first mandate of President Fernando Henrique Cardoso's administration, the National Program for Environmental Education (PRONEA) was created in order to develop professional qualification of managers and educators as well as appropriate educational actions, instruments and methodologies related to different lines of actions in Environmental Education.

In 1996, the Ministry of the Environment (MMA) instituted the Task Group on Environmental Education and signed the intention protocol with the Ministry of Education and Culture (MEC) with the aim of establishing an institutional and technical cooperation in Environmental Education, and in 1997 the National Curriculum Parameters (PCN) were approved. According to these parameters, the environment theme was regarded as one of the five transversal themes compulsory for the Brazilian education.

Amongst the points raised in the discussion on the theme were the following: environmental crisis as a civilizatory process; education as the crucial element, indispensable for transformation in environmental awareness; the environment and its natural elements; rural and urban areas with their physical and social environment factors, in addition to issues concerning protection, preservation, conservation, environment recovery and degradation; problematization of concepts such as "sustainable development" and "sustainable societies".

Also in 1996, the "Letter from Brazilia for Environmental Education" was elaborated. The document presents a summary of accumulated knowledges and was written 20 years after the Tbilisi declaration. It reaffirms the role of the Brazilian Environmental Education as an instrument for the development of eco-citizenship, despite acknowledging the lack of true commitment from the public administration in the implementation of national laws for Environmental Education.

Later, in 1999, the Board of the National Program for Environmental Education (ProNEA) was elected and the organization was linked to the Administrative Secretary of the Ministry of the Environment (MMA), which started the development of a National Environmental Information System (SIBEA), whose role is to act as an integrating system of information on the environment theme in the country. MMA also created the Environmental Education poles, disseminated sustainable practices throughout the states in order to spread Environmental Education actions, promoted the formation praocess of Environmental Education interinstitutional committees in the Federative Units (states) and participated in the elaboration of Environmental Education state programs. In addition, it developed long-distance courses on Environmental Education aiming at qualifying environment managers, teachers and technicians in all the country's municipalities. In this same year, Law nº 9795 was passed. This law deals with the National Environmental Education Policy (PNEA) and was only regulated in 2002.

The National Environmental Education Policy (PNEA) defines what is meant by Environmental Education, highlighting its relevance and need for permanent presence as part of the national education goal, always in an articulated manner at all levels and modalities of the formal and informal educational system. It further provides explanations for the fact that Environmental Education is not supposed to be a specific curriculum discipline (except, if necessary, in extension and post-graduation courses directed to specific areas of knowledge), but rather that it should be dealth with in a transdisciplinary way. It proposes that all individuals have the right of access to Environmental Education, emphasizing the responsibilities on the part of the public administration, educational institutions, means of communication, companies and society as a whole, in the consolidation of this right. It defines basic principles and fundamental principles of Environmental Education, as well as the lines of action concerning activities linked to PNEA. It points to the necessity that the environmental dimension be part of all teacher formation at all levels and in all disciplines. Finally, it defines the attributions of the managing entity responsible for PNEA coordination. In April 2009, some events and conferences celebrated the 10th anniversary of PNEA and also created a forum for debate.

Luís Inácio Lula da Silva's Administration (2003-2010)

In 2003, during the first administration of President Luís Inácio Lula da Silva, under the command of former Environment Minister Marina Silva, the MMA established the Environmental Education Intersectorial Committee (CISEA) in an initiative signalling the importance that would be attributed to Environmental Education in the administration. In the same year, the Ministry of Education and Culture (MEC) promoted actions that suggested renewed concerns over Environmental Education such as:

- the inaugural meeting of the Managing Entity of PNEA, sponsored by the Ministry of Education and Culture (MEC) and the Ministry of the Environment (MMA), which was decisive for the execution of Environmental Education laws by the federal government.
- the first National Environment Conference – adult and child/adolescent versions – which considered among its main concerns, the Environmental Education theme (which was reiterated in the 2nd Conference in March 2006 and in the 3rd Conference in April 2009, the latter primarily concerned with climate change issues).

In 2004, the first national government meeting on public policy toward Environmental Education took place and, in this meeting, the "Goiania's Commitment" was designed, establishing an important pact among government spheres with the common goal to promote the creation of state and municipal policies and programs on Environmental Education.

Nowadays, the Environmental Education Department of the Ministry of the Environment (MMA) is going through a restructuring phase due to the replacement of Minister Marina Silva by Minister Carlos Minc, which generated a renewal of staff.

In order to detail advances in actions and proposals concerning Environmental Education in Brazil, at a national level, it is worth emphasizing the following:

I. National Environmental Education System (SISNEA)

Launched in 2007, SISNEA intends to integrate and organize all instances of planning and implementation of policies, programs and formation and communication processes on Environmental Education in Brazil, by seeking to structure elements from ProNEA and PNEA in an organic and articulated manner.

II. National Program for Professional Development of Environmental Educators: toward a more educated Brazil by fostering environmental education for sustainability (ProFEA)

The program was designed between the years 2003 and 2004 by the Environmental Education Board of the Ministry of the Environment (DEA/MMA). Its aim is to implement Environmental Education federal public policies so that fewer direct interventions are required and additional support is provided to regionally self-managed actions and reflections. Following these lines, its mission is to achieve professional development of 180 million Brazilians who are also highly qualified environmental educators. The development of Education Collectives is one of its essential strategies.

III. Education Collectives for Sustainable Territories

Education Collectives are groups consisting of representatives of institutions, social movements, networks and councils that promote competence formation in Environmental Education, on a permanent, participatory and continued basis, by considering the socioenvironmental context of a specific territory.

The main goal of the Education Collective is, by means of formation processes, constitute a network of environmental educators committed to the improvement of the place they live by means of interventions and participation in decision making in the region.

The Program for Professional Development of Environmental Educators, formulated in 2003/2004 adopted the Education Collectives as sources for formulation and articulation actions of formation and, above all, as a strategy for the implementation of public policies in a determined territory. The map below indicates the municipalities reached by potential Education Collectives.

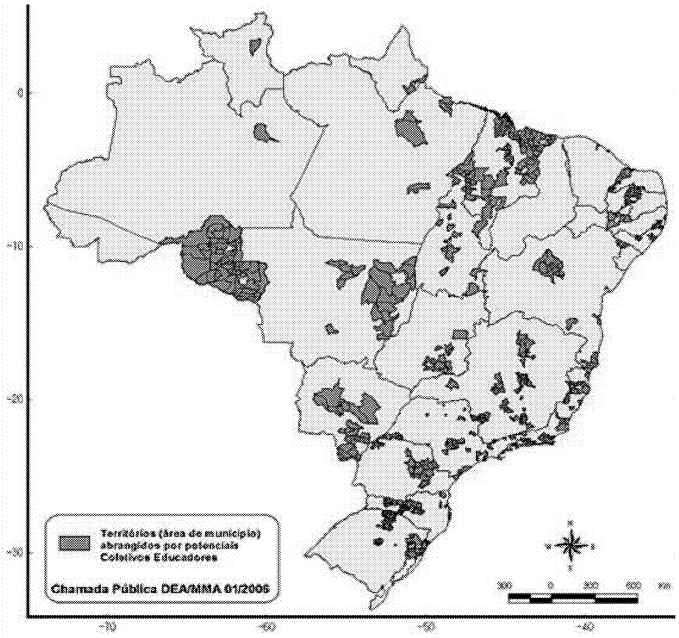

Figure 3. Map showing areas covered by potential education collectives in Brazil.

IV. **Green Rooms**

It is an initiative of the federal government through the Ministry of the Environment to provide access of the population to socioenvironmental spaces that function as centers of information and of environmental education by offering supporting material (bibliographical and audiovisual), promoting educational events and providing technical guidance for monitors. In 2003, there were 45 Green Rooms spread throughout the national territory; in 2004, there were 63; in 2005, 79; and in 2006, there were 225.

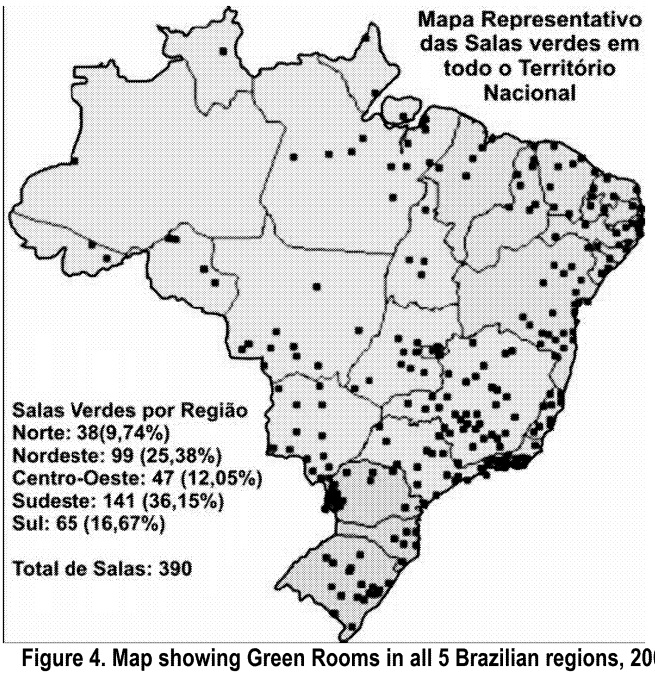

Figure 4. Map showing Green Rooms in all 5 Brazilian regions, 2006.

***** Map showing Green Rooms in all the National Territory**

***** Green Rooms per Region:**

- **North: 38 (9.74%)**
- **Northeast: 99 (25.38%)**
- **Mid-West: 47 (12.05%)**
- **Southeast: 141 (36.15%)**
- **South: 65 (16.67%)**

Green Room Total: 390

V. Educational Nurseries

The "Educational Nurseries" subproject aims to value, promote, direct and support the implementation of nurseries with educational purposes, as well as to stimulate the existing nurseries to incorporate the educational dimension in their activities.

VI. National Development Program for Environmental Managers (PNC)

The PNC, coordinated by the Institutional Articulation Board (DAI), with the partnership of the Environmental Education Board (DEA), aims to form and qualify agents responsible for the elaboration and implementation of the municipal environmental policies through the creation of a municipal environmental system, in order to strengthen the National System for the Environment (SISNAMA).

The Environmental Education Board (DEA) participated in the process of formulation and mobilization in the states, contributing to the participation of educational institutions in meetings for pedagogical planning of the Tripartite Committee. The DEA was also responsible for the design, together with partner institutions, of the PNC political-pedagogical proposal.

VII. Research: "What is done by Schools that say they do Environmental Education" (2001-2004)

The research Project was initiated by the Ministry of Education. In its first stage, the goal was to map out the presence of Environmental Education in schools, as well as its patterns and tendencies, by means of the analysis of the School Census between the years 2001 and 2004 – conducted by the Anísio Teixeira National Institute for Educational Research and Studies (INEP) and the Ministry of Education (MEC).

Table 11. Schools and registrations related to Environmental Education in Brazil, 2001/2004.

Schools offering Environmental Education by number and percentage of the grand total of schools in the country	
2001	**2004**
115 thousand (62%)	152 thousand (94%)
Registrations in Schools offering Environmental Education in Elementary and Middle Schools	
2001	**2004**
25.3 million	32.3 million

The second stage of the research consisted of a more detailed account of the way Environmental Education is carried out in Brazilian schools, with the purpose of effectively collect data on incentives, priorities, actors involved, modalities and findings resulting from the implementation of Environmental Education.

In the 418 schools surveyed, the research indicated the following:

Table 12. Motivations, goals and modalities of Environmental Education, 2001/2004.

Initial motivations for the implementation of Environmental Education	
Teacher initiatives	59%
Stimulus Parameters in Action	35%
Goals of Environmental Education Actions	
Citizenship awareness	39%
Sensitizing to conviviality with nature	13%
Critical and complex understanding of the socioenvironmental reality	12%
Modalities of Environmental Education Actions	
Actions per projects	66%
Political-pedagogical Project	38%
Transversallity across Disciplines	34%

Source: *Secad 1 Working Papers*

3.2 Environmental Education Network in Brazil: articulation initiatives by the civil society

Networks are understood as social constructions promoting communication, as forms of social relations and social movement articulation that interact with the use of the Internet. promoters, edes são entendidas como construções sociais e promotoras de comunicação, como formas de relações sociais e de articulção de movimentos sociais que interagem com o uso da Internet. The meaning shared by most Networks that are assembled around the Brazilian Environmental Education Network (REBEA) may be exemplified in the following proposal:

> Networks constitute a space, perhaps one of the most privileged, of creation of this new collective experience, ways of being and acting in reality. We may think, speak, write and debate about networks in search of its comprehension as a social and human phenomenon. We may feel them with the heart and plunge into the channel of reciprocal exchanges. We may further try to live them in action. And acting in networks has to do with lif. It is an exercise to learn to see the world in a systemic form. It has to do with

perceiving the possibilities of connections and willingly want to build them. It means to share and be inclusive. It means to yearn for the whole rather than its parts. It means to value the collective above vanity and ego. It means to be generous in small actions. To exercise, respect the diversity and learn to give consent in favor of the group. It means to impose less according to our will and accept the will of the other. To have passion for life in all its beautiful and unprecise forms. (Translated from REPEA, 2005, p. 20)"

The table below refers to number of Networks linked to the REBEA website, although in Brazil there are others that do not articulate directly with this site.

Table 13. Networks interconnected with REBEA by region, 2007.

Region	Quantity
North	3
Northeast	8
Mid-West	6
Southeast	16
South	5
National	4
International	2

4. Sustainable Development and Brazil's Agenda 21

Brazil's Agenda 21 is a process and instrument of participatory planning for sustainable development that has as its central axis sustainability, which establishes compatibility between environmental conservation, social justice and economical growth, and the participation and control of society as elements to democratize the right to quality of life.

It has its roots on the tenets of the global Agenda 21 set up in the United Nations Conference on Environment and Development, held between June 3 and 14 1992 in Rio de Janeiro.

4.1 History of the Constitution

The first phase of elaboration of the Brazilian Agenda 21 lasted from 1996 to 2002 under the supervision of the Sustainable Development Policy Committee and the National Agenda 21, with the participation of nearly 40 thousand people from the whole country.

The Committee was created within the Natural Resources Policy Chamber of the Government Council and consists of 34 members, among which the most influential are: the Ministry of the Environment, which presides the Committee, the Ministry of Budget Planning and Management, which holds the office of the vice-presidency, the Civil Office of the Presidency of the Republic of Brazil, the Ministry of Science and Technology, the Ministry of External Relations, the Ministry of Education, the Brazilian Association of the Environment State Entities (Abema), the Brazilian Business Council for the Sustainable Development (CEBDS), representative entity of the youth,

indigenous communities, traditional communities, the Brazilian Forum of NGOs and Social Movements for Environment and Development (FBOMS) and union centrals.

Brazil's Agenda 21, therefore, results from a vast process of consulting the Brazilian population, once it was conceived as a fundamental instrument for the construction of a participatory democracy and active citizenship in the country. The Brazilian Agenda 21 document was concluded in 2002.

4.2 Insertion as Public Policy

Since 2003, the Brazilian Agenda 21 has been elevated to the status of Pluriannual Plan[11] (2004-2007), once its scope involves great structural problems which requires more consensus and medium and long-term integrated solutions. Strategic issues such as saving economy in the knowledge society; social inclusion for a solidary society; strategy for urban and rural sustainability; strategic natural resources, and governance and ethics for the promotion of sustainability will only be dealt with once actual responsibilities are shared by the government and society.

The main goal of the Agenda 21 Program is to promote the internalization of principles and strategies of the Brazilian Agenda 21, whose means of implementation range from strategic, decentralized and participatory planning to the establishment of priorities to be defined and put into practice in a democratic and transparent manner. As a program, Brazil's Agenda 21 has gained political and institutional power. It has now become a fundamental instrument for the construction of a sustainable country, abiding by established tenets of the government environmental policies, transversality, sustainable development, strengthening of the Environment National System and social participation, adopting important reference models like the Letter of the Land. In sum, the following constitute the main challenges of the Agenda 21 Program:

- Implementation of the Brazilian Agenda 21.

After its elaboration, the Brazilian Agenda 21 seeks to have all its guidelines and priority actions known, understood and transmitted, among others, by means of actions by the Sustainable Development Policy Committee and the Brazilian Agenda 21; implementation and monitoring mechanisms; integration of public policies; inclusion of the Brazilian Agenda 21 proposals in the Local Agendas 21 Plans.

- Guidance for the elaboration and implementation of Local Agendas 21.

The Local Agenda 21 is one of the main instruments to conduct mobilization processes, exchange of information, consensus building in relation to local problems and solutions and the establishment of priorities for management processes ranging from those of a state, municipality, hydrographic basin, conservation unit, to those of a community or a school.

[11] The Pluriannual Plan is the medium-term planning instrument of the Federal Government that establishes, according to region, the guidelines, goals and aims of the federal public administration.

The process must be articulated with other government and social projects, programs and activities, consolidated by means of the engagement of local and regional agents; analysis, identification and promotion of financial instruments; dissemination and exchange of experiences; performance indicators definition.

- Implementation of continuing education in Agenda 21.

This refers to the promotion of education for sustainability through the dissemination and exchange of information and experiences by means of courses, seminars, workshops and didactic material. This line of action is fundamental for the improvement in quality of Local Agendas 21 processes through the formulation of technical and political bases for their formation; cooperative work with local interlocutors; identification of activities, needs, costs, implementation strategies; application of appropriate methodologies, in accordance with the stage at which a Local Agenda 21 is.

4.3 Principles and Tenets

The Brazilian Agenda 21 confirmed the concept of amplified and progressive sustainability. By amplified it is meant that it encompasses all dimensions of life: the economic, the social, the territorial, the scientific and technological, politics and culture. Progressive, on the other hand, since it is concerned with the negotiation of conflicts that, once fragmented in less complex parts, are better manageable in time and space.

Furthermore, the document proposes that the pedagogy of sustainability should model the ethical codes of the 21st century. As such it also has an impact on wealth and income distribution in target areas, by means of benefits from salaries and private revenues generated by productive projects and also from social projects not directly productive (as in the case of health and education).

As to Environmental Education, different realities and social actors are considered. In the rural context, Environmental Education is profiled in relation to the use of the natural resources of hydrographic micro-basins, developing in the population the perception about the close relationship between deforestation, water loss and desertification. In the urban context, the main concern is related to residue waste and management. In indigenous communities, the aim is to promote the sustainable use of natural resources, encouraging the transition from extractive activities to environmental service activities.

To attain such goals, formal and informal education in communities and companies seek to strengthen the educational mechanisms for science and technology in the name of eco-efficiency, for personal and/or professional development. And the means of communication – television, radio and newspapers – are summoned to play their relevant roles in social pedagogy to bring awareness to the public opinion of necessary change of behaviors. In this issue, there is a positive attitude toward the implementation of educational and community televisions for the dissemination of scientific and technological

information on sustainable development, by promoting the integration between knowledge producers and their users.

As a result of the national public survey, the social dimension of Agenda 21 contemplates actions toward the promotion of the sustainability culture, values like ethics, solidarity, cooperation, affection and spirituality. As far as Education is concerned, it becomes a fundamental instrument for the promotion of changes necessary for the implementation of the new sustainability paradigm. In this way, the internalization of the environmental issue is processed in the habits and customs of society through environmental education and sound capacitating tools for the sustainability of institutions and social actors.

In a more specific perspective, the following aspects are stressed: the dissemination of agro-ecological knowledge, the need for studies and research on economical, social and environmental viability of tourism enterprises, appreciation of traditions and the local regional culture, environmental and sanitary education actions as well as those of social mobilization for solid residue management.

As far as Climate Change is concerned, proposals are expected to be made to establish collaboration networks between international, national and regional research centers for the exchange of information and technologies so as to promote education, training and public awareness in relation to climate change and also stimulate more effective participation in this process.

4.4 Main Activities

- 1st Local Agendas 21National Meeting (2003);
- 2nd Local Agendas 21 Meeting (2005);
- Agenda 21 Capacitation Program for nearly 10 thousand public school teachers in the country (2005);
- Participation in the consolidation of the Mixed Parliamentary Front (107 federal deputies and 26 senators) for Sustainable Development and Support to Local Agendas 21.
- Formulation and monitoring of Edict nº 2, 2003 – Development of Local Agendas 21, with capacitating training offered to municipal managers and NPO's, in all the Brazilian states, for the design of the edict projects. Nearly 920 individuals were trained in 25 events and 64 projects with financing were approved.
- Publication of Agenda 21 and Sustainability Working Paper Series.
- Publication of one thousand copies of the 2nd edition of the Brazilian Agenda 21: Priority Actions and National Survey Results.
- Partnerships and agreements with Ministries, the NPO's Brazilian Forum on Environment and Development, public Banks and municipal city halls.
- Financial aid for the National Conference on Environment, the Cities Conference and the Health Conference. Nowadays, there are more than 544 Local Agenda 21 processes in progress in Brazil --- almost three times the number surveyed until 2002.

4.5 School Agenda 21

In 2003, in the 1st National Child and Teenager Conference for the Environment, with the partnership between the Ministry of the Envrionment and the Ministry of Education, 400 young delegates produced the *Letter Youngsters Taking Care of Brazil - Resolutions from the National Child and Teenager Conference for the Environment* in which they requested the creation of youth councils and Agenda 21 at schools as spaces for pro-environmental participation.

In this scenario, the Committee on Environment and Quality of Life in Schools – COM-VIDA was created. COM-VIDA seeks to get the school community involved in environmental issues and its goal is to implement the School Agenda 21 in each school, monitor Environmental Education projects, organize School Conferences on Environment, promote exchange programs with other COM-VIDA's and discuss specific issues relevant to the local reality.

The scope of the School Agenda 21 includes proposals of activities with the school community to map out the local reality in the past and in the present and, ultimately, devise action plans for the future.

5. Climate Change and Environmental Education in Brazil

In order to assess the effectiveness of the Brazilian Environmental Education with regard to Climate Change issues, some scenarios described by the Integrated Pollution Prevention Controls Directive (IPPC) and related initiatives, as well as educational institutions with projects and proposals on Climate Change will be briefly analyzed in the following sections.

5.1 Climate Change and Brazil

According to the 4th IPCC report, Brazil may stage different environmental impacts in relation to hydric resources and biodiversity at the local, regional and national levels.

HYDRIC RESOURCES:

- reduction of the estimated freatic groundwater recharge in more than 70% in the Northeast of Brazil (as compared to the 1961-1990 and 2005 rates);
- increase in rainfall in the Southeast with direct impact on agriculture and on frequency and intensity rates of flooding in large cities such as Rio de Janeiro and São Paulo;
- reduction of hydric resources in semi-arid and arid areas.

BIODIVERSITY:

- substitution of semi-arid vegetation for that of arid regions;
- species extinction in tropical rainforests;
- impact on mangroves due to sea level alteration, climate variability and climate-change disasters;
- 38% to 45% extinction risk for cerrado (tropical savanna) plants if temperatures rise to 1.7℃ above pre-industrial era levels;

With special emphasis on the Amazon region, IPCC predicts the following:

- highly unusual extreme climate events in the Amazon region, like the 2005 drought, due to rise in temperature and reduction in summer rainfall;
- a substantial increase in the density of lianas – long-stemmed woody vines – over the past two decades in non-fragmented areas of the Amazon Rainforest;
- additional rise in temperature during the summer in important Amazon regions: the conversion of forests into agricultural land has great impact on the climate since it alters the albedo in the region and the latent heat flux;
- high rates of biodiversity loss with rise in temperatures of 2.0℃ to 3.0℃ above pre-industrial levels;
- the savannization process in the eastern region due to rise in temperatures and reduction in groundwater.

However, the above described scenarios are still subject to scientific controversy and need further research and monitoring to be verified.

According to data provided by the Ministry of the Environment through the Environmental Quality and Climate Change Secretariat, it is possible to assert that most CO2 emissions stem from land and forest-use change which result in deforestation.

5.2 Climate Change Initiatives in Brazil

Different proposals and initiatives have been put forward over time in Brazil, along with the creation of institutions with tools to think and act when the reality of Climate Change is recognized. Nevertheless, the context still arouses controversy and uncertainties. Some of these initiatives, proposals and institutions are listed below:

I. The Environmental Quality and Climate Change Secretariat

In April 2007, the Environmental Quality and Climate Change Secretariat was formed according to the new regulatory structure established by the Ministry of the Environment (MMA). The specific attributions of the secretariat include the design of policy proposals and definition of strategies related to different forms of pollution, environmental degradation and risks; the formulation of policies for the promotion of environmental quality activities for air, soil, sea, the coastal zone and for residues harmful to health and the environment; the evaluation of environmental impacts and environmental licensing; the promotion of chemical safety; the monitoring of environmental quality; the development of new environmental management tools; the development of an energy matrix adequate to environmental profile; the formulation, proposal and implementation of prevention policies and assistance in situations of environmental emergency; and the coordination of the Ministry's actions related to climate change. Source: http://www.mma.gov.br/sitio/index.php?ido= conteudo.monta&idEstrutura=137

II. Climate Change Research Group (GPMC)

Subordinate to the Brazilian National Institute for Spatial Research (INPE), the research group's goal is to develop research on climate change. They carry out observational studies to characterize the current climate and its long-term variability, as well as projection studies on future climate change scenarios to characterize the climate.

Among the group members there are researchers who work in the fields of climate change, vulnerability analysis and impact and adaptation studies. They belong to the staff of important institutions such as the University of São Paulo -IAG (www.iag.usp.br), the Brazilian Foundation for Sustainable Development (www.fbds.org.br), in collaboration with Federal Government institutions, meteorology state centers, universities, the Brazilian Climate Change Forum and the Organized Civil Society.

The work being developed aims to provide information and climate projections to be disseminated and made available by climate change and applied research groups and to support decision makers in the formulation of policies on climate change impact, vulnerability and adaptation measures.

In addition, all members seek to establish a network of national and international researchers in search of permanent cooperation between scientific research products and formulation and decision-making processes. Source: http://www.cptec.inpe.br/mudancas_climaticas/

III. Interministerial Commission on Global Climate Change

The Commission was created in 1999 due to the Brazilian commitment to the United Nations Framework Convention on Climate Change. It is presided by the Ministry of Science and Technology (MCT) and is the designated national authority of the Clean Development Mechanism (CDM) in Brazil, giving approval to a total of 209 project activities in the country. In its organizational structure we find the General Coordination on Global Climate Change (CGMC) whose aim is to design policies and define strategies and procedures for the implementation of programs under their responsibility in Brazil, with special attention to the United Nations Framework Convention on Climate Change and the Kyoto Protocol.

Source: http://www.mct.gov.br/index.php/content/view/79158.html

IV. The Brazilian Forum on Climate Change

Created by Decree n° 3515 of June 20, 2000, the Forum has as its main goal to bring awareness and mobilize society for discussion and position-taking in relation to problems resulting from climate change due to greenhouse gases and the Clean Development Mechanism (MDL) defined in Article 12 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Source: http://www.forumclima.org.br/

V. Climate Change Interministerial Committee (CIM)

In November 2007, the government created CIM whose function is to elaborate the National Policy on Climate Change and the National Plan on Climate Change. CIM is coordinated by the Civil Office of the Presidency of the Republic of Brazil, encompassing seventeen federal organizations and the Brazilian Forum on Climate Change (FBMC).

VI. Research Funding Agencies

Among funding agencies in Brazil, the most influential are the Coordination Office for Improvement of Higher-Level Personnel (CAPES), the National Council for Scientific and Technological Development (CNPq) and, especially, the Foundation for Research Support of the State of São Paulo (FAPESP). This foundation offers the FAPESP Research Program on Global Climate Change (RPGCC) aiming at advances in climate change issues.

Program research findings are expected to support scientifically informed decisions regarding risk assessment and mitigation and adaptation strategies. Source:http://www.fapesp.br/materia/4473/pfpmcg/programa-fapesp-de-pesquisa-sobre-mudancas-climaticas-globais.htm)

VII. National Plan on Climate Change (PNMC)

The general goal of the Plan is to identify, plan and coordinate actions and measures that may be taken in order to mitigate greenhouse gas emissions generated in Brazil. Other measures included in the plan's agenda are related to the adaptation of society to climate change impacts. The specific goals are:

- to increase performance efficiency in productive sectors;
- to increase the participation of renewable energy in the electric matrix;
- to fund the sustainable growth of biofuels in the national transportation matrix and in the structuring of an international market;
- to seek sustained reduction in deforestation rates;
- to eliminate liquid loss in forest cover areas by 2015;
- to identify environmental impacts resulting from climate change;
- to fund scientific research to minimize socio-economic costs in the process of adaptation in the country.

VIII. Climate Change National Policy

The Law Project nº 3535/2008, still under consideration in the National Congress, proposes a Climate Change National Policy and establishes goals, principles, guidelines and instruments. It is mentioned that Politics will guide the formulation of the National Plan on Climate Change, state plans as well as other plans, programs, projects and actions directly or indirectly related to climate change.

IX. Youth Network for the Environment and Sustainability (REJUMA)

It consists of a national network of youngsters that gained visibility after the National Child and Teenager Conferences for the Environment. Its aim is to establish close ties with youngsters, all over the world, interested in the construction of more fair, equalitarian and sustainable societies. It is responsible for the articulation of different discussions on environmental education, theories and practices. It also promotes the socialization of initiatives all over the country and opens new paths for the creation of the Global Youth Network for the Environment . (http://www.rejuma.org.br/)

X. News Agency for Children's Rights (ANDI)

ANDI is a non-profit civil association whose mission is to contribute to the construction, through means of communication, of a culture that prioritizes the promotion of children's and teenargers' rights. ANDI regards the democratization of access by children and adolescents to basic social rights as a fundamental condition for social equality and for human development. It was founded in 1993 by the journalists Âmbar de Barros and Gilberto Dimenstein.

They have a site on climate change that discusses the implications of the phenomenon among children, such as natural system impacts on agriculture and water, impacts on urban areas, on health conditions, on family discord and the direct implications among children and teenagers, once they are regarded as the most vulnerable population to climate change impacts. (http://www.mudancasclimaticas.andi.org.br/).

XI. Brazilian National Institute for Spatial Research (INPE)

The Institute has a study group that develops research on climate change issues. This group is responsible for two studies on the teaching of the environmental problem for children at ages 6 to 12 years. They consist of interactive game softwares that teach children about the process involving climate change. (http://mudancasclimaticas.cptec.inpe.br/abc/index.html)

XII. Institute for Development, Environment and Peace (VITAE CIVILIS)

It is a non-governmental organization that since 1990 has been following debates and research on climate change. It published a coursebook mapping out the mains actors and initiatives on the theme. (http://www.scribd.com/full/7987509?access_key=key-2c7y9jwfjicmocd9l656)

XIII. Virtual Museum

It consists of an educational software on climate change, aimed at public and private elementary, middle and high school students. (http://www.museuvirtual.unb.br/climatico/navegacao.html)

XIV. Ministry of Science and Technology (MCT)

Within the Ministry of Science and Technology portal there is a page of the Interministerial Commission on Global Climate Change intended to emit opinions about projects, provide support to government decisions, define eligibility criteria about climate issues, promote articulation with representative organizations of the civil society and widely disseminate national and international debates on the theme. (http://www.mct.gov.br/index.php/content/view/14803.html)

XV. Law Project – LP nº 3535/2008

This LP instituted the National Policy on Climate Change and provides other measures to guide the formulation of the National Plan on Climate Change, state plans, and a variety of other plans, programs, projects and actions directly or indirectly related to climate change issues. (http://www.camara.gov.br/sileg/integras/574554.pdf)

XVI. Little Plenary ("*Plenarinho*")

The Little Plenary is a site of the Chamber of Representatives that informs the population about complex subjects related to national politics as well as issues related to the environment. There are some very simple and didactic explanations about climate change for the young public.
http://www.plenarinho.gov.br/ecologia/Reportagens_publicadas/ai-que-calor
http://www.plenarinho.gov.br/ecologia/Meio-ambiente/fenomenos-da-natureza/efeito-estufa

XVII. "Coleciona"

A bimonthly electronic journal, specialized in Environmental Education and Educommunication.
http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=20&idConteudo=7695

XVIII. GT CONAMA

It is a Climate Change Impact Working Group in Brazil that discusses the Role of the National Council for the Environment (CONAMA) in the Adoption of Adaptation Measures. (http://www.mma.gov.br/port/conama/ctgt/gt.cfm?cod_gt=139)

XIX. National Institute for Research in the Amazon (INPA)

INPA sponsors the Working Group on Climate Change and Hydric Resources (CPCRH), whose research interests are focused on the study and quantification of energy fluxes and mass balance in Amazon systems and their interactions with global and regional climates, geochemical characterization and environmental monitoring of hydric resources in urban and rural areas. (http://www.inpa.gov.br/coorden/cpcrh2.php)

XX. Brazilian Agropecuary Research Corporation (EMBRAPA)

EMPRABA has a website for students based on a compilation of documents and references mediated by various means of communication on Global Warming and Environmental Change issues, available on the site. It was constructed by means of the partnership between EMBRAPA satellite monitoring, through the program "Embrapa & School ", and "EPTV at School". (http://www.aquecimento.cnpm.embrapa.br/)

XXI. Climate Observatory (Observatório do Clima)

The Climate Observatory site was constructed by Communication and Information Technology teams from Getulio Vargas Foundation Study Centers on Sustainability. The site is intended to qualified information on climate change, from basic contents to approach the subject to in-depth discussions and current debates. (http://www.oc.org.br/)

XXII. Climate Network (Rede Clima)

The idea behind the network is to generate and disseminate knowledge and technology so that the country can fulfill the needs and challenges resulting from global climate change. Its mission is to produce data and necessary information to support Brazilian diplomacy in negotiations about the international regime on climate change. Rede-Clima is involved with a variety of Brazilian institutions devoted to studies on climate change, adaptation and mitigation toward various sectors and systems, like biodiversity, agriculture, renewable energies, coastal zones, hydric resources, human health, megacities, natural disasters and public policy.

5.3 Environmental Education and Climate Change in Brazil

The National Conferences on Environment are part of the federal government policy of social mobilization in decision-making processes. They have been held since 2003 when the 1st National Conference on Environment took place, and since then have become a source of social legitimization and democratic stability.

The following is a summary of deliberations and actions by the 3rd National Conference on Environment (CNMA), held in Brasilia, the nation's capital, from May 7 to 10 2008. Decisions made by the National Plan on Climate Change in the same year will also be included since they are regarded as the basic working framework for current proposals and policies on Environmental Education and Climate Change.

The main theme of the 3rd Conference was Climate Change. More than 115,000 people all over the country actively participated in 566 municipal conferences, 153 regional and 26 state conferences. The National Plenary session was attended by 1,104 delegates.

The major goals of the 3rd CNMA were to promote a debate on the climate change theme and put forward proposals for the formulation of the National Plano n Climate Change. The proposals or deliberations were divided

into thematic axes such as: Mitigation, Adaptation, Research and Technological Development and Education and Environmental Citizenship (Capacitating Processes and Dissemination).

In Axis IV of the Working Papers framing the deliberations of the 3rd CNMA, the specific role of Education in relation to Climate Change is described. This role is regarded as relating to mobilization, organization and education of the Brazilian society so as to understand and generate cultural changes necessary to deal with the causes and effects introduced by the National Policy and Plan on Climate Change:

> The National Policy and Plan on Climate Change must introduce institutional mechanisms that promote the critical understanding of this moment, encouraging the promotion of individual and collective actions to overcome the climate change crisis for the construction of **sustainable societies**.

The effectiveness of the National Plan on Climate Change is attributed to the implementation of far reaching environmental education programs for all the society:

> For the effective implementation of the National Plan on Climate Change it will be necessary to carry out environmental education projects as a systemic set of activities for qualification, training, planning, communication and information dissemination that will contribute to the participation and involvement of all citizens, social groups and movements, sectors, spheres and segments of the Brazilian society.

The strategic fields that synthesize the Conference deliberations are the following:

- *Environmental education for all the society, including managers;*
- *Agenda 21 for the construction of sustainable societies;*
- *Communication and information dissemination on climate change.*

The event also shed light on the fact that, in addition to greenhouse gas emission mitigation and human population adaptation, it is imperative to consider quality of life improvement for all human beings and recovery of natural systems all over the globe. In this manner, principles and commitments to Environmental Education and Agenda 21 were reinforced for effective local governance so as to translate the Nation Plan on Climate Change into concrete realities, with their actors, potentialities and limitations.

In the Education realm, 139 deliberations were held. Below, 15 of them are listed due to their importance and connections with formal basic teaching:

1. to stimulate the presence of environmental educations in graduation courses, technologcal higher education and post-graduations, to train professionals committed to socio-environmental and cultural transformation;
2. to include Environmental Education in political-pedagogical formal and informal educational programs, integrating socioeconomic and environmental alterations related to climate change;

3. to propose a general capacitation model on environmental education taking into account mitigation and adaption to climate change, appropriate to local and regional conditions, integrating the public and private sectors as well as social organizations;
4. to promote capacity for adaptation by means of an Environmental Education program aimed at communities vulnerable to change;
5. to develop participatory Contingency Plans, with priority measures for the adaptation of vulnerable communities, respecting cultural characteristics;
6. to map out the various institutions, programs and projects active in the environmental education to promote integration and socialization;
7. to expand and strengthen the Program "Let's look after Brazil through Schools" and activate the "Youth Program on Environment" in school communities, in addition to traditional and indigenous ones;
8. to engage and support the participation of the population in forums, conferences and other deliberative and participatory processes;
9. to reinforce actions of formulation and implementation of environmental education programs, local and school Agendas 21, "green rooms", "educational collectives" and youth groups for the sake of the environment;
10. to institutionalize Environmental Education within state and municipal secretariats in Environment, Education and Public Health;
11. to design incentive programs for qualification trainning of researchers and preschool, elementary and middle school teachers in order to implement Continuing Environmental Education, "Com-Vidas" and Agendas 21 in schools;
12. to ensure pedagogical and financial support for the capacitation of informal environmental educators;
13. to develop a policy of school curriculum design that accounts for regional singularities at all levels as well as teaching modalities of environmental education focussing on agroecological techniques and family agriculture;
14. to implement evaluation and award programs in public and private schools with special emphasis on environmental education;
15. to establish transversal practices in curriculum training of teacher education courses to allow for climate change discussion in the environmental education context;

As can be observed, the deliberations by the Conference are detailed and ambitious, different from the National Plan on Climate Change. Item IV – "Education, Capacitation and Communication" – introduces a brief description of proposed actions and interventions to approach the theme. The plan only emphasizes capacitation actions for Municipal Managers[12] and some activities already carried out in school environments.

[12] Capacitation projects for Municipal Managers are carried out by means of instruction manuals and are target at municipal city halls in the country. The goal is to offer tools for the study of athropic emmissions and removals of greenhouse gases and to formulate plans, programs, projects and local actions related to climate change.

5.4 Environmental Education and Climate Change Proposals and Projects

After the preliminary survey, which took into account considerations made by the National Plan on Climate Change and the National Conference on Environment, some activities, proposals and strategic educational public policies that either directly or indirectly enhance the ties between Environmental Education and Climate Change in the Federal realm.

1) Agenda 21 in Schools

In 2003, at the 1st National Child and Teenager Conference for the Environment, 400 young delegates produced the Letter Youngsters Taking Care of Brazil - Resolutions from the National Child and Teenager Conference for the Environment, in which they requested the creation of youth councils and Agenda 21 in schools as spaces for pro-environmental participation.

The School Agenda 21 is a proposal that integrates the studies of Global, Brazilian, State and Local Agendas 21 and diagnostic forecasts, to be implemented in the school, family and social realms.

2) "COM-VIDAS"

The Committee on Environment and Quality of Life in Schools – COM-VIDAS seeks to get the school community involved in environmental issues and its goal is to implement the School Agenda 21 in each school, monitor Environmental Education projects, organize School Conferences on Environment, promote exchange programs with other COM-VIDA's and discuss specific issues relevant to the local reality.

3) Procel in Schools

This is a project for the dissemination of information against energy waste by means of the methodology "Nature of the Landscape – Energy", promoting kowledge multiplication among Electric Energy Concessionaires, which provide qualified education to teachers, following the same methodological procedures and using Environmental Education as a communication channel.

Table 14. Quantitative reach of "Procel in Schools", 1995-2006.

Procel in schools – 1995 to 2006 Project "Nature of the Landscape - Energy"	
Project-assisted Schools	21 thousand
Students	18 million
Teachers	140 thousand
Source: 2008 PNMC	

4) "Collection Exploring Teaching" (Ministry of Education – MEC)

The series (collection) consists of didactic material with 8 volumes that cover contents implicitly related to the theme Climate Change. The 2008 goal was the distribution of 200 thousand copies in all schools in the country.

Volumes 1 and 2 on Mathematics cover curriculum contents of Middle and High Schools. In volume 1, there are articles dealing with the relationship between Mathematics and other fields of knowledge such as History, Geography and Astronomy, in addition to including pleasure reading stories about mathematical problems and curiosities. The articles enable the teacher to widen his view and acquire a new perspective by inserting mathematics contents in an ample and interdisciplinary context, exploring new teaching approaches. In volume 2, classroom activities, employing easy access materials for both teacher and students, are presented.

Volume 3 introduces texts that enable the teacher to diversify the approach and presentation of teaching contents, making classes more motivating and thus favoring learning among studetns.

Volumes 4 and 5, devoted to Chemistry, allow for diversity of interests on the teacher's part by discussing current themes in the development of Chemistry and its teaching, including relationships between Science and society, experience accounts and didactic experimentation.

Volume 6, on Biology, presents articles organized according to major áreas, followed by introductory texts that enable the teacher to update his knowledge, from the scientific and pedgogical viewpoints, in each of the major Biology areas.

The major goal of volume 7 – Physics – is to offer school teachers a series of texts with reflections on new knowledges, practices and activities developed in the classroom. It also deals with the role of laboratories as learning resources, of computational simulation and revitalization strategies for the teaching of the discipline.

The Geography volume, n 8, focusses on the theme "the sea in the Brazilian geographical space" and provides teachers with knowledge about studies, research and activities on the sea ans its potentialities, aiming at raising awareness and reflection on the economic and strategic importance of the sea to nations, in special Brazil, due to its huge coastline.

5) CONPET in Schools

The project emphasizes the importance of the rational use of energy and was devised for 6th and 9th graders from regular and technical schools of the public and private networks. It was developed with the perspective to educate e a future generation, aware of the rational use of fossil fuels and the conservation of natural resources and the environment.

In Middle and High Schools, school actions by CONPET are turned toward teachers, natural information multifliers. In order to pass on information to students, they attend informative lectures on oil and natural gas, environment and energy conservation and also supporting material.

The nationwide project was created in 1992, with the partnership of the Ministeries of Mines and Energy and that of Education. For its implementation, CONPET establishes technical cooperation agreements with State and

Municipal Secretariats of Education, which are responsible for the appointment of teachers to participate in this initiative.

For the sake of illustration, the results of the project are indicated in the table below.

Table 15. Quantitative reach of CONPET, 2004-2008.

CONPET 2004-2008	
Municipalities	520
Schools	4,600
Teachers	12,000
Students	420,000

6) The Brazilian Space Agency School Program (AEB)

Actions of the AEB School Program, in 2004, were directed toward the validation of its activities and the creation of na applicable dissemination model available to educational centers in the nation's capital and those of other parts of the country that show interest in the initiative.

They also develop products of educational nature such as didactic material, interactive modules for the performance of experiments and a list of challenges and problems based on four themes: "Astronomy and Space Sciences", "Meteorology, Atmospheric Sciences and Environment", "Remote Sensoring and Environmental Sciences" and "Satellites, Launching Vehicles and Launching Centers".

Themes referring to rockets or satellites, to mention a few, and also related to the Brazilian space program are integrated not only in the contents presented in the classroom but also in everyday activities. Such characteristics allow for the use of space subject areas as tools to stimulate and promote teaching, creativity, knowledge contextualization and the awakening of talents.

For more insertion, the Program offers courses, lectures and workshops for teachers. By integrating the school community with Brazilian actions in the field of space, teacher training and exchange programs among schools, universities, research centers and institutes, AEB hopes to aid in the strengthening of a culture of knowledge that may enable the country to fulfill its transformation potential to modify and improve the country's reality.

Table 16. Number of teachers and students assisted by the AEB Program in schools – Space Themes and Climate Change, 2007.

AEB IN SCHOOLS (2007) Space Themes and Climate Change	
Teachers	1,000
Students	233,924
Source: Brazilian Space Agency	

7) National Child and Teenager Conference for the Environment (CNIJMA): *Let's look after Brazil*

The National Child and Teenager Conference is regarded as the major proposal and activity to analyze and diagnose the práxis of Environmental Education with its connections with Climate Change, carried out by the federal government with wide repercussions in all states of the federation. According to information presented on its official site:

> It is a pedagogical campaign that enhances the political dimension of the environment, and which is characterized by the mobilization and engagement of teenagers and school communities in debates on contemporary socioenvironmental themes.

In participating schools, students debate themes and proposals and define actions. Regional conferences are held with the participation of delegates in the same way the National Conference is organized. The Conference is an initiative of the Manegement Office on National Environmental Education Policy, comprising the Environmental Education Department (DEA) of the Ministry of the Environment (MMA) and the General Coordination for Environmental Education (CGEA) of the Ministry of Education (MEC). At the end of the conferences, participants agree on a Letter of Responsibilities to guide their actions in the school community they are inserted.

Listing 2. Description of activities of the National Child and Teenager Conference for the Environment

Activities
Creation, production and gradual distribution of the guidelines document "Step by Step" in the Conference on Environment, all schools and among community participants.
Publicity for the Conference through production and exhibition of the vídeo "Step by Step" on Futura Channel and School TV (MEC) and the publicity movie on the open TV and radios all over the country.
Articulation and orientation by State Organizing Committees through visits, videoconferences and announcements.
School and community mobilization
Organization of Conference Workshops: educational meetings for students, teachers, youngsters, managers and remaining actors of the civil society
Cataloging works of Schools and Communities in computer systems I CNIJMA – htpp://www.mma.gov.br/propostasdasescolas II CNIJMA – http://www.mec.gov.br/conferenciainfanto
Selection of schools and communities
Preparatory activities for the final event
Organization of the National Conference

In the 1st CNIJMA (2003-2004), schools made their proposals on how *We are going to look after Brazil* together, according to the theme of the conference:

Table 17. Number of activities and participants in the 1st CNIJMA (2003-2004).

Conference workshops	Conferences and state/regional events	Conferences on Environment	Participants in conferences on Environment	Municipalities involved
121	10.367	11.475	3.801.055	2.865

In the 2nd CNIJMA (2005-2006), schools were urged to define responsibilities and actions about international documents, agreed upon and signed by Brazilian officials, related to climate change, nutritional and food safety, ethnic-racial diversity and biodiversity.

Table 18. Number of participants in the 2nd CNJMA e of those involved with the Climate Change theme in the areas of Mathematics and Sciences, 2005-2006.

2nd CNJMA 2005-2006				
Participants	Grand total	Mathematics Sciences		
Schools	11,475	2,897		
Teachers and school community	3,801,055	943,722		
		Schools	Teachers	School community
		768,743	43,367	131,612

The 3rd CNIJMA (2008-2009) under the title "Global Environmental Change", proposed that the theme Climate Change should be debated from a systemic and integrated perspectiva, with discussion views of Natural Sciences, Human Sciences, Mathematics and Languages. This broad thematic area was divided into themes related to the four elements of nature – water, air, earth and fire – in their environmental discussion, revisiting concepts of the western philosophy from the Presocratic philosophers until our days, as well as views from literature and the fine arts. Each theme was dealt with in two dimensions:

1) the biosphere, the atmosphere, the hydrosphere, energy and mobility regarded as bases of life and human societies sustainment on the planet; and

2) the intervention of the technosphere, of production and consuming technologies, disregarded by ethics toward socioenvironmental sustainability, result in the destruction of the planet's quality of life.

One hundred and six thousand copies of didactic materials, among which a book on Global Environmental Changes – Think + Act in the school and community, with distribution to 58 thousand Elementary and Middle Schools, in addition to 6 thousand schools located in indigenous communities and "quimbolas" and rural settlements. The 3rd CNIJMA (2008-2009) had as a goal to reach a public of 7 million people in 20,000 schools.

The 4th CNIJMA is considered the largest and major activity carried out nationwide that clearly converges all themes, practices and reflections to issues that get youngsters involved with knowledge, problematization and search for alternatives for climate change. The Conference has not yet systematized data, since it was held in April 2009. However, information is available on the official site: http://portal.mec.gov.br/secad/CNIJMA/index.html.

From the experience acquired from the organization of this kind of event, Brazil will host, in 2010, the National Child and Teenager Conference: *Let's look*

after the Planet, selecting the theme of climate change for school debates in the countries involved.

Summarizing, we have the following figures:

Table 19. Total number of actions from Brazil in the area of Environmental Education, 2007

Capacitating actions	Participants
Continuing Education for Teachers	65,646
2005 Conference	3,801,055
Chico Mendes	287,482
Young Collectives	838
V Brazilian Forum on Environmental Education	4000
Youth Meetings for the Environment	180
Brazil Geo Youth	60
V Iberoamerican Congress on Environmental Education	4,300
Total	4,163,561
Source: Secad 1 Working Papers, p. 93	

Final Considerations and Proposals

Brazil has an incipient and diverse history of Environmental Education now at an implementation stage. Since 2003, the federal government has been making an effort to combine the intitiatives from the Ministry of Education (MEC) and the Ministry of the Environment (MMA). Nowadays, a reorganization of activities is taking place due to the change of administration in the Ministry of the Environment. It can be asserted that, in the initiatives by the Federal Government, great emphasis placed on network capacitation and formation, especially, in the stimulus attributed to initiatives toward Educational Collectives. However, the stimulus is still concentrated on the development of autonomous initiatives, which are more dependent on the proactivity of the civil society rather than of the public power.

Some aspects are important to stress:

1) ESD in Brazil has not effectively been integrated conceptually to the institutional agenda of the ministries that are involved with environmental education, Ministry of Environment and Ministry of Education. Notwithstanding the multiple initiatives above cited indicate that the issues are being addressed by several programs and actions through governmental and non-governmental institutions, revealing interesting possibilities for the enlargement of the number of stakeholders involved and the replication and broadening of its impacts.

2) It is to be stressed that in the case of Brazil as in other developing countries the main issue is still the access to education. In the brazilian case this aspect has been almost solved in quantitative, but not in qualitative terms. The issue that is being increasingly addressed is related to the problematic of the formation and capacity building of teachers, and this implies that most of them are insufficiently prepared to deal with scientific concepts and knowledge associated to the teaching of environmental education and much more to education for climate change. The teachers lack the basic knowledge to involve

themselves with environmental education practices. There is a challenge to transform the social space of schools, emphasizing initiatives and learning practices and curriculums within an optic of tranversality, overcoming a strict and many times superficial approach to deal with environmental issues.

3) Another aspect to be considered is that the existing programs are not associated to the government in office or to specific leading persons in office, but that they acquire a legitimacy within the society as to their role in the formation of a participative and critical citizen, within a perspective of sustainability. One of the current challenges of the Federal Government is to overcome discontinuity of policy actions in a context of change of ministerial boards.

4) Since 2003 there has been concern on the part of the Federal Government to stimulate the educational system toward an increasing involvement with Climate Change issues through the organization of Conferences and production of didactic materials. Nevertheless, the outreach of these initiatives in the various regions of the country is differentiated. Regional and local data for analyses about project and program implementations are still quite poor. Therefore, only the data at the federal level were recorded.

5) From the standpoint of the relationship teaching-learning processes, there is a enormous gap in terms of research, interventions and more in depth debates. In this gap, the adopted option is that of seeking scientific-based teaching relevant to the theme, as for example, through the design of didactic materials with accumulated knowledge on climate, sea currents, the composition of the atmosphere, among others. Thus, the promotion of teaching with transmission of scientific content.

5) Critical positioning in relation to Environmental Education in the country – linked to politization, social engagement, exercise of citizenship – was only taken in the Conferences (3rd and 4th CNIJMA) when it was dealt with methodologically together with Climate Change. Mitigation and adaptation are the major axes for social actions related to scientific studies. Public policies to meet the needs of Climate Change issues are strategic to education. However, in the Conferences and in their didactic materials, these axes are incorporated to principles of Environmental Education that are fundamentally related to the Treaty on Environmental Education for Sustainable Societies and Global Responsibility, which proclaims the need for social transformation.

6) It is worth emphasizing that the 3rd National Conference on Environment (3rd CNMA) assigned the role of Environmental Education as an essential axis and the basis for social, political and scientific debates about the challenges of Climate Change. However, in the National Plan on Climate Change, education is tentatively approached, simply in a tangent manner. There is an ongoing effort at the Federal level- ministry of education to generate more capilarity of environmental issues within curricula. In comparison to other countries the incorporation of sustainable development issues into the curriculum as one of its thematic units is not something to consider in the short term. But the important aspect to consider are the multiplication of initiatives taken by school principals or even teachers to introduce the subject in an interdisciplinary project within schools. NGOs that are involved with environmental education have been in many cases well succeeded, but there is very reduced evaluation of its impacts.

7) The number of experiences with Local Agenda 21 and Agenda 21 in Schools has been very limited, but where developed, the outcomes brought in many cases, very positive outcomes.
8) In Brazil, scientific research related to Climate Change is acquiring a strategic position in science and technology policies with larger financial investments. There is an original mismatch between education and scientific knowledge. However, it is important to stress the idea that sustains the conceptual basis of Environmental Education encouraged during the period above mentioned. This idea stems from the understanding that the transmission of scientific contents is not enough to effectively verify the existence of a teaching and learning process in environmental education.
9) The most important challenges for Environmental Education associated to Climate Change are the following: to expand the number of educational actions, at the local and regional levels, through actions proposed in Conferences; to produce, expand and disseminate adequate didactic material, teachers' training and debate on pedagogical issues, mainly in relation to what is intended to be taught and learned with regard to the Climate Change problematic. From a pedagogical perspective, there is an urgent need to question, in methodological terms, the ways to deal with learning processes related to such negative and problematic scenarios, as indicated by the IPCC reports, without resorting to catastrophist standpoints on immobilization or, merely, by taking into consideration rather simplistic views concerning such crucial and important issues.
10) The main focus has to be related to the challenges of adaptation, and develop educational programs that include issues on regional diversity in the case of Brazil due to its complexity and multiplicity of ecosystems, the prevalence of a urban way of life with all its contadictions and very linked to consumption and mainly to their increasing logic of unsustainability. In agreement with other reports we also consider that more sustainable behaviours and attitudes have to be stimulated, but this has to do with the priority that is given by formal education, the informal spaces and how can education at different stages realistically contribute to achieving sustainable development goals. Within this perspective there is a need to think about the role of education in the promotion of environmentally-related content, stressing processes of capacity-building, social learning, within a cooperative based approach of critical thinking and problem-solving skills which focus on the need to help people address uncertainty and future change.
11) The most challenging issue is to create the conditions for, given the existing structural and institutional barriers to change towards sustainable development that educational initiatives will be strategic to bring about the changes needed to motivate citizens to move their actions towards more sustainable goals. The questions are complex and have no precise answer, but educational programs have to be coherent as to the multiplicatory impacts of approaches that stress the importance for mankind to move towards a more sustainable socio-political culture.

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Report from Canada

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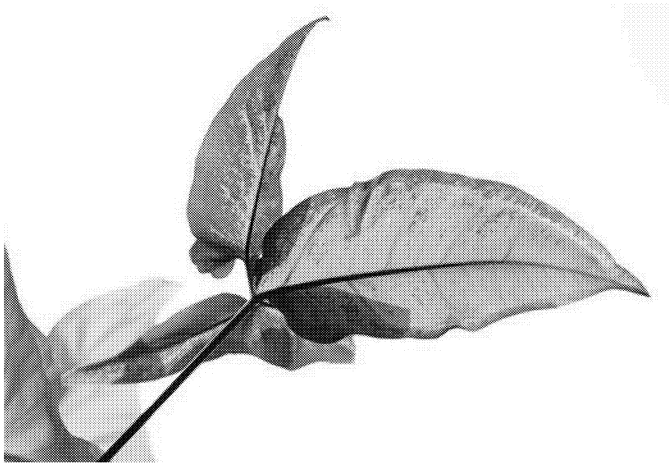

Climate Change and Sustainable Development: The Response from Education The Canadian Perspective

Joanne Nazir, Erminia Pedretti, John Wallace,
David Montemurro and Hilary Inwood

The basic vision of the United Nations Decade of Education for Sustainable Development (UNDESD) is to create

> …a world where everyone has the opportunity to benefit from education and learn values, behaviour and lifestyles required for a sustainable future and positive societal transformation. (UNESCO, 2004, p.4)

Based on this foundation statement, it is clear that Education for Sustainable Development (ESD) is a complex concept that may be subject to many interpretations. As such, providing an insightful, comprehensive account of the work being done to actualize ESD in any country is challenging, even more so, for a country as vast and diverse as Canada. It is therefore important from the outset to contextualize any report that seeks to do so. This report begins with an outline of the context and delimitations we used to frame our work. This is followed by brief descriptions of Canada and the Canadian education system. The next four sections constitute the main body of the report. Here, detailed descriptive analyses of critical examples of ESD policy, practice and research from across Canada are presented. The examples included are both geographically and contextually diverse. The concluding section of the report brings together the diverse threads of policy and practice described in previous sections by identifying major themes and tensions and reflecting on how these may further the concept, and practice of ESD.

Context of the Report

It is important to note, from the beginning, that this report is not a catalogue of all the examples of ESD policy, practice and research across Canada. Rather, it is an analysis of critical examples from across the country. This approach was chosen because reasonably comprehensive catalogues of ESD policy and practice for Canada already exist (e.g. CMEC 2007; 2006; 1999). However these reports are limited in their critical analyses of underpinning assumptions and outcomes of the policies and initiatives described. This report seeks to bridge that gap by providing a blend of description and analyses of several carefully chosen examples. In choosing critical examples two main criteria were considered. Firstly, examples were deemed critical if they possessed the potential to stimulate deeper thought about the concept and practice of ESD. Secondly, in order to represent Canada's diversity, exemplars from across the country were chosen.

Other delimitations of the report stem from the meaning of the term ESD. As previously mentioned ESD is a vaguely defined term, subject to multiple interpretations.

Even within Canada, several definitions of ESD exist. In developing this report, the touchstone used for analyzing the various Canadian examples is the UNESCO (2004) vision of ESD which suggests that ESD involves moving people to adopt behaviours and practices which enable them to live a full life without being deprived of the basics. However in assuming this definition it was also acknowledged that the words within it, such as 'moving people', 'full life' and 'basics' are themselves imprecise. Moreover, UNESCO's further explanation of these terms within a frame of respect for human rights; social and economic justice; respect for life and diversity; and care for the Earth represents but one worldview and one interpretation that may not be shared by all. Also, in common usage, the term ESD encompasses formal, non-formal and informal educational settings. It is important to note that this report focuses on formal education only; specifically formal school settings catering to students, ages six to sixteen.

Finally, in the initial stages of preparing the report it became apparent that the term Climate Change Education (CCE) has not yet become common in Canada. However the issue of CCE has been addressed in several provinces, within the broader area of Environmental Education (EE). For this report CCE is generally subsumed under the term EE. However, as will be explicated later in the report, EE in Canada is much more than a frame for CCE. Indeed it may encompass a uniquely Canadian interpretation of ESD; one that differs fundamentally from UNESCO's vision of the concept.

Some Facts about Canada

Canada is a vast country. By area, it is the second largest country in the world covering almost 10 million square kilometres. It stretches from the Atlantic, to the Pacific Ocean to the Arctic Sea. It can be divided into six distinct geographical regions. Aboriginal people were the first inhabitants of Canada until explorers and settlers from Europe arrived in the 1500's. Canada soon became a battleground for power between European colonial empires, until it became an independent country in 1867. Today, Canada is described as a federation of provinces and territories. There are ten provinces and three territories. It is governed by a parliamentary democratic system. The parliament consists of an elected House of Commons and an appointed Senate. The head of government is the Prime Minister.

Traditionally, Canada has been characterised as a resource rich country, renowned for its large deposits of economically valuable natural resources such as lumber, water and minerals. Ten percent of the world's forests exist in Canada. It is the third largest diamond producer and the world's foremost producer of potash and uranium. Primary industries such as mining and forestry have traditionally been seen as the backbone of the Canadian economy. Yet over the years, a steady tide of technological progress has moved the economy, from one based almost exclusively on exploitation of natural resources, toward a knowledge-based economy with a growing dependence on knowledge-intensive, and service industries. Indeed, it is estimated that the services sector currently accounts for 66% of the country's gross domestic product (Statistics Canada, 2009). Presently

Canada's economy is continuing to evolve, shifting in a direction of exploiting the global marketplace though expanding liberal capitalist trading regimes.

As of 2007, Canada's population was 33.1 million, with a density of 3.5 people per square kilometre and a median income of C$41,401. However this population is not evenly spread. Two thirds of all Canadians live within 100 kilometres of the United States border with 80% of these living in urban centres (Statistics Canada, 2007). This population is also ethnically, linguistically, and culturally diverse. While some regions are predominantly European, others still retain significant Aboriginal populations. Canada remains the home of over a million Aboriginal people belonging to three distinct groups: First Nations, Metis and Inuit (Statistics Canada, 2006). Provinces like Ontario and British Columbia are even more multicultural because of growing international immigrant populations who continue to be attracted to the country by an aggressive federal immigration policy. Immigration is so significant that Toronto, the largest city in Canada, is one of the most multicultural cities in the world, containing residents originating from every country. Quebec represents another unique example of Canada's diversity. It is a predominantly Francophone province, where French culture and language are maintained, in the heart of an otherwise English styled country. Diversity is, in many ways, a defining characteristic of Canada, so much so, that official statements acknowledge and protect it. In 1969, the government of Canada adopted a bilingual policy recognising both English and French as the official languages of all federal institutions in Canada (Office of the Commissioner of Official Languages, 2007). In these statements, Canada is described as a 'mosaic' society (as opposed to a 'melting pot'); a place where different groups of people are encouraged to live together equitably while maintaining their ethnic and cultural diversity (Citizenship and Immigration Canada, 2009).

The size and diversity of Canada can present unique challenges and exciting possibilities when seeking to implement new countrywide initiatives, such as ESD or CCE. The challenge lies in the fact that Canada is composed of thousands of individual communities each with its own local culture and priorities where general policies and programs may not be practically effective. Simultaneously, diversity and space to grow hold the potential for developing unique insights and approaches especially with loosely defined concepts such as ESD and CCE.

Formal Education in Canada

A few general statements can be made about education in Canada. Beyond these the situation becomes more complex. Basic elementary and secondary education is free to all Canadians. In most provinces attendance is requisite for children ages 6-16. There are approximately 15,500 schools countrywide enrolling some 5.3 million students. The elementary school curriculum emphasizes the basic subjects of language, mathematics, social studies, science, health and physical education, and introductory arts. One of the recognized challenges of education in Canada is catering to diversity: urban, rural, indigenous, non-indigenous and a growing immigrant population (CMEC, 2008).

As mentioned previously, Canada is a federation of provinces and territories. The federal government is responsible for national concerns such as international relations, immigration policies and national security. Provincial governments are responsible for social programs such as healthcare, education and welfare. There is no overarching federal department of education and no integrated national system of education in Canada. In lieu of a highly organized federal department of education, the country possesses a less formal association called the Council of Ministers for Education Canada (CMEC). Formed in 1967, this body provides a forum for provincial ministers of education to discuss matters of mutual interest related to education; develop educational initiatives cooperatively; and represent provincial and territorial educational interests with the federal government, foreign governments and international organizations. Officially, CMEC acts as the national voice for education in Canada. Though it is not responsible for overarching policy for education in Canada, CMEC has produced several guiding documents about Canadian education (e.g. CMEC, 2008; 1997) and several reports about the state of ESD in Canada (CMEC 2007; 2006; 1999). Recently, it has published a framework which provides specific statements relating to the future of ESD in Canada (CMEC, 2008a). It is important to note, however, that there is no specific requirement for provincial/territorial Ministries of Education to adopt CMEC recommendations. Education in Canada remains strictly in the control of provincial governments.

In each of the 13 jurisdictions, departments or ministries of education are responsible for their own organization, delivery and assessment of education. At the provincial level, the education system tends to be highly structured. Each province or territory has one or two departments of education. The minister of education is an elected member of the legislature and is appointed to the position by the government leader or premier of the jurisdiction. Deputy ministers appointed from the civil service are responsible for the operation of the departments. Ministries define both the educational services to be provided, local educational policy and legislative frameworks. School governance is entrusted to subsidiary bodies ─ school boards, school districts, or district education councils. Members of these subsidiary bodies are elected by local public ballot. Although provincial and territorial ministries of education control education in Canada, their policies and activities are influenced by several other local and national bodies, including teachers' associations, non-governmental organizations and universities. This is particularly true for ESD.

One critical implication of the provincial control of education is that while there are great similarities among the 13 education systems, there are also significant differences, expressive of differences in geography, history, culture and language and other specialized needs of the populations served. For example in Quebec, the education system is more reflective of a continental French system, whereas in Nunavut, educational policy is greatly influenced by the culture and traditions of its majority Aboriginal population. This also means that broader federal commitments and guidelines relating to ESD and CCE may not be fully realized at the school level, since these are

always filtered through provincial bodies who exercise their authority to interpret and implement federal guidelines.

The Federal Government's Response

In 2005, the government of Canada produced a key report summarizing the work of the federal government with respect to ESD. From this report it seems that the Canadian government is particularly keen to promote sustainable development, with education playing a key role (Government of Canada, 2005). According to the report:

> Sustainable development meets the needs of people today without compromising the ability of future generations to meet their own needs. Education for sustainable development can help people understand what sustainable development means in everyday terms, bringing them into a clearer understanding of the issues and their interconnections. It can also help them to develop the values, outlooks, knowledge, and skills they need to move forward into a sustainable future. (Government of Canada, 2005, p. 2)

However, in taking up the concept the Canadian government has made several distinctions of its own. It recognizes that there is no universal mode of ESD and emphasizes that Canada must develop its own version of ESD:

> Canada, like other nations, must move forward in defining its own priorities and actions for education for sustainable development, addressing its own social, environmental, and economic needs in ways that are culturally sensitive and forward looking. (Government of Canada, 2005, p. 1)

Secondly, it sees ESD as a process rather than as an end goal. ESD is viewed as a long term effort that "empowers people to reach the goal of sustainable development" (Government of Canada, 2005, p. 2). Thirdly, it is implied that ESD may not be a radically new concept to Canada, but one that may be accommodated by an expansion of Canada's already strong science and environmental education programs. Fourthly, in this document it is clear that although education is considered an important strategy for promoting sustainable development, implementation of educational programs, especially formal education in schools, is not the primary focus of the federal government. Rather, the work of Canada's federal government focuses more broadly on developing practical sustainable development strategies and raising public awareness. Finally, the overall goal of ESD is ambitious. ESD is attributed the power to improve individual and societal well-being socially, culturally and economically as described in the following statement:

> The Government of Canada believes that as a result of education for sustainable development, Canadians will come to understand that sustainable development contributes to their health and well-being, sense of place, social cohesion, equity, and heritage, and supports sustainable communities. People will have better access to the knowledge and tools that allow them to seize opportunities, confront challenges, compete successfully in the global marketplace, and take advantage of the social, environmental, and economic benefits afforded by sustainable development. They will recognize the vital

> role of science and technology in sustainable development, value investment in research and development, and support the further building of knowledge and capacity upon which sustainable development is built. In short, Canadians will become more accepting of the changes needed to achieve sustainable development, and more willing to alter their own behaviour accordingly. (Government of Canada, 2005, p. 4)

Two federal bodies that have been particularly active within the field of ESD in Canada are Environment Canada, the federal department responsible for environmental matters, and CMEC. In 2005, Environment Canada introduced the *Competitiveness and Environmental Sustainability Framework (CESF*) (Environment Canada, 2005), a policy document linking the concepts of sustainability, economic development and environmental protection to the Canadian context. This policy was the government of Canada's first major attempt at developing a national approach to sustainable development. Its three overarching goals were: enhancing the safety and well-being of Canadians; preserving the natural environment; and advancing the country's long-term competitiveness. Although the CESF is rarely referred to after 2006, it assisted in establishing fundamental ideas about sustainable development and ESD. The framework established the seemingly paradoxical premise that economic and environmental success, rather than being at odds, can act complementarily. The framework demonstrated in accessible language how environmental sustainability could act as a new basis for economic competitiveness. The hypothesis was supported by scientific evidence about the impact of environmental degradation on human health and well-being; the assumption that citizens believe this and want their health and environment protected; and models of how sustainability can save companies money, open new markets and develop new economically valuable technologies. The framework also helped to establish sustainable development as a national priority in Canada and supported the link between education and sustainable development by naming 'education and engagement' as one of the five pillars of the framework.

CMEC, the official national voice of education in Canada, has been more direct in addressing ESD in formal education. One of its first endorsements for making ESD an active part of the curriculum in Canadian schools is found within the *Common Framework of Science Learning Outcomes, K-12: Pan-Canadian Protocol for Collaboration on School Curriculum* (CMEC, 1997). This document was intended to be a national guide for Canada's provinces and territories as they developed their respective science curricula. It was developed during a period when the government of Canada was considering creating national guides to inform provincial curricula. The science document is unique, in that it is one of the few national statements on school curriculum. Throughout the framework the language of ESD is common. For example:

> Canadian society is experiencing rapid and fundamental economic, social, and cultural changes that affect the way we live. Canadians are also becoming aware of an increasing global interdependence and the need for a sustainable environment, economy, and society. (CMEC, 1997, p. 4)

Within the document, ESD is intrinsically linked to scientific literacy and science education. Among other goals, science education is delegated the responsibility to:

- enable students to use science and technology to acquire new knowledge and solve problems, so that they may improve the quality of their own lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical, and environmental issues. (CMEC, 1997, p. 5)

The approach to science education described in the Common Framework is referred to as Science, Technology, Society and Environment (STSE). STSE seeks to link science education to broader humanistic contexts (Aikenhead, 2006; Pedretti & Little, 2008; Pedretti, 2005). It shares many common goals with the UNESCO vision for ESD. However STSE places them within a science education frame (as noted earlier in the report, each province has developed their own science curricula and therefore STSE my or may not be emphasized). Positing STSE as a central organizer for the Canadian school science curricula has had mixed effects. While it has undoubtedly aided in bringing ESD to the forefront of the curriculum debate in Canada, it may have also inadvertently assisted in twinning ESD with science education, that is, placing ESD solely into the domain of science education. Recently this effect has been identified and challenged. ESD is being re-visioned to make it not only a science issue but a broader cross-disciplinary organizer for all school curricula. This move is evidenced by the recently issued *Learn Canada 2020* (CMEC, 2008a), a framework produced for provincial and territorial ministers of education. The document identifies eight activity areas and objectives to meet the general vision of 'Quality Lifelong Learning Opportunities for All Canadians'. ESD, defined as raising students' awareness and encouraging them to become actively engaged in working for a sustainable society, is stated as one of these objectives.

In reflecting on the work of the federal government concerning ESD several further conclusions emerge. While it is clear that the Canadian government has espoused the idea of ESD, it is also evident that many of the major underpinning ideas have not been questioned. For example, in government documents, there is little clarification of the meanings of the terms sustainability, education and development. The universality of the meanings of these and many other terms is assumed. Moreover these meanings are taken to be representative of the Canadian population and therefore unnecessary to define or challenge. The links between economic growth, development and education are also tacitly accepted. It is rare to find any critique of the notion that these phenomena are fundamentally connected. Another point of interest, apparent particularly from analysis of the CESF proposal, is the importance of economic interests in determining federal policy in Canada. The concepts of sustainable development and ESD seem to have become fully legitimated only when they were shown to be economically viable and valuable in maintaining the country's global competitiveness. Another observation that may partly explain the federal government's position on ESD is that the Canadian government does not seem to believe that ESD is a radically new concept for Canada. CMEC (1997) saw ESD as a part of science education. Almost ten years later the government of Canada (2005) positioned ESD as an extension of existing environmental education traditions. Canada's report on progress with respect to ESD describes the main challenges opposing ESD as structural rather than ideological (CMEC, 2007). Some of the main challenges to

ESD identified by this report are the already crowded curriculum, lack of teaching resources and inadequate teacher training. As yet, there is no clear evidence that the UNESCO vision of ESD has fundamentally challenged the government of Canada's ideas about the nature and purposes of education. In summary, it seems that ESD has not been so much adopted as it has been adapted by Canada to support a certain political and economic agenda.

Provincial Governments' Response

In this section of the report we describe critical examples of the response to ESD from four educational jurisdictions across Canada, namely Manitoba, Newfoundland and Labrador, Nunavut and Ontario. The jurisdictions also represent the geographical diversity of the country.

Manitoba

Manitoba is a prairie province located in central Canada. Within Canada, it is considered a leader, particularly active in all aspects of ESD (CMEC, 2006). Work has been going on in Manitoba surrounding the concept of sustainable development since the mid-1980's when the term was first coined by the UN. In 1990, the Manitoba Round Table for Sustainable Development released a core document outlining principles and guidelines of sustainable development as well as proposing strategies for enacting sustainable development in the daily life of Manitobans. This initiative was followed in 1994 by the publication of the *Sustainable Development Strategy for Manitoba* (Manitoba Conservation, 1994). This framework is described as "a world, national and provincial perspective on sustainable development" (p. 2). It outlined ten principles, six guidelines and sixteen component strategies to guide the enactment of sustainable development in the province. This document is pivotal since its main ideas pervade all subsequent provincial plans about sustainable development and ESD. Sustainable development is seen to involve economy, environment, human health and well-being. One of the key principles is that economic decisions should adequately reflect environmental, human health and social effects. Emphasis is also placed on sustainable development as a shared responsibility having global connections that all citizens need to accept. Actions pertaining to sustainable development entail a combination of stewardship or caretaking; anticipation and prevention of adverse actions; conservation and enhancement; and rehabilitation and reclamation. The role of formal education in sustainable development is referred to very broadly as a component strategy for further development. In 1997, many of the components of the sustainable development strategy became provincial law when *The Sustainable Development and Consequential Amendments Act* (Province of Manitoba, 1997) was declared. The passing of this act made Manitoba the first jurisdiction in Canada to pass legislation about sustainable development. The act re-established the Manitoba Round Table for Sustainable Development and a Sustainable Development Coordination Unit and vested them with the legal authority to further develop and plan for implementing sustainable development throughout the province for both public and private sectors.

By the time UNESCO's Decade for Education for Sustainable Development (UNESCO, 2004) began, Manitoba's plans for ESD in formal education were already relatively advanced. Building on existing provincial policy regarding sustainable development, the Manitoba Department of Education, Citizenship and Youth had already produced *Education for a Sustainable Future: a Resource for Curriculum Developers, Teachers, and Administrators* (Manitoba Education and Training, 2000). This policy was intended to assist workers in education to integrate sustainability concepts into new and existing school curricula. It contained basic definitions of sustainable development, a vision for ESD and a relatively detailed interdisciplinary framework for ESD. Within it, ESD is:

- characterized as a challenge which "enables students to make choices that incorporate the essential principles and values of sustainability" (p. 3)
- linked to the concept of lifelong learning
- viewed as a combination of knowledge, values, decision-making skills and life practices
- outlined as an inter disciplinary issue that could be integrated into all traditional subject areas existing in school curricula
- framed within broader educational issues like gender equity, anti-racist education, differentiated instruction and aboriginal perspectives.

The authors of this document also proposed that curricula should provide students "with the opportunities to think and act according to the principles of sustainability" (p. 3). Evolving from this policy the department of education further developed the *Education for Sustainability Action Plan (2004-2008)* (Manitoba Education and Training, 2004) to foster teaching and learning for sustainability in Manitoban elementary and secondary schools. In addition to plans infusing sustainability concepts into curricula, the Action Plan includes provision for:

- teacher training workshops to enhance teaching and learning for sustainability
- development of websites focusing on ESD
- provision of incentive grants for educators who plan, develop and implement sustainability focused curriculum units
- establishment of a provincial Education for Sustainable Development Working Group to foster a culture for ESD in Manitoba's education system
- guidelines for benchmarking and tracking of sustainability literacy in curricula.

To date many of these plans have already been enacted (CMEC, 2006). Additionally, Manitoba's educational initiatives have influenced the national ESD agenda. Through partnership with Environment Canada and the non-governmental organization Learning for a Sustainable Future (which will be discussed later in this report) eight Provincial/Territorial ESD Working Groups, similar to Manitoba's Working Group have been established.

Despite its comprehensive policy and plans, the practical outcomes of ESD in Manitoba remain unclear. There are very few reports about the impacts of these documents on schools and classroom practices. Two recent reports are not particularly encouraging. In a study of the role of government policies in Manitoba schools, Swayze (2008) found a significant gap between the provincial sustainability frameworks and district/school policy. She found only limited awareness of provincial policy about ESD at the school level, and concluded that school level actions related to sustainability issues may not be driven by policy but by passionate individuals and influence from informal sectors. These findings are further supported by Michalos, Creech, McDonald and Kahlke (2009). These researchers sought to understand the current status of Manitoban awareness and knowledge about sustainable development concepts. A student survey in this study revealed that while student knowledge about sustainability increased as students aged, only 14% of respondents reported that they had received formal education about sustainable development.

Manitoba's experience with ESD presents a conundrum. The province boasts a long history of engagement with the concepts of sustainable development and education for sustainable development. Much work has been done by the local government to develop a vision, policies and action plans addressing these issues. Analyses of the major documents reveal a seemingly comprehensive, holistic outlook. Many of the underpinning ideas have been inspired by relevant UN documents, so that of all the provinces, Manitoba's plans most closely align with the spirit of the UNESCO vision of DESD. Yet despite much planning at a governmental level, Manitoba seems to be struggling to realize ESD at the classroom level. The explanation for this paradox is undoubtedly complex. Speculatively, the policy-practice gap may be due to the heavy emphasis on centralized curriculum development or gaps in teacher training and support. Other explanations may lie in the tacit assumptions about sustainability, development and education that underlie Manitoba's policies and plans, and the congruence between these assumptions and teacher beliefs.

Nunavut

Nunavut is a territory in northern Canada in which 85% of the population is Aboriginal Inuit. This demographic has a profound impact on the governance and education system of the territory. For example, Nunavut has an overarching policy, heavily based in traditional Inuit culture and values, which frames all other territorial policies. The policy called *The Bathurst Mandate Pinasuaqtavut: that we've set out to do* (Government of Nunavut, 1999), presents an alternative view of governance and development, one that is socio-cultural rather than economic, and humanistic rather than technical. It also recognizes the mystic inter-connection of the human-nature relationship and the primacy of maintaining good human relationships as the driver for all other activities. These ideas are evident throughout the document. For example the policy starts with a basic vision:

> The health of Nunavut depends on the health of each of its physical, social, economic and cultural communities, and the ability of those communities to serve Nunavummiut in the

> spirit of *Inuuqatigiittiarniq*; the healthy inter-connection of mind, body, spirit and environment. (Government of Nunavut, 1999, p. 1)

The humanistic turn is further reflected in its fundamental guiding principles which state that:

- people come first
- people are responsible and accountable for their own well-being
- Nunavut needs to provide options and opportunities which will build the strengths of individuals, families and communities.

This original policy was reconfirmed and further detailed in the publication of *Pinasuaqtavut 2004-2009: Our Commitment to Building Nunavut's Future* (Government of Nunavut, 2004). Here, the importance of elders as sources of knowledge and wisdom is further established, along with the concept of Inuit *Qaujimajatuqangit*, that is, the Inuit way of life. This latter concept is designated as the essential way by which government should deliver programs and services in Nunavut. The guiding values of Inuit *Qaujimajatuqangit* identified are:

- respecting others, relationships and caring for people
- fostering good spirit by being open, welcoming and inclusive
- serving and providing for family and community
- decision making through discussion and consensus
- developing skills through practice, effort and action
- working together for a common cause
- being innovative and resourceful
- respecting and caring for land, animals and the environment.

Based on this particular worldview, the government of Nunavut has identified four specific goals for territorial development until 2020. These are healthy communities, simplicity and unity, self-reliance and continuing learning. Education is implicated within the goal of continuing learning as one key to development. As such, the policy has mandated the development of an education system within the context of Inuit *Qaujimajatuqangit*. It is important to note that although the term sustainable development is not prominent within Nunavut's guiding policy, the values of Inuit *Qaujimajatuqangit* resonate with many aspects of UNESCO's concept of sustainable development.

In response to the government's mandate, the Nunavut Department of Education, working closely with elders and educators from across the territory, has produced the *Inuit Qaujimajatuqangit Education Framework for Nunavut Curriculum Development* (Nunavut Department of Education, 2005). Within this framework 'the igloo' is identified as the metaphor for learning. Similar to the building of an igloo, education is seen as a spiralling, developmental progression aimed at producing resilient, lifelong learners. The proposed program of studies for Nunavut schools consists of four curricular strands embedded within six cross curricular competencies, all derived from Inuit *Qaujimajatuqangit*. The four strands replace the subjects of the traditional school curriculum. They are:

- Nunavut for Nunavusiutit- an integrated core of history, geography and environmental science
- wellness- an integrated core of social, emotional, physical and spiritual health
- communication- an integrated core of language and literacy
- describing and improving the world- an integrated core of math, science, technology and critical thinking.

The framing cross-curricular competencies for these strands are to:

- develop a collaborative relationship and work together for the common good
- show environmental stewardship
- be empowered and build capacity through knowledge and skills acquisition
- be resourceful and seek solutions through creativity, adaptability and flexibility
- cooperate, develop shared understanding to arrive at decisions through consensus
- contribute to the common good through serving and leadership.

Again it is important to note that although the term ESD is not used within this framework, the goals and language of ESD are clearly reflected in the descriptions of the strands and cross-curricular competencies.

As with other jurisdictions, it is difficult to say how these policies are being enacted in Nunavut's schools since there are very few research reports containing such information. Still, Nunavut is an important case that can provide some valuable insights into the concept and practice of ESD. It has been noted that the terms sustainable development and ESD are conspicuously absent from Nunavut's guiding polices. Rather than using UNESCO's vision of ESD as a starting point, Nunavut appears to have developed education policy to reflect its unique cultural tradition. These traditions happen to coincide with many of the ideas found in UNESCO's vision of sustainable development and ESD. In Nunavut, the foundations for governance and education are based on the very specific and unique set of relationships by which the Inuit have traditionally lived. The fundamental belief is that the connectedness which individuals feel for each other and to their environment ultimately determines personal character and value to the community. In Nunavut this is the definition of sustainability. In other words sustainability is a core value of Inuit life (Northwest Territories, Department of Education Culture and Employment, 1996), so that rather than having to be incorporated or infused into policies and programs, concepts of sustainability form a natural foundation from which all policies and practices are derived. This inversion of the usual order seen in most other jurisdictions within Canada has potentially far reaching implications. It provides a concrete example of how ESD can steer both education and the further development of societies.

Study of relevant Nunavut policies can also broaden understanding of the concept of ESD. Although Nunavut's policies resonate with the general vocabulary of sustainability and ESD, it seems that in Nunavut the drivers for development are socio-

culturally embedded rather than primarily economically driven. Policies are also overtly values based, derived from native culture, spirituality and tradition. Values are explicitly humanistic and ecocentric rather than mechanistically oriented. The portrait of ESD emerging in this case reinforces the idea that ESD entails more than a superficial reorientation of priorities. Instead it may require a radical shift in worldview. Additional study of Nunavut's policies and the Inuit way of life may assist in further illuminating this worldview.

Newfoundland and Labrador

Located on the Atlantic coast, Newfoundland and Labrador is Canada's easternmost province. It is comprised of two parts: the island of Newfoundland situated off the country's eastern coast and Labrador located on the mainland northwest of the island. Almost 94% of the province's population lives on the island of Newfoundland. Labrador is sparsely populated and contains large areas of pristine natural wilderness. The province is the site of the Gros Morne National Park, a world heritage site renowned as an outstanding example of the Earth's natural beauty. Citizens of Newfoundland and Labrador seem to share a special concern for their natural environment. Land and sea are intimately connected with the lives of the people. Much of the economy remains directly dependent on primary industries such as fishing, mining, forestry and oil production. Increasingly eco-tourism is becoming a significant part of the economy. This may in part account for the relatively active involvement of the provincial government in addressing climate change and ESD.

Newfoundland and Labrador was one of the first jurisdictions in Canada to develop policy to directly address the issue of climate change. The province issued its *Climate Change Action Plan* in 2005 (Newfoundland and Labrador Department of Environment and Conservation, 2005). In it, the government of Newfoundland and Labrador acknowledged that climate change is a serious issue and that efforts are needed to reduce greenhouse gas emissions. The vulnerability of the province to the possible impacts of climate change especially rising sea levels and destruction of natural ecosystems seemed particularly salient to the government's interests. The document goes on to outline commitments for reducing climate change to be enacted by most government departments. The plan affirms the importance of education in addressing climate change. It says:

> The importance of education in addressing climate change cannot be stated enough. Education on this issue has to be broad enough to include all aspects of this phenomenon: science, direct and indirect impacts (biophysical, socioeconomic and health), measures for reducing greenhouse gas emissions and measures to adapt to a changing climate. (Newfoundland and Labrador Department of Environment and Conservation, 2005, p. 9)

Specifically, the document promises continued support and funding to the Newfoundland and Labrador Climate Change Education Centre. This centre is part of a national network of public education and outreach hubs. Its work focuses on educating the public about Greenhouse gas emission reduction measures and encouraging actions to reduce personal emissions. Extended funding is expected to assist with program development and

expansion of public education efforts. The Climate Change Action Plan (2005) is described as complementary with the government's ongoing policy objectives and commitment to sustainable development. It is important to note that though the plan endorses increased public education it does not specifically address CCE in formal education settings.

Newfoundland and Labrador's Department of Education has developed several policies to foster the implementation of ESD and CCE in schools. An early attempt at this task is the *Foundation for the Atlantic Canada Science Curriculum* (nd), a framework developed in 1998 to guide science programs in Atlantic Canada. This document, built on the ideas of STSE as described in the *Pan-Canadian Common Framework for Science Learning Outcomes* (CMEC, 1997), lists "stewardship", defined as responsibility for living things and the environment, as a goal of science education. This policy is indicative of the province's initial vision of ESD, that it is equated with environmental science and primarily belongs to the domain of science education. More recently, the department of education issued its *Statement of Intent: Building a Better Tomorrow* (CMEC, 2007). This strategic framework affirms the principles of the United Nations DESD and outlines the Department of Education's plans to promote ESD on multiple levels. Although the plan outlines initiatives to foster education broadly in both public and private sectors; and within formal and informal settings; there are several specific commitments to advance ESD through formal education. One major initiative is the reorientation of existing educational programs to incorporate concepts related to sustainability. Accordingly, ongoing curriculum development and renewal have been taking place in all school curricula. A cross-curricular approach is being taken to infuse concepts of sustainability into all subjects taught in schools. This process is already almost complete for the disciplines of science and social studies. For example new elementary and secondary science curricula (Newfoundland and Labrador, Department of Education, 2002; 2004; 2005) attend to the value of living organisms, the impact of human activities on their survival, energy conservation, as well as cultural issues, cultural preservation and sustainability. In mandatory secondary science courses 25% of the instructional time is allocated to issues associated with sustainability. New social studies courses (e.g. Newfoundland and Labrador, Department of Education, 2004a; 2004b; 2007) focus on specific issues associated with sustainability in relation to cultural, political and social issues. The issue of climate change is generally treated in curriculum documents as a part of the issue of sustainability. However, Grade 10 and 11 Science curricula contain specific units that deal extensively with climate change (Newfoundland and Labrador, Department of Education, 2002; 2004).

In addition to a cross-curricular approach to ESD, the provincial department of education has also developed a specialized secondary Environmental Science Course (Newfoundland and Labrador, Department of Education, nd). This course is unique in that it takes an issues-based approach focused on the province's most pressing environmental issues. It locates these issues globally, nationally and locally. It provides extensive local information and detailed contextualized teaching strategies for exploring issues. Climate change is an important issue that is dealt with throughout the course, but also forms a specific focus of study in the unit titled 'The Atmosphere and the

Environment'. In this unit, climate change is identified as a human-effected event that can have catastrophic effects on the Earth. These notions coincide with UN ideas on this issue (UNESCO, 2008). This course was developed in collaboration with five federal and five Atlantic provincial government bodies concerned with environmental issues. CMEC (2007) considers this program unique, a potential pilot to initiating a pan-Canadian program of environmental science.

Newfoundland and Labrador presents an example where CCE is at the forefront of ESD policies and plans. Educational initiatives are already well developed. ESD and CCE seem to be rapidly finding their way into school curricula. Although it is difficult to explain why this change is being so rapidly effected in Newfoundland and Labrador where other provinces seem to be struggling, part of the explanation may lie in the strong provincial recognition of relevance of these issues to local interests. Both government and citizens seem to have accepted that sustainable development and climate change are issues of importance that need to be addressed urgently. If this is the case, then one of the reasons for the failure of ESD and CCE in other places may stem from a lack of deep engagement of the public and government with the issues. One way to strengthen ESD and CCE efforts in formal education settings may lie in demonstrating to all stakeholders ─ teachers, students and educational personnel ─ that these issues are locally and personally relevant and urgent. Further inquiry into how this has been achieved in places like Newfoundland and Labrador is warranted.

Another point of interest in this province is the multi-dimensional approach to implementing ESD and CCE. Both cross-curricula and specialized courses have been developed to address the issues. The concepts of ESD and CCE are being infused into all subjects and at all levels of school curricula. This cross curricular approach means that all students are exposed to the concepts of sustainable development and climate change at various stages in their formal education. It presents the issues as complex, overarching ideas important to all aspects of life. In this case a spiral developmental approach is taken. Spiral curricula (Bruner, 1960) seek to build understanding of complex concepts over time in developmentally appropriate ways. ESD is presented as developmental, growing in complexity and in tandem with students' own cognitive growth. A dedicated course allows older students to engage in detailed inquiry into the province's most pressing problems, one of which is Climate Change.

Ontario

Ontario is a province in east-central Canada. It is the most populous province in the country. Toronto, Canada's largest metropolis and Ottawa, the county's capital city are both located in this province. Residents of Ontario account for 38.5% of the national population (Statistics Canada, 2007). International immigration is a significant population growth factor in Ontario. Growing immigrant communities found mainly in and around Toronto include groups from the Caribbean, South Asia, East Asia, Central and South America, Eastern Europe, Iran and West Africa. Cultural and ethnic diversity is a major concern of education in the Greater Toronto Area.

The Government of Ontario's response to the DESD is relatively recent. In 2007, Ontario's Ministry of Environment issued *Ontario's Climate Change Action Plan: Creating our Sustainable Future*. At the time of its release, this plan was endorsed by the province's premier as the provincial response to the issues of climate change and sustainable development. The plan concedes that world-wide climate change is a reality and that "governments today have a clear choice; do nothing; or embrace the transition to a low carbon, green future" (Ontario Ministry of Environment, 2007, p. 2). The document states that Ontario has chosen the latter course and outlines provincial plans for reducing greenhouse gases by 80 % by 2050. Specific actions identified include:

- phasing out of coal fired power plants
- adoption of renewable power sources like solar, wind, biomass and water
- home energy audits and home energy improvements
- expansion of the mass transit system in the province
- development of more green spaces in the province
- creation of green jobs
- 'cap and trade' measures to limit the amount of greenhouse gases industries can emit.

This action plan subsequently led to the creation and passing of *The Green Energy and Economy Act* (Government of Ontario, 2009). This act outlines a two-pronged approach to 'green economic growth'. The first is to increase the production and use of renewable energy in the province and the second is to create more energy efficient measures to help conserve energy. In order to achieve these objectives, the bill provides for the development of administrative structures and standards for new energy projects. Incentives have also been proposed to encourage homeowners and others to develop renewable and/or energy efficient technologies and strategies.

Neither the provincial action plan nor the act contain any specific guidelines about the role of formal education in sustainable development or climate change. However in 2007, in addition to issuing the *Climate Change Action Plan*, the government of Ontario created a Curriculum Council to advise the minister of education on curriculum issues that required broader public consultation. This was done as part of a larger initiative to reform the curriculum of Ontario's schools. ESD was not one of the issues that the Curriculum Council identified for inquiry. Instead, the council chose to review how environment and conservation were being taught in elementary and secondary schools. This decision was made partly because of historical reasons. In Ontario, it was recognized that a wide range of environmentally based activities and formal and informal curricula already existed but that these lacked coherence. The working group's report titled *Shaping Our Schools, Sharing Our Future* was released in 2007. The report made recommendations towards mandating environmental education in Ontario schools. This mandate was further detailed in the policy document *Acting Today Shaping Tomorrow: A Policy Framework for Environmental Education in Ontario Schools* (Ontario, Ministry of Education, 2009).The importance of environmental education is summarized in the document's opening statement:

> It is critical that we help students understand how our individual and collective behaviour affects the environment, and how environmentally responsible lifestyles can contribute to healthy, sustainable ecosystems. Environmental education is a vital tool that helps young people understand the nature and complexity of environmental challenges and builds their capacity to take appropriate action. (Ontario, Ministry of Education, 2009, p. 3)

Currently, the ministry of education is revising school curricula. Part of this process includes integrating environmental education into all subjects, across all grades. This process has already been completed for the science curriculum. Similar to Newfoundland and Labrador, the issue of climate change is dealt with at different points throughout science curricula. In Ontario, it is generally located in what is called the "big ideas" - "the broad, important understandings that students should retain ..." (Ministry of Education, 2008, p. 6). In addition, the revised Grade 10 science curriculum has a unit dedicated entirely to climate change. Furthermore, a specialized course for Environmental Science has been developed for upper secondary school science. In the new science curricula (Ontario, Ministry of Education, 2007, 2008, 2008a) 'sustainability and stewardship' is one of the fundamental concepts identified and integrated throughout all strands. Sustainability is defined as "the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs" (Ontario Ministry of Education, 2007, p. 5). Stewardship is defined as

> …understanding that we need to use and care for the natural environment in a responsible way and making the effort to pass on to future generations no less than what we have access to ourselves. Values that are central to responsible stewardship are: using non-renewable resources with care; reusing and recycling what we can; switching to renewable resources where possible. (Ontario, Ministry of Education, 2007, p. 5)

From these definitions it would seem that in Ontario sustainable development has been defined in terms of environmental concerns. Also, although it is not explicitly stated, the concept of "green economic growth" subscribed to by broader provincial policies is also tacitly promoted as a major expression of sustainable development in educational policy.

Ontario's response to ESD and CCE are notable in that Ontario's definition of sustainable development seems oriented towards economic and environmental concerns and focused on climate change. The provincial government seems to be particularly concerned about maintaining economic growth. It has proposed the concept of 'green economic growth' which combines traditional theories of economic development with a shift to adopting environmentally friendly technologies and strategies. An underlying assumption that is not fully explored in any of the related documents is the compatibility of these two concepts. Also this approach does not question traditional ideas about the structures of society, governance, or the link between economic growth and development. It has effectively combined 'business as usual' with the language of sustainable development and climate change. For formal education it has meant the translation of ESD into EE.

At a broader level this example shows the multiplicity of ways in which the concept of ESD can be interpreted. UNESCO (2004) states that environmental education,

which focuses on humankind's relationship with the natural environment and ways to conserve and steward it, is only one aspect of ESD. ESD is also about respect for human rights, economic and social justice for all, cultural diversity and building a culture of tolerance, non-violence and peace. The place of environmental education in ESD is described in the following statement:

> Sustainable development therefore encompasses environmental education, setting it in the broader context of socio-cultural factors and the socio-political issues of equity, poverty, democracy and quality of life. (UNESCO, 2004, p. 16)

While Ontario's decision to adopt EE rather than ESD may be seen as a narrow approach, it is also clear that Ontario's vision of EE incorporates many of the broader UNESCO goals. This is evidenced by Ontario's definition of environmental education which states:

> Environmental education seeks to promote an appreciation and understanding of, and concern for, the environment, and to foster informed, engaged, and responsible environmental citizenship. Effective environmental education incorporates problem solving, hands-on learning, action projects, scientific inquiry, higher order thinking, and cooperative learning, and employs relevant subject matter and topics that actively engage students in the educational process. (Ontario Working Group on Environmental Education, 2007, p. 6)

This description of Ontario's vision for environmental education links learning about environmental issues with responsible citizenship which in turn implies broader socio-political and cultural issues.

The Work of Non-Governmental Organizations

Across Canada, a number of NGOs claim to be actively involved in providing ESD and CCE. Although much of their work is general, targeting the broader public audience in informal settings, some NGOs provide services specifically for formal school settings. These efforts may be independent or in cooperation with provincial ministries of education, school boards and schools. The work of NGOs in the areas of ESD and CCE is significant sometimes seemingly overshadowing the work of provincial departments of education. Two such organizations, which have countrywide influence on education in Canada, are Learning for a Sustainable Future (LSF) and Green Street.

Learning for a Sustainable Future (LSF)

Learning for a Sustainable Future (LSF) is one of Canada's oldest organizations supporting ESD, countrywide. It is a non-profit organization founded in 1991 by a diverse group of youth, educators, business and community members to implement sustainable development education in Canadian schools. The creation of the organization was fuelled largely by concerns about the environment and development arising from the

UN conference in Brundtland, 1987 and influenced by later UN events, so that the LSF's vision for ESD is similar to that of UNESCO (2004). It states:

> Education for Sustainable Development (ESD) encourages us to explore the profound interdependencies of ecological, societal, and economic systems. ESD is about respecting and preserving our histories, valuing culture and community, caring for others and the environment, and taking action to create a fair, healthy, and safe world for all beings. ESD also supports flexibility, creativity, critical reflection, and fosters a sense of personal responsibility for the economy, society, and environment. (LSF, nd)

Since its establishment, the LSF reports that it has introduced many pan-Canadian sustainable development initiatives in formal education (LSF, nd; 2009). These initiatives include:

- provincial/territorial ESD Working Groups: Ten of these groups have already been established through the LSF's work in collaboration with Environment Canada and Manitoba's Education department. To date, these groups have been active in sponsoring public forums, providing input into provincial curriculum reviews, developing resources, planning conferences and creating websites. According to the LSF, one recent contribution of an ESD Working Group comes from Ontario where the group has provided significant input into the recent provincial curriculum changes
- Canadian Sustainability Curriculum Review Initiative: the LSF seeks to encourage curriculum reform across Canada by targeting each educational jurisdiction's Curriculum Review Development and Implementation process. The goal is to align school curricula with the UN DESD by clarifying and recommending what should be taught at each stage of a student's cognitive development
- youth forums: the LSF offers hands on, skill-building workshops on local ESD issues. These are offered as springboards for students to develop and implement their own action projects within their school or community
- an ESD Resource Database: Resources for Rethinking is an online database of lesson plans and other curriculum resources available for teachers to support K-12 education
- professional development for educators: the LSF provides curriculum based workshops for teachers and teacher candidates to encourage ESD in classrooms. The Education Leaders' Seminar is a program that caters to motivating senior education officials to integrate sustainability as a core value in all aspects of formal education.

The work of the LSF in Canada aligns with UNESCO's philosophy and vision. The organization's website and progress report (LSF, 2009) highlight the activities of the organization in a very optimistic way. However there is very little independent research on the impact of the work of the LSF on formal education.

Green Street

Green Street (Green Street, nd; CMEC, 2007) is a non-profit organization created and funded by a private family foundation. Its activities are endorsed by the Canadian Teachers Federation. The organization was originally established to link schools to reputable environmental organizations within the country in a bid to promote environmental education. However in 2005, in response to the declaration of UN DESD, Green Street expanded its program themes to include broader issues related to sustainability such as human health, governance, citizenship, peace and human rights. It has also set up benchmarks for excellence in environmental learning and sustainability and student engagement. Any program that Green Street recommends to schools must meet certain benchmarks. Among other criteria, programs must be credible, accessible, affordable, relevant to students' concerns, curriculum linked, encourage a sense of personal responsibility for the environment, foster a commitment to sustainable living and promote an enduring dedication to environmental stewardship. Green Street provides additional support for teachers in the form of an online blog where teachers and students can share stories and exchange ideas about local environmental and sustainability issues they are working on. The organization also offers limited project funding on a first-come, first-served basis to encourage student engagement and school-based action projects.

Green Street's approach to ESD is highly action oriented and heavily biased towards environmental issues. Much like the province of Ontario, this organization seems to have defined sustainability in terms of environmental education. This is reflected in the term 'environmental learning and sustainability', which is used several times on the Green Street website to describe the activities of the organization. The meaning of this term is ambiguous. It could imply that environmental learning is separate from broader studies in sustainability or that environmental learning encompasses sustainability. Green Street's approach links education with activism, that is, students using their knowledge to bring about tangible changes in their own lives and communities. This approach challenges the orientation of traditional educational programs that tend to be silent about student activism (Evans, 2006; Roth & Desautels, 2002).

Academic Criticism of ESD

While many governmental and non-governmental organizations in Canada have affirmed their commitment to ESD and CCE and seem to be working assiduously to realize it, the response of the country's academic community has been less sanguine. Many academics in education and other relevant fields have criticized UNESCO's vision of ESD. Two broad strands of criticism can be distinguished. For some, the theoretical underpinnings of ESD are problematic. Others question the relationship of ESD to EE.

Critics in the first strand question the meanings of the term sustainability and sustainable development; the UN conception of these; and the tacit assumption that these are inherently realizable through education. David Bell, professor at York University and Chair of the LSF summarizes a chief concern of these critics when he asks whether ESD

is a cure or placebo, that is, a means of helping mankind attain a more sustainable future or a distracter from the main challenges facing mankind (Bell, 2007). Bell concludes that although ESD is not independently sufficient it is an essential component for finding a way to live more sustainably. Others are less optimistic. For scholars such as Lucie Sauvé, Bob Jickling and Connie Russell, UNESCO's conceptions of sustainable development and education are inherently flawed and possibly even the source of additional problems. Several (e.g. Daly, 2007; Daly, Cobb & Cobb, 1994; Jickling 1994, 2003) have called attention to the individual meanings of the two words that make up the term "sustainable development". Jickling (1994) argues that the term is an oxymoron, nothing more than a vague slogan susceptible to manipulation and deception. Similarly, he views the term 'education for sustainable development' as a conceptual muddle that frequently engulfs well-meaning educators.

These scholars argue that UNESCO and its supporters promote a particular ideology about the environment, education, and peoples' socio-political commitments. In the UN documents, these ideas are presented as incontestable values that are good, necessary and agreeable to all. In contesting this position, these scholars also suggest that UNESCO's ideology degrades education to a form of indoctrination, an increasingly unacceptable practice in scholarly educational circles. According to Jickling (1994, 2003), for example, education is concerned with enabling people to think for themselves, a notion inconsistent with indoctrination which forces people to accept certain values and ideas uncritically. The criticism that UNESCO's theories about education may be outmoded is supported by others, who have analyzed current practices in education claiming to promote sustainability, to show that the majority of initiatives continue to be underpinned by traditional technical ideas about education. Simultaneously they note that more recent ideas informing educational theory such as post-structural and feminist ideas are conspicuously absent (Russell, 2005; Russell, Bell & Fawcett, 2000; Russell & Bell, 2000).

The problematic nature of UNESCO's underpinning ideology about sustainability, development and education has been further illuminated by other Canadian scholars. Sauvé (1996) and Sauvé, Berryman and Brunelle (2007) have analyzed relevant UN documents to show that ESD is buttressed by:

- a resource view of the environment- the environment is viewed as a pool of resources to be managed rather than as a living entity of intrinsic value
- an economic view of development- sustained economic development is a precursor to all human development
- an instrumental view of education- education is generally seen as an instrument for predetermined goals which generally hover around development rather than as an emancipatory processes or endogenous practices.

These authors question the intrinsic truth of these ideas and their consistency with the principle of sustainability, so much so that they have suggested that UNESCO's mandate

of ESD may be an ethical and cultural mistake, an idea with the potential to create a new hegemonic world order rather than solving the world's problems.

Using this platform of criticism, another issue that has emerged from Canadian scholars is the relationship of ESD with environmental science. UNESCO's (2004) vision of ESD describes environmental education as one strand to be subsumed and integrated into a broader context of anthropocentric considerations. For Sauvé, Brunelle and Berryman (2005) this approach diminishes the role of environmental science by making it subservient to social and economic concerns. Hart (2002) seems to concur with this concern, further suggesting that environmental education entails a radically different epistemological and ontological base, one that may be antithetical to the anthropocentric foundations of UNESCO's ESD. For these scholars, environmental education is based on an ecocentric worldview. It is about construction of an ethical awareness and a critical understanding of one's relationship with the environment which is a living entity that humans are a part of and not superior to. Going further these authors have posited alternatives to UNESCO's ESD such as 'biophillic education' (Jickling, 2003), 'ecofeminist environmental education' (Russell & Bell, 2000) or 'education for the development of sustainable communities' (Sauvé, 1996). These alternative visions suggest that environmental education, embedded in a broader framework of justice, equity and respect is perhaps more consistent with the true meaning of the term sustainability than UNESCO's definition.

In summary, what some Canadian scholars seem to be suggesting is that the barriers to ESD may not be due so much to technical/structural reasons such as the lack of resources, inadequately trained teachers and overcrowded curricula, but rather to philosophical inconsistencies and theoretical weaknesses inherent to UNESCO's conception of ESD.

Discussion and Conclusion

Overall analysis of the various Canadian responses to ESD and CCE reveals several themes that have the potential to enrich the debate about these issues. Four of these themes are highlighted here.

Interpreting the term ESD

This report summarizes responses from eight different Canadian bodies/organizations to ESD/CCE. Despite sharing similar language surrounding ESD, each response seems unique. This uniqueness stems largely from differences in interpretation of the meaning of the term ESD. The term ESD is conceptually complex. Its three component words education, sustainable and development are in themselves separate concepts with no universal meaning. The situation is further complicated, since each term is used in everyday language, in a variety of ways, and has become tacitly associated with many underlying assumptions and ideas that are generally taken for granted. Analysis of the various Canadian responses reveals the variability of

interpretation created by putting the three words together in the term ESD. In some cases wide differences in interpretation of the component concepts are discernable. For example, federal government responses seem to promote education as a form of training, whereas the NGO Green Street seems to interpret education as a transformative, activist process. Also the term development seems to have different meanings. In Ontario development has a particular economic focus connected to economic growth; whereas in Nunavut development is interpreted from a socio-cultural perspective, as living within the bounds of cultural tradition. In other cases, the difference is not so much a variation of the meaning of the component words but in emphasis of individual concepts to the overall vision. For example in Newfoundland and Labrador, the concept of sustainability interpreted as climatic sustainability seems to be the most important facet of ESD; whereas in Ontario development interpreted in terms of economic growth seems to be the driver of ESD.

Some members of the Canadian academic community argue that UNESCO's initiatives are underpinned by a particular worldview that may not be shared by all. Perhaps in anticipation of this critique, the architects of the UN DESD left the term ESD fairly open and suggested that individual jurisdictions interpret ESD to suit local contexts. However the wide variation of interpretation and its consequent implications may not have been fully anticipated. In this case leaving the term ESD so vaguely defined may have inadvertently transformed ESD into a 'paper tiger', since in interpreting the term, individual bodies and organizations seem to have reconstructed ESD to suit their own ideology. The Canadian experience reveals that much more work needs to be done in unpacking the term ESD. In particular, the terms education, sustainability and development and the connections between them need to be more fully explored.

Fitting ESD into the School Curriculum

A common challenge to practical implementation of ESD seems to lie in determining how best to fit it into school curricula. UNESCO (2004) implies that ESD should transform school curricula. In Canada three different approaches to fitting ESD into formal education have been highlighted in this report: ESD as a part of science education; ESD as infused across the curriculum; and ESD as a fundamental educational principle. For the federal government ESD is a concept that can be fit into traditional school curricula as part of the discipline of science especially environmental education. Indeed this approach was one of the first popular responses to ESD in Canada. For example, the Science, Technology, Society and Environment (STSE) (CMEC, 1997) movement formed the basis for introducing ESD into formal school curricula in several provinces including Ontario and Newfoundland and Labrador. Even though the desirability of consigning ESD to a single discipline is now being questioned, it still seems that in Canada science remains at the forefront of efforts integrating ESD into formal education. STSE remains one of the best developed approaches to linking a traditional school discipline to the broader acceptable principles of ESD (Pedretti & Little, 2008; Pedretti, 2005).

As early as 2000, Manitoba promoted the notion of ESD as a cross curricular initiative. Policy guidelines suggested that ESD was made up of various principles that could be matched to each subject in the traditional curriculum. In other words ESD could be infused into every discipline in the traditional school curriculum. Infusion allows the essential structure of schooling and curricula to remain the same. The work of the LSF supports infusion by providing teachers with curricular resources to supplement their classroom activities. Recent curricular revisions in Ontario and Newfoundland and Labrador also reflect a growing trend to adopt infusion approaches to ESD in Canada. One of the problems of the infusion approach is that it may reduce the status of ESD to an 'add-on'; extra work for teachers and students in an already crowded curriculum.

The third approach to bringing ESD into formal education is to re-orient school curricula to make ESD a fundamental educational goal. This is the approach taken by Nunavut where ESD, defined as a basic principle of the Inuit way of life, has been used as a foundation for re-orienting education. In this approach ESD is more than a cross-curricula add-on. As a foundational principle, it is built in to every aspect of the curriculum ─ content, teaching/learning strategies and evaluation.

The Relationship between ESD and Environmental Education (EE)

In outlining its vision of ESD UNESCO (2004) distinguishes ESD from EE, arguing that ESD is not the same as EE. Under this view, EE is seen as one part of a comprehensive program of ESD. Several responses from Canada reflect a departure from this position. In Newfoundland and Labrador, even though ESD has been adopted and is currently being infused across school curricula, a separate course of EE has been retained for upper secondary school. Part of the justification for this action seems to lie in the environmental emphasis that lies at the heart of the province's vision for sustainability. Climate change and other environmental concerns are of prime importance in Newfoundland and Labrador. A separate specialized EE course is seen as a necessary supplement to general ESD initiatives. In Ontario the situation seems more pronounced. EE has been adopted as the framework for formal education, rather than UNESCO's ESD. Part of the reason seems to be that in Ontario sustainability has been defined primarily in terms of environmental concerns and economic development.

Initially, the ESD-EE tension seems easily explainable. Both Ontario and Newfoundland and Labrador seem to have stumbled in the way UNESCO (2004) that cautioned against, that is, limiting the meaning of sustainability to an environmental base. However this may not fully explain the situation. EE has a long history and a strong base of support in various parts of Canada (e.g. Livingston, 1981). Canadian environmental educators have been vocal in criticizing UNESCO's recommendation that ESD subsume EE. The heart of their critique seems to lie in a lack of belief that UNESCO's vision of ESD is congruent with the principles of sustainability promoted by EE. They point out that UNESCO's ESD is based on anthropocentric values and an instrumental view of the environment while Canadian supported EE is based on ecocentric values and a view of the environment rooted in respect, justice and equity. For many Canadian environmental educators, making EE a component of ESD is a retrograde step, antithetical to the true

spirit of sustainability. Additionally, over the years the EE movement has acted as a leader for transformative education in Canada often incorporating non-traditional educational theories like post-structuralism, feminist and social justice perspectives. Many environmental educators and scholars from Canada support the notion that EE may provide an alternative vision for education about sustainability to UNESCO's ESD.

Gaps between policy, research and practice

The eight responses to ESD described in this report show that across Canada, many policy documents have been developed about ESD and CCE. The three provinces and one territory highlighted in the report have formal policies that address, in different ways, aspects of UNESCO's DESD. Although these policies are not always backed by philosophical analyses, they all seem to have bought some version of the concepts of sustainability and climate change to the forefront of governmental thinking. Many of these broad policies have also lead to the development of policies related to ESD in formal education.

Despite this profusion of policy, countrywide, it is difficult to ascertain their practical effectiveness. There is a paucity of research on how ESD, CCE or EE policy is being implemented, and its impact on schools and classrooms. Reports that do exist come from government bodies and other organizations active in the area. These self reports tend to be uncritical catalogues that focus on successes, and are silent about problems and failures. This research gap may reflect a deeper systemic weakness, that is, the lack of emphasis on research in influencing policy and practice. On the other hand, the current research gap may exist because plans surrounding ESD are relatively new and the scholarly community has yet to develop appropriate research initiatives.

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The International Alliance
of Leading Education Institutes

Report from China

Climate Change and Sustainable Development:
The Response from Education

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IALEI-project: Climate Change and Sustainable Development: The Response from Education
Report of China

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Introduction: General Information about China

The following extraction from the Chinese government's official website portal[3] gives a general picture of the context in China.

China is a country with 5,000-year-long civilization and a long and rich history (source 1).

With a landmass of 9,600,000 sq km, China is the third largest country in the world (source 2).

Most of China lies in the North Temperate Zone, characterized by a warm climate and distinctive seasons, a climate well suited for habitation. Most of China has a continental monsoon climate (source 3).

People often use many huge numbers when describing China's cultivated land and mineral resources. Cultivated land, forests, grasslands, deserts and tidelands are distributed widely across China. Cultivated land is mainly located in east China; grasslands are mainly located in the north and west, and forests mainly in the remote northeastern and southwestern areas (source 4).

At the end of 2008, China's total population amounted to 1,328.02 million (source 5*).*

Political System

The system of people's congress is an organizational form for the state power in China. It is China's fundamental political system. The power in the People's Republic of China belongs to the people and the organ for the people to exercise state power is the National People's Congress and local people's congresses at all levels. The National People's Congress (NPC) and local people's congresses are established through democratic elections, responsible to and supervised by the people. State administrative, judicial and procuratorial organs are created by, responsible to and supervised by the people's congresses. The National People's Congress is the highest organ of state power. Local people's congresses are local organs of state power.

The NPC is composed of deputies elected from the provinces, autonomous regions and municipalities directly under the Central Government and deputies elected by the armed forces. Deputies to the NPC are organized into delegations according to the units they are elected from.

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[3] http://english.gov.cn/

Each delegation is headed by a chairman and vice chairmen. All the ethnic minorities are entitled to appropriate representation. The NPC is elected for a term of five years (source 6).

The Communist Party is the sole party in power in China. Founded in 1921, the Communist Party of China (CPC) established the People's Republic of China in 1949 through years of armed struggle. The CPC now has more than 60 million members in more than 3 million grassroots organizations. The CPC has established formal (through elections within the Party) and informal (appointed by the organization of the higher level) organizations within the Chinese government and various levels and walks of life in the country (source 7).

The multi-party cooperation and political consultation under the leadership of the Communist Party of China is a basic political system in China. The system means that the CPC is the only party in power in the People's Republic of China while under the precondition of accepting the leadership of the CPC, the eight other political parties participate in the discussion and management of state affairs, in cooperation with the CPC. Political consultation means that under the leadership of the CPC, all parties, mass organizations and representatives from all walks of life take part in consultations of the country's basic policies and important issues in political, economic, cultural and social affairs before a decision is adopted and in the discussion of major issues in the implementation of the decisions. Political consultation takes the organizational form of the Chinese People's Political Consultative Conference. Political consultation is the most important political and organization form of the multi-party and political consultation system. Cooperative relations between the CPC and other political parties are based on the principle of "long-term coexistence and mutual supervision, treating each other with full sincerity and sharing weal or woe." (source 8)

The central administrative system in the People's Republic of China includes: the central administrative organs under the system of the National People's Congress and the leadership of the central administrative organs over local administrative organs at various levels. The central administrative organ is the State Council, or the Central People's Government, of the People's Republic of China. The State Council is the highest administrative organ of the state. It is the executive body of the highest organ of state power and the highest organ of state administration. The State Council exercises unified leadership over local state administrative organs at various levels throughout the country, regulates the specific division of power and function of the state administrative organs at the central level and the provincial, autonomous regional and municipal level (source 9).

The entire country is divided into provinces, autonomous regions and municipalities directly under the Central Government. The provinces and autonomous regions are divided into autonomous prefectures, counties, autonomous counties and cities; the counties and autonomous counties are divided into townships, ethnic townships and towns; the municipalities directly under the Central Government and large cities in the provinces and autonomous regions are divided into districts and counties; and Autonomous prefectures are divided into counties, autonomous counties and cities. The Central Government may also set up special administrative regions. At the moment, China is divided into 23 provinces, 5 autonomous regions, 4 municipalities directly under the Central Government and 2 special administrative regions (source 10).

Education

Since 1950 China has provided nine-year compulsory education for a fifth of the world's population. Nine-year compulsory education operates in 90 percent of China's populated areas, and illiteracy in the young and mid-aged population has fallen from over 80 percent down to 5 percent. The system trained some 60 million mid- or high-level professionals and near 400 million laborers to junior or senior high school level (source 11).

China's basic education involves pre-school, nine-year compulsory education from elementary to junior high school, standard senior high school education, special education for disabled children, and education for illiterate people.… Government's aim for the development of China's basic education system is to approach or attain the level of moderately-developed countries by 2010 (source 12).

According to a presentation of an officer of the Basic Education Department of Ministry of Education (Zhu, 2009), the net primary school enrolment rate in 2008 is 99.54%, the girl's enrolment rate is 99.58% and the gross junior middle school enrolment rate is 98.5%. In addition, 99.9% of primary school pupils were admitted to junior middle schools in 2007, up by 5% from 2000. UNESCO statistics indicate that China ranks first in the nine most-populous developing countries in terms of the junior school enrolment rates. The policy of free compulsory education was introduced to rural areas since spring 2006 and became the norm in all urban schools in autumn 2008. Basic education funding also covers grant-in-aid for 11 million impoverished boarding school students in central and western areas based on a state financial policy. In 2007, 79.9% of junior high students were admitted to senior high schools that increases 29% over 2000. The gross enrolment rate of senior high rose by 23.2% to 66% during the same period. In 2008, China boasted 24.763 million senior high students, 106% more than in 2000, i.e. the number of senior high students doubled in an eight-year span. And the number of secondary vocational school students increased from 10.442 million in 2000 to 19.87 million in 2007.

For non-compulsory education, China adopts a shared-cost mechanism, charging tuition at a certain percentage of the cost. Meanwhile, to ensure that students from low-income families have access to higher education, the government has initiated effective ways of assistance, with policies and measures as scholarships, work-study programs, subsidies for students with special economic difficulties, tuition reduction or exemption and state stipends.

Investment in education has increased in recent years; the proportion of the overall budget allocated to education has been increased by one percentage point every year since 1998. According to a Ministry of Education program, the government will set up an educational finance system in line with the public finance system, strengthen the responsibility of governments at all levels in educational investment, and ensure that their financial allocation for educational expenditure grows faster than their regular revenue. The program also set out the government's aim that educational investment should account for four percent of GDP in a relatively short period of time.

The government is committed to markedly raising educational levels generally, as evidenced in a Ministry of Education program: by 2020, of every 100,000 people, 13,500 will have had junior college education or above and some 31,000 will have had senior high school schooling; rates for illiteracy and semi-literacy rate will fall below three percent; and average schooling duration across the population will increase from today's eight years to nearly 11 (source 11).

There are great challenges for Chinese educators. For example, the huge population obliges primary and middle schools to enroll far more students in a class than their European and American counterparts would. In some cases, the number of students in a class reaches 80. Furthermore, severe competition for college and school entrance caused an education for or oriented toward high scores in exams, which prompted society and the government to regard the enrolment rate as the sole benchmark for evaluating schools' teaching efficiency. The Chinese government and educational researchers have been trying to change the 'education for exam' to quality education that values the needs, competence and happiness of individual students rather than merely mastering book knowledge and getting high scores in test. With the impact of the national curriculum reform since 2001, more and more families and schools as well as the public got aware and accepted idea that the goals of education should not be based solely on wealth, power and other types of benefits obtained through utilitarian mastery of literal knowledge or through examination-room competition (Zhu, 2009).

Sustainable Development

After the United Nations Conference on Environment and Development in 1992, China was one of the first countries to formulate and carry out a strategy of sustainable development.

The Congress of Environment and Development under the U.N. in 1992, made the sustainable development become the cognition in common for the common strategy of development in the future by all the countries in the world. It upsurge on environmental protection emerged again in the world. In response the Congress of Environment and Development, it was not long after the conference that the government of China put forward the *Ten Countermeasures to Environment and Development in China* (1992), then organized and constituted the *Agendum of the 21th Century in China* (1994). It is claimed that China would persist in the basic national policy of environmental protection, implement the strategy of sustainable development, advance to the direction of sustainable development favorable to environmental protection, change the traditional mode of production, and establish new economic and social system accorded with long-term interests of China by adjusting industrial structure and strengthening environmental protection and environmental construction (Fang, 2002).

As the National Report on Sustainable Development (1997)[1] indicates, sustainable development in China comprises the following elements:

- *Social and economic developments are the cornerstone of sustainable development.*
- *China must firmly give priority to the primary task of developing her national economy so as to alleviate poverty and improve the living standards of the people.*
- *Sustainable utilization of natural resources and maintaining a viable ecosystem are two of the most important foundations of sustainable development.*
- *Sustainable development requires that both the present and the future needs are taken into account, ...*
- *At the present stage, the nation is effecting two major transformations - one being the economic system transforming from a planned economy to a socialist market economy; the other being the pattern of economic growth transforming from an extensive mode to an intensive mode, so that the national economy and social development can progress in a virtuous circle, in harmony with the nation's environment.*

[1] State council (1997), [Online], http://www.zhb.gov.cn/english/SD/21cn/national_report/, (accessed May 31, 2002)

- *Attitudes and behavior of the public must be adapted to sustainable development.*

It was also mentioned in that Report that the government of China has taken a responsible attitude in implementing the policy for sustainable development in the context of the country-specific conditions of China. As a result, actions were taken and achievements were made in the major fields of sustainable development, i.e. population, poverty alleviation, human environment and settlement construction, agriculture and rural areas, industry, energy production and consumption, resources of land, forest, water, marine, disaster mitigation and prevention, protection of the atmosphere, control of solid wastes, and biodiversity protection.

However as the annual Report on the State of the Environment in China[1] (Minister State Environmental Protection Administration of China, 2000) suggested, more efforts are still in need to improve the environment in China, such as:

The air pollution in the cities is still very serious, with the number of the cities whose air quality complying with the national standard Grade II accounting for one third of the total. The pollution of surface water is universal, particularly those river sections flowing through the cities that were contaminated by organic pollutants. The lake eutrophication is also an outstanding problem. The underground water is polluted by point and non-point sources of pollution, in addition to the lowering water level. All this has aggravated the conflicts between water supply and demand. The trend of ecological degradation has not been effectively controlled.

China has been trying hard to fulfill the goals of sustainable development. *Responding to stresses on natural resources caused by fast economic growth, development and urbanization, the state at the turn of the 21st century responded with a "green strategy" that includes developing a revolving economy, increasing resource-use efficiency; developing clean production, reducing pollution cost in production processes; developing green consumption, reducing ecological impact of consumption; developing new energy resources, reforming production methods, moving toward ecological industrial civilization, and creating a balanced ecological environment* (source 13).

The Outline for National Eco-Environmental Protection promulgated in 2000 by the State Council advocated the energetic establishment of eco-provinces, eco-cities, eco-counties and eco-townships. These eco-areas, whose objective is regional sustainable development, should simultaneously promote economic development, social progress and environmental protection in a unified way. Eco-designated localities should strengthen environmental protection and ecological construction, promote awareness, protect and improve the environment whilst also developing eco-industry and economy, and enhancing the quality of life. By the end of 2004, the number of examined and approved state-level trial eco-areas had totaled 166 (source 14).

As the Outline of Science and Technology for Sustainable Development (2001-2010) indicate, the most challenging issues of SD in China include population control, health and prevention of severe diseases, food safety, safety and security of resource of water, oil, gas, and minerals, monitory on the ocean and development of ocean resources, clean and recyclable energy, reduce of environmental pollution and comprehensive governance of the eco-system, reduce and prevention of disasters, construction of cities and towns, and global environmental problems especially climate change, biro-diversity, etc.

[1]Minister State Environmental Protection Administration of China (2000), http://www.zhb.gov.cn/english/SOE/2000/soechina2000, (accessed May 31, 2002)

Climate Change

The Information Office of China's State Council issued a white paper titled *China's Policies and Actions for Addressing Climate Change*, which addressed main issues of climate change (CC) in China, including CC and China's situation, impact of CC on China, strategies and objectives for addressing CC, policies and actions to decelerate and adapt to CC, public awareness of CC, international cooperation on CC, and institution and mechanism building for coping with CC, etc. Some extraction for this white paper is following.

As a developing country with a large population, a relatively low level of economic development, a complex climate and a fragile co-environment, China is vulnerable to the adverse effects of climate change, which has brought substantial threats to the natural ecosystems as well as the economic and social development of the country. These threats are particularly pressing in the fields of agriculture and livestock breeding, forestry, natural ecosystems and water resources, and in coastal and eco-fragile zones. Therefore, China's priority task at present is to adapt itself to climate change. The multiple pressures of developing the economy, eliminating poverty and mitigating the emissions of greenhouse gases constitute difficulties for China in its efforts to cope with climate change, since the country is undergoing rapid economic development.

A responsible developing country, China sets great store by climate change issues. Fully aware of the importance and urgency of addressing climate change, following the requirements of the Scientific Outlook on Development, and taking into overall consideration of both economic development and ecological construction, domestic situation and international situation, and present and future, China has formulated and implemented a national plan for coping with climate change, and adopted a series of policies and measures in this regard. China combines the handling of climate change with its execution of its sustainable development strategy, acceleration of building a resource-conserving and environmental-friendly society and construction of a country of innovation. Taking economic development as the core objective, and placing emphasis on energy conservation, optimization of the energy mix, reinforcement of ecological protection and construction, and scientific and technological progress as backup, China strives to control and mitigate the emission of greenhouse gases and continuously enhance the capability of adapting itself to climate change.

China actively participates in worldwide efforts to address climate change, earnestly observes the United Nations Framework Convention on Climate Change (hereinafter referred to as the UNFCCC) and the Kyoto Protocol, and plays a constructive role in international cooperation in this regard (Foreword, source 15).

The first principle to address climate change is to address this issue within the framework of sustainable development. *Climate change arises out of development, and should thus be solved along with development. It is necessary to promote sustainable development amidst efforts to address climate change, and strive to achieve the goal of win-win in both.*

China National Plan for Coping with Climate Change, released by the Chinese government in June 2007, set the following objectives to be met by 2010: Policies and measures concerning control of greenhouse gas emissions should achieve significant results, the capability of adaptation to climate change should be relentlessly enhanced, climate-change-related research should be promoted and

new development should be made in scientific research related to climate change. In addition, the public awareness of the importance of tackling climate change should be enhanced, and the institutions and mechanisms for dealing with climate change should be further strengthened (part III, source 16).

In recent years, the government has constantly guided the public in enhancing its awareness of climate change, and advocated the concept of harmonious development between man and Nature through publicizing and implementing such advanced ideas as the Scientific Outlook on Development, establishing a harmonious society and sticking to the sustainable development road (part VI, source 17).

Theme 1 ESD - overall conception

ESD in China is partly expanded from the environmental education (EE), which have been conceptualized as environmental education for sustainability (EEFS) since late 1990s. The first edition of Training Manual for Trainers in China of Education for Sustainability was published by Beijing Normal University Press. In 2003 the Guideline for Implementing Environmental Education in Elementary and Secondary Schools was issued by the Ministry of Education of People's Republic of China. The concept of EEFS was adopted in this Guideline, which means under the framework of SD an infusion of education of environmental issues as well as education of peace, development and population, etc. Many ideas of ESD are addressed in the National Guideline of Environmental Education, which did not include ESD in the title but says it for EEFS. One of the reasons might be that the phrase ESD in Chinese are easy to be explained or understood as education about SD rather than education for SD. The latter has two or three more words.

The history of China's EE can be divided into three phases (Huang & Zhang, 2002). The first phase, 1972 to 1983, is the start-up of EE. Since the Stockholm Conference in 1972, Chinese people – specially the leaders – began to recognize environmental problems in China. In August 1973, the First National Meeting on Environmental Protection was held in Beijing, after which the State Council approved and distributed two documents: *Report on Situation of Environmental Protection in China* and *Several Regulations on Protecting and Improving Environment*. From then on, environmental protection including environmental education in China got start. In those days, some famous books like *Only One Earth* and *Silent Spring* etc were introduced into China to help the public understand urgency of resolving environmental problems and the circumstance of environmental protection in the world. Two sections of EE got special attention in this phase, i.e. improving environmental awareness of officials and training professionals on environment. The first specialties of the environment were established in colleges and universities in Beijing in early 1970s, and up to 2000 more than 200 colleges/universities have departments or specialties of the environment, especially bachelor, master or doctor degree programs of pollution control and ecosystem conservation.

The second phase, 1983 to 1992, started from the Second National Meeting on Environmental Protection, in which environmental protection was set as a basic state policy, and Chinese government recognized the necessity to strengthen EE for both officials and the public. The first newspaper on environmental protection, *China Environment News,* started publication in early 1984, and later several other newspapers and periodicals were publicized and the Environmental Press was set. In 1988, State Environmental Protection Administration (SEPA) was established and a

department of communication and education for the environment was set up within it for improving the quality of macro management of environmental education in China. At the same time EE was gradually introduced to other educational sectors than just higher education and adult education. It was suggested by the Society of Environmental Science in 1979 to conduct trial projects of EE in basic education, and some elementary, secondary school and even kindergartens began to try experimental EE projects since 1980. In 1989, the Third National Meeting on Environmental Protection pointed out that the central government should pay more attention to environmental propaganda and education for improving the environmental awareness of the whole nation. Later, SEPA called up the First Workshop on Environmental Propaganda and Education, in which experiences of EE in the past 16 years were summarized and further development of EE was advocated.

In the third phase since 1992, EE in China was reoriented to EEFS or ESD. In 1992, the UN Conference of Environment and Development was held at Rio de Janeiro in Brazil, and the First National Meeting for Environmental Education in China was jointly held by the Ministry of Education (MOE) and SEPA in November. Since then Chinese government set EE as an education for all, the importance of EE in basic education was enhanced, and several EE training workshops for head teachers of middle/elementary schools were organized by MOE and SEPA. Those who received such training became were empowered to promote EE in schools and districts. In the curriculum program started in autumn of 1993, knowledge about environment began to be integrated into many subjects. Then, in March 1994, the State Council approved China Agenda 21, in which EE was considered as a prerequisite for sustainable development. Since late 1990s environmental education centers were established in some universities specialized in teacher education, which conducted training programs for elementary and secondary school teachers, did studies in EE, and provide optional courses for other undergraduates than those majoring in environmental science. At the same time, national or international environmental NGOs were established or came to China and got great development since then. Those NGOs and other international organizations not only introduced ideas and approaches of teaching and learning of EE or ESD to China, but also helped to attract public attention to EE and SD. Tian (2008) made a literature review on both EE and ESD from 1979 till 2005 and found that the number of paper on ESD increased while that on EE decreased in 2004 – 2005, which shows the trend that EE was transforming to ESD. Given the research topics, the social dimensions such as environmental equity and justice were discussed in more and more paper.

The distinct feature of ESD in China is that it was developed through experimenting with pilot projects (UNESCO, 2006; Chen, 2006). For example, the 'Education for Environment, Population and Sustainable Development' programme was initially launched in 1998 and aimed at providing interdisciplinary and moral education to teenagers. In 2006 reaching 3,000 schools and over one million students, it is being expanded to incorporate primary school students as well. The success of the pilot project is changing national educators' minds about ESD and it could serve as the basis for a national curriculum initiative. The above-mentioned ESD Guideline of Beijing could be regarded as one of the outcomes[1] of the EPD project. And the National Guideline of EE is partly originated by the EEI project, in which WWF had a close relation and good cooperation with the Ministry of Education. Other international EE projects included the Trial Utilization of the Beautiful World of

[1] A series of books about this project has been published by the Educational Science Press in 2004, including Shi Gendong's *2003 Report of Education for Sustainable Development: Introduction to Education for Environment Population and Sustainable Development(EPD) in China*; Wang Guiying's *Case Studies on EPD in Primary Schools in China* and *Case Studies on EPD in Secondary Schools in China*, etc.

the Plants, a series of teaching materials for rural schools in Asian and Pacific areas; Enhancing EE through Developing Teaching Resources with Interactive Teaching Methods, which is financially supported by the United Nation Department of Development and Program (UNDP), and other projects sponsored by organizations like UNESCO (Ren & Liu, 1998). There are also some EE projects sponsored by Chinese environmental NGOs like the Friend of the Nature and the Hand in Hand Earth Village (Shou & Shou, 2000). Such pilot projects brought lots of EEFS or ESD initiatives in schools and local communities. Hao (2006) found that the attitudes, interest, awareness and teaching abilities of teachers from the EPD project are significantly better than others, which implied that the EPD project made positive impact on teachers' professional development of ESD.

The concept of ESD in China is literally correspondence to that in international statements, partly because the ESD theory construction was mainly based on the international perspectives (Wang, 2007), and many of the ESD practices and studies are sponsored and promoted by international organizations. Comparative study is one of the main approaches in ESD research in China. It is not difficult to find books or papers addressing ESD ideas in the international documents as well as ESD practice patters in other countries (see Qian, 2005; Ma, 2006; Wang, 2002, etc.).

Let's see the three nation-wide programme of ESD, the UNESCO ESD project, the Environmental Education Initiatives (EEI) project and the Green School Project[1]. Although all of the programme are jointly sponsored or supported by the Ministry of Education, the executive agencies are international organizations or other government departments. The EEI project was originally sponsored by an international NGO, the World Wild Foundation (WWF), and financially supported by the British Petroleum Company (BP). The Green School Project was sponsored by the Ministry of Environment Protection, but the concept of 'green school' also came from the international community. Among the eight teacher training programs of ESD in China introduced by Wang, Wei and Yuan (2006), three programs other than EEI and EPD are sponsored by international or foreign institutes, such as the Roots and Shoots Program sponsored by the Jane Goodall Institute, Leadership for Environment and Development (LEAD) financially supported by the Rockefeller Foundation, and Seminar of Teacher Training in ESD sponsored by UNESCO.

In the documents of the National Commission of Chinese ESD Project, ESD is defined as an education based on the needs for SD, highlighting the values of SD, and aiming at resolving problems in SD. ESD should make contribution to the SD in society, environment and economy by helping learners to learn the values, knowledge, behavior and lifestyles required for a sustainable future.

In the Guideline for ESD in Schools in Beijing, ESD is mainly defined as an education for values of respecting both current and future generations, differences and diversities, and the environment and the earth resources. The aims of SDS are to make students acquire scientific knowledge, beliefs, behaviors, and lifestyles necessary to actively participating SD, and further enhance SD in the society, culture, economy and environment. It is regarded as an important approach to infuse ESD in the basic education reforms for approaching the quality education and raising the reputation of education in Beijing.

[1] 'Green school' is a national award for schools that adopt an environment - friendly adminstration strategy with the idea of SD as its guiding principle, and keep trying to make use of all resources inside and outside of the school to improve both teachers' and students' environmental competence. The poject is sponsored and managed by the Ministry of Enviromental Protection, with support from the Ministry of Education.

The objectives of ESD in this Guideline include: values, accountability and behaviors of respecting living, other persons, and SD of the society and the nature; awareness, beliefs and lifestyles for caring the environment, treasuring the resources, and conserve the biodiversity; sense of responsibility of inheriting and developing the Chinese traditional culture, as well as understanding and respects of cultural differences and diversity, conservation of the cultural inheritance of human beings, and competence to interact friendly with people from other places; scientific outlook of SD, accountability and capacity to concern and resolve practical problems in SD in society, culture, environment and economy.

It seems not difficult for Chinese government and educators to understand and accept the ideas of SD and ESD. Chinese people are traditional concern about the happiness of their future generations. Many parents' hard working are motivated to bring a happier life for their sons or daughters and grand children. There are abundant words in Chinese traditional works related to values of sustainable development, which addressed interpersonal relationships and relationships between human and the society, and between human and the nature (Huang & Zhang, 2002). For instance it was said in Confucius that 'do not do whatever you do not expect others do to you' , which has been taken by the western countries as same as what Jesus said that 'you should treat others in the manner that you hope others to treat you'. Given the relationships between man and the nature , it was said in the ancient literatures more than 2000 years ago that, for example, not to cut trees or hurt animals in the germinating season; not to hurt female animals in pregnancy; and not to catch baby fish by enlarging the size of the mesh in fishing net, etc.

However it may take some time for Chinese people to comprehensively understand the complexity and practical approaches for SD and ESD. And there are still huge gaps between theory and practice, policy and implementation of ESD (Tian, 2008). It is argued by some ESD researches (see Huang & Zhang, 2002) that critical thinking is the core concept of EE and ESD, which implied that critical thinking need to be incorporated and improved in ESD research and practices. When EE developed to ESD, the environment jumps out from layer of 'nature' and expanded to a holistic 'environment' which involved ecology, society, economy and politics, and EE jumped out from layer of skills and knowledge about environment and expands to a holistic 'education' which involved awareness, attitude, values, and ethics of the environment and SD. All these changes were caused through critical thinking and participatory spirit of ESD.

Of course more efforts need to be made to clarify ESD from EE. There are diverging opinions at this point (Huang & Zhang, 2002). According to documents of Bruntland Report and other EE meetings, it is clear that EE should be reoriented toward education for sustainability, and 'sustainable development' could cover 'environment' and ESD could cover EE. On other hand, it is widely accepted that ESD was rooted in EE. While some scholars think EE and EFS are different and far away from each other probably because EE emphasizes knowledge about environment at the beginning and it is hard to introduce social, economic and political ideas into EE. Some others even think to replace EE with ESD so that the concept of EE could be called off.

In addition, as Zhang and Kang (2007) argued, ESD in China should be conducted with joint efforts of all parts of the education. The national sector needs to rethink about the current educational policies and content, reconstruct the educational institutes and organizations, and encourage theoretic research on ESD. The local sections need to clarify what education (basic education, vocational education, and higher education) should respond to the needs of SD of local society,

environment and economy, to construct organizational network of ESD in the local area, to train teachers and develop learning materials, to organize ESD activities based on the local contexts, to expand the idea of SD through public communication, and to define strategies and ways to spread ESD step by step in the local areas. All types of schools including kindergartens, elementary and secondary schools, colleges and universities, vocational schools should conduct ESD. The other social sectors such as children's clubs, the community, the family and the media should work together with the schools to guarantee and improve the outcomes of ESD,

Theme 2
Education for Sustainable Development (ESD) and Sustainable Development (SD); Climate Change Education (CCE) and Climate Change (CC):
The role of education in relation to the challenges of sustainable development and climate change respectively

The central government of China highlights the importance of education to sustainable development as well as for climate changes. Education and publicity is addressed as one of the necessary approaches for SD and climate change in all the government documents.

In 1992, the Chinese central government issued a document on the Nation's 10-Point Strategy for Environment and Development. The eighth solution is to strengthen environmental education and continuously improve the whole nation's awareness of environment, in which propaganda of mass media, school education, and training of specialists in environmental science and management were mentioned. Later in the Resolutions of the Chinese State Council on Problems of Environment Conservation issued in 1996, it was highlighted again to strengthen environmental education and improve the public awareness of environment. Five dimensions were addressed there including propaganda and education in environmental science and legal matters about environment, EE in all kinds of schools and professional training, public participation in environment protection and implementation of environmental legislation, work of the mass media, and international communication (Zhang, 1997).

In the Chinese Action Program for Sustainable Development in 21st Century (State Council，2003), it is said *all levels and types of education should be developed for improving the whole nation's awareness and capacities of SD, enforcing development of human resources, and enhancing public participation. Both textbooks of basic education and higher education should add content about SD.*

In Environmental Protection in China (1996-2005) (white paper of 2006), issued by Information Office of the State Council of the People's Republic of China, June 2006, it is said:

To strengthen the publicity and education of environmental protection, the State has formulated the National Action Program for Environmental Publicity and Education (1996-2010) and the 2001-2005 National Program for Environmental Publicity and Education Work. The Fourth Five-Year Plan of Legislation Publicity, commencing in 2001, has made the publicity and education concerning laws and regulations on environmental protection a major part of the national legislation publicity and education drive, and included the publicity of those laws and regulations in the annual legislation publicity plan. Every June 5, World Environment Day, various activities are held across the country, publicizing protection of the environment. Neighborhoods, schools and families are encouraged to make themselves environmentally-friendly. So far, the drive has

gathered the support of 2,348 neighborhoods and 25,000 primary and middle schools, secondary vocational schools and kindergartens, and 100 model families have been elected. Special programs tailored for young boys and girls, such as "Mother River Protection Operation," "Green Promise," "Environmental Action Every Day" and "Ecological Monitor," are launched to give them moral education in eco-environment and make them more aware of the importance of environmental protection.

In China's Energy Conditions and Policies (white paper of 2007), issued by Information Office of the State Council of the People's Republic of China, December 2007, it is said:

It will incorporate energy conservation into the system of elementary education, vocational education, higher education and technical training, and publicize and popularize relevant knowledge by means of mass media. It will enhance the energy-conservation week campaign, and mobilize all sectors of society to participate in it. All these measures will help to build a long-term mechanism of energy conservation with the participation of all sectors of society.

It seems that the issue of climate change has not got specific attention until recent years. The documents specifically addressing climate change were issued mainly in recent three years. In China's Scientific & Technological Actions on Climate Change, it is said:

Climate change knowledge popularization activities in different forms with rich information should be organized for young students at primary and middle schools. Institutes and universities are encouraged to set up student organizations and forums on climate change. Researches in institutes and universities should be integrated with the science popularization activities.

The topic of climate change should be an important component of all science popularization activities. Centralized training, outreach and demonstration activities should be well enhanced. Appropriate but differentiated outreach and knowledge popularization activities should be conducted in large, medium-sized and small cities and in rural areas.

In China's Policies and Actions for Addressing Climate Change, it is said:

China has all along attached great importance to education concerning the environment and climate change. The state makes the concept of building a resource-saving and environmental-friendly society an important component of school education and the mass media, and disseminates knowledge about climate change by all ways and means to sharpen the concern of the whole society about global environmental issues.

It fosters students' awareness of the importance of energy conservation and emission reduction through school education and practical activities.

In recent years, with vigorous development of the recycling economy as focus, the government has launched a series of educational and publicity activities in order to root the idea of a recycling economy deeply in the people's minds and create a sound social atmosphere.

China will further enhance education and training in order to better deal with climate change. Knowledge about climate change will be included in basic education, higher education and adult education, with the focus being place on fostering among youngsters the awareness of climate

change and a sense of participation in relevant activities. It will conduct training courses and seminars on climate change for government agencies, enterprises, consultation institutes, scientific research staff and communities, so as to improve their understanding of the importance and urgency in dealing with climate change, and encourage them to undertake their social responsibilities in an active manner.

Although the importance of education are highlighted in all policies of SD and CC and lots of papers discussing about both the importance and the ways to conduct ESD, there are few research addressing the actual role education have played and are playing for SD and CC in China.

In addition, ECC is quite a new concept in China. It was not explicitly addressed either in the Guideline for ESD in Elementary and Secondary Schools in Beijing or the National Guideline for Implementing Environmental Education in Elementary and Secondary Schools. In elementary and secondary schools, only a few subjects like geography and science have some general introduction about the climate rather than specific content about CC. There is no ECC in higher education and vocational schools either (Zhang & Kang, 2007).

However, some research and professional training programs were started in some higher education institutes in recent years. For instance, in the UNEP-Tongji Institute of Environment for Sustainable Development (IESD), Tongji University, many research activities are closely related to SD, such as green accounting practice in China, carbon emission reduction in Shanghai, eco-city planning and management, planning environmental assessment and low carbon economy, etc. The fifth leadership programme on environment for SD in Sept. 2008 emphasized mitigation and adaptation for climate change. This programme and other training programs were organized in the aspects of human (soul, mind, and body), environment (air, water, and land), and development (economy, sustainability, and decision-making) etc. (Jiang, 2008).

Theme 3
ESD and the curriculum:
Including evaluation, assessment, success-criteria, and the question of the relationships between ESD and the (academic) disciplines.

Although the national curriculum does not directly claim it as an ESD, it is oriented toward SD to some extend. In June 2001, the Ministry of Education issued the *Program on Reform of Basic Education Curriculum (Experimental)*, along with 22 curriculum standards for compulsory education, and a document concerning evaluation and testing systems for primary and middle schools. In 2003, the Ministry of Education issued the *Experimental Curriculum for Senior Middle Schools* along with 17 curriculum standards for regular senior middle schools. The curriculum reform is a response to the changes of the world toward a post-modernized and learning society with growing uncertainty, international competition, and needs of flexibility and long-term thinking (Zhong, et al., 2001). We can see some correspondence between ideas of such reformed basic education curriculum in China and ESD ideas in international documents, and the national reform of curriculum brings opportunities to implementation and improvement of ESD in China's schools.

The specific aims of this reform have some relations to ESD. The first is to keep an emphasis on value education. According to the *Program on Reform of Basic Education Curriculum (Experimental)*, the objectives of the new curriculum should embody the requirements of the era, which include spirits of patriotism and collectivism, loving of the socialism, and carrying on and

forward the Chinese good tradition and revolutionary tradition; awareness of the socialist democracy and legal system, and observing the nation's laws and social ethics; formulation of correct views of the world, the life and the value; accountability to serving for the people; initial development of creativity, competence to practice, accomplishments of science and humanities, and awareness of the environment; basic knowledge, skills and methods for life-long learning; strong physique and good mentality, healthy aesthetic appetite and life style, and becoming a person with ideals, morality, knowledge and good behaves.

The second is to make school curriculum more comprehensive and holistic. The curriculum in elementary schools should be mainly interdisciplinary. The courses in primary (the first two) grades are ethics and life, Chinese, math, PE, art (or instead music and visual art separately), life and science and technology, etc. The courses in the third to sixth grades are ethics and society, Chinese, math, science, foreign language (usually English), PE, art (or instead music and visual art separately), comprehensive practical activities which include ICT education, project learning, community service and social practice, and education of labor and techniques, etc. Both disciplinary and interdisciplinary courses are set for the junior high schools, including moral education, Chinese, math, foreign language, science (or physics, chemistry, and biology separately), history and society (or history and geography separately), PE and health education, art (or instead music and visual art separately), and comprehensive practical activities. Schools are encouraged to provide other optional course. The high schools in rural areas are encouraged to develop vocational training programs based on local needs and conditions. Here a totally new form of course is legalized in the curriculum, i.e. the comprehensive practical activities, which provides time and spaces for interdisciplinary activities like social work, environmental study, and project learning.

The third is to increase the diversity and competence of the curriculum to adapt to local surroundings, which will empower the school and teachers' exploration of school-based curriculum. In the curriculum reform, a three-level of curriculum system was established including national curriculum, local curriculum and school-based curriculum. The comprehensive practical activities are a part of the national curriculum covering 3 class hours each week and there are 1-2 class hours for local and school-based curriculum. These hours provide good opportunities for many schools to try ESD project learning. The most typical themes of project learning in EPD schools are environmental protection education, health education, military science and technology, sustainable ways of consumption (Shi, 2004).

The fourth is to make students' learning initiative, active, creative, and based on everyone's own experiences. Here the importance of a democratic classroom and a teacher acting as a facilitator was addressed. Teachers need to work collectively with students and encourage peer cooperation. They should create a friendly surrounding for the children's inquiry, discovery and critical thinking, with positive feedback to develop children's self-esteem.

In the National Guideline of EE, four basic principles of EEFS that are similar to those of ESD were addressed, i.e. the world is interconnected and interdependent; biodiversity should be treasured and the impacts of culture on the environment should be concerned; the concept of SD should be understood emphasizing on communication, understanding and cooperation among counties and regions for conserving the resources and the environment as the bases for survival and development of the future generation as well as other living things, while serving the needs of current generation; and students need opportunities to actively participate resolution of environmental problems and their accountability for the environment should be cultivated.

The objectives of EEFS in this Guideline show that it tries to address citizenship education qualities. There are three dimensions of the objectives. The attitudes and values include caring for the nature and respecting the life; being nice to others, cooperating actively, equally and fairly, respecting different perspectives and diversity of the culture; being aware of citizens' rights and duties to the environment and willing to create a sustainable future; actively participating actions and decision-making process for a better environment and being a responsible citizen.

The competences include observing and analyzing the status and changes in surrounding environment; identifying environmental issues in the family, school and community, and designing, implementing and evaluating solutions; effectively collecting information about the environment with appropriate approaches; expressing personal viewpoints about the environment and communicating with others effectively; critically thinking about the causes for regional or global issues of the environment and making comparison of different ways of solutions.

The knowledge includes knowing man's dependence on the environment and reflecting on the impact of personal life on the environment; understanding environmental issues and their impacts on the individual, the family, the school, and the community; knowing the construction, function and evolution of the natural and ecological system; understanding the interactions between the environment and the economy, technology, social life, policy and law; being aware of approaches for the citizens to participate environment protection and making comparison of the results of different approaches.

While the Beijing Guideline of ESD are more likely oriented toward promotion of prescriptive learning of ESD values and knowledge. It suggests nine topics in social, cultural, environmental and economic areas. The social topics are life and security, citizens' rights and responsibilities, harmonious society; the cultural topics are Chinese traditional culture and the world heritance, cultural diversity, the environmental topics are environmental protection and prevention of natural disasters; and the economic topics are recycling economy and greening consumption, and rural development and sustainable urbanization.

A series of project-learning textbooks have been developed following the above ESD Guideline in Beijing and based on findings of the pilot projects of EPD. The theme for the first three graders is to feel about the environment. The learning topics are the school, the nature and the precious resources. The theme for the 4th to 6th graders is to know about the environment. The learning topics are healthy and green family, the way to the school, and the community. The theme for junior high school students is SD issues in daily life. The issues are traffic jams in Beijing, the common inheritance of the world, urbanized modern agriculture, electronic wastes, recycling economy, etc. The theme for high school students is critical thinking about the SD issues. The learning content was divided into three sections. The first part is a general discussion about the man, the environment and SD. The second part includes three case studies: respects of both the current and the future generations (under the same blue sky), respects of cultural diversity (the various world), respects of the environment and the earth resources (the green treasures). The last part addresses public participation in SD and working together to construct the harmonious society.

Both discipline oriented and interdisciplinary approaches of ESD are encouraged in China. According to the ESD Guideline as well as research paper, there are several approaches to teach and learn for SD in schools. The first is to infuse ESD in subject teaching and learning, especially in

geography, biology, chemistry, science and moral study etc. The second is cross-disciplinary project learning of ESD themes. The third is developing school-based curriculum addressing ESD topics. The forth is ESD provided by social agencies outside of the school. The fifth is ESD in activities of students' organizations, such as the activities of the Young Pioneers in elementary schools and the Communist Youth League in secondary schools. The last is to create an environment-friendly or sustainable school culture. The approaches in the National Guideline of EE are similar.

ESD objectives are explicitly addressed by curriculum standards of many subjects. In geography, for instance, the introduction part of the Curriculum Standards of Geography in Compulsory Education highlights the importance of ESD in secondary geography teaching. It was regarded as one of the mission of geography teaching to cultivate correct viewpoint of the population, resources, environment and sustainable development. In the Curriculum Standards of Chemistry, one of the fundamental rationales for this subject addresses ESD explicitly, that is to help pupils get aware of the great contribution chemistry have made for development of the human society and civilization, recognize the role of chemistry in formulating harmonious being together of the human and the nature and promoting sustainable development of the human society, and believe in the significance of chemistry for construction of a better future for the human. According to the Curriculum Standards of Physics, one of the objectives of this subject is to help pupils care for the science development, have awareness of SD, form correct views on science, and develop responsibility and accountability to serve the motherland as well as the human with science. The other relevant objective is to prepare pupils with creativity, independent thinking, courage to doubt, and the scientific attitudes and spirits of respecting the fact and freely imagination. To understand the significance of harmonious development among the human and the nature and improve awareness of environmental protection is one of the objectives of biology teaching. And active participation in decision making process for social issues is also mentioned as an objective in the Curriculum Standards of Biology. Caring, appreciation and protection of the nature as well as the awareness of SD are also addressed in the Curriculum Standards of Science.

Partly due to the cross-disciplinary feature of ESD, the ways to infuse ESD in subject teaching became one of the main topics in ESD research. There are several master degree dissertations discussing about ESD in individual subjects like geography (Chen, 2006; Li, 2006), biology (Lu, 2008), chemistry (Li, 2007), science (Liu, 2008), Chinese (Deng, 2005), PE (Sun, 2007), and moral curriculum (Wang, 2008), etc. It is argued in these dissertations that both the National Curriculum Standards for these subjects as well as the instructional materials provide possibilities of implementing ESD in subject instruction. In the high school geography textbooks, the first four units address SD of the resources and environment, and the fifth to seventh unit address SD of the economy and society (Wang, 2005). Lu (2008) described her attempts to integrate ESD in the middle school biology classes. For instance, in the lesson of Family Planning, she led the seventh graders think about the impact of uncontrolled population growth on the environment, society and economy, and discuss about significance of the policy of family planning and the personal responsibilities in birth control. Another case is in a lesson about sex determination under the unit of inheritance and differentiation, students were guided to think and discuss about the maladjusted sex ratio at birth as a social problem.

It was found (Yin & Fang, 2002) that implementation of EE in subjects is unbalanced. In subjects closely related to SD issues, such as geography, biology, and chemistry, EE prevails. More than 80% of teachers of these subjects can carry out environmental education as required by textbook or curriculum standards. While in subjects of physics, Chinese, and mathematics, more than one third

of the teachers adopt an approach of 'to teach only if there is time', and a fraction of them do not teach at all. In each subject, only a small number of teachers did 'a lot' teaching on environmental education. It was reported that 'the main obstacles in environmental education' are 'lack of hours' and 'lack of teaching materials'. Another problem found in this research is that EE lack differentiation in different stages. After-school EE activities for students from primary schools and middle schools were almost the same, such as 'picking rubbish', 'planting trees', and 'cleaning public places', etc. With up-going of grades and knowing more about the environmental problems, students began to doubt the practical impact and the significance of such activities and their interest and passion in environmental issues gradually diminished.

Dai (2007) tried to formulate a curriculum system of ESD that corresponds to different age groups. In her proposed program, two themes of ESD were set for elementary school students, i.e. education for life and health, and sustainable consuming. The topics of the former theme include safety as well as sense of safety is human's basic needs, human's survival presuppose life, every one is responsibility for their own health, something in natural environment might be poisonous to the human, etc. The topics of the second theme include definition of resources, recyclable and non-recyclable resources, reduced and appropriate consumption, etc. ESD themes for the junior high school are population, citizenship, and the environment and the life. The sub-topics include relations among population, resources and the environment, possible disasters caused by urbanization, over exploitation of the land and inappropriate ways of dealing with the waste, population and migration issues in China; public participation, gender equity, security of the nation, human right, nationality identification; and bio-diversity, environmental issues, human's impacts on the environment, etc. Two themes are suggested for the senior high school, i.e. cultural diversity and scientific outlook of development. The sub-topics include the significance and features of, as well as threats and conservation of cultural diversity; basic concepts of sustainable development, economic development in China and in the world, revolving economy, resource-use efficiency, clean production, ecological industrial civilization, etc.

Shi (2008) and Wang (2006) described the quality standards for good ESD instruction based on the pilot study of the EPD project. They are to have the students preview the text and inquiry questions before the class; provide spaces for students' exploration and cooperation; lecture appropriately related to instructional context; and teach about the SD values related to the learning materials. Shi (2008) also described the basic quality standards for the model school of ESD, i.e. the principal and the leading team have clear understanding of ESD ideas; the curriculum construction of the school show distinctive features of ESD; rules are set to cultivate both teachers and students' behavioral norms of saving energy and reducing emission and encourage active changes in teachers and students' behavior and life style; school construction for saving energy and reducing emission make effective impact on the students' understanding of SD. Wei (2006) proposed three levels of assessment of ESD, the district, the school and the teacher. The dimensions at the level of district are aims and programming, providence of resources, monitoring and administration, and outcomes such as public participation, publicities, projects, etc. For the school, dimensions of assessment include organization and administration, forms and procedures of ESD within and outside of the classroom, and outcomes such as the environment of the school, environmental awareness of the teacher and the student, lesson plans and publicities, etc. Dimensions for the teacher are their understanding of SD and ESD, professional knowledge and teaching skills, ways and process of teaching about ESD, and the achievement of both the students and themselves.

However, official guidelines for assessment and evaluation of ESD practices as well as a correspondent administrative system need to be developed with reference to those of the experimental projects, so that the ESD in China might be oriented toward a clear vision. In the case of the National Guideline of EE which was issued in 2003 and embedded many ideas of ESD, it did not play the role that it should have done partly because it is unclear who should be in charge of promoting the implementation.

Given the concept of ESD as an interdisciplinary approach, it seems even harder to resolve this problem in the discipline based curriculum system, from elementary schools to higher education institutes, unless some cross-disciplinary agencies be established to coordinate and organize comprehensive studies and projects of ESD. Although the curriculum reform in basic education advocated a more comprehensive curriculum, the newly set comprehensive courses such as science or social study are conducted just like new disciplines. Things change little that different teachers teach different disciplines and it is seldom to see cross-disciplinary team work or learning activities, which are essential to ESD. It can be expected that establishment of agencies for ESD assessment, administration or academic studies should bring more interdisciplinary ESD practices and studies in schools and universities.

Theme 4
ESD and pedagogical traditions and development tendencies.
ESD and school development; ESD and what happens in the classroom; ESD and teaching methodologies.

As mentioned above, the advocated approaches of teaching and learning in the curriculum reform are quite correspondence to those addressed by the international ESD documents. There are two suggestions of the *Program on Reform of Basic Education Curriculum (Experimental)* for instruction process in basic education. Firstly, teachers should have active interactions and mutual development with the pupils, balance delivering knowledge and cultivating competence, enhance pupils' independence and initiatives, guide them to question, investigate and inquiry, to learn by doing, and facilitate their active and individualized learning; teachers should respect pupils, pay attention to individual differences, serve varied needs of pupils, create an educational environment which may inspire pupils' active participation and enthusiasm of learning, foster positive attitudes and capacity to understand and apply the knowledge, and help every pupils' development. Secondly, ICT should be integrated into the teaching process for renewing the ways of presenting learning content, as well as the ways of interactions between the teacher and the pupil. Therefore, inquiry learning, independent thinking and comprehensive understanding of relations among the nature, the human, science and the society are included in the suggestions for instruction in curriculum standards of many subjects, such as physics, chemistry, geography, science, etc.

Many research papers as well as the Beijing Guideline of ESD suggest inquiry learning, cooperative learning, experiential learning, and integrated approach to ESD. These ideas are described in more detail in the National EE Guideline. It emphasize inquiry learning and action research with multiple approaches including out-door teaching, community service, field trip, simulation and role play, and case study, etc. It also suggest to respect the students' needs and desires, guide them to discover problems in taken-for–granted phenomena, start from problems they have capacity to handle, and to create mutually supportive interpersonal relationships.

It is suggested and encouraged in the *Program on Reform of Basic Education Curriculum (Experimental)* that schools incorporate and make use of varied resources for teaching and learning, including libraries, labs, and specialty classrooms within the school, and natural and cultural sites outside of the school such as farms, museums, and exhibitions, etc. It was reported that investigation and participation in the community was encouraged in some ESD project learning cases, in which students made posters, wrote letters with suggestion, or gave presentations based on their inquiry in around environmental issues and tried to persuade social agencies in charge or the community to take actions for SD in the local or community context, or participate in actions like cleaning the community, dealing with different waste separately, saving water or energy, and protecting birds, etc. (Zhang, 2006; Wang, 2004).

Meng (2009) made a case study of ESD in higher education institutes. In the case a true story in the local area was introduced to the students where the nature, population, economy and even cultural conditions have changed a lot in the past 30 years. Four topics were raised in this case: the role of the government in protecting and constructing the environment, cultural mergence between the original Mongo residents and the new comers most of whom are Han nationality, changes in the environment and the weather, and development of the commercial economy. The questions for students' inquiry and discussion include what the local government should and should not do in the environmental protection and economic development? What is the core value or essence of the Mongolia culture that needs to be conserved? How to make plans for sustainable development in the local area in the future by learning from the deterioration of the pastureland in the past? And will the extended gap between the rich and the poor cause more ecological deterioration and how to empower the local residents to fulfill their needs of economic interests and life conditions?

In another case (see Yin, et. al. 2002), a group of senior high school students were guided to do an investigation on unban refuse problems with four assignments that addressed three aspects of SD, i.e. consumption manner, ecological perspectives, and economic principles. The first assignment was a survey on home refuse classification in a week, including recording and statistical analysis on volume and weight of classified refuses, the usage of the 'refuse' before they were thrown away, and the reasons for throwing them away. The second was a field trip to a refuse disposal plant in the city for understanding the current status of refuse disposal and its cost. The third was an investigation on salvage stations in the community to find out what kinds of waste were reclaimed and the corresponding price. The fourth was a record on family purchase in a week about the detail of the items and the original places they came. Here the students had chances to enhance their skills to collect, organize and interpret data and information and were encouraged to reflect critically on their own behaviors and life styles. One of the students' final reports in this inquiry lodging proposals on how to implement rubbish classification and reclamation in a more economical and convenient way won a third prize in a competition of students' science thesis in Beijing City.

Students' critical thinking and formulation of questions could be seen in a few ESD lessons. For instance, Yi (2004) reported an elementary science class, the topic of which is Animal Domestication. After a brief introduction to how animals were domesticated (mostly about the biotechnology) and what changes occurred during this process, the teacher left five minutes for the students to question. One of the questions raised by the students was drawn for further discussion, i.e. what domestication means in the context of environmental protection? Several complicated issues were addressed in students' presentations on conclusions of the group discussion, such as '*Domestication is positive to protect the environment since it is helpful to fulfill human needs and at the same time create a better life for the animals'; 'Domestication is a negative action to the*

environment since it violates the animals' rights of naturally living'; 'Domestication is an inevitable outcome of human development and it might be evaluated in different way in different contexts'; 'The society is developing and environmental protection is also in change. We need to combine the consideration of both the ideal and the real contexts'. Here we could see students' sophisticated thinking about human's actions toward the nature. There is not a 'single' or 'right' answer, but contrasting perspectives on the effects of human's behaviors on the nature. Students had opportunities to think of their own perspectives on human action and share with each other. In students' words, this lesson was like a mental competition or a debate, and some said 'we were not likely learning about the book but about the life'. This lesson also inspired students' further interest in inquiry of the relative issues. They read, investigated, talked and wrote about their discussions after the lesson for a long time.

Educators who have realized the importance of ESD and learnt some ideas about its approaches tried to design some learning activities with imagination and creativity. For example, a school in Beijing re-structured the learning content and teaching time of several subjects including Chinese, math, science, social study, health education, art and music which address the same theme of Yangzi River, creating an integrative thematic learning in a morning by team work of the involved teachers. These cases show the potential changes that ESD could bring to teaching and learning.

Although many experimental projects of ESD got great achievement and brought positive changes of teaching, learning and administration into schools, however, problems were still there (Yi, 2004). Firstly, many learning topics addressed the natural environment or the biological side of the environment. Secondly, few evidence of teachers' cooperation, especially among different subject specialists, could be seen. Thirdly, students' inquiry on reasons for the pollution and deterioration of the nature was often guided toward a simplified consideration of people's inappropriate behaviors. Fourthly, teachers were more likely to introduce general environmental issues that seemed too distant from the young students' experiences to inspire their motivation to take real actions toward the environment. The problems, mostly the theory-practice gaps in holistic outlook and critical thinking, could be partly explained by the teachers' partial or incomplete understanding of ESD, which is related to professional training of ESD.

Wei and Wang (2007) argued that with the development of ESD in China, the teachers' training on it is in dire need. The teachers' training on ESD in China still is in leading strings, and it is mainly promoted by some international programs like UNESCO EPD program, China-Germany Teachers' Training Project on ESD, etc. Hao's investigation (2006) shows that more than half of teachers in Beijing did not take any training of ESD. In another survey study on EE in Beijing, Yin and Fang (2002) asked 259 teachers of 7 subjects and 270 secondary school students to complete two questionnaires separately. It was found that many teachers tried EE just because of their personal interest and a few even showed a passive attitude that they tried EE just because it was 'required by textbook and curriculum standards'; most teachers except those in geography were not ready or used to searching for information about EE in daily life and they got EE knowledge through the same resources, usually the mass media, as the students; and thus the most often adopted teaching approach in EE was still lecture that was least welcomed by students. It will be a big challenge for the Chinese government, especially the Ministry of Education to prepare and train quality teacher of ESD and develop supportive resources for teaching and learning of ESD.

Another factor hindering ESD pedagogy might be the idea and practice of 'education for exam' or 'education for entering a higher school', which may cause simplified ESD as 'a pure knowledge education' (Tian, 2008), or in other words, an education about SD that might be tested in exams.

Conclusions

As a developing country, China is facing the big challenge to simultaneously consider about all the SD issues in the international community as well as the increasing needs of economic development for improving its' people's life standards. In Chinese discourse, China is trying to construct a harmonious society in which all aspects of the society such as the nature and the human, the rural and the urban, the poverty and the rich, economy and the environment etc. should get together equally and harmoniously. China has special advances in making efforts for SD. Firstly some of the ideas of SD could be seen in Chinese traditional literatures. Secondly China keeps open-minded to the international community, learning about the ideas and strategies and searching supports of SD and ESD.

Partly due to such learning from the international community, most of the concepts of ESD in policies and literatures in China are literally correspondence to those in the international documents, although many ESD ideas were addressed in literature branded as EE. Education was thought highly by Chinese government as a necessary measure for SD and CC. The key issues engaged in ESD in China include environmental protection, corporate social responsibility, protection of indigenous cultures and mutual understanding and respect among diverse cultures, sustainable lifestyles and economy, etc.

The nation-wide curriculum reform since 2001 is correspondent to ESD values and approaches. A lot of teaching and learning activities of ESD could be seen in schools from kindergartens to universities, including interdisciplinary activities within or after-school, and infused ESD in subject learning like geography, chemistry, physics, science, Chinese, etc. ESD approaches such as inquiry learning, participation in the community, data collection and interpretation, and sharing and discussion have been tried in some of the ESD activities, and students' understanding and attitudes toward SD did change positively in such activities.

However, problems of ESD are still there such as the theory-practice gaps in teaching for holistic outlook and critical thinking, insufficient motivation and competence of teachers, and non-supportive conditions for interdisciplinary teaching and learning, etc. And there is no national guideline of ESD till now other than the National Guideline of EE that was oriented to EEFS. Thus it is difficult to make a standard-based assessment of ESD in China. In the context of discipline based curriculum system and the public demands for education with both quality and high scores in exams, it might be hard to develop an authentic ESD without definite agencies for ESD assessment, administration, or researches.

In addition, more efforts should be made to do evaluate research of the current situation of ESD and ECC. Many questions need to be answered, such as where, when and how the ESD or ECC are done by the teachers, what outcomes have been achieved in ESD or ECC, what challenges and opportunities ESD and ECC might bring to the school development as well as improvement of teaching and learning, and to what extend the policies on ESD and ECC in the government documents have been realized in the practice, etc.

The analytic framework of this project is quite helpful for making illustration of ESD policies and practices in current China. More detail and applicable assessment instruments should be developed based on this framework for further study on ESD in the international community.

Acknowledgement

Thanks to our colleagues in the Environmental Education Center, BNU who shared their fruitful experiences and critical insights in EE and ESD studies that were very helpful for our work on this report, and without their encouragement we could not have taken and accomplished this task. Appreciation of the trust and support from the leaders of the School of Education BNU，especially that from the vice dean in charge of international exchange and cooperation, Dr. Zeng Xiaodong. Thanks also to our DPU colleagues for their impressive work in forming the practicable analysis framework and setting up the platform for an international communication and collaboration in ESD studies.

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Appendix: Executive Summary

For the policy analysis, we tried to search government documents from two sides, the one is policies for SD and climate change, the other is educational policies addressing ESD or ECC. It is not difficult to find documents about SD since 1990s. But the ESD files are quite few. Three documents are mainly included in the report, one is the National guideline of EE in Elementary and Secondary Schools issued by the Ministry of Education in 2003; another is Beijing Guideline of ESD in Elementary and Secondary Schools issued by the Beijing Educational Commission in 2007; and the other is Guideline of the Chinese UNESCO ESD Programme.

It seems that climate change is quite a new topic since the government documents addressed this issue were issued in just recent years. Of course it is hard to find document or research specifically addressing ECC.

For the research analysis, we searched books and articles with ESD in the title, as well as some books entitled SD mostly after 2002, when the UN Decade of Education for Sustainable Development was adopted by the UN General Assembly.

The main findings are following.

The first is about the context of ESD in China. China is a developing country with a large population, and a relatively low level of economic development. The multiple pressures of developing the economy, eliminating poverty and mitigating the emissions of greenhouse gases constitute difficulties for China in its efforts to cope with climate change as well as reach sustainable development. China tries to be a responsible country. The government combines the handling of climate change with its execution of its sustainable development strategy, acceleration of building a resource-conserving and environmental-friendly society and construction of a country of innovation.

Then, about ESD and ECC, the central government of China highlights the importance of education to sustainable development as well as for climate changes. Education and publicity is addressed as one of the necessary approaches for SD and climate change in all the government documents.

The nation-wide curriculum reform since 2001 is correspondent to ESD values and approaches and brought opportunities to ESD in elementary and secondary schools. Some ESD values are included in the educational objectives, inquiry learning is encouraged, and time for ESD is set especially in the local and school-based curriculum.

The concepts of ESD discussed in books and articles are mostly correspondence to and some of them are quoted from the international statements. It emphasizes education for responsible citizens who have willingness and capacities to serve needs of both current and the future generation, seek SD of the environment, society and economy, and understand and cooperate with each other, etc.

ESD in China was developed through experimenting with pilot projects, and many of the projects are sponsored or supported by international organizations and domestic NGOs, mainly for environmental education. These experimental projects made great contributions to develop ESD curriculum, learning materials, and administrative structures. A lot of teaching and learning activities of ESD could be seen in schools from kindergartens to universities, including interdisciplinary

activities within or after-school, and infused ESD in subject learning like geography, chemistry, physics, science, Chinese, etc. ESD approaches such as inquiry learning, participation in the community, data collection and interpretation, and sharing and discussion have been tried in some of the ESD activities, and students' understanding and attitudes toward SD did change positively in such activities.

However, there are few policies of ESD and no of ECC. Maybe because CC is a new topic, ECC needs some time to be noticed. While for ESD, there is only one government entitled Guideline of ESD. It is a local policy of Beijing City that is more likely oriented toward promotion of prescriptive learning of ESD values and knowledge. Some distinctive substances of ESD like critical thinking and decision making etc. are not addressed in the Guideline. However and interestingly, many ideas of ESD are addressed in the National Guideline of Environmental Education, which did not include ESD in the title but says it for EEFS. One of the reasons might be that the phrase ESD in Chinese are easy to be explained or understood as education about SD rather than education for SD. The latter has two or three more words. Another reason might be that ESD in China is partly expanded from the environmental education, which has been conceptualized as environmental education for sustainability (EEFS) since late 1990s. The Ministry of Environment Protection seems more influential than the Ministry of Education in China to promote EE and ESD.

The problems of ESD practices are still there such as the theory-practice gaps in teaching for holistic outlook and critical thinking, insufficient motivation and competence of teachers, and non-supportive conditions for interdisciplinary teaching and learning, etc. The context of discipline based curriculum system and the public demands for education with both quality and high scores in exams might set obstacles on ESD. It is suggested to establish agencies for ESD assessment or administration.

When preparing for this report, we found the analytic framework very helpful for our writing. Maybe in the future we can work together to develop some criteria and procedures for assessing ESD policies and practices across the world.

The International Alliance
of Leading Education Institutes

Report from Denmark

Climate Change and Sustainable Development:
The Response from Education

Søren Breiting, Jeppe Læssøe, Simon Rolls and Karsten Schnack
Danish School of Education, University of Aarhus

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Danish National Report

Søren Breiting, Jeppe Læssøe, Simon Rolls and Karsten Schnack

July 2009

Research Programme for Environmental and Health Education
Danish School of Education, University of Aarhus, Copenhagen, Denmark

Contents

Preface

This report is conducted as a contribution to the cross-national project: “Climate Change and Sustainable Development: The Response from Education”, decided as the 2008-2009 joint project by the International Alliance of Leading Education Institute.

Denmark – Introduction to the Socio-Material Setting

Denmark is a small country, only 43.094 sq km., located in the temperate zone of Northern Europe. Denmark has historical and cultural ties to the other Scandinavian countries (Sweden, Norway, Iceland and Finland). The landscape is flat and most of it is used for agriculture. The population is 5.5 million, but only around 4% of them work within agriculture. Thus this field is characterised by high technology factory farming. Especially the production of pigs is enormous; more than 20 million annually.

The majority of the adult population is employed in small and medium sized companies or in the public sector. They live in cities (around 1/3 in the region of the capital, Copenhagen), and most of them in their own single-family houses. The Danes are world leaders regarding number of square metres living space per person (Dansk Byggeri, 17 August 2006), and their material consumption levels belong among the highest in the world.

Denmark is highly secularised - although the majority of people are members of the Christian, Evangelical Lutheran church, few are regular churchgoers. The ethos of the culture is modern; i.e. traditions and collectivity are gradually supplanted by a focus on continuing innovation and individualisation. However, like the other Scandinavian countries, these tendencies are tempered by a societal coherence which remains relatively strong. This strength is based on a long tradition for political democracy and corporatism/ consensus, as well as social egalitarianism and inclusion. The Danish welfare state follows what is commonly referred to as the Scandinavian welfare model. A large public sector offering e.g. free healthcare and education as well as relatively generous levels of social security benefits is financed by one of the world's highest tax rates. Despite the high taxation, there is widespread public support for the current welfare system and Denmark is commonly regarded as a relatively egalitarian society based around the traditional social-democratic values of freedom, equality and solidarity. (Nordisk-Ministerråd and Huset-Mandag-Morgen 2006). During recent years, these basic values have to some extent been challenged by a neo-liberal trend and by the change from a rather homogeneous towards a more multi-ethnic society.

Denmark has been a unified state of varying size since the 10th century. It is a constitutional monarchy with a single chamber parliamentary system and is one of the oldest democracies in the world, constituted as such back in 1849. During the 20th century, the Social-democratic party was the biggest party and was in government most of the time. Since 2001, a liberal-conservative government has been in power, supported by the nationalist Danish People's Party.

Since the introduction of democracy, social movements, first the peasant movement and later the labour movement, have been key agents in the development of the modern Danish society (Gundelach 1986). They were both supported by 'folkeoplysning', which is a term (literally 'enlightenment of the people') used to describe government supported but independent educational efforts to empower the population to reflect on their own lives and values and participate in the democratic development of society (Borish 1991). Previously, Folk High Schools and Evening Schools were key 'folkeoplysning' institutions, but, although they still exist, the tradition for non-formal adult education has gradually changed from the original democratic ideals towards leisure activities centred on ideals of self-realisation and individual development. (Korsgaard 1997).

After the Second World War, Denmark gradually changed from a country dominated by agriculture and domestic production towards industrial production for the international market. From the end of the 1950s this change gave rise to a significant economic growth. Hence, during the 'golden age' of the 1960s it became possible for the ordinary Dane to buy a house, car, holidays abroad and other consumer goods (Jamison, Eyerman et al. 1990).

However, this transformation involved pollution and a dramatic transformation of the physical environment as well. As in other Western industrialised societies, this gave rise to an environmental movement. In Denmark it was organised by students and became a part of 'the youth revolution'. With origins in student action groups, the environmental movement developed into a broader social movement during the 1970s, culminating with a remarkable victory at the end of the decade when plans for nuclear power, strongly supported by the government, industry and scientific experts, were abandoned (ibid).

In the wake of the movement of the 1970s, the established societal institutions gradually took over the responsibility for environmental policy and eco-technological development. Especially production and use of windmills, water treatment plans and organic farming became relatively successful innovations. As in neighbouring countries, an 'ecological modernisation' discourse took over from the late 1980s and became the dominant approach to sustainable development during the 1990s. This approach argues that there is no contradiction between economic and ecological development; rather eco-technical innovation should be regarded as a vehicle for economic growth. Furthermore it implies a change of focus from waste management towards an ecological transformation of production systems as well as consumer patterns. Everybody is expected to do their bit, so ecological modernisation was promoted as a process characterised by synergy and consensus. The environmentalists were integrated as partners in this process and a number of governmental programmes supported efforts to involve the population in projects focusing on saving resources when they consume (Læssøe 2007; Petersen, Holm et al. 2007).

When the liberal-conservative government took over in 2001, another approach to sustainable development was introduced. In accordance with president Bush's policy in USA, and supported by Bjørn Lomborg, a Danish social scientist known globally for his criticism against giving economic priority to a number of key environmental efforts, the new government stressed the need for a more economically effective environmental policy. This new trend did not entirely halt the ecological modernisation process, but it was ideologically downscaled for a period, until the middle of the decade when the climate crisis became widely acknowledged as one of the most challenging and urgent issues facing the global society. On the one hand, this change has pushed the government to make a dramatic shift towards signalling a progressive green attitude, including a renewed appeal for ecological modernisation. On the other hand, by focusing so much on mitigation and adaptation to climate change, other issues of sustainable development have been de-emphasised.

While environmental issues were considered among the most pressing issues among Danes in the late 1980s, this concern gradually decreased during the first phase of ecological modernisation in the 1990s. In 2001 they only ranked the environment as number 16 among political issues. The climate crisis has changed this trend and has been ranked 2nd in the latest opinion poll from 2007 (Læssøe 2006; Petersen, Holm et al. 2007). This new public concern challenges policymakers to reconsider how to support the involvement and learning of the population. The positive, harmonious approach of ecological modernisation is still dominant, but other conceptions of public involvement

and sustainable development challenge this dominance involving renewed discussion of issues such as economic growth and the need for structural changes.

There can be little doubt that the environmental changes and the ecological modernisation discourse influence the ways in which ESD and CCE are approached. However, the educational system and pedagogical traditions also influence these approaches. The Danish public school system has it roots back in the 18th and 19th century and the European period of enlightenment (Korsgaard 1997). The German tradition for formal 'bildung' and the 'progressive' pedagogical ideas have influenced the Danish school system perhaps more than anywhere else (Illeris, Laursen et al. 1978). This not only means that the ordinary Danish school during the 20th century became less authoritarian, less focused on formal training and relatively more interested in creative learning and personal development than schools in other European countries. It has also resulted in the Danish school legislation being liberal with regard to the establishment of alternative, 'free' schools. They are not only accepted; as long as they fulfil some basic demands, they are also supported economically by the government. Although this tradition has been challenged by the Anglo-Saxon schooling tradition and positivist, science-based teaching methodology, it still influences everyday educational practice in Denmark. This is of great importance when it comes to understanding ESD and CCE practice in Denmark. As will be documented later, this historical-ideological context has also influenced the approaches to educational research in the field.

Environmental Education in Denmark as a Forerunner for ESD

As is already clear from the above, in order to properly understand ESD in Denmark, it is necessary to operate with a framework of understanding extending further back than 2005 and the launch of the UN Decade for ESD. However, not only are Danish ESD efforts a result of a particular socio-material setting, political currents and pedagogical traditions, it is possible to identify many of the actual concepts and principles of ESD as described in this thematic analysis long before the Decade's inception. The existence of these concepts and principles indicates that most of the ideas of ESD had already long been incorporated within the Danish school system, albeit under different names.

In the following, a brief clarification of this statement is given along with a few examples.

Internationally, Environmental Education (EE) is seen by many as a forerunner for ESD; by others as a major ingredient in ESD; or even, by some, as a competitor to ESD. In Denmark, at least at the conceptual level, ESD can be seen as a fairly straightforward development and continuation of EE. Some of the main mechanisms are the following:

In the school year 1988-89, a nationwide in-service training course was planned for teachers in the Danish folkeskole (municipal primary and lower secondary school) about local development of EE. In preparation, the Royal Danish School of Educational Studies (RDSES) organised 22 school-based pilot projects during the previous school year in order to generate experience, clarification and descriptions of cases from schools.

The idea with the nationwide course was to help teachers develop new strategies and modes of practice according to an action oriented version of EE. With the notion of action orientation it was underlined that the goal should be to empower students with regard to environmental issues instead

of just bogging them down with a feeling of guilt. It should be noted that for the previous 10-15 years, many Danish school teachers had already been trying to persuade their students to be aware of environmental pollution, of the destruction of rainforests, the stupidity of overfishing, desertification etc. In a survey from 1989 (Breiting 1989), it was indicated that themes like global population growth and the future of mankind were among the themes many teachers 'usually taught'.

Since the 1975 amendment to the Education Act, many subjects had incorporated broader environmental issues, and a specific subject 'samtidsorientering' (modern studies) was introduced in lower secondary school which should deal with 'important contemporary issues/problems', many of which would today be classified as within the scope of ESD. To complete the picture, it should be noted that teachers engaged in 'peace education', 'global education' and 'development education' were active at the same time, and, although these areas were not directly reflected in the school's curriculum, they could be easily accommodated.

At the same time the official overall aim of the school emphasised an education for democracy perspective. The pupils/students should achieve useful knowledge and skills, of course, but as least as important was the formation of citizens who were prepared to engage and involve themselves in the social processes in a democratic society. Therefore, it was not enough to learn by heart a lot of facts about the challenging issues in the modern world, you should also get some experience in taking a stand and on the basis of serious reflection eventually take action. Naturally, this had to be adjusted to the age and development level of the children and youngsters. The whole idea, which has a relatively long tradition in Denmark, is often in short called 'education for democracy with democracy'.

In the same spirit a specific section, 16.4, in the Education Act stated that the students in all grades as much as possible should participate, in the meaning of co-determinate, in the selection of both the content and the form of the lessons.

Seen in this context, the intention with the nationwide in-service training course for teachers was to make these efforts more successful. Important conclusions from the pilot schools working with EE in 1987 were:

- Students should be heavily involved in deciding which environmental issues to focus on.
- The attention should be focussed on local problems and issues. (To enable students to investigate them and, if motivated, to take appropriate action, instead of focussing on the destruction of the rain forests and other distant problems).
- The focus shouldn't be on nature isolated from man, but on problems related to man's use of nature
- The approach should preferably be cross-curricular to reflect and increase student understanding of the complex and inter-related character of environmental problems and possible solutions.
- The local community should be seen as a resource and be drawn upon.

In the teaching material for the actual training course, a number of chapters of more theoretical content supplemented the cases, among others on 'Sustainability as an example of content in environmental education' indicating an intention very close to ESD.

After the implementation of the full EE in-service training, it was clear that the basic ideas were viable and improved the focus and quality of the teaching, but teachers were still often uncertain of how to understand and implement this action oriented view on EE and empower their students. This, combined with experiences from and research on other Danish EE activities, fostered a special focus on concept clarification and experimental teaching regarding 'conflicting interests related to the use of natural resources' as the main focus of classroom investigations of environmental issues and the development of students' 'action competence' (see theme 1) related to environmental issues/problems as the overall goal of EE. The first perspective underlines a focus on social, economic and political aspects of environmental issues while the second perspective demonstrates a clear democratic-societal emphasis.

Another shift that moved the understanding of EE in the direction of current conceptions of ESD was the establishment at RDSES in 1986 of a centre collecting researchers dealing with EE and Health Education (HE). There were clear arguments for such a combination: A concept of health as quality of life has to be an important aspect of EE, and the environment is an important factor for health promotion and therefore deserves attention within HE. At the same time, more or less identical trends could be found with regard to HE and EE pedagogy and to research within the fields. The objective of empowerment, for example, was central within both HE and EE, as was the view that a cross-curricular approach is necessary. In this convergence between HE and EE, they both placed considerable emphasis on the living conditions of people and their experienced quality of life – so much so that in many cases, it was in practice difficult to label the teaching as either EE or HE. In other words, the realisation that EE had to be seen as an anthropocentric endeavour became absolutely clear.

The development of the identity and approach of such an anthropocentric and democratic understanding of EE in Denmark culminated for a time during the MUVIN project (1991-1995) and subsequent activities. 100 schools, 300 teachers and 3.000 students participated in MUVIN and descriptions of the approach and of the experiences gained were widely disseminated within the Danish educational community. The MUVIN project remains the most extensive and influential study of EE in Denmark to this day. The focus for the research was the action competence approach to EE and the identification of environmental problems as issues in the community characterised by conflicting interests regarding the use of natural resources. The MUVIN project was a Nordic initiative and as such a good example of how international co-operation can spark innovations at the national level.

The Emergence of ESD in Denmark

In the wake of the publication in 1987 of the so-called Brundtland report by the UN World Commission on Environment and Development, educating the population with regard to sustainable development was for the first time placed firmly on the national political agenda in Denmark. Referring directly to the report, in 1988 the Danish government decided to supplement their strategy concerning technology and production with two initiatives promoting citizen participation in sustainable development. As such, these initiatives were not directed towards the formal education system, but towards the non-formal youth and adult education ('folkeoplysning'). To begin with, between 1989 and 1992, this took place in the form of a government initiated and funded nationwide campaign 'Our Shared Future', along with the development project 'Green

Municipalities'. Subsequently, the government founded 'The Green Fund' which, with a budget of DKK 50 million (approx. € 7 million), had the objective of supporting local non-formal education initiatives concerning sustainable development. The fund operated 1994-2001 and its initiatives and the requirements made of stakeholders was highly influential in the Danish discourse on non-formal education and sustainable development throughout the 1990s (Læssøe 2007). Here, it is highlighted as an important part of the context for the following account focusing more specifically on the emergence of ESD within the school sector.
While the report of the Brundtland Commission kick-started non-formal ESD, the UN summit on environment and development held in Rio in 1992 had an effect when it comes to increasing focus on ESD within the school sector. The first fruits came in the form of collaboration between the Baltic countries [1]. In addition to researchers, teachers and NGOs, government officers and ministerial consultants were also involved. In March 2000, this led to the first official document on ESD, the Haga Declaration, which was signed by the Ministers of Education from each of the participating countries – including Denmark.

The Haga Declaration describes sustainable development as a challenge which will require an integrated approach and broad participation. In addition, the key paragraphs on ESD state:

- "ESD should be pursued at all levels of education; it should be included in all curricula or equivalent instruments corresponding to the level of education. Such education should rest on a broad scientific knowledge and be both integrated into existing disciplines and developed as a special competence. It demands an educational culture directed towards a more integrative process-oriented and dynamic mode emphasising the importance of critical thinking, and of social learning and a democratic process
- ESD should be based on an integrated approach to economic, environmental and societal development and encompass a broad range of related issues such as democracy, gender equity and human rights. This broad approach should be recognised in both natural science and social science, and should complement and build on existing initiatives in environmental education.
- ESD should also be regarded as an important tool for achieving sustainable consumption and production patterns as well as for necessary lifestyle changes."

Two years later, in January 2002, and continuing on from the Haga declaration, a background report (Baltic 21E) was published presenting a proposal for an Agenda 21 for education in the Baltic Sea region. This report, comprising 46 pages, was compiled in collaboration between the relevant stakeholders from each of the participating nations. It did not contain anything new in relation to the Haga Declaration with regard to the concept of ESD and the role of education; however, it did contribute by taking stock of progress within the field on the basis of a survey, a proposal for an action plan, reflection on indicators and evaluation, as well as on funding, organisation and implementation. In other words, at the beginning of 2002, a document was available which clearly prepared the ground for work with ESD over the course of the following years.

The same year - and thereby also the same year as the Decade of ESD was adopted at the UN summit in Johannesburg – the Danish government approved a national strategy for sustainable development. It contained less than half a page on education, but is still worth highlighting, partly because the social-democratic government who signed the Haga Declaration had now been replaced

[1] Estonia, Finland, Germany, Latvia, Lithuania, Norway, Poland, The Russian Federation, Sweden and Denmark

by a new liberal-conservative coalition, partly because it contains a number of statements regarding the educational sector's role and objectives for ESD. We will take a closer look at these statements under themes 1 and 2 of the analysis; for now, we will merely point out that, despite being largely consistent with the Haga Declaration, a shift can be observed away from a prioritisation of critical thinking and democratic learning ('bildung'), and towards knowledge and responsibility (ethics).
The Danish Ministry of Education has also played a role by incorporating sections on sustainable development within the curricula for the folkeskole. In Denmark, the Ministry of Education's curricula are only afforded the status of general guidelines for the municipalities, but they typically follow them, sometimes with minor changes. In the mid-1990s, the Minister for Education at the time stated as an overall principle that all school curricula should have a 'green touch. Even though this principle was later removed following the change in government in 2001, sustainable development remains a part of the objectives for a number of school subjects. We will look more closely at this under theme 4.

As a direct prelude to the Decade for ESD, Denmark formed a part of the United Nations Economic Commission for Europe's (UNECE) joint European preparations. As such, Denmark is a cosignatory of the common strategic guidelines for the decade which were approved in March 2005[2]. This is an important document, even though they are only guidelines, as it describes what ESD is about, contains a number of requirements of the national efforts, and a joint timetable for the decade. The document additionally obliges Denmark to deliver assessments – based on common European criteria – of national ESD efforts to UNECE. As such, the UNECE strategy document puts pressure on the Danish government to live up to the agreement.

There is generally speaking a lot of common ground between the documents on ESD produced by the Baltic countries as referred to above and the UNECE strategy in terms of strategic and organisational recommendations. This may well simply be a consequence of the Baltic countries introducing the earlier documents during the process of compiling the UNECE strategy. As will be apparent in the thematic analysis, however, it is worth noting that the UNECE strategy's chapter on principles contains a shift towards a broader and more open approach to ESD. As such, ESD is presented as an ongoing societal learning process:

> "There is a need to consider the evolving meaning of SD. The development of a sustainable society should, therefore, be seen as a continuous learning process exploring issues and dilemmas, where appropriate answers and solutions may change as our experience increases" (p. 4, para 13)

The UNECE strategy also includes a number of SD themes which suggest a wider scope for ESD than found in the Baltic E21 report with its focus predominantly on environmental issues. Whilst the latter describes ESD as primarily a question of the use of natural resources, only incorporating ethics and justice as peripheral aspects (Baltic E21 p. 17), the UNECE strategy also considers issues such as poverty alleviation, human rights, gender equity and cultural diversity as key themes (p. 4).

It should also be noted that the shift away from critical and democratic citizenship competences and towards individual responsibility which one finds in the Danish strategy for sustainable development is not apparent in the UNECE strategy. Rather the latter stresses the importance of ESD encouraging "systemic, critical and creative thinking and reflection in both local and global

[2] UNECE Strategy for Education for Sustainable Development

contexts" (p. 4) and states that ESD should promote participatory learning, hereby facilitating processes "encouraging dialogue among pupils and students and the authorities and civil society" (p. 5). Contrary to the Danish focus on knowledge, the UNECE strategy thereby recommends "a reorientation away from focusing entirely on providing knowledge towards dealing with problems and identifying possible solutions" (p. 6)

In summary, in relation to developments leading up to the inception of the Decade for ESD in 2005, we can conclude that Denmark and its neighbouring countries had already during the 1990s begun to work together with the objective of formulating a policy for ESD and that, during the five years from the turn of the millennium to the inception of the Decade for ESD in 2005, this work led to the compilation of official documents containing not only the formulation of objectives and a description of the field of ESD, but also accounts concerning strategy, evaluation etc. As such, Denmark had a relatively well-developed bedrock upon which to formulate a strategy for the Decade. During the same period, work had also commenced on implementing ESD within primary, lower secondary and upper secondary curricula. There were at the same time signs that the Danish government placed greater emphasis on knowledge and individual responsibility than on the development of action competence in relation to democratic participation. This goes against the conclusions contributed by Danish research within the closely related field (at least in Denmark) of Environmental Education. Although they are not diametrically opposed, there exists a tension between current policy and research which we will deal with in more detail in the course of our analysis.

Producing the Danish ESD Strategy

There can be good reason to study the compilation of the Danish ESD strategy: partly because, as has already been implied, there is talk of a lengthy process whereby not only the strategy, but also the interpretation of ESD itself has been negotiated adapted politically; partly because the strategy comprises the central document in the analysis presented in this report of the official political perspective on and action taken in relation to ESD.

Four years and three months elapsed from the inception of the Decade to the launch of the Danish ESD strategy. In Denmark, the Decade was primarily introduced in the form of three conferences: the first was arranged by a team from the research programme on Environmental and Health Education at the Danish School of Education (DPU) in collaboration with IBIS, an NGO working with developing countries; the second was held by a number of NGOs; the third was an international conference organised within the SEED network [3], an offspring of the ENSI cooperation. The Ministry of Education participated in these conferences and was co-organiser of the SEED conference[4]. Apart from this participation, the government's contribution to mark the Decade was supporting the Danish UNESCO commission in publishing an introductory booklet and helping establish an internet portal for the Decade.

[3] SEED is a Comenius 3 Network 'School Development through Environmental Education' in co-operation with the international network ENSI 'Environment and School Initiatives' www.ENSI.org. The conference delivered an interesting report: 'Building Capacity and Empowerment through ESD. Conference on Education for Sustainable Development in Esbjerg 2005', prepared by Bjarne Bruun Jensen.

[4] Later – in March 2007 – the Ministry of Education used its annual UNESCO conference to launch the Decade for ESD.

The NGOs had expected a more marked and pro-active approach from the government including, inter alia, an action plan, a scheme for subsidising initiatives, and coordination of national efforts. When such an approach was not forthcoming, in March 2006 the NGOs sent a collective request to the government asking for a meeting aimed at kick-starting the process. This meeting was held six months later and, over subsequent years, similar dialogues have been held between ministerial representatives and the NGOs. At these meetings, the latter have been highly critical of the government's efforts, while the government officers, on the other hand, have called for initiatives originating from the NGOs and the educational sector (Minutes from meetings in 2006 and 2007). The political opposition has also been active. Among other things, they have consulted the Minister for Education and asked him to answer a number of questions concerning the government's management of its international obligations regarding ESD. The Minister for Education and his officers have repeatedly rejected critique and stressed that the government's efforts have been sufficient and that the educational sector itself should take responsibility for promoting ESD within the available financial framework (ibid; the Minister's published speech manuscript from Parliament's environment and planning committee, 21.03.2007).

Researchers also play an active role in the process in several ways. Apart from organising two of the opening conferences and taking part in the dialogue meetings between the government and the NGOs, the Ministry of Education provided funding to DPU's research programme on Environmental and Health Education to produce a draft of the national strategy for the Decade. This funding constituted a small figure (DKK 400,000 or approx. € 55,000), half of which was to be used on a school development project on ESD. It did not therefore enable a proper mapping of ESD within various areas of the educational sector as recommended by the researchers. Instead, they elected to arrange four meetings with representatives from, respectively, the primary and lower secondary sector, the upper secondary sector, the tertiary sector, and the non-formal ('folkeoplysning') and adult educational sectors. The idea with these meetings was partly to gain an impression of the Decade's current level of permeation, partly to receive feedback on their preliminary outline of the strategy. Judging from the fact that two of the four meetings, despite being widely publicised, had to be cancelled due to a lack of interest and the two remaining meetings were attended by, respectively, six and twelve external participants, the impression was that the Decade had not been visible and engaging within the actual educational institutions. With this limited backing from practitioners, the researchers compiled a strategy discussion paper which both defined and elaborated the concept of ESD, and offered a suggestion as to the overall organisation and the central initiatives in line with the UNECE guidelines and inspired by the ESD strategies for other countries.

In brief, the document can be described as emphasising the new aspects of ESD compared to EE and the natural sciences. It attempts to counteract 'ESD becoming all encompassing' by focusing it on four key issues within SD, and retaining the importance placed on developing democratic competence as can be found in the UNECE strategy. This, and the researchers' presentation of a pro-active, and therefore also more expensive, plan for the remainder of the Decade, has apparently not found resonance within the Ministry of Education. The presentation was submitted to the Ministry in August 2007, that's more than 1½ years before the adoption of the finalised strategy, but here, only a handful of passages remain which in itself makes it fairly apparent that there is a considerable divergence in perspectives. These differences will be elaborated under themes 1 and 2.

The process of completing the strategy was placed under the auspices of the Ministry of Education. However, as is custom in Denmark, there was a consultation phase where stakeholders had the

opportunity to submit comments to drafts. Furthermore, it is worth mentioning in relation to the final phase prior to the completion of the strategy that the government, as part of the build-up to the global COP15 climate summit in Copenhagen, December 2009, has established a Ministry of Climate and Energy which, with a national campaign '1 tonne less' is also operating within the field of ESD. The issue of climate change has become a hot topic, politically speaking. It has a strong media presence and surveys have shown that it constitutes the issue which Danes afford the highest priority (Politiken 21st April 2009). According to ministerial officials, this development has caused the delay in finalising the Danish ESD strategy as it has been clear that initiatives concerning the populace's involvement in the climate change problem should be incorporated. We will take a closer look at this relationship between CCE and ESD in theme 3.

The Danish strategy for the Decade for ESD was published on 5th March 2009, i.e. less than a month before the UNESCO conference in Bonn marking the halfway point for the Decade. As it constitutes *the* central national document on ESD in Denmark, it will be the subject of detailed consideration in the thematic analysis. Regarded as a historic process, there can be little doubt that the Ministry of Education has had problems finding their legs with regard to ESD. The Minister for Education and the Government did not originally have ESD as one of their key issues, but have had to find their way under pressure from the NGOs, the research community, the escalation of climate problems, and, not least, from their obligations to UNECE and the Decade for ESD.

Summary and Interpretation of the Development of ESD in Denmark

The development of ESD in Denmark contains what appears to be a paradox: on one hand, as we have shown, Denmark was engaged in work within the field in preparation of policy already at an early stage, and had firm experiences from pedagogical research and practice as a foundation for the development of ESD; on the other hand, Denmark had a strikingly slow start, only adopting a national strategy almost halfway through the Decade. In light of the fact that many other countries only began working with ESD in conjunction with the Decade – or in some cases have yet to get started – one can pose the question of why a pioneer country within the field like Denmark began to lag behind.

There are a number of possible explanations:

- It might be a case of resting on one's laurels. With reference to the efforts to incorporate SD within the school curricula, the argument might be that Denmark had already implemented ESD and therefore did not need to take new initiatives. However, this interpretation is somewhat undermined by the fact that Denmark had committed to the UNECE timetable and, on the basis of Nordic and Baltic collaboration on ESD, should have been able to compile a strategy in tandem with the launch of the decade, or at least before the UNECE deadline at the end of 2007, with relative ease.
- Another possible explanation might be that ESD has become a waiting room full of good intentions: the process began in the form of a dialogue between NGOs, researchers and government officials resulting in the formulation of a number of objectives, principles and suggestions for political and organisational initiatives. There has been a good deal of political sympathy for these good intentions in principle, but only as far as the point where they are to be developed into a binding strategy and implemented in practice. A

counterargument is that the process in several of Denmark's neighbouring countries – Sweden, Finland, Lithuania and Germany – did not stall in the same way. The next point suggests one possible explanation for this.

- As mentioned previously, the Danish general election in 2001 resulted in a change of government which also meant a break with the pro-active and expansive environmental policy pursued by the previous government. However, this break was not sufficiently dramatic for Denmark to pull out of the ongoing collaboration with the Baltic countries or within UNECE, so Denmark continued to be involved in ESD activities within these forums. But when it came to transferring these intentions to actual policy in Denmark, the shift in political opinion was clear. ESD was not the government's project. Instead, it had other priorities for the educational sector, not least improving standards and proficiency in basic skills (reading, writing and arithmetic), and promoting the natural sciences. The delay to the Danish ESD strategy can therefore be seen as a result of the government on the one hand having to fulfil international obligations (primarily to UNECE), and on the other hand doing so in a way such that they, as far as possible, are compatible with their own educational policy priorities. As will be clear in themes 1 and 2, this exercise in compromise has left its mark on the view of ESD present in the Danish ESD strategy.
- As a supplementary explanation to the last point, the Danish ESD strategy can be considered as representing a vagueness, or perhaps rather a political game regarding what is the responsibility of the government and what is the responsibility of the NGOs, the educational sector and other stakeholders. As was evident in the account of the compilation of the strategy, precisely the question of areas of responsibility has been a bone of contention. The NGOs have applied pressure to force the government to play the leading role in relation to coordinating and providing support while officials from the Ministry of Education for their part have maintained that separate funding would not provided; the various stakeholders from the field of education were instead expected to get to work within their existing budgets. Under pressure when this did not happen, the government elected to adopt a slightly more pro-active approach in the immediate run-up to the publishing of the national ESD strategy. Although this 'bargaining process' has taken time, it not only suggests that clarifying this role distribution marks an important part of the process of implementing ESD, but also that pressure from international agreements has been a key factor in this case.

Theme 1 ESD – overall conception

The concept of ESD can be approached from two different angles focusing either on the understanding of *Education* or of *Sustainable Development*. As theme two looks at how SD is interpreted within ESD and considers the role of the educational sector in relation to SD, we will in the following concentrate on examining the educational philosophy which characterises, respectively, political documents and research within the field of ESD in Denmark.

Policy documents

The educational approach to ESD

The Danish strategy for the Decade for ESD from March 2009 comprises the most important policy document. Focusing on what it can tell us about the educational philosophy, it is striking that this strategy does not include a definition, only of SD. The first section of the strategy is essentially about SD as a field of interest while the section on initiatives and actions is primarily concerned with organisational proposals regarding ESD. However, it should be noted that the tradition in Denmark is that the government only outlines overall objectives and guidelines for teaching while the teachers themselves are responsible for the pedagogical approach.

Although the strategy lacks an explicit presentation of an educational philosophy, it does include a number of implicit assumptions which give an indication of its philosophy.

In the section outlining the messages which comprise the strategy's points of departure, it is stressed that:

- "*Personal responsibility* and engagement are important for guiding *own actions and behaviour*.
- *Democratic decisions* should be made on the basis of *sound scientific knowledge*" (p. 13, our italics).

So the approach here has the goal of upgrading pupils' qualifications with scientific knowledge. This should enable the development of, on one hand, democratic decisions, and on the other hand, a personal set of ethics concerning one's own actions and more routine behaviour.

This is in line with sections on education found in previous Danish strategy papers concerning SD. In the national strategy for SD from 2002, it is stated:

> "The key concepts in a forward-looking information and teaching strategy on sustainable development are knowledge and responsibility" (p. 74)

The ethical dimension is also present in that schools and youth education programmes are ascribed a special role "as the institutions that help shape the fundamental values of children and young people" (ibid)

In the draft for a new SD strategy from 2007, the importance of knowledge and personal responsibility are underlined again as:

> ”greater emphasis will now be placed on the link between knowledge, opinions and behaviour and on the impact our everyday actions can have in relation to sustainable development at a local, national and global level” (p. 39, our translation).

While the basic philosophy contained in these documents is consistent, other perspectives can be found in UNECE’s strategic guidelines for DESD in Europe which the Danish government signed. Here, the development of democratic competencies forms an important element of the principles outlined for ESD:

> ”Learners at all levels should be encouraged to use systemic, critical and creative thinking and reflection in both local and global contexts; these are prerequisites for action for sustainable development” (UNECE, 2005, p. 4).

Furthermore, in the same document, knowledge is treated as more than just scientific knowledge:

> ”Formal ESD should be permeated by experience of life and work beyond the classroom. Educators involved in ESD play an important role in facilitating this process and in encouraging dialogue among pupils and students and the authorities and civil society.” (ibid p. 5)

This perspective involves a participatory approach to ESD. This is explicitly stated in the following:

> ”ESD involves initiatives for developing a culture of mutual respect in communication and decision-making, shifting the focus away from solely transmitting information towards facilitating participatory learning” (ibid)

It is noteworthy that these pedagogical perspectives are not included in the Danish strategy documents: partly because they are explicitly present in the document which the strategy is directly related to, partly because the same view of education can be found in the national school curricula. Here it is stated among other things that teaching should lead to:

> ”…pupils developing competencies, critical faculty, and personally acquired core values which enable them to participate in the development of society in a qualified and engaged manner” (Lysgaard 2009, p. 20, own translation);
> …pupils having acquired sufficient knowledge and skills to be capable of discussing different interpretations of values in relation to production, revenue and consumption” (ibid. p. 6);
> ”… [pupils] using language as a means of resolving conflicts” (ibid. p. 8);
> ”…the pupil developing the prerequisites for an active and equal participation in school, education and society” (ibid. p. 8);
> ”… [pupils being able to] illustrate a subject from different perspectives, e.g. in conjunction with presentations and debates” (ibid. p. 9);
> ”Through aesthetic, practical, experimental and theoretical assignments, the pupils should have the opportunity to develop self-esteem, imagination, *joie de vivre* and

> knowledge, so that they, both together with others and individually, want to and are able to make critical assessments and act privately and within society" (ibid. p. 14)[5].

These pedagogical intentions correlate well with both the Danish educational tradition and research within Environmental Education (see accounts in the introductory chapter).

The deviation from the focus on participatory learning and action, and thereby on the goal of a democratic competence development, found in the UNECE strategy document may perhaps be explained by reluctance from the government to see a potentially critical politicisation of ESD. On the other hand, citizenship education has become more prominent under the same government. This is described in a publication from the Ministry of Education:

> "Primary and Lower Secondary Schools and General and Vocational Upper Secondary Education shall contribute to inspire the students to seek knowledge and influence on the society, and teach the students to commit themselves and participate actively. It is important that the students learn where to gather information about social matters. Furthermore the student shall learn to listen, be curious, take a critical position, and express their own opinion" (Learning Democracy, UVM 2008, p. 13).

As is apparent, these formulations are in accordance with the passages cited from the UNECE strategy. The absence of similar phrasing in the Danish ESD strategy and the focus upon scientific knowledge and individual responsibility is therefore more likely due to a general prioritisation within, respectively, the government's educational policy and its policy regarding sustainable development, which have governed the perspective on ESD in the strategy.

The conception of challenges and the relationship between rhetoric and action

As detailed in the previous section, the strategic documents describe the educational challenge as strengthening relevant scientific knowledge and the link between this knowledge and everyday attitudes and behaviour.

In the introduction to the section on initiatives and actions in the Danish ESD strategy, the challenge is described as follows:

> "In Denmark, work has been carried out for a number of years within the areas mentioned in UNECE's strategy and in regard to UNESCO's interpretation of the concept of education for sustainable development. But there continues to be a need for devoting effort to ensuring that pupils and students acquire broad and in-depth knowledge of science-related issues and the link between these and society's economic, environmental, social and cultural conditions" (UVM 2009, p. 14).

The opinion would therefore seem to be that the challenge is not so great, as work has already been done for a number of years, but there will continue to be a focus on ensuring that the intentions are realised. At the same time, it is striking that the strategy in reality only contains concrete initiatives which support learning within the natural sciences whilst the desire to promote understanding of the

[5] We return to the school curricula under theme 4.

aspects concerning society outside of a natural science framework does not result in similar initiatives. This will be documented in the section on priorities under theme 2.

Research

ESD research in Denmark

In the process of conducting this examination of the development of ESD and CCE in Denmark, we have contacted researchers, employees at university colleges, teachers, associations, NGOs, government officials and others, who we knew were engaged in work with ESD. We asked them to aid us in identifying and locating research on ESD other than the research we conduct at DPU. Based on the responses we received, we found that there exist a number of development projects within the field, but that there apparently has not been conducted research on ESD in Denmark other than at DPU. [6]

As seen in the introductory chapter on the background for ESD in Denmark, research on ESD has developed from research on Environmental Education (EE) and Health Education (HE). This link might suggest an approach to Danish ESD research characterised by a natural science perspective; however, the EE research conducted at DPU is notable for its foundation on a concept of environment clearly distinguished from a pure concept of nature, as environment is viewed here as nature seen through human interests, and environmental issues are interpreted as conflicts of interest within society regarding the use of natural resources (Schnack 1995 and 1998). This makes the Danish EE research highly relevant in relation to ESD in that the concept of SD similarly shifts the focus from natural ecology to how society deals with this in relation to the overall societal development.

In addition, this research is characterised by its development, at an early stage of the international development of theory within the field of EE, of an educational philosophy based approach to teaching about the environment. This as a counterbalance to approaches which derive their pedagogy from environmental and nature issues and generally base themselves on various forms of behavioural sciences. Whereas the latter typically can be characterised as prescriptive in the sense that its educational project is to teach children and young people to change their behaviour in accordance with a predetermined standard for environmentally correct behaviour, the Danish EE research draws instead on an empowerment tradition within pedagogic theory. Rather than a 'conditioned socialisation' which reduces humans to objects for political processes they do not recognise as political, an 'educational socialisation' is set with the aim of emancipating humans to be political subjects (Schnack 2003).

The central concept in the Danish researchers' idea of an alternative to the prescriptive approach is 'action competence'. The use of 'action' stresses a difference form 'behaviour' in that action is seen as conscious and intentional and, by adding 'competence', these intentional actions are related to: "… being able – and willing – to be a qualified participant" (Jensen and Schnack 1994 p. 7 and 1997). As such, according to this approach there are no neatly packaged solutions to environmental issues; it is instead a democratic duty to develop, select, and implement solutions, meaning that children and young people must be supported in developing action competence so they can

[6] This informal survey uncovered a few evaluations of projects within ESD and CCE, but as these were not carried out with a research objective, we have chosen not to include them here.

participate in these processes. With sources of inspiration including both Dewey and Critical Theory, the concept of 'experience' is incorporated in a central role as experience here does not only refer to a concrete trial and error process, but also to the collective, critical reflection through which pupils learn by analysing underlying structures and other relevant matters for understanding the environmental issue in question.

Within this action competence approach, Danish EE research has collected empirically based knowledge through development projects (Breiting et al. 1999, 2009), sought clarification of the educational philosophical foundation (Schnack 2003), been occupied with adding greater nuance to the elements of the concept itself (Mogensen 1995), and worked on developing the central auxiliary concepts such as participation (Simovska 2005; Reid, Jensen et al. 2008) and mental ownership (Breiting 2008). As EE, within this approach, is not regarded as fundamentally different from ESD, it has been possible for research to gradually drift towards a focus on ESD. This development, however, involves new challenges which have also been the subject of theoretical reflection. This reflection has concerned, among other things, the historical link between the concept of emancipation and protecting one's own interests in relation to SD's radicalisation of the regard for the common good (Læssøe 2008). Similarly, it has considered that education can no more be separated from societal conditions than environment can, meaning that e.g. the concept of participation in ESD must be analysed and addressed on the basis of a historical-contextual understanding (Læssøe 2007).

Separate from the action competence approach, the Danish philosopher Peter Kemp argues in the book "The World Citizen" (2005) against both modern, individualist conceptions of emancipation as self-fulfilment and the transfer of responsibility to the state. With inspiration from Gadamer and Ricoeur, *mimesis* is used as the key concept in the education of a world citizen:

> "… who neither cultivates his or her individuality at the expense of a sense of community with society and the global world or the state at the expense of the individual's capacity for interpretation and personal development" (Kemp 2005 p. 275, own translation).

Mimetic learning in this sense involves a relationship between teacher and pupil whereby everyday acts (préfiguration), are interpreted in the form of a narrative (configuration) which, in turn, affects everyday acts (refiguration) (ibid. p. 205f).

Research and the development of ESD in Denmark

When it comes to school and youth education programmes, Danish research on ESD has not previously studied how ESD is approached and implemented in policy or the effect of policy initiatives regarding ESD on educational practice in schools.[7]

As outlined in the introductory chapter on the development of EE in Denmark, research at the time played a part by its inclusion in evaluations and development projects the results of which were also used as input to the sphere of politics from research. This relationship has been re-established in

[7] Within non-formal youth and adult education on sustainable development there exist both evaluations and analyses illustrating this problem (Læssøe & Jamison 1990; Larsen & Læssøe 1991; Læssøe 1995; Læssøe 2001; Læssøe 2007). However, as there are substantial differences between the formal education system and the field of non-formal education, these are not detailed here.

conjunction with the development of ESD, albeit on a much smaller scale so far, with the Ministry of Education granting funding in 2007 for a collaboration between researchers and four schools on a development project within the field of ESD. At the same time, research was provided with a much more direct opportunity to affect the development of ESD in Denmark as the Ministry entered into a contract with the ESD research team at DPU regarding the compilation of a draft for a national strategy for the DESD. As will be apparent in theme 2, in the end this draft only had very limited influence on the final strategy.

Theme 2: The role of education in relation to the challenges of sustainable development and climate change respectively

Policy Documents and initiatives on ESD

Broad and complex signals regarding Education's role in SD:

Based on the paragraphs on ESD in the Danish national strategy for SD from 2002, the current government's draft strategy for SD from 2007, and its strategy for the Decade for ESD from 2009, the official view of the role of education with regard to SD may be described as wide-ranging and open. As will be evident from the more detailed analysis, however, the DESD strategy contains certain priorities and initiatives which involve a somewhat narrower understanding of this role.

In the Danish ESD strategy one finds the following section on sustainable development:

> "UNESCO's interpretation of the concept of education for sustainable development indicates that education programmes and learning environments must increase the population's competencies and skills in a way that enables them to make decisions based on knowledge and considerations concerning:
>
> - the relationship between the needs and interests of present and future generations
> - the relationship between preservation and change
> - the relationship between rich and poor
> - the relationship between local interests and global considerations" (p. 7).

Here, the role of the educational sector is thus emphasised as improving the ability of citizens to make authoritative, considered and knowledge-based decisions. The formulation is tentative. It does not explicitly express the government's view, instead referring to 'UNESCO's interpretation' which furthermore merely 'indicates' the role of ESD.

In one of the strategy's three overall goals, the role of ESD is described more directly as:

> "To strengthen the population's understanding, engagement and knowledge regarding the concept of sustainable development that simultaneously incorporates the interrelationship between economic, social, political and cultural elements, thereby ensuring qualified general debate on the subject" (p. 11).

This passage tells us a number of things:

- Firstly that the task is to qualify the general debate – i.e. a clear citizenship ('bildung') perspective.
- Secondly, the perspective on SD in the previous citation is confirmed, namely that SD has to do with an interaction between a number of societal elements.
- Thirdly that it is not just a matter of increasing knowledge of SD, but also about strengthening engagement.

The importance of qualifying the population's understanding of SD through knowledge was also present in the SD strategy from 2002:

> ”The education sector plays an important role, for example through teacher and educator training which should focus on helping children and young people understand the problems associated with sustainable development” (p. 74)

But in the same document, the normative and formative role is accentuated more explicitly than in the term ‘engagement’ in the citation from the DESD strategy above. It is stated that:

> ”The key concepts in a forward-looking information and teaching strategy on sustainable development are knowledge and responsibility. Schools and youth education programmes assume a special role as the institutions that help shape the fundamental values of children and young people” (p. 74).

So far, we therefore have a competence development perspective which is primarily presented as increasing the knowledge base regarding SD, but also involves engagement and a sense of responsibility. Meanwhile, neither knowledge nor responsibility are unambiguous concepts as used in the strategy documents.

In the citation regarding the overall goals of the DESD strategy, responsibility can be said to be linked to the role as citizen; the qualification of the general debate. This perspective is likewise contained in the following passage from the 2002 strategy:

> ”Sustainable development should be taught in a context of international cooperation among educational institutions. This would cause children and young people to realise that we have common problems that can best be solved by taking joint international action” (p. 74)

However, in the draft strategy from 2007, ESD is placed within a chapter on the consumer elements of SD. Knowledge is again emphasised, but here, it is linked to our everyday conduct:

> ”Within the field of education, work will build on previous efforts concerning the green element in teaching, but greater emphasis will now be placed on the link between knowledge, opinions and behaviour and on the impact our everyday actions can have in relation to sustainable development at a local, national and global level.” (p. 38ff)

So, in this case, engagement is not linked with general discussions and international efforts, but to everyday consumer behaviour.

When it comes to knowledge, the previous citations considered SD as a societal problem. Elsewhere, the importance of knowledge about nature is stressed:

> ”Greater awareness of the natural basis of human existence combined with profound knowledge of the interplay between the environment and economic and social issues will be reflected in the attitudes and sense of responsibility of future generations” (2002 p. 74).

> ”But there continues to be a need for devoting effort to ensuring that pupils and students acquire a broad and in-depth knowledge of science-related issues and the link

between these and society's economic, environmental, social and cultural conditions" (DESD strategy 2009 p. 13)

Sustainable development is frequently described as a hazy and complex concept. As has been apparent, the same applies to the Danish government's documents on the role of education in SD. They are about competence development, which includes both a knowledge base and engagement and responsibility. This responsibility is related to both the role of citizen and the role of consumer and their connection to international efforts and individual behaviour respectively. Meanwhile, the knowledge perspective has to do with both social and natural science knowledge. The descriptions hereby contain considerable room for interpretation which would seem to suggest that the educational sector itself can construe and shape ESD as they see fit.

Priorities

There are, however, two parts of the DESD strategy which in fact involve a more specific interpretation of SD and the role of the educational sector. Firstly, a section which directly specifies the government's priorities and secondly, the part of the strategy describing the initiatives which are to be set in motion.

The section specifying the priorities immediately follows the overall goals of the strategy. Here it is stated that:

> "A number of current Danish initiatives within the education field already support the Strategy for Education for Sustainable Development.
>
> These include, in particular:
>
> - *The report "Et fælles løft" (A General Boost), which focuses on strengthening science, technology and health education.*
> - *Teaching Climate Issues 2009*[8]
> - *Virtual Galathea 3*[9]
>
> This linkage between the ongoing Danish initiatives must be seen particularly in light of the Ministry of Education's ambition that scientific knowledge is afforded a more prominent place as part of general education.
>
> A solid grounding in natural science is a prerequisite for the quality of the democratic decision-making process in a society characterised by high-technology and great challenges in, for example, the fields of health care and climate change.
>
> The strategy takes a point of departure in the following messages:
>
> - Personal responsibility and engagement are important for guiding own actions and behaviour.

[8] Teaching Climate Issues 2009 (Klimaundervisning 2009) is a government funded project which, as will be evident later, includes other intentions beyond the promotion of the natural sciences, but is nevertheless located within Danish Science Communication (Dansk Naturvidenskabsformidling).

[9] Virtual Galathea is a scientific expedition vessel which has studied, among other things, environmental and climate matters and provided virtual communication to schools and the general public.

- Democratic decisions should be made on the basis of sound scientific knowledge.
- The desired economic growth should ideally not damage the opportunities for growth of future generations or other continents" (DESD strategy 2009, p. 11ff).

As is apparent, in this section it is made clear that the government prioritises a promotion of knowledge of the natural sciences, increasing the responsibility related to individual behaviour, and a reading of the 'development' concept within SD as synonymous with economic growth. This is entirely in accordance with the prioritisation of subject knowledge and natural sciences within general Danish educational policy and with the 'ecologically modern' strategy of environmental and climate policy.[10]

The section 'Strategic efforts' supports the prioritisation of the natural sciences in education's contribution to SD. As such, the concrete initiatives involve:

- Closer cooperation between schools and nature schools regarding education programmes and teaching materials
- The establishment of a National Centre for Science, Technology and Health Education (Budget 2009-2012: DKK 65 million or approx. € 9 million)
- The Academy for Talented Youth (ATU) which offers upper secondary school students the opportunity to pursue 2½ years of intellectual challenges alongside their normal studies
- The establishment of a National Science Centre for talent development and nurturing for all in the education sector (ibid. p. 16).

The other initiatives mentioned here are characterised by not being expressed in such direct terms, but as statements of intent or as initiatives which the government are not responsible for. Among the statements of intent are e.g.:

> "As part of the preparations for the Climate Change Conference in 2009, work is to be carried out in the formal and informal learning environments, strategically and substantively, with projects relating to climate change and sustainable development";
>
> "During the UN Decade of Education for Sustainable Development, action is to be taken to focus and differentiate in relation to other problems than climate change, as well as other age groups than children and young people – e.g. as part of the concept of lifelong learning" (ibid. p. 16).

Examples of phrasings of strategic efforts not originating form the government and implemented by other stakeholders such as NGOs or local councils are:

> "A series of climate change summits targeted at young people are to be planned";

[10] That is to say, a strategy which regards an environmentally-friendly growth in terms of production and consumption as the path to sustainability (Hajer 1995; Dryzek 1997; Holm, Petersen et al. 2007)

”Popular participation in aspects of sustainable development can be strengthened through interest groups and the liberal education organizations actively incorporating the concept in their activities. Democratic processes should have a prominent place” (ibid. p. 16-17).

A process with the potential for other approaches

Whilst the strategy is broad, open and in accordance with UNECE’s guidelines, as described, national efforts focus on enhancing children and young people’s knowledge of the natural sciences. However, this is a snapshot based solely on the DESD strategy paper. In conjunction with the publication of the strategy, the Ministry of Education presented a number of documents describing the flagship initiatives. In addition to those mentioned above aimed at promoting the natural sciences, they also detail government-supported initiatives which could potentially strengthen other forms of ESD and thereby other roles for the educational sector in relation to SD. In the following, we will highlight two such initiatives:

The project ’Teaching Climate Issues 2009’ is to provide an overview of what is available concerning climate education as well as creating networks among involved teachers and the organisations, museums, publishers etc. who develop teaching materials to be used in climate education. This is carried out in collaboration between the Ministry of Education and Danish Science Communication (DNF) which might indicate that the focus will again be on the natural sciences. On the other hand, it is specified that the initiatives that form part of Teaching Climate Issues 2009 will take five central perspectives as their point of departure, namely a knowledge perspective, an action and behaviour perspective, a technology and society perspective, a future perspective, and a societal perspective (document from the Ministry of Education). We will take a closer look at this project in theme 3.

Another flagship project is comprised by the development of the concept of Eco-Schools (in Danish literally 'Green Flag - Green Schools'). The concept originated in 1994 and offers schools the opportunity to be certified as ‘Eco-Schools’ if they have implemented one or more environmental themes. Right from the start, there has been discussion centred on the extent to which objective environmental results (e.g. a 10% reduction in water or energy consumption) or harder to measure learning outcomes should comprise the criteria for awarding Eco-School status. This discussion contains ideological as well as methodological questions.

In 2007, 230 schools had achieved Eco-School status (the Danish Outdoor Council 2008). It thereby represents by far the largest current project within the field of environmental education in Denmark. Furthermore, the number of Eco-Schools comprises the only indicator concerning ESD in the Danish Ministry of the Environment’s evaluations of the national strategy for SD. As part of the DESD, it is now the Ministry of Education’s ambition to increase the number of Eco-Schools to 500 at the same time as updating the concept to be more in line with the ideas of sustainable development. As such, this is another example of an initiative with the potential for a development of ideas and theory concerning the form and content of ESD.

With the publication of the Danish ESD strategy and the initiatives taken or supported by the Ministry of Education, along with a general increase in the level of activity regarding climate change issues in the lead up to the December 2009’s COP15 summit in Copenhagen, the situation in Denmark concerning ESD and the role of the educational sector in SD is not fixed or clearly-defined, but an ongoing process.

Policy regarding the role of education in relation to climate change

In a historical perspective, the greenhouse effect and climate changes (e.g. desertification) have been themes which have been part of previous campaigns for environmental education in Denmark and, as has been evident, the problem of climate change is explicitly incorporated in the DESD strategy. There are no separate policy documents detailing the role of the educational sector or outlining pedagogic guidelines for teaching within the area of climate changes. On April 30th, the government published a climate policy report, but education and the school sector are only dealt with here with a brief mention in relation to a broad statement regarding an ongoing involvement of the populace with the aid of information and campaigns.

If one studies the efforts of Danish climate policy regarding climate adaptation and mitigation up to the present day, one finds that they are characterised by endeavours to solve the problem with help from scientific research and technological development. The research funds earmarked for the climate area therefore do not offer an opportunity to support research on socio-cultural matters or on education in relation to climate change. This prioritisation is in line with the focus on promoting scientific knowledge found in the DESD strategy. Similarly, the strategy's emphasis on the responsibility of the individual citizen corresponds with the (so far) only significant government initiative within the area of non-formal CCE, namely the '1 Tonne Less' campaign which seeks to offer inspiration and advice to the public in order to save one tonne of CO2/year (Rubik, Scholl et al. 2009).

The increasing awareness of climate changes as an extensive and urgent risk to society has thereby so far accentuated political efforts aimed at promoting natural sciences, technology and individual behaviour reducing CO2 emissions. If this were to be transferred to school CCE, it would be in accordance with the government's priorities in the DESD strategy, but in conflict with the pedagogical approach found in many of the school curriculum's stated objectives which are primarily concerned with developing pupils' competencies as citizens in a society.[11] As is the case for ESD in general, however, CCE is also in the midst of a process which can include other qualities. For example, initiatives that form part of the Climate Education 2009 project can enhance other elements than scientific knowledge and advice for environmentally-friendly consumer behaviour, just as Danish schools have the opportunity of working with societal issues in conjunction with Science lessons.

Research:

As described in the introductory historical account, the research work with ESD in Denmark has its origins in research into environmental education (EE) which has largely been concentrated within one institution, The Royal Danish School of Educational Studies (Danmarks Lærerhøjskole), which later became the Danish School of Education (DPU). As the research conducted here has been the source of an alternative to an EE approach limiting the field to the natural sciences and with modification of individual behaviour as its objective, this research also involves an understanding of the educational sector's role in relation to SD different from that found in the government's DESD strategy. When ESD is understood as a matter of promoting democratic action competence in

[11] Elaborated in theme 4.

pupils, the role of education - instead of getting pupils to adapt their behaviour in a pre-defined manner in order to solve society's problems with sustainable development - becomes a matter of equipping them as citizens to critically appraise proposed solutions and themselves participate in reflecting upon and developing possible solutions in a democratic manner (Schnack 2008).

Researcher participation in ESD policy development

Although the researchers thereby in some ways are in direct opposition to the government's view of the educational sector's role in ESD, this does not mean there is no dialogue between researchers and government officials. As described in the historical account, researchers from DPU received funding from the Ministry of Education in 2007 to produce a draft for the national strategy for the Decade. The difference in the views of researchers with a pedagogic perspective and politicians and government officials with a political perspective regarding the educational sector's role in ESD had the unsurprising result that the draft strategy compiled by the researchers was subjected to a fairly thorough revision prior to adoption. The invitation to compile a draft strategy did, however, have a separate consequence – the DPU research group had the opportunity to work on the relationship between EE and ESD. Operating with an understanding of environment as being about conflicts of interest within society and emphasising pupils' status as actors who need to develop competencies in order to understand and solve the problems as societal issues, the step from EE to ESD was not far. On the other hand, the question remains if it does not make a difference that the subject matter is sustainable development rather than the environment; and how to avoid SD and ESD becoming meaningless concepts by taking every aspect into account and affording them equal value. As an answer to these questions, the researchers suggested that ESD be defined as centred around four interrelated issues, namely the four relationships mentioned in the strategy and included in the first citation at the beginning of this theme.

Researcher participation in CCE

Researchers and policymakers are likewise engaged in dialogue regarding CCE. As such, the Danish Centre for Ethics and Law in Nature and Society (Center for Etik og Ret i Natur og Samfund) received funding in 2008 from the Climate and Energy Ministry to compile a report on '*Barriers to Climate Awareness*' containing recommendations for how to tackle them pedagogically. In 2009, the Climate and Energy Ministry has also appointed a member of DPU's ESD research group as chairman of a panel assigned the task of proposing new ways of increasing public participation.

When it comes to cooperation concerning the development of practice the Ministry of Education tends to work with larger NGOs on development projects,, for example about the Eco-Schools project. Bucking the trend, however, it should be mentioned that the ESD group at DPU received funds from the Ministry in 2007 to conduct a small development project at four schools.

Reflections

As stressed previously, it is important to be aware that, in Denmark, there is traditionally very little top-down political control of teaching: to the extent that teachers receive more precise directives, these stem largely from the municipal level. Schoolteachers therefore have considerable freedom to decide the content and form of their lessons. This also means that ESD and CCE can be found within classrooms where the scope and depth of what is included, as well as the approach taken to the subjects, are independent of the policy process and its priorities. As resources have not been provided for research evaluating or in some other way investigating the various teaching approaches to ESD and CCE and their spread in practice, we currently know little about what actually takes place in the classroom.

Theme 3: Education for Sustainable Development and Climate Change Education (ESD and CCE)

Relationships between Education for Sustainable Development and Climate Change Education

CCE was explicitly incorporated within ESD in Denmark as an area deserving particular attention at a relatively late stage, i.e. mid-2007. Nevertheless, as we have already seen, the issue of climate change plays a large part in the recently published DESD strategy and is the focus of many of the initiatives being promoted in conjunction with its launch. This enables the government's strategy for ESD to be strongly tied to the upcoming climate summit in Copenhagen, taking advantage of the increased public attention to climate issues resulting from such an event taking place on domestic soil.

However, with CCE still an emerging field, its exact relationship to ESD is still a matter for debate – attempting to map possible overlaps and distinctions as well as suggesting future paths for CCE are among the goals in conducting this international project. The problem of defining the exact role of CCE in relation to ESD is reflected in the Danish strategy, where it is stated in the section on 'strategic efforts' that:

> "During the UN Decade of Education for Sustainable Development, action is to be taken to focus and differentiate in relation to other problems than climate change" (DESD strategy 2009, p. 15).

However, precisely which problems or what action there is talk of here is not specified. In a press release by the Ministry of Education in conjunction with the launch of the Danish DESD strategy, it is pointed out that ESD in Denmark has focused a number of issues during recent years, including citizenship and equal opportunities. This year, it is stated, it is the turn of climate change (UVM Press Release 2009). One might ask whether dividing ESD into focus areas in this way does not partly defeat the object of operating with the more holistic approach - accounting for the complexity and interconnectedness of the issues at stake - that a concept of sustainable development would seem to entail. Furthermore, concentrating to such an extent on one particular element, highlighted as a focal point for the 2008/09 school year, seems somewhat at odds with the launch of what is intended to comprise the Danish ESD strategy over the next five years.

Despite this criticism, the various initiatives centred around the issue of climate change often implicitly support other principles of ESD. For example, the government is supporting a number of meetings and summits regarding climate change for children and young people from across the globe. These meetings are to result in a number of recommendations which are to be presented to policymakers at COP15. As such, this initiative can be said to foster a participatory and democratic approach and incorporate a global citizenship perspective. Of course, such initiatives are supported by the Ministry of Education but compiled and formulated outside the Ministry's realm which may explain the apparent difference in emphasis and approach compared with the government produced DESD strategy.

Likewise the launch of the Teacherscop15 international teachers' website on climate change in the classroom, which forms part of the Ministry of Education's project Teaching Climate Issues 2009 (Klimaundervisning 2009) and also seems to promote a participatory, democratic and global approach to CCE. The site is in English and presents a global audience with ideas offering inspiration for climate teaching and examples of teaching programmes dealing with climate-related issues. It is particularly interesting that the site professes to present a Danish perspective on learning, thereby equating this with a particular set of values:

> "These programmes are focusing on pupil participation and on learning as part of a democratic process, and school classes are encouraged to cooperate across frontiers" (http://www.teacherscop15.dk/).

One of the key initiatives highlighted by the Ministry of Education as part of its activities aimed at promoting climate teaching in education in the build up to COP15 is the conference 'Inspiring Climate Education (ICE2009) – international teachers' conference on teaching current climate change in secondary education' to be held in Copenhagen in October. This is described in the promotional material as the first international conference on climate change education and is sponsored by the Ministry and organised by Danish Science Communication.

In the introductory passage of the first material produced announcing the conference, the role of education in relation to climate change is outlined:

> "Children and youth are the coming generations that will live with climate change. It is of outmost [sic] importance that they understand the impact that climate change will have on their everyday life and that they learn how they can take action both inside and outside of the classroom in order to change or find solutions to the development" (ICE09 First Announcement).

This would seem to emphasise the 'action competence' approach which, as previously detailed, has played an important role in the development of first EE and later ESD, but is largely missing from the Danish DESD strategy. The description continues:

> "Incorporating the many scientific, political, economical and behavioural dimensions of climate change into the curriculum and teaching practice of secondary education plays a major role in this aspect. We need to understand and expose the hidden potential in establishing cooperation between educational institutions and private companies and we need to realize that teaching climate change is not confined to science class, but can also take place in a humanities class" (ibid).

As such, this would also seem to represent a break with the dominant focus on science education found in the strategy with interdisciplinary approaches to CCE highlighted as one of the themes of the conference and would seem to allow CCE to be incorporated within the approach to ESD found in e.g. the UNECE strategy with relative ease.

The project Teaching Climate Issues 2009, which is an umbrella project covering many of the Ministry of Education's smaller initiatives within the area of CCE, is also described in fairly broad terms compatible with such an approach to ESD. Five key perspectives are outlined:

- "Knowledge perspective - what do we know about Earth's climate and factors that affect it?
- Action and behavioural perspective - what can be done to limit global warming?
- Technology and community perspective - which technologies / production forms in existence could help limit the greenhouse effect? What are the socio-economic conditions for the spread of these technologies / production forms?
- Future Perspective – future sustainable technologies, practices and dissemination
- Socio-economic perspective - issues connected to climate change, including a) how will climate change and efforts to improve the climate influence economic growth? b) security aspects of climate and energy policy" (http://en.cop15.dk/about+cop15/information+for/the+press/show+article?articleid=321) .

As the various examples above have shown, the boundaries and relationships between CCE and ESD in Denmark remain blurred. It is, at this stage, too early to determine with any degree of certainty whether CCE will be incorporated as one element of the broader field of ESD, assuming the dominant values and approaches as is the case in a number of the initiatives outlined here; whether CCE will, so to speak, 'colonise' ESD transforming sustainable development into a question of adapting to climate change through behavioural change on the background of 'technical' knowledge to the detriment of a more multi-faceted and participatory approach, as one might interpret certain aspects of the DESD strategy; or indeed whether CCE over time will become established as an independent, although related, field to ESD.

In Denmark, this process is likely to be influenced not only by the Ministry of Education and other key stakeholders within the field of education. As was seen in theme 1 with the congruence between the concept of ESD within the Danish strategy and national SD policy, the Ministry of Climate and Energy is likely to play a part, directly or indirectly, in the development of a concept of CCE.

The recently published 'Climate Policy Report 2009' is the newest expression of Danish climate policy and here, education is conspicuous by its absence. Instead of through education, the policy seeks to adapt behaviour through information campaigns and by providing incentives, for example through higher taxation of energy consumption (Klimapolitisk redegørelse 2009 p. 10).

The report recognises the importance of actively engaging the general public:

> "… the readjustment of Danish society necessary to ensure a reduction [in the emission of greenhouse gases] can only be achieved if businesses, consumers and municipalities play an active role. New initiatives only have a discernible effect if Danes actively utilise them as an opportunity to change their habits" (ibid. p. 12, own translation).

However, the methods for ensuring such an active populace are marked by a view of the general public as predominantly consumers, not citizens:

> "Therefore the task is to ensure well-functioning framework conditions and incentives which make sure that citizens, municipalities and businesses can actively assume joint responsibility" (ibid. p. 12-13, own translation).

The lack of a clear citizenship perspective is likewise clear when describing how Danes very much want to share the responsibility for solving climate issues "… both as consumers, as employees and as business owners" (ibid. p. 13, own translation). No reference is made to any feelings of civic duty, as members of a society committed to the common good, let alone as global citizens.

As mentioned, information campaigns are also regarded as an important tool as they can increase public awareness of the various possibilities available. One example given is the previously described '1 Tonne Less' campaign. These campaigns are described in terms of providing knowledge and advice to citizens and are thereby difficult to reconcile with the definition of ESD found in e.g. the UNECE strategy. Another initiative aimed at involving the general public – and the only place in the report mentioning schools, albeit briefly – is a soon to be launched internet guide to the climate and energy field. This is described as.

> "… a virtual cityscape which citizens, school pupils and businesses can move around in and obtain good, accessible information" (ibid. p. 14, own translation).

Despite depicting the website in terms of a virtual community, the objective seems to be the provision of information rather than any form of active involvement of citizens. Indeed, the possibility for citizens to play a more active role is only mentioned once, and then in terms of an added bonus resulting as a by-product from the other initiatives; namely that they can supply suggestions for initiatives that can contribute to national initiatives to reduce energy consumption or fuel emissions. The report does not however provide any further detail of, for example, initiatives for organising or promoting dialogue with citizens.

In determining the future directions of CCE, there would therefore already seem to exist a clear demarcation between the participatory and action-oriented approach common within concepts of ESD and an approach promoting individual responsibility and the dissemination of information and (scientific) knowledge found in much of the existing policy regarding climate change. As seen in the Danish DESD strategy, the current focus on climate change issues means that this battleground is likely to spill over and impact upon the broader field of ESD.

Theme 4 ESD & the curriculum

Including evaluation, assessment, success-criteria, and the question of the relationships between ESD and the (academic) disciplines.

Policy Documents

In the Danish DESD strategy, curricular matters are, naturally, mentioned several times given that curriculum is perceived as goal-descriptive, as a provider of inspiration for development and as an instrument for regulating practice, particularly in the formal education system.

The highest curricular level can be found in the strategy's statements regarding targets or, as it is put somewhat more resolutely: 'The strategy shall ensure that…' This can be regarded as the formulation of an overall objective, worded in the Minister of Education's foreword to the strategy as follows:

> "The strategy shall ensure that children, young people and adults become aware of the concept of sustainable development and learn how to act competently through knowledge and skills" (UVM 2009 p. 3).

The strategy paper itself formulates the overall objectives in a little more detail with three points:

" The overall goal of the strategy is:

- *To ensure that knowledge for education for sustainable development is disseminated and utilized in practice at all educational levels in the formal education system, and also to engage in special efforts vis à vis the non-formal learning environments and also – where possible – the informal environments.*
- *To strengthen the population's understanding, engagement and knowledge regarding the concept of sustainable development that simultaneously incorporates the interrelationship between economic, social, political and cultural elements, thereby ensuring qualified general debate on the subject.*
- *To coordinate a series of Danish educational initiatives that ensures cohesion and synergy in relation to both time and content.*" (UVM 2009 p. 11)

Although these points are referred to as the overall goal, they should presumably be understood as subordinate to the previous citation. This is likely especially true of points one and three as point two is closer to the original objective. The most notable difference is the replacement of 'acting competently' with an ambition of 'ensuring qualified general debate on the subject'. Here, the action perspective therefore involves reflection and discussion actions.

It is worth noting that both environmental (in a narrow sense) and nature-related issues are conspicuous by there absence from the four elements mentioned (economic, social, political and

cultural). This is in stark contrast to the dominance of the natural sciences in the initiatives outlined elsewhere in the strategy. This can be seen either as an oversight on the part of the authors or as an expression of an understanding of sustainable development as in itself a nature and environment-related concept.

The first step towards this overall objective is the dissemination and application of knowledge regarding ESD at all levels of education. One of the strategies employed to achieve this goal is to influence educational curricula:

> ”In connection with coming changes to curricula, etc., sustainable development will be inserted into relevant parts of education-related legislation, ministerial orders and goal descriptions” (UVM 2009 p. 14).

At the same time, it is pointed out that this has already been happening since 2005.

The national curriculum in Denmark is more or less confined to the formulation of overall objectives and a specification of which subjects are to be taught at the various levels of schooling and the central knowledge and skill areas. The objectives for the various subjects are of a relatively general nature with more detailed stipulations of content determined at a local level. The Ministry does, however, distribute suggested guidelines which are traditionally complied with by the individual school. In other words, there are parts of the curriculum on which the Ministry can legislate and other parts where they can only provide guidance and inspiration.

In the DESD strategy, it is not always entirely clear which level is being addressed and at times the phrasing seems somewhat vague, e.g. when it is stated that:

> ”In all education programmes, the participants must address the concept of sustainable development from both a scientific as well as societal, humanistic and democratic perspective” (UVM 2009 p. 14);

Or when the Minister writes in his foreword to the strategy:

> ”The aim is to introduce sustainable development in all relevant curricula used in basic education, youth education and teacher training in order to establish a link between natural and social sciences and humanities” (UVM 2009 p. 3).

In this case, meanwhile, an example is given which might suggest that it is primarily intended as inspiration to schools and teachers:

> ”Different aspects of climate related problems can for instance be introduced in multidisciplinary educational programmes” (ibid.).

In general, it may be established that [T4, P1] the national policy documents on ESD do describe needs for reorientation of the basic school curriculum. It is meanwhile more difficult to ascertain [T4, P2] which key qualities and points regarding the specific substance of ESD one envisages in relation to such a reorientation. This is kept very open (in accordance with Danish curriculum traditions) by merely stating that ‘sustainable development’ should be ‘introduced’ or ‘inserted into’ the curriculum.

On the other hand, it is clear that the strategy, structurally speaking [T4, P3; P5], is focused on significantly strengthening and giving greater priority to the field of natural sciences within the general education system, as well as encouraging 'multidisciplinary educational programmes'. The prioritisation of natural sciences is a government agenda which exists independently of the campaign for ESD, but here, the two are closely linked. Meanwhile, the idea of multidisciplinary education programmes is specified as not only being a matter of cooperation between related subjects, but of establishing 'a link between natural and social sciences and humanities', in line with the ideas put forward by UNESCO and UNECE. Nowhere is it elaborated, however, exactly what is meant by such a 'link', even though it is referred to in singular form as a known quantity. The use of the term 'multidisciplinary' rather than 'interdisciplinary', which is more commonly found in a Danish educational context, constitutes a clear allusion to the government's general agenda of strengthening subject knowledge within the education system. As such, 'link' and 'multidisciplinary' can to some extent be said to be pulling in opposite directions and it can be difficult to determine whether it has a direct impact on the curriculum. Certainly, it is stated in the section on 'Incorporation of the concept of sustainable development in legislation, regulation and curricula' that:

> "In all education programmes, the participants must address the concept of sustainable development from both a scientific as well as societal, humanistic and democratic perspective" (UVM 2009 p. 14).

This is a clear statement regarding the content of education programmes and thereby curriculum, but the significance of its inclusion in a section on legislation, regulations and curricula is unclear.

In a process taking place entirely independently from the DESD strategy, the objectives for the various subjects at primary and lower secondary levels, known as 'Common Objectives', are currently being revised by the Ministry. A review of the previous common objectives reveals that in a number of subjects, particularly, but not exclusively, the natural sciences and, to a lesser extent, the social sciences, there are various elements which can be considered directly or (especially) indirectly relevant to ESD. Reviewing the currently available revisions reveals that the relevance to ESD is slightly stronger in some areas and a little weaker in others, but a general trend is not evident.

In the common objectives and the DESD strategy – as well as 'the folkeskole act'[12] - the tendency is more towards an empowerment and action competence way of thinking than one of behavioural modification [T4, P7]. This is in line with the Danish democratic tradition which understands the role of the school as to educate pupils to become competent participants in democratic processes. In this context, pupils are primarily perceived as (future) citizens, and while they are naturally also both consumers and producers, these roles are not a particular theme [T4, P4].

There are no guidelines for evaluating curriculum development, education programmes or pupils' learning with regard to sustainable development and democratic skills and values [T4, P6; P10]. However, it is stated that:

[12] The act regulating the overall framework for municipal primary and lower secondary schools ('folkeskoler').

> ”The work on developing indicators will take a point of departure in the existing work, but focus will be placed on developing objective, measurable indictors that can show a progression in the education sector’s work on promoting sustainable development” (UVM 2009 p. 19).

It is further mentioned that:

> ”In evaluating the Danish efforts to promote the UN Decade of Education for Sustainable Development, the Ministry of Education will take a point of departure in the indicators that UNECE has proposed” (UVM 2009 p. 19).

Research

In conjunction with this project, we have conducted a systematic review of the national goals for the various subjects within primary and lower secondary schooling, the so-called ‘Common Objectives’. This review shows that objectives or subsidiary objectives are indicated for a number of subjects which can be considered as having at least some relevance to ESD. SD only seldom figures as a topic, and then primarily within the natural science subjects. Climate change is rarely mentioned and, when it is, mostly indirectly.

These common objectives are currently being revised, but, so far, there is little to suggest any significant change in the attention paid to CC and SD.

There are no systematic studies of the Ministry of Education’s syllabus guidelines or of the local syllabuses at the individual schools.

As an indication of the Danish tradition of including themes relevant for ESD in the taught curriculum, the results of a survey conducted in 1989 in Danish primary and lower secondary schools can be mentioned. Approximately 1% of Danish school teachers were asked what they ‘usually taught in their subject areas related to EE’. A list was offered in the questionnaire and the list in itself is indicatory.
The list included headings such as: ‘The consumer society’, ‘Developed versus developing countries’, ‘The global military build-up’, ‘The population explosion’, ‘Famine’, ‘Energy and resource shortages’, ‘The future of mankind’, ‘Political aspects of environmental problems’ alongside more classic themes linked to pollution and ecology. The subject ‘Samtidsorientering’ (modern studies) was shown to have some of the highest occurrences of the themes that were not closely related to the more traditional themes of pollution and ecology. The theme ‘Political aspects of environmental problems’ is among the lowest scoring of all the themes, indicating a need for a greater focus on these aspects already at the time of the investigation.

3. Has educational research suggested criteria for evaluation of the outcome of ESD and/or CCE?

Work has yet to be conducted directly concerning criteria for evaluation.

More indirectly, one might draw certain principle consequences from the development of the concept of ESD (see theme 1) regarding relevant criteria for success. The argument has therefore been made by researchers that the criteria for evaluation should be about what the pupils learn from the activities in the lessons rather than what objective improvements can be registered concerning energy consumption, pollution, equality, bullying etc.

Under the auspices of ENSI, a set of criteria for ESD-schools, green schools, eco-schools etc. has been compiled as part of an extensive international collaborative research project. These are however intentionally not presented as criteria for assessing outcomes, but as material for inspiring the reflective processes which teachers must get involved in if they are to aid the transition to e.g. an ESD-school in a qualified manner.

4. Has educational research examined the validity of stated outcomes and assessment strategies?

No

5. Has educational research made a contribution to support curriculum development regarding ESD and CCE?

On a general level, research can be said to have contributed with a number of crucial points related to the action competence perspective, but as of yet, no research is available directly and concretely considering ESD and CCE with a view to supporting curriculum development.

Theme 5

ESD and pedagogical traditions and development tendencies.

ESD and school development; ESD and what happens in the classroom; ESD and teaching methodologies.

According to Policy Documents

Do the documents on ESD signal any demand or recommendations for new pedagogical approaches compared to traditional teaching?

The ESD strategy from the Ministry of Education signals some need for new pedagogical approaches by stating that:

> "The concept of education for sustainable development contains both well-known, new and, in particular, multi-disciplinary aspects" (UVM 2009 p. 16).

It is relevant that it is also stated that ESD includes well-known aspects in the Danish schools as already documented in the introduction to the present report. At the same time it is interesting to note the emphasis on 'multi-disciplinary aspects', for at least two reasons:

Firstly, it involves a concept of ESD that stresses that ESD isn't only for the natural sciences – very much in accordance with the predominant international understanding of ESD.

Secondly, it is interesting that the wording 'multi-disciplinary aspects' is used and not 'cross-curricular aspects' or 'interdisciplinary aspects', terms that have a long tradition in the Danish pedagogical discussion (in Danish 'tværfaglig') linked to teaching through project work that deals with real life issues and which would therefore constitute an obvious form of organisation for ESD teaching in schools. We interpret this choice of wording as a political attempt to underline the importance of learning the basic theoretical knowledge and proficiency skills in the separate subjects rather than in interdisciplinary projects

At the same time, the need for special efforts to develop new pedagogical approaches is signalled by the formulation:

> "A pilot project is to be implemented on teaching methods for incorporating education for sustainable development across the subjects taught in primary and lower secondary school" (UVM 2009 p. 16).

In reality the Ministry has supported a rather small pilot scale teaching experiment in 4 schools during the school year 2007-08 with the involvement of educational researchers. The experience from this development work has been described in a publication (Breiting & Schnack 2009)

highlighting the need for much more focus on and understanding of what ESD could mean in relation to classroom teaching practice.

Are there any general guidelines or recommendations regarding teaching methods in the fields of ESD and CCE?

These aren't that concrete, but in general there is an indication of combining subject matter from several subjects as part of ESD:

> "The concept of education for sustainable development contains both well-known, new and, in particular, multi-disciplinary aspects" (UVM 2009 p. 16).
>
> "In all education programmes, the participants must address the concept of sustainable development from both a scientific as well as societal, humanistic and democratic perspective" (ibid. p. 14).

And here concerning non-formal education, but signalling the same principles as for the school system:

> "The adult education sector can use the UN Decade of Education for Sustainable Development as a starting point for teaching about the interrelationship between natural science, social science, economic, social and cultural aspects" (ibid. p. 14-15).

According to Research

1. **Has educational research within the field of ESD and CCE contributed to methodological innovation? - Is it possible to say something about how they have influenced practice?**

As mentioned in the introduction, the development of EE in Denmark already began to move in the direction of key elements of ESD at an early stage, the Danish part of the MUVIN project (1991-95) being one of the prime examples (Breiting et al. 1999, 2009). The aim was to enhance the students' action competence related to environmental problems. And the findings of the research indicated the value of students' active investigations of real environmental issues and of their experience by taking action according to their own commitment. In addition, the use of conflicting interests regarding people's use of natural resources helped to underline the societal democratic perspective and thereby to clarify the focus of EE. Its potential for teaching innovation as a coherent framework for lessons within many subjects and for cooperation between teachers was demonstrated. The findings from the MUVIN project have influenced a number of initiatives in Denmark as well as in other countries, e.g. in South Africa, Hungary and Thailand.

Through the hundreds of cases from the MUVIN schools and later work, many interesting practical approaches related to EE have been developed, described and discussed, e.g. how to introduce issue-oriented learning, how to interact with the local community, how to cooperate with other schools about environmental problems, how to include students' action-taking in the teaching-learning process, how to combine concept formation with investigations of real life issues, how to

investigate communities, how to integrate different subjects in project work, how to use creative work as a tool for students' reflections etc. Examples of school work and an introduction to this kind of EE work have been disseminated in the form of a book to all schools in Denmark. In this book, the approach was to make use of a focus on EE as a way to enhance the quality of teaching in general.

A master thesis conducted a follow-up study to emphasise the long term influence on teachers that had been involved in the MUVIN work (Neumann unpublished thesis). It was encouraging to learn that many of the involved teachers continued with their engagement in EE after their MUVIN work had stopped, but the weak point seemed to be passing experiences on to other teachers and other schools not involved in MUVIN.

Parallel to this work under the label of EE, health education (HE) in Denmark has developed along similar lines. Schools involved in projects like the 'Health-Promoting Schools' initiative have had a clear democratic empowerment perspective and the questions listed above also apply to approaches within HE.

The problem for ESD as things presently stand is that, in our experience, the engagement at the schools in EE (and to some degree HE) might have evaporated during the intervening years due to increasing pressure on teachers and schools to perform in other areas. Exceptions exist in a small number of municipalities. Projects and initiatives concerning citizenship education might provide interesting contributions of relevance for ESD, but at present, there is no available overview of Danish experience within this field.

We consider teachers as far better at maintaining and furthering educational innovation than written reports and instructions and therefore fear that much of the shared more or less tacit knowledge and understanding within schools regarding EE methodology of relevance to ESD might have been lost with the retirement of some teachers and the 'loss' of others who now have other duties.

The conclusion is therefore that there exists research in Denmark that has produced substantial findings and methodological approaches of relevance to ESD, but that much of it may bear little resemblance to the practice and competencies of present day teachers.

With regard to climate change education (CCE), it has only been on the agenda as a separate theme since around 2008 and a number of initiatives are still to be evaluated and summarised at present.

Finally, two older studies related to EE should be mentioned. The first one concerned lower and upper secondary school students' attitudes and knowledge about environmental problems (Mogensen & Nielsen 1999). This investigation sought to answer the question: How much influence do students believe they can have in relation to environmental problems? The second study dealt with the importance of school pupils having experience with real actions as a part of EE (Mogensen 2001). The findings underlined several positive effects for the students when they had been able to act to help solve an environmental problem. The findings seem to support the general theory and practice related to the action competence approach to EE.

2. Has research been conducted within the country's universities which is not linked to national initiatives, but that, nevertheless, could be of pedagogical relevance to the field of ESD and CCE?

It is possible to categorise a small number of studies that are interesting in relation to the development of ESD in Denmark. They have typically been a part of development programmes:

One kind of study concerns the cooperation between schools and the local community. Of these, the 'QUARK' study is an example of an early study with a special focus on the resource persons in the local councils (See Mogensen & Vognsen 1993). Some of these research questions have later been taken up in relation to the schools' cooperation with external actors and the benefits and pitfalls of such cooperation, exemplified by energy issues (Hoffmann & Carlsson 2003). Later studies have looked at guidelines for school classes visiting organic farms as examples of excursions in EE (Breiting & Ruge 2006).

Another category of studies have built on the cooperation between schools in Denmark or between schools in Denmark and in other countries with a focus on health issues, environmental issues or both, e.g. Simovska & Jensen (2004) and Simovska & Jensen (2008).

Obviously, there is an important overlap with a third category of studies dealing with participation in EE, HE and ESD of which a number of studies are included in Reid, Nikel, Jensen & Simovska (2008). This research highlights an examination of different notions of participation as crucial to the development of ESD.

3. Is there research within the field which could contribute to the project with new and interesting perspective?

From the work with the pilot project for ESD development with 4 schools mentioned above, a number of findings are interesting:

- It takes time for teachers to fully grasp the idea of ESD and to develop an understanding of what the innovative potential of ESD might be at different grade levels. In this process some facilitator role is important.

- For every planned sequence of teaching, the teacher could ask herself: How could this teaching become directed even more toward ESD without losing its stated objectives? – Ingredients in such a quest for concrete ideas could focus on:

  - How can students reflect on the effects of current actions on their future grandchildren?
  - How can students reflect on the effects of current actions on people living in other parts of the globe?
  - How can students generate more engagement in connections between their everyday lives and what they learn in school related to development and sustainable perspectives?
  - How can students develop an increased understanding that we create the future everyday and that life is full of choices with complicated consequences for ourselves and many other people in the world?
  - How can we involve and get in contact with the local community to enhance the students' learning experience and to get insight into the concerns of and issues facing the general public?

- Teachers need to see the progress of their students to fully accept and value the innovative power of a focus on ESD.

4. **Has research been conducted in the field of ESD, CCE and/or related topics that is able to document effects of specific pedagogical approaches on the learning outcome of the students?**

See below.

5. **Is it possible to draw conclusions from earlier or recent research regarding what works and what doesn't work in the field of ESD and CCE or related areas? If so, what are the applied success criteria, what kind of documentation/evidence supports the conclusions, and what are the main conclusions of general relevance?**

What works well can be reflected on the basis of a list produced as part of the MUVIN research with the emphasis on what students value in EE - aspects that have often been confirmed in later experience:

- · Working with real problems that engage people outside the school.
- · Taking part in a learning project that also creates interest among people
- outside the school.
- · Being respected for their work, both by the school and by outsiders.
- · Working in groups, with a free hand to organise their work and have ideas
- for studies, etc.
- · Co-influencing the actual in-class education in terms of target, content, or
- ganisation, and concrete design.
- · Obtaining 'quasi-professionalism' at some of the things they are able to
- accomplish.
- 15. What do students appreciate about environmental education?
- · That people from outside the school have expectations for the work and
- outcome of the class.
- · Having their self-esteem in class boosted.
- · Learning something from education that gives them greater confidence
- in their own power of influence.
- · Working on issues that engage them existentially, and which appear to
- carry weight for their future.
- · Meeting adults outside the school.
- · Experiencing institutions and milieus outside the school.
- · Getting an opportunity to do something towards solving or counteracting
- environmental problems.
- · Doing cross-disciplinary work that implicates methods, approaches,
- perspectives, general knowledge and 'real-life studies' in a productive
- manner.
- · Acquiring new knowledge and insights that strike them as being useful
- and meaningful.
- · Having opportunities for processing their impressions both intellectually
- and emotionally.
- · Getting to meet thought-provoking people and viewpoints.

• Breiting et al. 1999, 2009, p. 181-2

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The International Alliance
of Leading Education Institutes

Report from Korea

Climate Change and Sustainable Development:
The Response from Education

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International Alliance of Leading Education Institutions (IALEI)

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the International Alliance of Leading Educational Institutions

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Korea: Introduction to the national context

▣ Geography

Korea is a peninsula extending south from the northeast Asian mainland. The western coast of the Korean peninsula is bounded by the Yellow Sea, while the east coast faces Japan across the East Sea. The total area of the peninsula, including its islands, is about 220,000 square kilometers (MEHRD, 2007). The Republic of Korea covers the southern part of the Korean peninsula. The Republic of Korea has a population of approximately 48 million people spread over an area of 99,600 square kilometers (population density 493/km^2), which comprises 9 provinces and 7 metropolitan cities (UNESCO, 2008).

The climate of Korea, affected by the Asian continent as well as the marine currents is characterized by four distinct seasons. Generally, it has a more continental climate with extreme climatic contrasts between winter and summer. Annual precipitation is about 1,200 mm, with 50-60 percent of the total rainfall concentrated in summer, June to August. It is normally bitter cold and dry in winter, December to February, and there is often snow. The prevailing winds are southeasterly in summer, and northwesterly in winter (MEHRD, 2007).

▣ History, Culture and Politics

According to the written history of Korea, the earliest state was founded by Dangun, the mythical progenitor of the Korean people. This tribal state, called Ancient Joseon (Gojoseon), ended around 100 B.C. with the advent of the Three Kingdoms: Goguryeo, Baekje and Silla. The Three Kingdoms were followed by Unified Silla and Barhae in the 7th century. In the 10th century, the Goryeo Dynasty succeeded the Unified Silla Kingdom to reign over the Korean peninsula. Goryeo was, in turn, succeeded by the Joseon Dynasty in the late 14th century. Korea was subjected to colonial rule by Japan from 1910. Korea renewed its national sovereignty with the establishment of the Republic of Korea in 1948, which continues to this day.

Koreans are a homogeneous people. Ethnically, they belong to the Mongolian race and speak a common language. The language, part of a Ural-Altaic variant, uses a unique phonetic alphabet called “Hangul”, which is characterized by a scientifically designed system that is easy to read and write.

Korea is a democratic republic and all citizens, 20 years of age or older, have the right to vote. The government, based on the presidential system, consists of executive, legislative and judiciary branches. The legislature is unicameral and the judiciary is composed of the lower court, the court of appeals and the Supreme Court.

After the Korea War (1950-1953), Korea remained split into the Republic of Korea (ROK) and the Democratic People’s Republic of Korea (DPRK) along the 155-mile

demilitarized zone. The ROK government has steadily sought to achieve national reunification, upholding the principles of independence, democracy and peaceful unification.

▣ Society and Economy

Korea was a society based primarily on agriculture, up until the early 20th century. Korea is scarcely endowed with natural resources, but has been able to join the leading group of developing countries, thanks largely to a series of five-year economic development plans since the early 1960s. Korea's Gross Domestic Product (GDP) increased from $2.3 billion in 1962 to $ 969.9 billion in 2007, with its per capita Gross National Income (GNI) soaring from $87 to about $ 20,045 in the same period. In 2007, Korea is ranked in the 10th place in terms of the size of GDP among 30 member countries of the Organization for Economic Cooperation and Development (OECD).

Over the past decades, the government has endeavored to nurture heavy and petrochemical industries, develop high-tech manpower, and increase international trade. Korea made remarkable development in the cement, iron & steel, shipbuilding, automobile, and machinery industries.

The rapid economic growth has produced various side effects, and drastic social changes have brought about dramatic changes in social structure. The population concentration in urban areas is a case in point. Drawing on the potential and capabilities accumulated thus far, the nation is expected to cope with this and other problems arising from the nation's rapid development.

▣ Sustainable Development

The Republic of Korea has achieved rapid economic growth since the 1960s but is experiencing a serious level of ill-balanced development in terms of environmental preservation and social integration. Its development-oriented economic growth resulted in pollution load that exceeded the environment's auto-purification capacity and increased conflicts between regions, classes and generations. Consequently, the level of Korea's national sustainability was evaluated to be weak (PCSD, 2006).

In the economic sector, Korea's economic size has increased and people's income has risen substantially as shown in its GDP increase. However, lack of consideration of environmental issues in the economic development and industrialization process led to a weak socio-economic structure in terms of pollution prevention comprising industrial structure, production and consumption patterns and people's attitudes.

In the environmental sector, there are limits in improving the environment as post-pollution treatment is much more focused than pollution prevention. Environmental pressure has exceeded the receiving capacity of the ecosystem, thus threatening the

sustainability of national environment and increasing conflicts between development-oriented policies and environmental movements.

In the social sector, Korea's 'compressed economic growth' caused the increase of social conflicts due to a concentration of wealth and lack of social welfare system such as employment, public health and welfare. This proves that social basis for sustainable development cannot be established without an equitable distribution of wealth.

In short, the Republic of Korea has a relatively large population for its territorial size and its environmental pollution load is high as the industrial production activities are high energy and resource consuming. Therefore, Korea is vulnerable to environmental pollution. Social conflicts related to development and preservation thus frequently arise and sometimes in duplication with those between income classes or regions.

To cope with these national situations, it was necessary to manage economic, social and environmental sectors in a comprehensive and integrated way when formulating and implementing national policies. On the occasion of the President's declaration of the 'National Vision for Sustainable Development' in June 2005, the Republic of Korea drove forward the formulation of the National Strategy for Sustainable Development (NSSD) which had been partially carried out from 2000 and finalized the NSSD in October 2006 through multi-stakeholder consultations including government departments, civil society organizations and business (PCSD, 2006).

▣ Education System

The school ladder system is an overall inter-school structure. Korea has a single-track 6-3-3-4 system which maintains a single line of school levels in order to ensure that every citizen can receive elementary, secondary and tertiary education without discrimination, according to the ability of each student. The single-track system requires six years in primary school, three years in middle school, three years in high school and four years in college or university. Higher educational institutions include graduate schools, four-year colleges and universities, and two- or three-year junior colleges (MEHRD, 2007).

The purposes of education in kindergartens, primary, middle, high and special schools are stipulated by the Primary & Secondary Education Act, and their curricula are prescribed by the Enforcement Decrees of the Primary & Secondary Education Act. The goals of education are stated in the national curriculum for each school level. The national curriculum serves as the basis for educational contents at each level and for textbook development.

The national curriculum has been revised on a periodic basis to reflect the present demands for education, emerging needs of a changing society, and new frontiers of academic disciplines. The current National Curriculum, as revised for the seventh time

in 1997, emphasizes "strengthening of basic education, extension of self-directed learning capabilities, student-oriented education, and expansion of local and school autonomy."

Under the 7th National Curriculum, students are to learn ten basic compulsory subjects, elective subjects and extracurricular activities from the first year of primary school through the first year of high school. During the second and third years in high school, students are given the opportunity to choose their curriculum and courses they wish to take so that they may benefit from education that facilitates their future path. The 7th National Curriculum has been applied to all schools (graders) from 2004. A new revised national curriculum ('2007 Revised') is now gradually applied to schools.

(1) Pre-school education

National, public and private kindergartens provide pre-school courses for children in the three- to five-year age brackets. Based on the government's kindergarten education curriculum, kindergartens aim at providing an appropriate environment for nurturing children and promoting their wholesome development through various enjoyable activities with diversified contents and methods of instruction. The kindergarten curriculum is composed of the five life domains of health, society, expression, language, and exploration.

(2) Primary school education

Primary education aims to provide the general rudimentary education necessary in life. The six-year-long primary education and three years of middle school education are compulsory in Korea.

(3) Secondary education (middle & high school)

The purpose of middle schools is to conduct standard secondary education on the basis of primary education. All who wish to enter middle schools are assigned to the school nearest to their residences. Free compulsory middle school education began in 1985 in rural areas, and gradually expanded to cover the entire country in 2004.

High school education aims at developing students' capability to chart their future befitting their aptitude and talent, and to enhance their ability as global citizens. 99.7 percent of middle school graduates advanced to high schools in 2005.

(4) Higher Education (college & university)

Institutions of higher education in Korea are divided into seven categories: colleges and universities, industrial universities, universities of education, junior colleges,

broadcast and correspondence universities, technical colleges, and other miscellaneous institutions (MEHRD, 2007).

▣ Contribution of Education to National Development

(1) Contribution to political development

Education has contributed to democracy and political development in numerous ways: First, it has aided in political socialization. Education has helped people increase their knowledge, change their behavior and form their value systems about their nation. Second, education has increased people's participation in politics. Third, education has helped political leaders improve their capabilities and competence and has contributed greatly to producing politicians, government officials, journalists and political party members (MEHRD, 2007).

(2) Contribution to the economy

Education's role in the nation's economic development can be analyzed in the following ways: First, it has helped provide the diverse manpower necessary for economic development, thus contributing to economic growth and increased national income. Second, skilled and professional manpower, produced through education, has lent sophistication to industrial structure and improving labor productivity. Third, people's overall living standards and welfare have improved due to increased job opportunities and income. Fourth, the expansion of the educational industry has contributed to economic development. Quantitative expansion and qualitative improvement of education have created demand for teachers and educational facilities and equipment, thus playing a part in the nation's economic growth.

(3) Contribution to social and cultural development

Education has also been instrumental in the nation's social and cultural development. First, it has contributed to forming a modern value system and civic virtues. Second, it has enhanced social mobility. Increased education opportunities have had significant impacts on the hierarchical structure of society, expanding the middle class and promoting so-called "upward mobility." Third, education has aided the rediscovery and creative development of the nation's traditional culture.

Theme 1. ESD Overall Conception

In the Republic of Korea, how are the conception of Education for sustainable development (ESD) and the relation between sustainable development and education defined? What has been researched on ESD? In which direction, has the ESD been developed? This chapter deals with these questions based on documents such as national strategy for ESD and reports on ESD from Korean National Commission for UNESCO (KNCU) and Local Sustainability Alliance of Korea (LSAK) which is the former Korea Council for Local Agenda 21 (KCLA21).

▣ The beginning of discourse on ESD in Korea

The history of discourse on ESD in Korea has begun with the UN Conference on Environment and Development (1992) held in Rio de Janeiro where the Agenda 21 was adopted. The chapter 36 of Agenda 21 deals with 'education, public awareness and training.' People who participated in the conference introduced the conception of ‘Environmentally Sound and Sustainable Development’ into Korea and tried to share and deliberate on the idea (Ku, 1996). The “Symposium on Environment Policy for ESSD” was held in 1993. Two years later, the book of "Sustainable Society and Environment" was published by a study group of experts from various fields and the book introduced the conception of sustainable development (SD) and SD-related subjects. Choi (1995), one of the authors of the book, suggested as below;

Up until now, we have talked about education about the environment, education for the environment, and education in the environment but we should replace “environment” with “sustainable development.” The education should develop from acquisition of the knowledge on sustainable development to establishment of the value and action skills for sustainable development (Choi, 1995).

In 1997, it is suggested that the relationship between the conservation of the environment and sustainable development should be emphasized as one of the future directions of EE program (KNCU, 1998). Thus, KNCU co-developed a pilot environmental education program with UNDP, implemented with forty participants from community-based organizations, and then published an environmental education guide book based on the reflection of the results of the program.

Many local governments have made their own local agenda 21s in Korea. While sharing the conception or vision of SD, the local agenda 21s showed different features based upon the local situations. The Korean Council for Local Agenda 21 (KCLA21), a

network of local agenda 21s, was organized in 2000. The Ministry of Environment (2002) conducted the "Research on development of EE implementation strategy for sustainable development in Korea" where formal/informal EE strategy and indicators for SD were developed. An International seminar on “Quality environmental education in schools for a sustainable society" was held in Chong-ju National University of Education by the Korean Society for Environmental Education in 2004. In the seminar, the participants from abroad introduced the United Nations Decade of Education for Sustainable Development (UN DESD) and the activities of Environment and School Initiatives (ENSI), and suggested possible ESD approaches such as action research while the participants from Korea presented about the situations of EE in Korean school systems (Lang, et al, 2004).

▣ National Strategy for DESD

The role of the Presidential Commission on Sustainable Development (PCSD) is to deliberate the direction of national plans for sustainable development and issues concerning the establishment and implementation of policies on water, energy, local agenda 21, major international environmental convention and follow-up to the World Summit on Sustainable Development (WSSD). Since 2003, PCSD has taken responsibility for UN DESD activities. The Committee of International Cooperation and Education in its 3rd term (2003-2005) and the Committee for Implementation of Sustainable Development in its 4th term (2006-2008) have played a focal role for UN DESD in Korea. Within the PCSD, discussion about implementation of the DESD began in February 2004, and was later carried over to the research project for developing the “National Strategy for DESD” in 2005 (Lee & Choi, 2008). The researchers comprising experts from universities, schools, environmental NGOs and KNCU made a draft of national strategy for the UN DESD. The draft was shared during numerous meetings with stakeholders, including government officials, local Agenda 21 representatives, teachers, NGO representatives and researchers. Such a process contributed to information sharing and triggered discussions and debates on ESD among stakeholders involved. Based on this consultation process, which lasted a total of 14 months, the implementation plan for the DESD was established and announced by PCSD in 2006.

The research project was carried out based on the conception of ESD suggested by the draft of UN DESD Implementation Strategy (UNESCO, 2004) and suggested the relation between sustainable development and education as follow:

The vision of education for sustainable development is a world where everyone has the opportunity to benefit from quality education and learn values, behavior and lifestyle

required for a sustainable future and for positive societal transformation (UNESCO, 2004).

Education should be a core strategy of sustainable development because the "people" is the most important factor for driving sustainable development (Lee et al, 2005)

▣ Current status of ESD in Korea

Lee et al. (2005) highlighted the current states of ESD in Korea - in schools, the society, the private sector and higher education institutions.

(1) School

ESD in school can be implemented through curricular activities and extracurricular activities. The excellent cases are discovered among the whole school initiatives such as Environmental Conservation Model Schools, School Forest Project, UNESCO Associated Schools Project, alternative schools, ESD Model School, and so on.

(2) Society

A) Agenda 21: Through local Agenda 21, the SD-related educational activities are being carried out. However, most of them are EE-oriented yet.

B) Social Organizations: The ESD in social organizations such as NGOs includes environmental education, human rights education, re-unification education, peace education, and so on.

(3) Private sector

The role of private sectors in ESD is very important, since it can support partnerships among school, society, organizations and companies in many ways. Such partnerships are not so active yet.

(4) Higher Educational Institutions

In most higher education institutions, there are no explicit approaches to implement ESD yet. There are some programs to prepare EE experts such as the Graduate Program of Environmental Education at the Seoul National University.

Many challenges to the implementation of successful ESD initiatives in Korea are identified. First of all, the awareness level of teachers is low. Most teachers in Korea do not know much about sustainable development or ESD. A survey measuring teachers' awareness of SD and ESD showed that 68% of the school teachers answered that they

had never heard of those terms in 2004. Teachers also reported that there have been limited opportunities for training and education on ESD-related themes. The university entrance examination system is another obstacle in changing educational system more sustainable.

▣ Vision and objectives of ESD

The national ESD vision of Korea is “Sustainable development and sustainable society leaded by education". In the vision, everyone learns the values, action competencies, and lifestyles for sustainable development, which lead to a sustainable society (Lee, et al, 2005).

The objectives of national ESD are as follows:

- Both individuals and groups share the vision and high awareness for SD.
- Both individuals and groups are equipped with the capacity for learning and implementing SD.
- Multi-stakeholders of ESD have strong partnerships and solidarity through active communication.
- Both individuals and groups participate actively in creating SD and a sustainable society.

▣ Policy recommendations for ESD

The national ESD implementation strategy also includes 8 policy recommendations and each policy recommendation includes current status, problems, and suggestions for improvement.

The policy recommendations are as follows:

- Construct the legal and administrative base for ESD
- Construct the national implementation system
- Establish and implement the vision sharing plan to improve the (E)SD-related awareness through a participatory approach
- Expand the opportunities of education and training for building capacity for SD
- Establish research and development system for supporting ESD
- Strengthen the solidarity and communication among ESD stakeholders
- Promote the integration of SD and education through practical action
- Establish the monitoring and evaluation system for implementation and improvement of ESD

▣ Initiatives for ESD in Korea

The conceptions and visions of SD and ESD in Korea have been shared and strengthened among the leading bodies such as PCSD, KNCU, KLCA21, and so on. They have been carrying the national ESD plans into practice. For example, in 2006, attempts to integrate ESD into the national curriculum revision process were carried out by PCSD in cooperation with experts in education. Efforts to integrate ESD into the curriculum involved many features such as incorporating ESD into subjects and extracurricular activities (see details in chapter 4). In 2007, the PCSD launched the first Sustainable Development Week from 4 to 10 October in cooperation with the Ministry of Environment, the Korea Business Council on Sustainable Development (KBCSD) and the Local Sustainability Alliance of Korea (LSAK). The programs of the week consisted of sharing best practices of EE, forum on national climate change strategy and forum on SD at local level.

The establishment of a Regional Centre of Expertise for ESD (RCE) was also an innovative initiative for ESD in Korea. Tongyoung, a harbor city in the southern end of the country, was designated as a RCE by United Nations University (UNU) in 2006, and has established the RCE Commission responsible for planning and implementing SD/ESD activities. Many planned programs are related to the preservations of the city's maritime heritage. One elementary and one secondary school have been designated as ESD research schools (see details in chapter 5).

As a leading agency of UN DESD, KNCU (2007) published a guide on ESD for teachers in cooperation with Tongyoung RCE. KNCU also organized the "International Forum on ESD" with KEEN, LSAK and ESD-J in 2007 of which objectives are discussing ESD perspectives, strategies, and tools among NGOs, governments and academies. In the international forum, ESD experiences and practices of each country were shared: community-based, policy-based, and formal or alternative school education. In 2008, KNCU published a booklet titled 'Education for Sustainable Future' consisted of UN DESD implementation plan, ESD toolkit (McKweon, 2002), and teaching and learning materials on ESD. Asia-Pacific Centre of Education for International Understanding (APCEIU, 2007), one of UNESCO organizations, conducted a project "Development of EIU Programmes & Teaching/Learning Materials" of which core themes were cultural diversity, sustainability, human rights, peace and globalization.

LASK (former KCLA21) changed its 'Environmental Education' sub-committee into 'Sustainable Education' sub-committee in 2005, and implemented a workshop on ESD where most participants agreed that promoting processes of the local agenda 21 are the very sorts of ESD practices and it is necessary to strengthen the partnership and promote participation of all the stakeholders toward sustainability. In its re-organization

process later, LASK dismantled the Sustainable Education sub-committee and decided to integrate the conception of ESD into the all initiatives instead. In the meanwhile, there is no research or evaluation regarding how ESD is approached and implemented in policy yet.

▣ ESD and education research

In Korea, research on ESD has been carried out mainly by environmental education researchers and teachers. This is due to the close relation between ESD and EE. For example, if you search research articles with such keywords as 'Sustainable development & Education,' 'Education for sustainable development' or 'Education for Sustainability' through online databases, you could find the articles are mostly written by EE researchers or teachers. Many of the research documents are deliberations on how we could integrate sustainability or SD into EE as contents or orientation and how we could deepen discourse and widen practices of EE with the concept of SD. For example, according to 'Promoting strategy of EE for national SD' (Ministry of Environment, 2002), the vision of EE is to 'build a civil society with literacy and will to participate in for the realization of sustainable society'. In their research titled 'Research on improving support for experiential EE program and Environment Conservation Model School Initiatives,' Lee et al. (2006) proposed that the overall direction of the model schools should be changed for the link to sustainable development from the existing direction to "help the youth increase awareness on values of environment and develop and disseminate model case of environment preservation efforts" to "develop, disseminate and promote model cases of environment education towards sustainability."

Most education research documents on ESD propose teaching and learning methods or approaches for ESD at schools (see details in Chapter 5). There are a limited number of research documents (e. g. Kim, 2006; Ji & Nam, 2007a) which attempt to deepen or refine the very conception or definition ESD. Rather, most research documents are based on the conventional ESD conception or definition by international policy documents such as 'UN DESD Implementation Scheme' (UNESCO, 2004). In other words, many of ESD researchers seem to accept the conception of SD or ESD suggested in international policy documents as a definite premise upon which they seek for appropriate methods to implement the conception.

▣ Prospect and suggestions

It is expected that the EE community will keep its interests in ESD in Korea. Considering that the conception of sustainable development began as 'Environmentally Sound and Sustainable Development (ESSD),' it is convinced that EE community may

lead discourse on ESD in Korea. However, we still have a long way to go. Now, it is necessary to deepen and widen the conception of ESD and to get all the educational fields and stakeholders involved into the discourse or practices on ESD or SD.

ESD in Korea is now at the crossroads and the trajectory will differ depending on social, environmental, political and economic situations as well as the contribution of educational research and practices. In the “Dynamic Korea”, there have been a lot of chances for all of the society to participate in social learning process to deliberate and discuss on sustainability. Such controversial issues on “Saemangeum project, the biggest land reclamation project in the world (2006~),” “Nuclear waste disposal facility in Buan (2005),” “Oil spill by Samsung Heavy Industries (2007~),” “Importing American beef suspicious of mad cow disease (2008~) and candlelight movement,” “Great Canal Project (2007~),” “Low Carbon, Green Growth (2008~),” “North Korean nuclear weapons program and rocket (2009)” have became hot topics of debates all over the country. Such topics can be used for more inventive social learning in ESD if educational researches could interpret these phenomena from a view of sustainability and the government could provide the public with space to learn from each other and with materials to deliberate on. Reflections on the relation between Lee administration’s policies/perspectives on SD and ESD will be discussed in the following chapters.

In addition, the conception and practices of ESD in Korea should be rooted in relevant unique cultural, philosophical and historical backgrounds of Korea. This means that we should share the vision and method of SD/ESD with international community while seeking impetus and methodology for SD/ESD in our root (See details for educational research regarding traditional cultures and ESD in chapter 5).

Theme 2. ESD and SD; CCE and CC

The role of education in relation to the challenges of sustainable development and climate change respectively

It is widely recognized that education plays a vital role in socio-economic development of Korea. Looking at the changes that have taken place in the Republic of Korea over the past 50 years, it is clear that the driving force for improvements came from gains in knowledge and technologies, and the transformation of value systems through education. Education plays a crucial role in development but we need to find the type of education that can bring about the changes needed for sustainable development. The important thing is the quality of education, and it is necessary for students to learn what truly matters. In order to steer society towards sustainable development, we must ensure that the values and skills required for sustainability are integrated into the various levels of education. In this chapter, the role of education in pursue of sustainable development in Korea will be reviewed based on policy documents and research articles.

▣ National vision and strategy for sustainable development

The official 'National Strategy for Sustainable Development (NSSD) of the Republic of Korea' is the very first national strategy integrating economic, social and environmental policies. The NSSD came into being as the official through the Vice-Ministerial Meeting on October 27, 2006 and the Cabinet Meeting on October 31, 2006. The NSSD of the Republic of Korea was launched to mainstream sustainable development into the government's national policy.

The PCSD (2006) systematically organized 48 implementation tasks under 5 strategic policy areas for the goal to 'enhance integration of economic, social and environmental policies.' The five strategic policy areas are 'sustainable natural resource management', 'social integration', 'sustainable economic growth', 'climate change' and 'institutionalization and education.'

Education (ESD) has its role to consolidate the foundation for the enforcement of the implementation plans. Education in Korea is supposed to play a crucial role in ensuring the social foundations for sustainable development by raising public awareness, educating youth and adults, and training professionals (Figure 1).

Goal	Enhance integration of economic, social and environmental policies			
Strategic Policy Areas	Sustainable natural management (17 tasks)	Social integration and national health promotion (10 tasks)	Sustainable economic growth (13 tasks)	Dealing with climate change and global environmental issues (5 tasks)
Implementation Tasks	◦ Integrating development and preservation ◦ Sustainable water management ◦ Biodiversity ◦ Sustainable natural disaster prevention	◦ Promoting women's economic activities ◦ Promoting the development of farming and fishing communities ◦ Establishing a social conflict management system	◦ Establishing a sustainable energy system ◦ Promoting a sustainable production system ◦ Safe management of hazardous chemicals and disposals	◦ Establishing national climate change policies ◦ Bridging global digital divide
	Institutionalization and education of sustainable development (3 tasks) ◦ Developing sustainable development indicators and an evaluation system ◦ Consolidating a foundation for sustainable development ◦ Action plan for education for sustainable development			

[Figure 1] National strategy for SD of the Republic of Korea

▣ Action Plan for Education for Sustainable Development

In order to promote implementation of SD at the national level, the NSSD includes the 'Action plan for ESD' prepared through public-private deliberation. This action plan comprises programs to consolidate a foundation for ESD, raise public awareness, expand sectoral education programs and establish a network (PCSD, 2006).

1) Establish a foundation for education for sustainable development

- Objective: Formulate a comprehensive plan for national ESD
- Action Plan
  - Formulate a comprehensive plan to systematically promote ESD
  - Extend support to education programs for sustainable development carried out by local authorities, industry and civil society organizations

2) Raise public awareness of sustainable development

- Objective: Reinforce promotion and research support for sustainable development
- Action Plan
  - Formulate and implement a promotional plan for sustainable development
  - Achieve full expansion through organizing a launching ceremony of a national 10-year education strategy for sustainable development
  - Increase support to sustainable development-related policy research
  - Find best practices of sustainable development, disseminate them and put them into trial operation at the national level

3) Expand sectoral education programs and reinforce cooperation

- Objective: Expand education programs and establish a network for reinforcing sustainable development capacity
- Action Plan
  - Expand and integrate ESD in school curriculums
  - Carry out education programs on sustainable development for public servants, citizens and companies
  - Support the creation of a training program for experts in sustainable development
  - Establish a sustainable development network in private, public, industrial and academic sectors
  - Lead ESD in North East Asia and reinforce international cooperation

Theme 3. ESD and CCE

Relationships between Education for Sustainable Development and Climate Change Education

ESD can contribute substantially to addressing key sustainable development challenges. To successfully confronting issues like climate change, the re-orientation of education is necessary. Indeed, introducing sustainable development issues into all areas of education will help to make education more relevant. Engaging learners in contemporary questions such as climate change brings education closer to life and enhances the learning experience by stimulating motivation and interest.

In the ESD of Korea, the topic of climate change has been considered as one of key themes (Figure 2). The topic of climate change has been included in some school subjects: e.g., Climate (Geography), Energy (Science) and Global warming (Environment). However, any national curriculum or guideline for CCE is not established yet.

▣ CCE in Korea

Korea is striving to better inform and educate the public about global warming and climate change to achieve a national consensus on Korea's commitment towards the international efforts for the issue of global climate change. Many agendas have been set to encourage industries and individuals to voluntarily take part in the efforts. As such, systematic educational programs are targeted accordingly by source, means and stage. Education on climate change functions as a means of informing the public about the adverse effects of and preventive measures for climate change. By educating children and youth about the important role they can play in preserving the environment, they will carry into their adulthood a changed perspective and attitude towards the environment that is lasting and make a positive impact on future greenhouse gas reduction.

The “Environment” is being instituted as an independent subject in the secondary school curriculum to ensure systematic education on energy, climate change and other environmental issues, whereas the environment is introduced in relation to each subject at the primary school level. Moreover, the Korean government has encouraged the compiling and publishing agencies to modify or add entries regarding the climate change and/or ‘green growth’ in textbooks.

The government is also providing grants to thirty-two primary schools and junior high schools nationwide that have been designated as “Research schools for energy

conservation education." Furthermore, government-approved textbooks are put together and distributed to schools to be used during discretionary activity hours to develop educational programs on energy conservation and climate change during classes and extracurricular activities. Energy conservation field trips, lectures and regional community campaigns are additional programs that are being implemented.

Programs other than those specified above are being implemented in Korea. They are summarized as follows:

- the theme of UNFCCC is reflected in the curriculum of education & training courses for personnel in relevant fields including those in charge of energy management in industries, especially in the construction sector, and regional government workers who are responsible for energy management;
- pamphlets to raise public awareness of forest sinks for greenhouse gases are distributed;
- educational programs on the cause of climate change and atmospheric pollution are conducted for those in fields related to hazard prevention and weather & environment;
- over 500 science teachers in primary and secondary schools attend the annual "Weather Education Program for Science Teachers" to better understand the mechanism and cause of climate change; and
- the "Weather Education Program for Women" provides homemakers to expand their knowledge on climate change by learning what climate change is and how it occurs.

▣ Green Growth: Korea's new strategy

Korean government is now making its every effort to promote a green economy with the "green growth" strategy. "Low-carbon, green growth" has become the Lee Myung-bak administration's new paradigm for national development. The president has presented it as a strategy to overcome the global economic crisis with job creation.

Korea has not been well-prepared for energy and environmental problems in the process of rapid economic growth and industrialization. As climate change and a natural resource crisis became a real threat, those problems have emerged as major factors in determining our future. Moreover, they are considered crucial factors for sustainable growth, especially at a time when joblessness continues to rise and a powerful new growth engine has yet to emerge to take over the information technology industry.

Ban Ki-moon, the United Nations Secretary-General, and many supporters of the green growth policy believe that this strategy can tackle two of the most vexing challenges of our time - climate change and sustainable economic growth.

▣ Green Growth: A new model for development in the Asian and Pacific region

Recent global crises require a drastic reassessment of how we define progress. An opportunity exists to usher in a new model-one that provides for greater social equity, economic accountability, and environmental sustainability. UNESCAP's Green Growth attempts to assist in making this vision a viable reality.

The *Green Growth* approach is a new policy focus which is aimed at helping Asia-Pacific countries to achieve progress towards sustainable development and poverty reduction. The Green Growth approach seeks to harmonize the two imperatives of economic growth and environmental sustainability by promoting fundamental changes in the way societies produce and consume (UNESCAP, 2006).

Based upon a needs assessment of the Asian Pacific region, UNESCAP proposed five focus areas as the most important policy measures to enhance green growth:

- Promotion of Sustainable Consumption and Production
- Greening the Market and Green Business
- Development of Sustainable Infrastructure
- Green Tax and Budget Reform
- Monitoring Eco-efficiency Indicators

▣ Green Growth: Approach to capacity development

UNESCAP has recently conducted Green Growth capacity development seminars. The Green Growth programs seem to show the features of 'green growth education' which can be characterized as follows (UNESCAP, 2008):

- Collaborative: The program promotes dialogue between multiple stakeholders to facilitate a critical examination of issues and opportunities involved in implementing Green Growth. This approach supports a cross-fertilization of ideas, reinforcing institutional partnerships and enhancing participants' capacities to conduct future training.
- Inclusive and participatory: The training aims to build capacity towards the design of strategies that accurately reflect the needs of vulnerable groups: encouraging participation that adds value to the decision-making process
- Integrated: Capacity development is viewed as the process through which policy frameworks are strengthened for Green Growth. Accordingly, training is structured to address mutually-supporting goals such as skills development, resource mobilization, and good governance.

- Holistic: The curriculum encourages participants to identify specific obstacles to sustainability with a view to develop coordinated, multi-stakeholder interventions for Green Growth.

Varying situations merit different learning approaches. Recognizing this, the program works to accommodate diverse learning styles to maximize training effectiveness. In addition to conventional techniques such as lectures and presentations, the program incorporates a variety of interactive activities aimed at encouraging dynamic and experiential learning. Methods emphasized: group exercises, questions/quizzing, brainstorming, discussion/negotiation, case studies, role playing, guided visualizations, participatory mapping and analysis and future problem solving.

▣ Green Growth and its influence on ESD

Now most governmental supports for ESD or EE have been re-oriented towards Green Growth education. Thus the Green Growth policy in Korea seems to substantially influence ESD and EE practices. Rhetorically, the concept of green growth education is in line with the core of ESD or EE. Jung (2008), the alleged developer of concept of “Green Growth” (UNESCAP, 2006), argued that to tackle the challenges of climate change we need to change our worldviews and life-styles as well as to find a way to increase energy efficiency. Such fundamental changes in worldviews and life-styles can be achieved by education. However, the features of green growth policy seem to have less focus on changing life-styles but place most emphasis on economic growth through green technologies or energy efficiency industries. Thus, many of citizen groups and environmentalists are expressing their concerns about some Green Growth policies such as the four major river restoration project. Furthermore, while the concept of ‘green growth’ harmonizes the two imperatives of economic growth and environmental sustainability, it places less emphasis social equity which is another important aspect of sustainable development. Finally, some Green Growth policies are rather implemented as a ‘top-down’ approach than based upon the participatory principles of sustainable development. Such processes as multi-stakeholder consultations and consensus-making are essential to make our society more sustainable.

Theme 4. ESD and the curriculum

In this chapter, it is explained that how ESD is integrated in the national curriculum in

Korea. For this purpose, we focused on the national policy documents and research articles on ESD in Korea especially related to school curriculum. The review of important policy documents and research papers on ESD showed that there are few research articles which suggest the ways of incorporating ESD into the national curriculum. However, we could find that there are some reports on ‘Environment’ subject in ‘2007 Revised Curriculum’ which suggest guidelines of ESD at national level. To explain ESD in Korean curriculum, therefore, we mainly reviewed policy documents on ESD, ‘2007 Revised Curriculum’ and 'Environment' subject with regard to ESD.

▣ **Re-orientation of the basic school curriculum**

National documents of ESD have recommended that Korean education system needs fundamental change through re-orientation of school curriculum and whole school approach. For example, PCSD (2005) suggests that ESD should not be approached as an individual curriculum or educational content.

> *"ESD should be approached as the re-orientation of the whole education process not as an individual curriculum or educational content. The whole school initiatives should be encouraged to change the school ethos* (PCSD, 2005)"
>
> *"ESD in school can be implemented through the connection with curricular activities and extracurricular activities* (PCSD, 2005)."

These quotations mean that ESD aims to change school systems rather than a specific curriculum. Such approach can be described as ‘whole-school approach.’ There are several whole-school projects in Korea that have high potential in supporting ESD. The Environmental Conservation Model School Initiative, School Forest Project and Associated Schools Project Network can be examples of whole school approach in Korea (Lee, 2008a).

Like these initiatives, national documents suggest many different approaches for school reorientation. One of main approaches in Korea is through national curriculum. In the process of revision for the ‘2007 Revised National Curriculum’, the PCSD has recommended that ESD can be included as one of cross-curricular themes. The themes of cross-curricular learning feature key ideas of ESD such as democratic citizenship education, environmental education, energy education, economics education, consumer education, gender education, human rights education and global understanding education. ESD can readily be used as the framework to coordinate and integrate these themes by serving as an umbrella to link the relevant topics.

It is explained that the approaches to ESD in Korea are not based on subjects but through cross-curricular themes or whole school initiatives.

▣ Themes in ESD

The core perspectives and priorities for ESD in Korea were identified based on UNESCO (2004) and then re-identified based upon the social, economic and environmental situations of Korea. These themes can be regarded as the main topics of ESD in Korean national curriculum in the future. The ESD themes in Korea are as follow.

	Socio-cultural perspectives	Environmental perspectives	Economic perspectives
UNESCO (2004)	◦ Human rights ◦ Peace and human security ◦ Gender equality ◦ Cultural diversity and intercultural understanding ◦ Health ◦ HIV/AIDS ◦ Governance	◦ Natural resources (water, energy, agriculture, biodiversity) ◦ Climate change ◦ Rural transformation ◦Sustainable urbanization ◦ Disaster prevention and mitigation	◦ Poverty reduction ◦ Corporate responsibility and accountability ◦ Market economy
PCSD (2005)	◦ Conflict resolution ◦ Re-unification ◦ Society renovation ◦ Partnership ◦ Media literacy	◦ Natural resources (Water, Energy, Air) ◦ Biodiversity ◦ Transportation ◦ Housing	◦ Sustainable production and consumption

[Figure 2] Core perspectives of ESD in Korea (PCSD, 2005, p.53)

Regarding this, the KNCU had already suggested that the notion of ESD in Korea should be further developed according to the national and local needs. Choi (2004) from KNCU wrote “considering the special political situation of Korea, education for re-unification can be one of ESD elements. Peace education in Korea has always been related to education for re-unification in some way because a peaceful re-unification is one of the most critical elements for the sustainable development of Korea.” Another issue that KNCU is focusing on ESD is education for conflict resolution. The challenge against social cohesion due to the globalization and economic growth is serious than ever before. And desires of public participation in social issues have been increased.

However, not only young students but also parents have never received any education on how to resolve conflicts.

▣ ESD and CCE in the curriculum

The Korean National Curriculum for grades 1–10 is divided into three components: the curriculum with compulsory subjects regulated by the government, subjects selected by each school, and special activities. ESD, in Korea, is suggested to be included through either disciplinary or interdisciplinary approach. ESD is more often recommended through interdisciplinary approaches, however, few national documents and research shows specific ways for such inclusion in national curriculum. For this reason, ESD in curriculum mainly can be seen at the specific subjects which have similar or common themes and contents with ESD. Lee et al. (2005) analyzed the degree to which ESD is included in the subjects of the 7th National Curriculum and the result is as follow.

Subjects		Number of Objectives	Number of ESD Objectives	% (related with ESD objectives)
Korean		95	3	3.2
Ethics		22	11	50
Social Studies		34	19	55.9
Technology / Home Economics		35	6	17.1
Physical Education		63	6	9.5
Music		15	5	33.3
Art		8	1	12.5
Optional Subjects	Chinese Characters	49	5	10.2
	Environment	42	42	100

[Figure 3] ESD in Korean curriculum (PCSD, 2005)

This analysis focused on key ESD content addressed in the existing curriculum and thus indicates the potential for ESD, but does not reflect the ESD approach in teaching and learning contexts. The study found that ESD was most prevalent in the subjects of Environment, Social Studies and Ethics.

The 'Environment' is one of the subjects and it is closely related to ESD. Recently, a new revised national curriculum ('2007 Revised') of the 'Environment' subject for middle and high schools was announced. In the new national curriculum, some of the contents

have been revised to incorporate the changed status of environmental education areas since the last announcement of the 'Environment' curriculum in the late of 1997. Especially, in this new curriculum, the concept of the 'Education for Sustainable Development (ESD)' was incorporated.

> *"In a new revised national curriculum, 'Sustainable Development' and 'Education for Sustainable Development', which is widespread concept internationally, are considered on the selection of the contents of 'Environment'* (MEST, 2007)."

In addition, cross-curricular learning or interdisciplinary learning, which crosses discipline-based subjects, can contribute much to activate ESD (Lee et al., 2005). Cross-curricular learning can take place outside of the systematic curricular structure. Cross-curricular learning encourages the education of the whole person in many areas of societal interest and needs. Since such cross-curricular learning is not main subjects, it stands the risk of being marginalized. At the same time, any relevant contents can be featured in many classes through cross-curricular learning.

To sum up, ESD in Korean national curriculum is recommended to be included not only in disciplinary subjects but also in interdisciplinary learning. The ways to integrate ESD in the curriculum are often seen through such specific subjects as “Environment.”

▣ The citizen's roles and competences of ESD

Ideal citizens described in ESD documents are who have competences to participate actively for a sustainable future. PCSD (2005, p.54) suggested that active participation of students should be the most important process of ESD, through which students can improve the awareness, knowledge, understanding, and value of ESD. To promote ESD within the realm of independent and special activities, PSCD recommended the inclusion of ESD contents to promote not only the development of personal knowledge on sustainable development but the idea of societal approaches featuring family, school and society. Lee (2008b) further recommended the development of a variety of special ESD activities that stress critical thinking, participatory decision making, and problem solving.

The competences and skills of students and citizens for sustainable society have been suggested at the EE field. For example, the aim of 'Environment' subject in the revised curriculum is to foster 'environmentally responsible citizens'(KICE, 2006, p.46). And the Ministry of Environment (2006) rephrased the aim of EE as to bring up citizens who is suitable for sustainable society, in other words, who understand their roles for

sustainable society and act for it.

▣ Reflection

Through review of policy documents and research articles on ESD, we found that there are several ways of efforts to initiative ESD at schools. Since most efforts for ESD are made by the experts on EE and environmental educators, we could find that ESD is more explicitly integrated in the “Environment” subject at school curriculum.

ESD is insufficiently descried throughout national curriculum. According to Lee (2008a), ESD at Korea schools is not apparent yet and does not have any important position at all. She also suggests that it is necessary to find out excellence cases of ESD which show best practices. Ji and Nam (2007a) also suggested the need of a newly defined concept of sustainable development and more emphasis on system thinking in the context of the knowledge-based society in Korea.

As a result, ESD in Korean school curriculum is recommended through ESD-related policy documents and research articles. However, it is necessary to prepare effective ways to incorporate ESD into school curriculum.

Theme 5. ESD and pedagogical traditions

ESD and school development; ESD and what happens in the classroom; ESD and teaching methodologies.

Many of policy documents on ESD mentioned the meanings and directions on ESD but less directly described teaching methodologies or pedagogical approaches. Rather, education research has suggested a variety of ways to incorporate the concept of ESD into school curricula. A group of EE researchers proposed teaching and learning methods of ESD in schools. Some of them suggested the possibilities for interaction between the school and the local community.

▣ Recommendations for new pedagogical approaches

The PCSD (2005) recommended that ESD should be approached as the re-orientation of the whole education process not as an individual curriculum or educational content. The PCSD further recommended the development of new pedagogical approaches for ESD which stress critical thinking, participatory decision making and problem solving. However, there is no explicit guideline for such pedagogical approaches yet.

▣ ESD teaching methods

Teaching and learning methods and its impacts on classrooms are rather reported in research papers than policy documents. Ji & Nam (2006a) developed an ESD program with three key teaching-learning strategies such as case study, story telling and project learning, and then reported that those methods could play a key role in the ESD learning process. Ji & Nam (2006b) also reported that cooperative learning methods could encourage discussions among students and respects for other opinions. Lee (2004) developed an ESD project learning model with role-play, investigation and discussions. Kim (2008) developed an ESD program for 5th grade social studies using project learning method. After implementing the program, the author reported that project learning method could build not only learning capacity but also democratic attitudes, decision-making functions, investigation, critical thinking, problem-solving skills, and acceptance of other opinions which are required for the purpose of the Social Studies and ESD.

▣ ESD through the whole-school approach

It is alleged that ESD should be approached as the re-orientation of whole education process. Thus, the whole school initiatives can be encouraged to change the school ethos. There are several whole-school projects in Korea that have high potential in supporting ESD such as Environmental Conservation Model School Initiative, School Forest Project, UNESCO Associate Schools Project and alternative schools.

The Environmental Conservation Model School Initiative is a national-level program since 1985. The two-year model school program for environmental conservation supported by the Ministry of Environment. Up to 11th program (1985-2007), 173 schools in total attended the model schools program. The designated schools receive government grants and educational materials in order to provide best teaching practices to instill students with positive attitudes towards the environment and to encourage environmental conservation in everyday lives of students.

Choi & Choi (2005) carried out an evaluation study for the new directions of model school program in EE. A school evaluation framework was made with modification based on the SUSDE project of Europe and UNESCO Teaching & Learning for Sustainable Future (TLSF) program. The school evaluation framework was used to reveal how well the model schools implement sustainable development education in each of the five areas: formal curriculum, and social, ecological, economic and democratic sustainability. In the study, qualitative and quantitative data were collected mainly based on the operation reports of ten (10) participating schools and then analyzed through the evaluation framework for sustainability. The study revealed the areas where the model schools are already making a positive contribution to sustainable development education and where the schools achieve low accomplishments. The results provided meaningful implications for teachers and governmental officers involved in the model school program in EE.

While the initial goal was to develop model teaching-learning programs for environmental conservation and to systemize environment education by disseminating the programs out to other general schools, the program has been modified to shift emphasis from environmental conservation to sustainability. The research of Lee at al. (2006) proposed that the overall direction of Environmental Conservation Schools should be changed to develop, disseminate and promote model cases EE towards sustainability. Such change in direction may lead to an increase in the participation of schools with strong whole-school ESD programs.

The Associated Schools Project Network (ASPnet) led by UNESCO could be another example of a whole-school approach. The ASPnet started in Korea in 1961 with 4 schools; by 2005 the number grew to 80. These schools cover four major areas of understanding: international organization, international affairs, inter-cultural understanding, and environmental education.

The School Forest Project is also a good example of the whole-school approach in Korea. The program transforms barren school grounds into environmentally friendly forests or garden areas with a partnership among various stakeholders including students and community members. Since 1999, nearly 700 schools participated as model schools for this initiative.

Research on school forests has focused on exemplary cases and showed educational effects in schools. Jung (2001) studied how to implement EE programs in school forests. And Lee & Kim (2005) showed the effects of school forest on elementary students' awareness of their own school and the nature. The study was intended to investigate effects of building school forests on elementary students, including changes in mental image of their own school, attitude toward the nature and forests, and awareness of their relationship with school forest. The results showed that there were significant differences between two student groups, respectively forest school group versus non-forest school group, in their mental image of school. In the writings of forest school group students, stories about school forests and curiosity regarding the nature were more frequently found than non-forest school group.

Kim (2002) studied how the students' participation in school forest projects influenced their environmental attitudes. Participation in school forest projects is expected to provide students with great opportunities for developing stewardship and further maintaining the strong motivation necessary for enhancing their community's environment. The results implied that youth' participation in school forest activities can help them grow to be citizens who are environmentally responsible and active in community sustainability issues.

▣ Interaction between the school and the local community

The needs for school-community collaboration in implementing ESD programs are found in several policy documents. As one of them, PCSD (2005) suggested to develop and implement ESD programs through the collaboration among researchers, teachers, school administrators, local education board, and local government. The Ministry of Environment (2005), in "10 Year Plan for Developing Environmental Education in Korea," suggested that environmental education programs should be implemented in local communities. As one way, community centers can provide ESD programs to foster decision making skills of their members in solving local issues.

One good example of school-community collaboration can be found at Tongyoung, a city in southern coast of Korean peninsula. Tongyoung was selected as the 8th city to have a Regional Center for Expertise (RCE) on ESD sponsored by the United Nations University. Inpyung Elementary School, a model school for ESD, has integrated ESD into existing school curriculum and extracurricular activities through a whole-school

approach. With the supports of Tongyoung RCE, teachers at the school developed an objective to “increase awareness of harmonious lives through the exploration of the future of the community.”

At first, teachers there had difficulty understanding the concept of ESD and in finding where and how to start the integration processes. They participated in workshops and forums with the Tongyoung RCE, consultative meetings with the College of Marine Science of the Gyeongsang National University and the Research Institute of East and West Studies at Younsei University and then developed the objective of increasing awareness of harmonious lives.

To achieve the objective, the school enhanced its ESD curriculum by studying regional environmental, social, and economic issues in order to understand the key concepts and values necessary for regional sustainability. An Eco-School was built in InPyung Elementary School in order to transform it into a sustainable system featuring tree planting, an "Empty Plate” campaign, and a “Zero Waste” campaign.

To expand ESD within and outside of the school, the school has training programs for teachers and parents and a research exhibition on the 'Future of Our Town'. For the exhibition, a team consisting of students, a teacher, and parents researched a subject of importance to Tongyoung’s sustainable development. Many efforts of Inpyung Elementary School are closely linked with outside organizations such as Tongyoung RCE, Korean Marine Rescue Center, Fisheries Science Museum, College of Marine Science at Gyeongsang National University and Younsei University. Though still developing, Inpyung Elementary School's ESD initiative is significant as the entire school strives for sustainability.

▣ Korean Traditions and ESD

As suggested, the practices of ESD in Korea should be rooted in relevant unique cultural, philosophical, historical background of Korea. While sharing the vision and methods of ESD which are internationally accepted, each country needs to seek methodology for ESD in their own roots. There are educational efforts to incorporate Korean traditional cultures into ESD programs.

For example, Kim (2003) developed a program with cooperative learning based on the spirit of 'Dure' which is one of Korean traditional cultures. 'Dure' was an institution as well as an organization in the late Chosun Dynasty that mobilized farmer's labor intensively when periodic agricultural necessity took place. The formation of 'Dure' was autonomous but the mobilization was mandatory and implemented very strictly. Nevertheless, the operation of 'Dure' was not just focused on the farming labor mobilization but connected to various activities such as instrumental music of peasants, village guardian rituals, and so on. Therefore, 'Dure' was a labor organization of

farmers, an autonomous and cooperative guild, and an amusement group (Bae, 2005). The study implied that the program could foster students' learning capacity in collaboration and understanding of others.

Ji & Nam (2007b) investigated cultural aspects of sustainable development in Korean traditional children songs and proposed to use such songs for elementary ESD classes. The Ministry of Environment (2007) developed lesson plans on traditional foods, traditional ecological knowledge, natural dyeing, and so on in the context of Tripartite Environmental Education Network (TEEN) among Korea, China, and Japan.

As seen above, teaching methods or pedagogical approaches for ESD are rather found in education research than policy documents. A group of EE researchers has shown ways to incorporate the concept of ESD into school curricula and influences on classes. The possibilities for interaction between the school and the local community are also suggested explicitly.

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The International Alliance
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Report from South Africa

Climate Change and Sustainable Development:
The Response from Education

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South Africa: Climate Change and Sustainable Development: The Response from Education

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Introduction

The IALEI project provides an ideal opportunity to reflect on the emerging discourse of Education for Sustainable Development (ESD) and Climate Change Education (CCE) in the formal school curriculum and in national policy[1]. The report seeks to identify the current state of ESD and CCE in South Africa by engaging with two of the five themes that form the framework for the IALEI project[2]. Evidence is presented from the most recent South African National Curriculum Statement of 2005 to identify the current state and limitations of the curriculum to address sustainable development and climate change, and in so doing, to raise a number of concerns about the state of preparedness of young South Africans to cope with climate change and to contribute to sustainable development.

South Africa: issues in context

1994 is a significant milestone in the development of South Africa as it marks the end of nearly five decades of racially-based, unjust legislation under the Apartheid system. In that year an historic election was held to usher in a new government together with a powerful mandate to redress the injustices and discrimination of the past so as to:

> *'heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights; lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; improve the quality of life of all citizens and free the potential of each person; and build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations'*
>
> (Constitution of RSA No. 108 of 1996: (1) 1243)

[1] This report could not be compiled in consultation with other leading educationalists in the country partly due to the relatively late invitation afforded to the author, but also due to the author's own commitment to a number of other pressing research projects at the time of writing.
[2] Only first two of the five themes are addressed in detail. Themes 3 and 4 are partly addressed in themes 1 and 2. Them 5 could not be undertaken because of insufficient time and resources available to assess the practice of ESD and CCE in schools

The post-Apartheid period is now characterised by new and overwhelming challenges: to redress the past, to promote equity, to enable broad-based development, and to support job creation and economic growth. Some of the most pressing issues lie in the provision of services, housing, education and employment. While considerable progress has been made in the case of water and sanitation provision, financial resources and human capacity have been severely stretched. Since 1994 over 12 million people, who previously relied on unsafe water, now have access to clean, potable water. Some improvements have also been made in sanitation, but 20 million people, nearly 50% of the population, are largely without access to on-site, safe waterborne sanitation (Statistics South Africa, 2005). The Human Poverty Index (HPI) which measures the lack of access to education, health care, and basic services including water and sanitation, and unemployment, increased from 16,4% in 1995 to 31,7% in 2002, but by 2003 over 30% of the population were living at or below the globally recognized threshold of US$1 per person per day (GCIS 2009).

South Africa is one of the most biologically diverse countries in the world with a rich array of terrestrial, aquatic and marine ecosystems. The surface area covers little more than 2% of the world's land surface, yet it contains nearly 10% of the planet's plant species and 7% of the reptile, bird and mammal species. Yet just less than 3 % of the total land area is protected by national reserves (GCIS 2009). Biodiversity is increasingly threatened by human activities; by an increasing population especially in certain regions of the country; by rapid urbanization into some of the most biologically diverse areas; and by a legislative system that has limited control to direct progress towards a more sustainable state.

Further challenges lie in the population dynamics. The South African Census of 2001 recorded a total population of 44,819 778 (Statistics South Africa 2001) with 43% of the population being under the age of 19 years. Despite a youthful population, HIV and AIDS infection has had a dramatic impact on life expectancy that impacts severely on the youth. In 1998 average life expectancy peaked at 67 years, but during the period between 2000 and 2005 it decreased to 46 years (GCIS 2009). South Africa slipped down the Human Development Index (HDI) from a ranking of 67th place out of 144 countries in 1995, to 120th out of 177 countries in 2003, largely explained by the decrease in life expectancy as a result of HIV and AIDS (GCIS 2009).

Equally alarming is the challenge of education. In 2001 the highest level of education of those 20 years and older revealed that 4,567 497 had no schooling**;** 4,083 742 had only some primary schooling; 1,623 467 had completed primary schooling; 7, 846 125 had some secondary; while a mere 20% or 5,200 602 had completed twelve years of schooling; and only 8% or 2,151 336 had any form of tertiary education qualification. These levels of education attainment partly explain why only 33,7% of the population were found in formal work, 24% were unemployed and 42,3% were economically inactive (Statistic South Africa 2001).

A final picture, and pertinent to this report, is that of a developing country with one of the highest level of carbon emissions per capita despite the high level of poverty and unemployment. Per capita emissions are claimed to be higher than those of China and India and exceeds the global average (DEAT 2005). The main reason for the high emission rate is the continued reliance on non-renewable energy sources largely coal which is fed to energy-intensive industries such as mining, iron and steel, aluminium, ferrochrome and chemicals.

Energy demand is also the result of increasing demand with rapid urbanisation where more than 58% of the population now live in cities and towns (Statistics South Africa 2001).

Theme 1
Education for Sustainable Development - overall conception

The discourse on Education for Sustainable Development (ESD) is still embryonic and has gone largely unnoticed in the formal school curriculum of South Africa. The absence of ESD as a formal concept and guiding framework is partly explained by the fact that events leading up to the pronouncement of the UN Decade of Education for Sustainable Development (UNDESD) and the preparation of the South African National Curriculum Statements (NCS) coincided. By 2005 it was already too late to incorporate much of the discourse associated with ESD. However, while there is no explicit mention of ESD in the current national school curriculum it does not imply that education for sustainable development did not find a rightful place in the curriculum. The concepts of sustainable development and sustainability were certainly infused into the curriculum, but largely from the perspective of environmental education. Contributors and developers of the NCS clearly found it difficult to differentiate between environmental educational and education for sustainable development.

The development of the current school curriculum began with a bold claim from the National Department of Education in which it stated: "The curriculum can play a vital role in creating awareness of the relationship between human rights, a healthy environment, social justice and inclusivity … all Learning Area Statements reflect the principles and practices of social justice, respect for the environment and human rights, as defined in the Constitution." (DoE 2002). However noble these intentions, a brief analysis of the National Curriculum Statements from Grades R to Grade 12 reveals a fragmented approached to education for and about sustainable development, while only limited attention is given to climate change and even less to education for climate change (CCE).

A key word search was performed on the curriculum statements for the General Education and Training (GET) phase (Grade R to 9) and the Further Education and Training (FET) (www.education.gov.za/Curriculum/SubjectStatements.asp). The key word search was used as a technique to identify statements expressing the purpose, learning outcomes (similar to aims and objectives) and assessment standards associated with each Learning Area or Subject.

In the GET phase learners are required to select and undertake to study nine Learning Areas as outlined in the table (Table 1). A brief summary of the relevant text was extracted and placed alongside each Learning Area.

Table 1 GET Phase – approaches to sustainable development, climate change and environment education

Learning Area	**Approaches to ESD, CCE and EE** (key words used to identify statements: environment, sustainable development, climate change and sustainability)

Arts & Culture	No mention of education for sustainable development and climate change. Attention is focused on understanding and learning from the immediate and national environment.
Economic & Management Sciences	Understanding 'sustainable growth' is a dominant learning outcome. Achieving sustainable growth is understood as being a reduction in poverty and fair distribution of wealth, while still pursuing the principles of an open market and profitability. Learning Outcomes focus on actions, processes and structures that 'advance sustainable reconstruction and development in the economy'. Learners are encouraged to reflect critically on the impact of resource exploitation on the environment and on people. Environmental sustainability is mentioned in the only with the expectation that learners should investigate the public relations, social responsibility and environmental responsibility strategies and actions of different businesses and organizations (Grade 7). No mention is made of climate change.
English First Additional Language	Reference to the environment is made in passing and only in relation to various environmental issues and concerns. There is no mention of sustainable development or climate change.
English Home Language	Reference to the environment is made in relation to environmental values, rights, issues and concerns. No mention is made of sustainable development or climate change.
English Second Additional Language	Reference is made to the environment in the context of signs found in the environment. No mention is made of sustainable development or climate change.
Life Orientation	In general the learner is expected to make informed decisions about personal, community and environmental health. Assessment standards, for example, include participating in a recycling project; exploring and reporting on links between a healthy environment and personal health; investigating a local environmental health problem using different data sources; planning a strategy to address the problem; and developing an environmental health programme. No mention is made of sustainable development or climate change.
Mathematics	Learners are expected to develop a critical awareness about how mathematical relationships can be used responsibly in addressing human rights and issues such as social, political and economic relations and environmental problems and risks, however little guidance is offered about how to achieve such ends. It is uncertain how a mathematically literate learner will 'participate equitably and meaningfully (with an awareness of rights) in political, social, environmental and economic activities'. There is no mention of sustainable development or climate change.
Natural Sciences	Learning outcomes focus on knowledge and understanding of how the climate is changing and ways in which these changes are determined. A further outcome deals with understanding the sustainable use of the earth's resources. This outcome is assessed by, for example, the learner successfully planning and carrying out an audit of water use around the school

	premises. Another outcome prepares learners to participate in a democratic society in which human rights are valued and environmental services are promoted responsibility. Climate change, sustainable development and environment are mentioned throughout this Learning Area.
Social Sciences	This Learning Area studies relationships between people, and between people and the environment. Outcomes seek to enable learners to develop an informed concern for the world and an ability and willingness to participate in actions that contribute to a sustainable environment. Knowledge of terms/concepts such as developing, developed, sustainable development and sustainability are presented. A further outcome is that the learner is expected to make informed decisions about social and environmental issues and problems; and to explain how sustainable development could impact positively on people, places and environments.
Technology	This Learning Area seeks to show how science and technology can be used effectively and critically, and encourages learners to show responsibility towards the environment and the health of others. The learner is expected to demonstrate an understanding of the interrelationships between science, technology, society and the environment. They should be able to suggest ways to improve technological products or processes so as to minimise negative effects on people and/or the health of the environment. There is no mention of sustainable development or climate change.

The development of knowledge and understanding of society and the use of natural resources resides largely in the Social Science and Natural Sciences Learning Areas. Both Learning Areas expect learners to develop critical skills in order to make decisions, choices and to exercise value judgements when thinking about and studying human-environment relations. Most other Learning Areas have attempted to include some environmental education in the respective curriculum statements but it is not obvious how the intended purposes can be translated into a meaningful learning activity or might be assessed as a meaningful outcome of the learning. For example, in Mathematics learners are expected to develop a 'critical awareness about how mathematical relationships can be used responsibly in addressing human rights and issues such as social, political and economic relations and environmental problems and risks'. A further example is found in Technology in that one of the purposes is to show 'how science and technology can be used effectively and critically', and to encourage learners to 'show responsibility towards the environment and the health of others'. The discourse on environmental education and sustainable development appears to offer a limited framework in the development of the current curriculum. It is suggested that many well-intentioned and well-constructed statements found in the NCS, in the context of sustainable development ideology, is difficult to translate into practice and might therefore fail to motivate young learners or meet their needs and interests. Furthermore, the curriculum does not deal adequately with some of the minimum requirements for sustainable human development as suggested by the UNDP including a conceptual understanding at the very least of factors that will result in the elimination of poverty; a reduction in the population

growth rate; and an improved understanding of the diversity of ecosystems and the environmental impact of development activities.

A final observation is the scant reference to knowledge and understanding of climate change (including an understanding of risk, mitigation, adaptation, vulnerability etc). It seems fair to suggest that climate change was not taken seriously at the time the curriculum was being prepared.

Similar conclusions are drawn from the Further Education and Training (FET) phase. Table 2 presents a selection of subjects that were considered most likely to include statements on sustainable development, sustainability, climate change and environment. The FET phase provides an exit point from the formal school curriculum (Grade 12) in which learners are required to write a public examination based on a minimum of six subjects offered from a suite of 31 possible options.

Table 2 FET Phase - approaches to sustainable development, climate change and environment education

Subjects	**Approaches to ESD, CCE and EE** (key words used to identify statements: environment, sustainable development, climate change and sustainability)
Accounting	No reference to ESD, CCE or EE
Agricultural Management Practices	One of the purposes is to understand the social contribution of this subject to promote a culture of human rights, economic growth and sustainability as a tool for change, improve quality of life and provide solutions that are responsive to individual and community needs.
Agricultural Sciences	Learners are expected to become aware of the need to use natural resources in a sustainable manner and to outline the issues involved in sustainability, and to explain ways in which various agricultural practices have affected natural resources in the past (Grade 11). In Grade 12 learners are expected to understand and explain the agricultural labour market and the reasons for the continual development of agricultural commodities to maintain sustainable development.
Business Studies	A purpose of this subject is to enable learners to create business opportunities, creatively solve problems and take risks, while respecting the rights of others and environmental sustainability. Learners also explore what makes a business successful (e.g. sustainability, profitability, customer base).
Consumer Studies	A Grade 12 Learning Outcome requires learners to demonstrate consumer responsibility towards the sustainability of the environment, the community and self through the judicious use of resources. Learners demonstrate this competency by analysing the impact of the selection and use of food, clothing, household equipment or furnishing on the natural or economic environment, and identify a consumer issue and suggest a strategy for addressing this issue. In Grade 10 the learner should be able to demonstrate consumer responsibility towards the sustainability of the environment, the community and self through the judicious use of resources.

Economics	A Learning Outcome expects learners to demonstrate knowledge, critical understanding and application of the principles, processes and practices of the economy. By Grade 12 they should be able to demonstrate an ability to analyse and evaluate contemporary issues of inflation, tourism and environmental sustainability.
Geography	This subject sets out to develop knowledge and critical understanding of the changing nature and interrelatedness of human existence and the environment over space and time. This creates a frame of reference for asking and answering geographical questions, identifying and solving problems, and evaluating the consequences of alternative solutions and possible actions. Geography is in the unique position of drawing together aspects of natural sciences, humanities and indigenous knowledge systems in order to contribute to the understanding of spatial distribution, human-environment interactions, and sustainable development. Learning Outcomes aim to prepare learners to become informed, critical and responsible citizens who can make sound judgements and take appropriate action that will contribute to equitable and sustainable development of human society and the physical environment. A Learning Outcome for Grade 10 seeks to enable leaners to demonstrate knowledge and understand processes and spatial patterns dealing with interactions between humans, and between humans and the environment in space and time. A further Learning Outcome that applies to all Grades is the expectation that a learner is able to apply geographical skills and knowledge to environmental issues and challenges, recognise values and attitudes, and demonstrate the ability to recommend solutions and strategies.
History	No reference to ESD, CCE or EE
Hospitality Studies	No reference to ESD, CCE or EE
Life sciences	As a Learning Outcome the learner must be able to demonstrate an understanding of the nature of science, the influence of ethics and baises in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society. In Grades 10 to 12 learners explore various historical developments (indigenous knowledge systems, biotechnology, environment, legislation, social behaviour and ethics); and explore issues in relation to exploitation vs. sustainability.
Mechanical Technology	The purpose of this subject is to expose learners to knowledge, skills, values and attitudes (SKVA) relevant to the manufacturing processes. Learners are expected to understand the social contribution of Mechanical Technology with regard to the promotion of a culture of human rights, economic growth, entrepreneurship, sustainability, and as a tool for change, improving the quality of life and providing solutions that are responsive to individual and community needs.
Physical Science	Learners in Grade 10 are expected to be able to evaluate science's impact on the environment and sustainable development by discussing the impact of scientific and technological knowledge on sustainable local development of resources and on the immediate environment. By Grade 11 learners are expected to suggest long-term and short-term strategies to improve the management of resources in the environment. Finally in Grade 12 learners are expected to assess

	South Africa's contribution to management, utilisation and development of resources and the environment to ensure global sustainability.
Tourism	No reference to ESD, CCE or EE
Visual Arts	No reference to ESD, CCE or EE

Evidence presented in Table 2, extracted from FET curriculum phase (15 to 18 year age group), shows that sustainable and sustainability concepts are reiterated in many subjects selected for this analysis. For example, 'promote ....sustainability as a tool for change' (Agriculture Management Practices); `...creatively solve problems and take risks, while respecting the rights of others and environmental sustainability' (Business Studies); and `...demonstrate an ability to analyse and evaluate contemporary issues of inflation, tourism and environmental sustainability' (Economics). These and other examples in Table 2 suggest that efforts were made to include education for sustainable development, but many of the learning expectations and assessment standards were designed to support the conventions of the disciplines rather than consider an approach that might enable learners to develop new forms of knowledge and understanding beyond the world we already know. Education for sustainable development in the FET curriculum appears to be fragmented, and tainted by rhetoric and jargon that is difficult to translate in practice.

Only limited reference is made to climate change in the FET. It is mentioned in Geography and framed as knowledge about how El Niño and La Niña effects climate change in Africa. The absence of climate change in subjects such as Agricultural Sciences, Consumers Studies, Business Studies, Life Sciences, Natural Science and Tourism is disturbing.

Theme 2
Education for Sustainable Development (ESD) and Sustainable Development (SD); Climate Change Education (CCE) and Climate Change (CC)

This theme is informed by the evidence from the previous theme, but also from findings resulting from a consultation exercise led by the Southern African Development Communities' Regional Environmental Education Programme (SADC REEP) in preparation for UNDESD. This consultation process took place in fourteen southern African countries involving over 600 participants and resulted in a comprehensive report published in 2006 (Lotz-Sisitka, Olvitt, Gumede & Pesanayi, 2006a; 2006b; 2006c; 2006d).

(a) Sustainable development and education for sustainable development

Only the Social Studies Learning Area in GET phase offers a definition of sustainable development in the glossary and chooses to quote the definition from the Brundtland Report as published in 'Our Common Future' (1987). No other Learning Area offers a definition or description of sustainable development, and as noted earlier, the concept is only referred to in Social Studies in statements expressing the purpose of the Learning Area and some Learning Outcomes.

By way of contrast, the FET phase offers a number of definitions and descriptions of sustainable development. No definitions were offered in the case of Business Studies, Life Sciences and Economics. The following 'definitions' were extracted from the glossaries of selected subject curriculum statements:

> ***sustainable development –*** *development that meets today's livelihood needs, without preventing the needs of neighbours or future generations from being met. This is achieved by continuous efforts of individuals to adapt to a changing environment, so as to protect and enhance the stocks of natural, physical human and social 'capital' available to themselves and to future generations.* Consumer studies
>
> ***sustainability –*** *a way of living that meets the needs of the present without compromising the ability of future generations to meet their needs*. Geography
>
> ***sustainable agriculture –*** *production that avoids exploitation of natural resources while ensuring the maintenance of productivity.* Agricultural Sciences
>
> ***environmental justice –*** *redressing the situation whereby people with fewer choices (the poor and disadvantaged) often suffer most from pollution, jobs hazardous to health, resource depletion (e.g. the loss of trees and fishing stocks), and unequal access to resources such as water and energy.* Life Orientation
>
> ***environmental sustainability –*** *developing a country and meeting people's needs in ways that do not damage or use up the environmental resources (clean water, air, healthy soils and ecosystems) on which sustainable development and quality of life ultimately rest, so that we can continue to develop and meet human needs for generations to come.* Life Orientation

There is a mismatch between some definitions found in the glossaries and the intended learning outcomes. A comprehensive analysis is likely to indicate some confusion about how to translate an understanding of sustainable development into the practice of teaching and learning. For example in Geography, it is difficult to see how learning outcomes, assessment standards or the suggested content might develop a learner's understanding and response to consider "…*ways of living that meets the needs of the present without compromising the ability of future generations to meet their needs*. The Geography curriculum statement tends to avoid dealing with the implications of sustainable development as a social construct that is too complex for relatively young learners. In a further example, Life Orientation offers two well considered definitions of environmental sustainability and environmental justice, but does not refer to either in the statement of purpose or learning outcomes of the subject. This brief analysis suggests that education for sustainable development has not provided the curriculum developers with adequate guidance from which to formulate a logical framework that could be translated into meaningful and practical learning.

Much of the discussion above confirms the findings of the SADC REEP consultation process which concluded that debate and conceptual understanding of sustainable development was inadequate. This is one reason why there is confusion in some of the curriculum statements

highlighted in the foregoing. A limited understanding of the sustainable development discourse could explain why the curriculum still has a 'business as usual approach' (e.g. Business Studies); where development is seen as synonymous with growth and the only game in town (e.g. Consumer Studies); and where educational activities and outcomes are based on the ambiguity of sustainable development ideologies (e.g. Geography).

ESD initiatives in South Africa need to be reviewed critically against the current prevailing perspectives on sustainable development. The concept of sustainable development, as it is encapsulated in the FET, at the very least appears to support the 'prevailing political economies of the day' and seeks to avoid a critical understanding of realities of an unsustainable world that is unable to meet the needs of the present let alone consider a future generation. Lotz-Sisitika warns that if such a review is not done, then sustainable development will become just another ideology that leaves the *status quo,* with all its risks and injustices intact (Lotz-Sisitka 2006). Although the assumptions in this report are based on limited evidence found in the national curriculum statements, it is suggested that many of the intended Learning Outcomes do not provide learners with an opportunity to consider alternate development strategies, nor to explore the pressing problems of addressing poverty alleviation or improving the general quality of life for all South African citizens. These issues highlight some of basic tenants of a sustainable humane world as suggested by UNDP. Some Learning Outcomes in the FET phase encourage learners to engage in practical action in support of ESD, but currently there appears to be inadequate and insufficient scope for such activities in the curriculum. Research and consultation exercises similar to that of the SADC REEP consultation will need to be initiated in order to provide further guidance with the intention of considering how or if to develop ESD into a robust, logical and unambiguous framework before being introduced effectively into the formal school curriculum.

(b) Climate Change Education (CCE) and Climate Change (CC)

As already mentioned climate change and climate change education is neglected in the curriculum statements. This does not mean that climate change is being ignored in schools currently, but it does suggest the demands of the NCS is lagging behind recent messages and information from national and international scientific community working in the field of climate change. CCE in the FET curriculum is confined to knowledge about how El Niño and La Niña affects climate change in Africa. The absence of climate change education in subjects such as the Agricultural and Life Sciences is a cause for concern.

It must be conceded that education is but one of many other strategies that could bring about behavioural change and the transformation of society. The South African government is committed to the UN Framework Convention on Climate Change and in so doing, is obliged 'to promote and cooperate in education, training nation and public awareness related to climate change'. This response was reiterated at the recent National Climate Change Response Policy Development Summit held in Johannesburg, March 2009. The Departments of Environment and Tourism, and Science and Technology were lead agency in formulated the policy response to climate change for South Africa. The fact that the Department of Education (DoE) was not considered as a lead agency may have contributed to resultant statement about the role of education in climate change which amounted to little more than awareness raising and a belief that both government would support informal and formal education to'encourage behavioural changes required to support the efficient and effective implementation of the

climate change response policy' (Departments: Environment and Tourism, Science and Technology 2009).

Conclusion

Evidence presented by the NCS provides only one window through which to analyse ESD and CCE against a wider array of education processes and activities that are presented daily in school programmes. Moreover, curriculum statements are nuanced with a plethora of socio-political demands and might often be perceived by the practising educator as impractical and cumbersome. Nevertheless the NCS is a definitive guide that demands attention because it is fundamental to structuring education practice in South Africa. It is therefore disappointing to observe that the GET and FET curriculum statements do not do justice to the discourse on either ESD or CCE. The discussion highlighted the confusion linked to environmental education and sustainable development education, and the mismatch between intentions, outcomes and assessment standards. It was also suggested that both ESD and CCE are inadequately grounded in theory and context, and, as such, do not provide a coherent framework for implementation into the formal schooling system as yet. ESD and CCE in the NCS must be reviewed with the intention of understanding if or how these discourses can address the challenging socio-political, economic and environmental dynamics of South Africa. Raising awareness about sustainable development and simply knowing about climate change will undoubtedly under-prepare a young nation facing an uncertain future.

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Climate Change and Sustainable Development:
The Response from Education

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CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT: RESPONSE FROM EDUCATION – THE CASE OF SINGAPORE[1]

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1. INTRODUCTION

"We have built. We have progressed. But there is no hallmark of success more distinctive and more meaningful than achieving our position as the cleanest and greenest city in South Asia." **Lee Kuan Yew, Keep Singapore Clean Campaign on 1 Oct 1968.**

1.1 Basic facts about Singapore

Singapore is an island city state of 707.1 km^2 with a population close to 5 million (4,839.4 million) out of which 3.642.7 are residents, and out of these 3,164.4 are citizens. The population density is high with 6,489 people per km^2. Total live births in 2007 were 39,490 and the low birth rate is cause for concern to the authorities as they are not able to replace mortality. Three major ethnic groups define the population with the Chinese accounting for 75%, Malays 13.7%, Indians 8.7% and others 2.6%.

Singapore's history as an independent nation began in 1965 with the setting up of a republic based on democracy with the President as head of state, the prime minister and his cabinet colleagues. Since independence the People's Action Party (PAP) has been the dominant ruling party with little by way of opposition strength. While this imbalance would be a stark contrast to many countries in Europe, the dominance of the ruling party has provided stability and continuity in development and growth for the nation. With this political set-up is the strong, able and efficient bureaucracy in the various ministries.

1.2 Education System

Singapore's education system is based on 6 years of primary and 4 years of secondary education (for the slower ones 5 years in Secondary). National examinations are held at the end of primary (Primary School Leaving Certificate) and Cambridge O-level at the end of secondary. Beyond secondary education, students can go for the 2-year academically oriented junior college education at the end of which they sit for the Cambridge Advanced Level or A-level examinations or any of the five polytechnics for the 3-year polytechnic diplomas in before they go to universities. See Figure 2.

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[1] Paper presented at the Workshop on Climate Change and Sustainable Development; Response from Education, Copenhagen, Denmark, 2-4 Mar 09.

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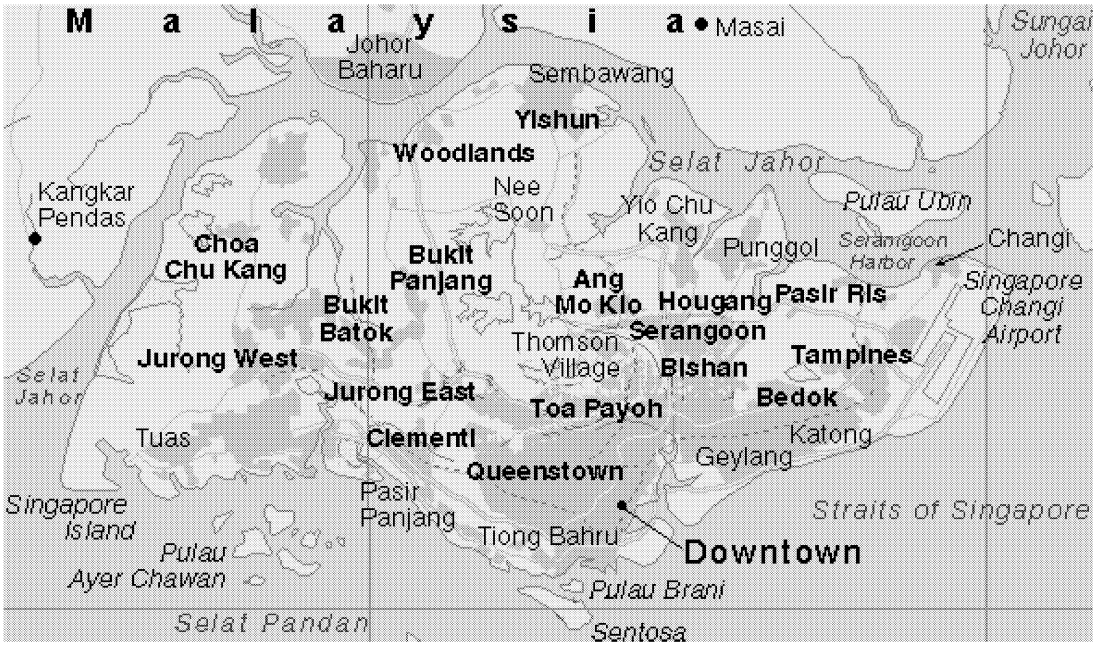

Figure 1: Map of Singapore

Compulsory education is mandatory at the primary school. Out of those who enroll in the primary 1 some 22 % will finally go to a university and end up with a degree, 40 % to polytechnics ending up with a diploma, another 25 % to the institutes of technical education while the rest enter the job market after secondary school.

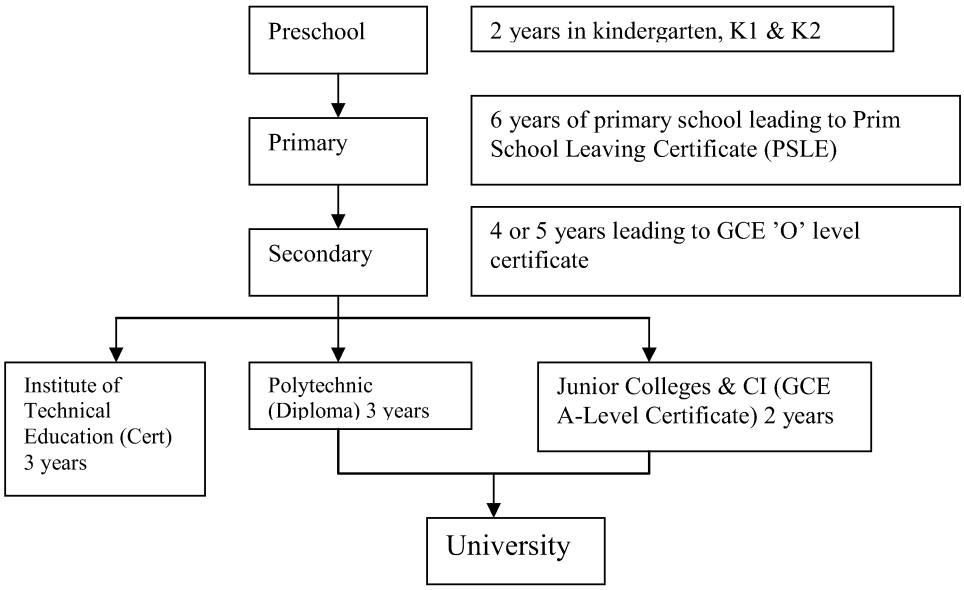

Fig 2: Singapore education system

The literacy rate for those above 15 years old is 95.7%. Enrolment in all educational institutions totaled 700,774 in 2007 with primary schools accounting for 285,048, secondary 218,062, universities 65,746. There are 27,505 teachers in some 370 primary and secondary schools in Singapore.

The education system implemented a major reform in 1998 with the approach of the new millennium where questions of what makes for the new learning in the 21st century and the knowledge, skills and disposition required for the young to thrive in this new globalizing world were raised. With this reform were several initiatives that were implemented under the concept 'Thinking Schools and Learning Nation.' These new initiatives include ICT implementation nationwide, critical and creative thinking, and National Education, the last focuses on how to create in Singaporean children the sense of rootedness to the nation no matter where their professions would lead them to when they grow up. The importance of these reform initiatives for Singapore which is an open economy, cannot be overemphasized.

These reforms were further refined along the way and each year saw new targets being set up and progress reports being reviewed so that the education system is relevant to the new economy and challenges facing Singapore and the world. Subsequent initiatives saw the 'Teach Less and Learn More' concept that opens up more space for students in school to develop more holistically particularly in the area of innovation and enterprise and social and emotional learning.

With the new approach towards learning was the decentralization of autonomy and resources to schools, greater recognition for new initiatives and peaks of excellence in schools, greater room for different strategies and delivery of curriculum and instruction and the use of technologies and interactive media, professional development of teachers and with this were many pathways for upgrading, incentives and reward systems put in place to retain a generally very young teaching force. In the same vein, resources and attention have been given to improving and reforming teacher education and professional development of teachers. Thus at the National Institute of Education (NIE) that produces the bulk of teachers for schools and that meets the in-service and professional development needs of teachers has received substantial resources towards these ends. NIE also plays a major role in research that informs school education. This new emphasis on evidence-based research in education saw the establishment of the Centre for Research in Pedagogy and Practice (CRPP) and the Learning Sciences Laboratory (LSL) at NIE where generous funding from the Ministry of Education has been given the past five years and for the next five years.

1.3 Economy

Singapore rose from a colonial entre port in the centre of Southeast Asia under the British to a modern city state that it is today. With very little natural resources and limited land, the continuation of its status as a free port would not have been able to sustain let alone propel the country to greater economic developments. Industrial development was seen as the engine for economic growth and job creation, and in the early years heavy industries were the main focus of attention. As a consequence the Jurong Industrial Zone was created to attract investments in heavy industries. Large flows of foreign investments in subsequent years saw the focus of industrialization moving to high value add industries in the late 1970s and 1980s and

less labor intensive ones. In the 1990s increasing demands for electronic goods saw Singapore capitalizing on its competitiveness. During this period too Singapore strategized to modernize industries and services, develop its human and intellectual capital, improve infrastructure, acquisition, production and application of ICT in manufacturing and services, and promote growth of government-linked companies with a global reach. Though there were periods of economic downturn and severe challenges Singapore's economy has been quite resilient and recovery has also been quick after each downturn. In general unemployment is low. With a stable government and stable currency the economic development of Singapore has seen steady progress. Today, Singapore economy is supported by manufacturing, trade, tourism and the increasingly important role played by financial and other services. It strives to be the regional hub in other areas such as education, health and biomedical sciences as well as the media industries.

Through its good governance, well planned economic growth and holistic urban development Singapore has become an affluent society with per capita GDP is S$52,994 (US$35,000).

2. SUSTAINABLE DEVELOPMENT: POLICY AND KEY CHALLENGES

Singapore is very much aware of its limited resources, the high rate of economic development, high population in an island state of very small size. When comparing its economic and urban development and what it has achieved and hopes to achieve in future with the resources available, Singapore is an enigma. By most standards of measure, its growth is unsustainable. It is land-scarce, water-short and energy-poor in a context of high consumption of these resources. For Singapore, these issues are not merely crucial for its sustainability of development but its survival.

Within the last 43 years of its development much of Singapore's landscape has been transformed and in the process of development environmental issues had been a cause of concern and provoked much debate. But it has been clear from the start that economic development in the earlier years was directed towards providing basic infrastructure and fulfilling basic needs and making Singapore viable as an independent state. The need to balance environmental and conservation concerns with economic and urban redevelopment was recognized very early in Singapore's development (Tan et al., 2009). However, in later years, with greater affluence, the well-being of the environment as part and parcel of cityscape and urban life has very much been integrated in urban planning such that Singapore today is more successful as an eco-city than many of its counterparts within Southeast Asia.

The vision of Singapore's environmental management and protection programs was conceived in the Singapore Green Plan, released in 1992, covering the period 1992-2001, which involves, among others, creating a city conducive to gracious living, with people who are concerned about and take a personal interest in the care of both the local and global environment (The Singapore Green Plan – Action Programmes, 1993, Ministry of the Environment). The Plan identified public education as a key strategic direction that had to be addressed if this vision was to become a reality.

> *"For the Green Plan to succeed, we will need the strong support, commitment and participation of Singaporeans from all walks of life. The man in the street can, and should, through his simple, everyday actions, help to translate the*

vision under the Green Plan into reality" (Mah Bow Tan, Minister for National Development, quoted by Teo, 2004).

The Singapore Green Plan provided the basis for the Singapore Green 2012 or SGP 2012 that was crafted in 2002 and the revised 2006 edition of the same. For this discussion, the Singapore Green Plan 2012 (2002 and 2006 editions) will be referred to.

The SGP 2012 addresses several issues and sets targets for each of them as summarized in Table 1.

The ambient air in Singapore is generally good except for the occasional hazy skies. This ability to maintain clean air quality is attributable to the policy and strategy in the management of air pollution as well as its implementation with regard to the sources of those emissions within its borders. Targets have been set to reduce emissions further by 2012. However, the challenge is the occasional but severe smoke haze episodes that result from forest burning from outside its borders particularly from Indonesia. In this respect Singapore has been working with its neighbors directly as well as through ASEAN to tackle trans-boundary air pollution.

The Plan also addresses the issue of climate change by mapping out strategies to promote the use of clean energy, energy efficiency and reduction of CO_2 emissions in the various sectors. A more detailed report on this is addressed in the Singapore's National Climate Change Strategy, 2008 (2008).

Water is in short supply within Singapore but the shortfall since colonial days has been made up through imports of water from Malaysia through long-term treaties. However, spates of friction between the two countries have challenged Singapore to find alternative sources and reduce dependence on imports. Singapore currently consumes 1.4 million m^3 of water per day. Diversification of sources of water includes expanding the catchment area from the current 50% of Singapore's land area to 67% (this will increase further in the years to come) to include urban runoff collection, desalination and water reclamation from waste water known as NEWater. Measures in place do not only address supply issues but also demand management, conservation and reduction of water consumption as well (Goh, 2003, 2005). Domestic per capita consumption has been reduced from 165 litres d^{-1} in 1999 to 160 in 2005 but the target has been set in the SGP 2012 to lower consumption to 155 litres d^{-1}. In tandem with this target various measures at reduction of water usage, public awareness by conveying the water conservation messages to the public will also continue.

Singapore is making concerted effort at wastes reduction. Four strategies to deal with wastes are to reduce the volume of waste through incineration, reduce the volume of waste sent to incineration plants through recycling, cutting down the volume of waste sent to landfills, and cutting down the volume of waste generated through waste minimization. The amount of waste Singapore is incinerating is declining, from 2.31 million tonnes in 2003 to 2.26 million tonnes last year (2002). The overall recycling rate is up. The attempts taken have resulted in reduced wastes generation and greater recycling overall from 40% in 2000 to 49% in 2005. From schools the amount of recycling is up from 30% in 2003 to 50% in 2004; from households from 45% to 54%; and from condominiums from 20% to 34% in the same period.

Table 1: Some of the targets set in the updated SGP 2012 (Source:** Chew, Valerie **written on 2008-10-20, National Library Board Singapore - http://infopedia.nl.sg/articles/SIP_1370_2008-11-22.html, 5 Feb 09)

Focus Area	Selected Targets
Air and climate change	• Maintain the Pollutant Standards Index (PSI) for ambient air within the "good" range for 85% of the year and within the "moderate" range for the remaining 15%. • Reduce the ambient Particulate Matter 2.5 (PM 2.5) level to within an annual average of 15µg/Nm^3 by 2014.
Water	• Increase catchment areas to 67% of Singapore's land surface. • Increase the supply of water from non-conventional sources, such as desalination and water reclamation, to at least 25% of Singapore's water demand. • Reduce per capita domestic water consumption to 155 litres a day by 2012.
Waste management	• Increase the overall waste-recycling rate to 60% by 2012. • Extend the lifespan of Semakau Landfill to 50 years, strive towards "zero landfill" and "close the waste loop".
Conserving nature	• Establish more parks and green linkages. • Set up a National Biodiversity Reference Centre.
Public health	• Increase community ownership to sustain a high standard of public health. • Maintain low incidence of vector-borne and food-borne diseases.
International environmental relations	• Intensify collaboration with partners at regional and global levels to tackle environmental challenges.

All 21 Jurong Town Council flatted factory industrial estates in Singapore now have a waste recycling programme, and the National Environmental Agency (NEA) is working on extending the collective recycling system to other smaller factories and workshops.

In all, these efforts have helped cut down on the waste going into the landfill. In a land-scarce country Singapore cannot afford to have more landfills. However, with decreasing

waste production and greater recycling, the lifespan of the existing landfill at Semakau has risen by a decade to 2040 and the need for additional incineration plants has been reduced from one in every 5-7 years to one in every 7-10 years. The target in the SGP 2012 is to increase overall waste recycling to 60%, extend the Semakau landfill lifespan to 50 years, and strive for 'zero landfill' and close the waste loop; and reduce the need for incineration plants to one in every 10-15 years.

Going forward, Singapore is targeting for 80% of schools to have recycling programmes by the end of 2005, up from the current 50%. Piloting is being tried on a regional recycling scheme to serve clusters of private condominiums and apartments to encourage even more people to recycle their waste.

Much of Singapore is developed but there are tracts of primary and secondary rainforests particularly in the Bukit Timah and Central Catchment areas, with some pockets of wetlands and mangroves in the coastal areas such as the Sungei Buloh Wetland Reserve. The competing uses between land for economic development and preserving natural vegetation is a challenge for a small country like Singapore. The government, working through its agencies such as the National Parks Board, and with NGOs, like the Singapore Nature Society, has been cognizant of the need to balance these competing needs to ensure that Singaporeans enjoy the natural environments and flora and fauna around them. Through the Nature Recreational Masterplan, core areas which are rich in biodiversity have been marked out for conservation and research only. In the SGP 2012 attempts are being made to establish more parks and green linkages, keep nature areas as long as possible, monitor and up-date biodiversity information, promote nature awareness and education, and set up a National Biodiversity Reference Centre.

In the area of public health Singapore's urban environment has emphasized cleanliness and sanitation, and this is evident all around. However, the urban environment, if left unchecked, can also encourage the spread of vector diseases such as dengue fever due to the breeding of mosquitoes. This problem constantly monitored through house inspections, public awareness and legal means. In the SGP 2012 engagements with the community are aimed to increase its ownership to sustain a high standard of public health, increased control of vectors and prevention of vector-borne diseases, and monitor and improve Indoor Air Quality in public places.

In the area of environmental challenges, the need to work with other neighboring countries within the ASEAN framework is very important and urgent, especially when there have been frequent episodes of trans-boundary transfers of pollutants that have far reaching economic and health implications. Also, with greater collaboration there is greater ease of exchange of information, technologies to address specific concerns and research, as well as in providing resources for capacity building and conservation efforts. The SGP 2012 addresses issues such as relations enhancements between Singapore and the international community through international environmental agreements and collaborations (See Appendix A), capacity building through sharing Singapore's environmental experience in contributing towards global sustainable development, industry partnership and community partnership - the latter with the view of promoting greater awareness of environmental issues among the youths.

3. CLIMATE CHANGE

3.1 Policy and Key Challenges

Singapore was a signatory to the United Nations Framework Convention on Climate Change (UN FCCC) in 1992 but it was in 2006 that Singapore became the 168th country to adopt the Kyoto Protocol. For a long time Singapore has been ambivalent on the issue of climate change and the obligations it has on the country to reduce greenhouse gases, which Singapore was deemed to be a high contributor per capita. Singapore's policy of economic growth first has relegated issues of climate change to one of lesser importance (Hamilton-Hart, 2006). However, in 2006 Singapore made its stand clear in light of scientific evidence of climate change and global warming. The 2006 Singapore Green Plan describes climate change as "now looked upon as one of the most pressing environmental challenges of the global community" and "Singapore intends to engage in the ongoing international debate on how to manage greenhouse gas emissions in a manner that is not harmful to economic growth." (MEWR, 2006).

Issues of climate change and sea level rise due to carbon dioxide emission have now come to the fore of public debate with the leadership in Singapore discussing them in different local and international forums. For example, Minister Mentor, Lee Kuan Yew in no uncertain terms highlighted the inevitability of climate change and that Singapore and the world must prepare themselves for more adaptations than pushing back climate change. One way that could be encouraged in Singapore is to address the problem of excessive energy consumption caused by the widespread use of air conditioners (Straits Times, 3 Dec 2008). At the Singapore Energy Conference 4 Nov 2008 held in conjunction with the inaugural International Energy Week Minister Mentor Lee again emphasized the need for Singapore to stay green and clean. This is important not just to maintain its status as a clean, green city, Singapore "will lose business and lose our extra premium for being an unusual city." On the issue of why Singapore has not joined the list of countries that have pledged to cut carbon emissions by an average of 5 per cent from 1990 levels by the year 2012, Minister Mentor Lee responded that Singapore's carbon footprint per capita is low and that as a small economy it is economic for Singapore to take these high carbon footprint industries which the more developed countries do not want, and then Singapore exports the products. But Singapore may not need to rely on these sectors in the future if diversification into high-tech industries pays off.

The Prime Minister in Sep 2008 in a dialogue reflected on the difficulty of tackling the problem of climate change which is a tricky one for leaders. He said,

> "*It is a long term issue, yet societies were not set up to deal with problems 'that have 100-year time spans.' In addition the solutions are neither cheap nor painless: the remedies to this problem also take 30 or 100 years to get moving." (Straits Times 10 Sep 08)*

Singapore has the largest emission of greenhouse gases on a per capital basis in the world. This rough index masks the fact that Singapore is a manufacturing base for multinational corporations here. Minister Mentor Lee explains that this large index was not due to population using it, but rather the world population because the world market is using Singapore through these multinationals to produce the emissions. With the prospect of moving from big bulky industries to smaller ones such as electronics, pharmaceuticals, and more and more into services, he opined that the ratio will go down (Straits Times 25 Apr 07).

Deputy Prime Minister Jayakumar explains (Straits Times 22 Jan 08) that Singapore has laid out guiding principles with regard to post-2012 climate change deal. One of these is to support plans to fight smoke haze and reduce emissions from the razing of forests.

A 10-year roadmap for Singapore to grow its economy in an environmentally sound way was rolled out sometime last year (2008). The aim was to make Singapore the leading eco-city in Asia and will look at green solutions in transport, housing and industry. There is also a recently formed committee on sustainable development chaired by the Minister for National Development and Minister for the Environment and Water Resources. Singapore has adopted principles of sustainable development from the late 1980s in its nation building, but the Singapore way of sustainable development was not out of choice but necessity, because of its small size and scarce resources. Now Singapore's strength is seen in its integrated township planning and maximizing land use as well as breakthroughs in water and waste management. In all these efforts environmental considerations should not be at the expense of economic growth. Singapore has also formed another inter-ministerial panel on climate change (Straits Times, 29 Feb 08).

On 26 Sep 07 Minister Mentor Lee at the inaugural Singapore Maritime lecture indicated that with the prospect of melting ice caps and sea level rise, Singapore has already engaged the Dutch to teach it how to build dykes.

In a response to a letter in the press, Director (Strategic Policy) Ministry of the Environment and Water Resources stated that Singapore has set a national target of reducing the carbon intensity (carbon dioxide emissions per dollar of GDP) by 25 % from 1990 to 2012. This ensures that as Singapore develops the carbon intensity is lessened, thus balancing the economic and environmental goals of sustainable development. It has put in place a range of policies and measures to reduce carbon dioxide emissions. Promoting energy efficiency and encouraging the use of less carbon-intensive fuels in different sectors of the economy, such as industry, buildings and transport are strategic priorities for Singapore. The government has committed $350 million towards research and development, test-bedding and pilot projects in clean energy.

A major study has been commissioned by the government to look into how global warming and climate change will impact Singapore. The two year study aims to better understand what the possible long term effects could be. The study is being conducted by NUS's Tropical marine Science Institute (Straits times, 7 Mar 07). However, back in 1992 Wong (1992) had studied the possible impact of sea-level rise on the coast of Singapore pointing out the impact on natural coast, reservoirs and drainage.

In recognizing the importance of climate change and its impact on Singapore, the Singapore's National Climate Change Strategy report has been produced in Feb 2008 (2008). This report presents Singapore's current and future efforts to address climate change in vulnerability and adaptation, as well as mitigation of greenhouse gas emissions (Singapore's National Climate Change Strategies, 2008).

Singapore as an island state is vulnerable to climate change and the potential impacts will include the following:

a. Increased flooding
b. Coastal land loss
c. Water resources scarcity
d. Public health impact from resurgence of diseases
e. Heat stress
f. Increased energy demand
g. Impacts on biodiversity

Flooding had affected several areas of Singapore but the development of drainage infrastructure over the last three decades has largely solved these recurring problems. However with an anticipated rise in sea level by 59 cm the vulnerability to flooding will increase. In anticipation of this since 1991 the Public Utilities Board (PUB) has made it mandatory that new reclamation projects to be built to a level 125 cm above the highest recorded tide level.

Sea level rise will impact coastal land areas and currently 70% to 80% of Singapore's coastal areas have hard wall or stone embankments, which help protect against coastal erosion, the rest are either natural areas such as beaches and mangroves. Some of the recreational areas such as East Coat park, Sungei Buloh, Pasir Ris park, West Coast park, and Sentosa will be especially affected by coastal erosion due to sea level rise. Measures will be taken to strengthen revetments and reduce coastal erosions and land loss as and when the need arises.

Singapore is diversifying its water sources and one of the major supply sources is the construction of coastal reservoirs protected from the sea by barrages. A significant increase in sea level can cause sea water flowing into such reservoirs or sea-water intrusion. However, this is unlikely to happen as the reservoir dams are much higher than the projected rise in sea-level and the gate structures can be raised. One concern with climate change is the change in rainfall patterns and a decrease in rainfall may affect the capacity of water stored in the reservoirs. However, this could be mitigated by other sources of supply including NEWater and desalination.

The inherent urban heat island effect of Singapore's climate and warmer temperatures brought about by global warming would significantly increase heat stress and therefore the use of air-conditioning and energy consumption. One way which has been ongoing is to increase the amount of greenery in the city and rooftops, using building materials with better thermal properties, lighter tonal building surfaces, layouts and maximizing wind and ventilation effects. In fact, Singapore prides itself as a city in the garden, and this deliberate policy of urban development has caught the attention of other cities that want to model their development after Singapore eco-city concept. Singapore's aim to be a "city of gardens and water." On the Prime Minister's visit to Guangzhou, Nanning and Chengdu, China he noted all three cities have been beautified. "They have seen what Singapore has done and want to try to do the same." (Straits Times, 6 Nov 06)

Increased energy demand through the use of air-conditioning in homes and buildings must be curtailed through greater energy efficiency in buildings. Already under the Building Control Act, air-conditioned buildings must be designed with a high-performance building envelope that meets the prescribed Envelope Thermal Transfer

value (ETTV), currently set at 50 W/m^2. A study is being conducted to review the ETTV standards and to apply these to residential buildings. From 2008 buildings are awarded BCA Green mark rating based on energy efficiency, water efficiency, site/project development and management, good indoor environmental quality and environmental protection, and innovation. Points are given for each of the categories. Apart from achieving the minimum points in each rating scale, the project has to meet all requirements, and score a minimum of 50 per cent of the points in each category, except the innovation category (Table 2).

Table 2: Green Mark Award rating (Source: Singapore's National Climate Change Strategy 2008)

Green Mark Points	Green mark rating
85 and above	Green Mark Platinum PLUS
80 to < 85	Green Mark Gold
70 to < 80	Green mark Gold
50 to < 70	Green mark Certified

Public health issue is of concern to Singapore in the context of rising global temperatures. Vector borne diseases such as dengue is endemic and occurrences of deaths have taken place and studies are being undertaken to determine the links between dengue outbreaks and climate factors such as temperature, humidity and rainfall. Steps have been taken to control breeding of mosquitoes and hence suppress its population.

In terms of marine biodiversity the loss of mangroves concomitant with a rise in sea level will lead to a loss of biodiversity as well as coastal land devoid of natural protection from erosion. A rise in sea temperatures will also endanger marine life through coral bleaching. The National Parks Board (NParks) is studying the role of Singapore's nature reserves in carbon sequestration and is monitoring long-term tree diversity, growth and survival in study plots. The role of corals in the southern islands, both for sequestering carbon and mitigating storm damage and erosion is also being monitored. A coral nursery has been established off Pulau Semakau.

3.2 Mitigation Efforts

Climate change actions are deemed to have economic benefits and in Singapore these can be reaped in the areas of power generation, industry and transport sectors which can help to reduce air pollutants thus creating a better environment for the people. Climate change actions generate economic opportunities by reducing energy consumption costs with greater energy efficiency in various sectors.

The report has outlined mitigation efforts in different sectors. The first area is energy use and green house gas emissions. Singapore is a city state with energy intensive economy for the manufacture of produce for the world market. On per capita basis Singapore is deemed a serious polluter but this index masks the role played by industry in producing goods for export. A better index is gas emissions on GDP basis. On the basis of CO_2 per dollar GDP Singapore produces less than the world average (IEA). Measures will be taken to reduce GHG emissions through increasing energy

efficiency, using less carbon-intensive fuels, and increasing carbon 'sinks' such as forests. In some ways Singapore has already carried out these measures through the use of natural gas for electricity generation instead fuels. Currently 78% of the electricity produced is generated by natural gas using highly efficient combined cycle technology, one of the highest in the world. Its policy of not subsidizing energy costs has caused consumers to be energy efficient, and this together with other past measures have led Singapore's energy intensity to improve by 15% between 1990 and 2005. of not subsidizing energy costs has caused consumers to be energy efficient Singapore supports APEC 's aspiration of a reduction in energy intensity of at least 25% by 2030 from 2005 levels. In this area of improving energy efficiency and renewable energy, funds have also been allocated to invest in research and development test-bedding to improve their performance and cost-effectiveness.

Singapore has undertaken large areas of land reclamation from the sea to increase its land size as well as land bank for future developments. The minimum heights of reclaimed land set prior to 1990 help protect Singapore from the effects of rising sea levels. In 1991 PUB had set the minimum platform levels for new reclamation projects at 125 cm above the highest recorded tide, to "ensure proper drainage of the reclaimed land." (Straits Times, 26 Feb 07). This means that areas such as Changi East and the Tuas View extension will be able to cope with even the highest sea level rise of 59 cm, as projected by UN IPCC. Other measures range from land loss and flooding, to the impact on Singapore's water resources. However, Singapore has the financial resources to protect its developed lands, and it will be able to carry out effective adaptation plans (Ng & Mendelsohn, 2006)

The strategy paper points out that for Singapore – a tropical island city state – issues like warming temperatures and rising sea levels are real concerns requiring anticipatory measures. It was launched last April along with Singapore's signing of the Kyoto protocol, an international agreement to curb pollution by reducing gas emissions from various sources, including air conditioners, cars and large coal-fired power plants. In anticipation of sea water being able to get into reservoirs, there are plans for more steel plates in tidal gates.

An on-going two year study by the National Environmental Agency (NEA) – the first of its kind here – is looking at the possible impact of climate change, including changes in the rainfall patterns, sea levels and possible extreme weather conditions, and to identify strategies to help deal with the problems.

Inter-agency task forces, like those previously formed in response to dengue and the haze, will be formed to deal with 'likely scenarios arising out of climate change.'

On energy efficiency, the NEA will implement a mandatory energy-labeling scheme for air-conditioners and refrigerators by middle of 2007 (Straits Times, 8 Mar 06). This aims to let consumers know the energy consumption levels and efficiency of these appliances. The voluntary scheme introduced in 2002 was limited in its usefulness to consumers as only 121 air-con and 77 fridge models were labeled by Jan 2006. Therefore, NEA is making the scheme mandatory. It is also studying the possibility of extending the scheme to other appliances.

One of the main energy consumers is transport. From its early beginnings Singapore has emphasised the use of public modes of transport as the main mode of urban

transport. This is in contrast to many other Southeast` Asian cities which favour private modes such as the use of the private car (Ooi, 2008). There is greater urban mobility that is comparable to cities in Europe because of this policy. The public transport system is well-organised relying much on public bus as well as mass rapid transport system connecting teh entire island. While private car ownership is allowed, it has been well regulated and managed by the transport authorities. By making it mandatory for car purchases to have certificates of entitlement (COE) first the number of cars on the road is regulated, and by levying charges for use of roads in central business districts by through the electronic road pricing system during peak hours congestion in those areas is prevented.

Singapore introduced its Area Licensing Scheme in 1975 which required`cars to pay a fee to enter and use roads in the central business district during peak periods of the day. This scheme has since been replaced by the Electronic Road pricing scheme in 1998. Electronic gantries are constructed at the entrances of roads for which vehicles have to pay a fee to use.

The city-state of Singapore, wich is by far the most urbanised among the Southeast Asian countries, is also the highest consumer of electrical energy. In the process, Singapore is also among the largest emitters of carbon dioxide.

Table 3: Carbon pathways in SEA (Source: Wolrd Bank data 1999) (Geh Min & Ooi, 2007)

Country	Electricity Use (kWh per capita)	CO_2 Emissions (metric tonnes per capita)
Singapore	7,196	21.6
Malaysia	2,078	5.6
Indonesia	296	1.2
Thailand	1,289	3.4
Philippines	405	0.9
Vietnam	177	0.5

Singapore's income growth and development have been fuelled by increasing levels of energy consumption. While the policy framework for urbanization and urban expansion needs to focus on de-carbonization, few cities and national govrenments in the region are seriously addressing the issues of high carbon emissions. A policy framework that is aimed at de-carbonization would comprise the following measures:

- Use of renewable energy resources
- Energy efficiency
- Urban Redevelopment
- Public and Mass transport system
- Expansion of green spaces

Singapore is perhaps best positioned to take the lead in the concerted effort to reverse high energy consumption and carbon emissions. Its powerful engine of effective government, efficient bureaucracy and displined population which has led the country to achieve success economically, can do the same for a more environmentally sustainable

future, through greater energy efficiency, the use renewable sources of energy, and lower carbon emissions.

Its high level of economic development, urbanisation and industrialisation which has resulted in her equally high levels of energy consumption and CO_2 emissions should not be regarded as an insurmountable obstacle (Geh & Ooi, 2007). Instead, the fact that it is further down the road of unsustainable high energy consumption means it is more likely to see many of the problems and perils that lie ahead and also better equipped to handle them.

Singapore, as a small city-state, is acutely aware that its survival depends on achieving environmental sustainability. Under the Singapore Green Plan 2012 or SGP 2012, targets have been set that are spread across the focus areas of clean air, water supply, waste management, public health, nature conservation as well as international collaboration, to sustain a quality of living environment that would endure for generations to come (Yaacob Ibrahim, Minister for the Environment and Water Resources, 14 Oct 2004).

The community's efforts are also important in helping Singapore close the water loop. Conserving water and caring for our waterways and water catchments requires the cooperation of all. On a per capita domestic basis, the water consumption has dropped from 165 litres/day in previous years to 162 litres/day in 2004. The target is to reduce to 160 litres/day, an achievable target.

In engaging youth fostering environmental volunteerism is being encouraged. The NEA has begun to build up a network of environmental champions among students to reach out to their peers. To date, NEA has trained some 470 student champions, from 82 primary and 58 secondary schools. Some of them have begun to give environmental talks in their schools to encourage their fellow students to adopt good environmental practices, such as recycling and checking for mosquito breeding in their homes.

While cities like Singapore, might have implemented planning norms as well as policies that are aimed at addressing rapid urbanization, the city population has not been fully participatory in a programme of environmental management that has been largely state-driven and state-led. In other words, citizens in Singapore have not necessarily been inculcated behavioural norms that are important in putting cities on far more sustainable growth pathways than they have been in the past. These are norms concerned about the reduction of consumption of materials and energy as well as the simplification of urban lifestyles to achieve such a goal. The importance of addressing such issues through education of the young cannot be overemphasized.

4. THEME 1
ESD - overall conception

Education for sustainable development is highly debated and contested and it means different things to different people depending on their orientations and concerns (e.g Sauve, 2002; Bonnett, 2002; Fien et al., 1997). Even the meanings of sustainable development and sustainability remain a nebulous concept that is variously defined, debated and deconstructed (Higgit, 2006). Although ESD may look new relative to

environmental education, the distinction between the two is far from clear cut (Summers, et al., 2003), and this is true of the education system in Singapore.

Key statement from UNESCO where the importance of education in relation to sustainability is emphasized:

> *The potential of education is enormous. Seen as social learning for sustainability, education can increase concern over unsustainable practices and increase our capacity to confront and master change.*
>
> *Education not only informs people, it can change them. As a means for personal enlightenment and for cultural renewal, education is not only central to sustainable development, it is humanity's best hope and most effective means in the quest to achieve sustainable development.(UNESCO, 2002: 8)*

Singapore as a small nation but economically significant and highly exposed to international trade with a strong unitary government is different from many countries of the world. As such, it is highly sensitive to the challenges it faces to remain competitive. While in principle the policy of the government towards the environment and ESD is very much in line with the statements from the world bodies, it's interpretation and translation in the national context is often determined by national priorities, challenges, interests and constraints. Very often ESD is understood more as EE and environmental concerns are often incorporated into development and urban redevelopment. However, when compared with issues such as racial harmony, Singapore having to be self reliant and able to overcome constraints, and national rootedness, education very often is 'used' to achieve these socio-economic-political aims through what is termed the National Education, at all levels of the education system. In this regard, National Education has a much higher profile than ESD in the education system and the curriculum. Even when ESD topics are discussed in the curriculum, they tend to gravitate to topics that are relevant to and have direct impact on Singapore while the wider environmental issues facing other parts of the world are given much less emphasis. Another reason for this specific national orientation of ESD is due to the issue that is introduced earlier – the contestation of the term itself which gives rise to different interpretations and implications.

There are no policy documents that spell out what and how ESD should be incorporated in the curriculum and taught in the schools. Very often there is greater synergy and alignment of understanding and purposes where issues that affect the nation are concerned. Environmental issues are within the purview of the Ministry of Environment and Water Resources. Taking water as an example, Singapore is dependent on foreign sources of water supply for almost 50% of its daily needs and this dependence has its strategic implications. As such it is an issue of top priority. The Ministry of Education thus understands that this issue is important for its citizens to appreciate and hence it is incorporated within the curriculum especially in Social Studies, Sciences, geography and Civics and Moral education where pupils from a young age are imbued with the sense of valuing water and thus helps to reduce consumption, appreciating how Singapore is trying to diversify supply internally to reduce dependence on foreign sources, and how in overcoming the challenges Singapore was able to develop a water management system that is a model to many countries and is able to make contributions to other nations.

5. THEME 2

Education for Sustainable Development (ESD) and Sustainable Development (SD); Climate Change Education (CCE) and Climate Change (CC):
The role of education in relation to the challenges of sustainable development and climate change respectively

Most of the issues dealt with in ESD, SD, CCE and CC are captured in the Singapore Green Plan 2012 (2002) and its revised (2006) edition, and Singapore's National Climate Change Strategies, 2008. These are documents that spelt out what the Ministry of the Environment and Water Resources saw as the challenges Singapore will face from now till 2012 as well as their mitigation efforts. However, even within the Singapore Green Plan 2012, the issue of education for sustainable development and for that matter in the other areas are inferred more in the informal areas, little mention is made of the need to incorporate in the school curricula such issues, mainly because to do so would have encroached into the purview and territory of another ministry. It is left to the Ministry of Education to deliberate and consider how much to incorporate those sustainable development and climate change issues into the curricula at all levels of education. The documents by the MEWR also indicate the desire to see greater awareness of these issues through participation in co-curricular activities of school children in projects organized by MEWR and non-governmental organizations. If the level of awareness and understanding of these issues is to be increased, then the education system must necessarily work together with MEWR to ensure that these objectives are met. This is not the case at the moment, where issues regarding SD and CC are deliberated and decided by committee appointed by the Ministry of Education to select topics and themes to be included in the syllabuses at the primary, secondary and junior college levels of education. Having said the above, while SD has been in public and education discourse for some time, discourse on CCE is very recent phenomenon and therefore there is a need for greater deliberations before some semblance of CCE could be finalized, incorporated and implemented in the curriculum.

Going by past experience this understanding of SD and CC is not widespread and is reflected in a survey conducted by the media. For example, the level of awareness, understanding and the role of the public in mitigating climate change is limited. From a survey reported in the media 50% of the respondents in Singapore know nothing about climate change or global warming. To address this The National Environmental Agency together with the Singapore Environmental Council rolled out a public awareness program in April 06. Targeted at households and motorists, the program aimed to raise awareness of the link between climate change and energy conservation.

6. **THEME 3**
EDUCATION FOR SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE EDUCATION
Relationships between Education for Sustainable Development and Climate Change Education.

As indicated earlier much of the discourse on SD is connected with EE and this is well reflected in the curriculum in schools in Singapore. However, CCE is a new concept and given the interconnectedness of the issues and challenges Singapore as a small island state encounters it would not be wrong to conclude that they will be dealt with within the EE as conceptualised currently. A detailed report could be seen in the next section.

There is a need for Singapore to re-examine in a more focused way the trend towards greater understanding of education for sustainable development as well as climate change education. The Ministry of Education through its Curriculum Planning and Development Division has various committees to revise and refine its curricula in the various subjects such as geography, social studies, humanities and the above issues reside in these subjects. A deliberate effort needs to be made to ensure that education for sustainable development and climate change education be given greater emphasis, not just under the broad theme of environmental education.

Also, two days ago, the national report of the Inter-ministerial Committee on Sustainable Development was unveiled and the issues raised would be useful topics to be incorporated in the revision of these curricula.

7. Theme 4: ESD and the Curriculum

7.1 ESD and the Formal Curriculum:
Including evaluation, assessment, success-criteria, and the question of the relationships between ESD and the (academic) disciplines.

Much of the following discussions under formal education, community-based environmental programmes and nature learning camps comes from Tan, et al, (in press). The mission of the Ministry of Environment and Water Resources (MEWR) is to sustain a clean and healthy environment and water supply for all in Singapore (MEWR, 2004). Focusing on pollution prevention and the sustainable use of resources, the MEWR seeks to raise public awareness of issues related to air pollution, solid waste management, water resources and waste water treatment, energy conservation and efficiency, and climate change. Besides campaigns and educating the general public though public education programs, another means of increasing public awareness of the environment is through formal environmental education (EE) in schools. Awareness must be based on correct knowledge that may in turn influence attitude and behaviour of the young people towards the environment at present and as adults. They should be nurtured to act beneficially towards the environment. Thus, the EE of young people, including children, is of utmost importance, as it is a proactive movement to ensure sustainability of resources and formulation of innovative solutions to environment problems. In Singapore, EE in both the primary and secondary levels is generally incorporated into science and social science subjects, as well as in civics and moral education. The emphasis is on students acquiring knowledge and understanding of the environment and developing a sense of responsibility for the environment (Curriculum Planning and Development Division [CPDD], 2005a).

7.1.1 Primary Level (ages 7-12)

Social studies as a subject is studied by all students in primary and secondary schools. At the primary level, only at Primary 3 and Primary 6 will students have explicit contact with education for sustainable development. At Primary 3, one of the key understandings is ”Pupils will be able to understand how people adapt to and utilize the environment,” while at the Primary 6, one of the key understandings is ”Pupils will be able to understand how people adapt to and change their environment.” While the understanding of these principles is important, the examples used are Singapore-centric focusing on resource constraints to the nation. For example, in the Primary Three (age 9) syllabus, the students learn how Singapore meets her needs in terms of food, water,

housing and fuel, and are exposed to the concepts of conservation, scarcity, needs and wants, land use, constraints faced in the allocation of resources, and the need to show care for the environment. In an activity on saving water (CPDD, 2006a), students have to determine how water is used at home by themselves and their family members, to evaluate if the water is used wisely, and to discuss with their family members ways to conserve water. This is to enable them to realize that they can make a difference, even as children, and can have an impact on saving the environment. The emphasis on constarints is also part of the drive to enhance the understanding of National Education (similar to citizenship education) in order to nurture pride of being citizens of a nation that has achieved trmendous success despite the constraints, and that, as Singaporeans, they themselves will defend the country and determine their future. In neither case is the issue on Climate Change explicitly spelt out in the syllabus document. Indeed, the content at primary Social Studies focus on land-use rather than environmental management as such. However, the big ideas of the human-environment interaction and stewardship are clearly included in the syllabus.

The above relevant concepts are further explored in civics and moral education where students discuss what they appreciate about the environment, why they need to care for the environment, and what they can do to care for, protect and conserve the environment (CPDD, 2006b). In the topic, Protecting the Environment, in the upper primary (ages 10-12) civics and moral education curriculum, students learn that to continue living in a healthy environment, they need to protect the environment, as the damage is irreversible. They are encouraged to examine the products that they use in their everyday lives and consider if these have adverse effects on the environment, find alternatives if they do, and be involved in recycling activities. However, while this reinforcement of environmental issues are made in the civic and moral education curriculum, the fact that it is a moral education programme located within the mother tongue subjects would not allow the environmental issues to be taught by teachers who are knowledgeable about the subject, unlike social studies where the many of the teachers have geography background or science where teachers have the necessary understandings of environmental issues through their subject mastery in biology or chemistry.

The theme of care and concern for the environment is also taken up in primary science where students continue to learn about the interactions between people and the environment, with an emphasis on science and technology. For example, students will discuss positive and negative impacts that humans have on the environment in the section on Interactions within the Environment; the importance, uses and conservation of energy, in Energy; and the water cycle, the impact of pollution on the earth's water resources and the need to conserve water, in Cycles (CPDD, 2007a).

7.1.2 Lower Secondary Level (ages 13-14)

The concepts introduced in the primary level are revisited in greater breadth and depth in the lower secondary geography, social studies, civics and moral education, and science curricula. Two of the objectives of the geography curriculum are to "develop an informed concern about the quality of the environment and the future of the human habitat; and thereby enhance students' sense of responsibility for the care of the Earth and its people [and a] sense of appreciation and responsibility for the quality of the environment" (CPDD, 2005b, p. 1). In Secondary 2 (age 14), in Managing the Changing Environment, students learn about the "impact of human activities on the environment at

local, regional and global scales [and to] justify the need for protection and conservation of the environment at different levels" (CPDD, 2005b, p. 14). They will discuss Singapore's land constraints and the tension between land clearance and reclamation and the need for the conservation of nature reserves and marine habitats in Singapore as the human population increases. Other topics related to EE include how Singapore has responded to its water supply constraints, implementation of pollution control, and how global warming and climatic change affects the country. In the topic of Pollution and its Effects in social studies (CPDD, 2006c) the haze caused by forest fires in Indonesia and its impact on neighbouring countries such as Brunei, Malaysia, the Philippines, in addition to Singapore, and how regional cooperation is necessary to reduce the haze problem are discussed. The students would have personal experiences of the haze episodes which would have had great impact on them and concretize the global nature of pollution for them.

In the lower secondary Social Studies syllabus, there is an entire topic on "Caring for our Environment". The aims of the unit are to develop student attitudes in "responsibility, commitment, as well as, care and respect for the environment". To achieve these, students have to be able to "explain the causes and effects of environmental problems; and describe ways to manage the environment effectively". The content of the unit revolves around land, water and air pollution. While there is no direct mention of climate change as an issue, ESD is delivered through this topic. The values are similar to those for responding to climate change. However, the skills prescribed in the lower secondary Social Studies syllabus stop at just explaining and describing. Unlike the lower secondary Geography syllabus, there is no suggestion for evaluation or assessment as skills required in ESD. Nevertheless, the lower secondary Social Studies syllabus is tailored for academically weaker students in the Normal (Technical) stream. This might be the reason for the exclusion of higher order cognitive skills such as evaluation.

The issue of climate change is featured in the concluding unit of the curriculum. Apart from the knowledge of the causes and impact of global warming, students are expected to learn how to describe and evaluate the measures to reduce the impact of global warming and climate change. Further, students will develop attitudes such as accountability, social responsibility and personal care and concern for the environment. At a glance, the knowledge, skills and values for this unit address the core concepts in ESD. It provides opportunities for teachers to move students from an awareness phase into a taking action phase, assuming that the values are well learnt.

During civics and moral education classes, the environmental theme is located in the context of learning that one of the ways of showing respect for life, nature and the environment is "keeping the environment clean and green, and maximising the natural resources that we have through recycling efforts" (CPDD, 2006d, p. 15), acting with care towards plant and animal life, and obeying local laws that protect the environment.

Care and concern for the environment is further reinforced in science. The objective of the science curriculum is to inculcate in students traits of "showing care and concern for living things and awareness of our responsibility for the quality of the environment" (CPDD, 2007b, p. 9). In the topic on separation techniques, students learn how pure water is recovered from seawater in desalination plants, and why desalinated water is an important source of water for Singapore in addition to the collection of rainwater, recovery of waste water and buying water from our neighbouring countries such as Malaysia and Indonesia. Under the theme of Energy, the need for conservation of

energy is revisited to accentuate the fact that Singapore has no natural resources and has to import all her energy needs. For example, students are made aware of how they can help save electricity at home and in school by switching off lights and electrical appliances when not in use, even at the mains; to use more energy efficient lamps and appliances; and to set the thermostats of air-conditioners at a higher temperature (Heyworth, 2008). Concepts like population, community and ecosystems are taught under the theme of Interactions and students learn the importance of understanding and maintaining the relationship between living things and the environment.

Up this level (both primary and Lower secondary) all school pupils are exposed to the same level of knowledge of ESD and Climate Change. However, subjects such as social studies and moral education are non-examinable i.e. they are not included in the Primary School Leaving Certificate examinations at the end of Primary 6. For Lower Secondary school these subjects do not have the same degree of importance as attached to other subjects like English Language, Mathematics, Physics, Chemistry, Biology or Geography, History and English Literature which will be subjects that are examinable at the end of Secondary 4 in the national GCE 'O'-Level examinations. Having said that, there is room to explore themes in ESD and Climate Change through integrated project work.

7.1.3 Upper Secondary Level (ages 15-18)

The aims of the upper secondary science courses include promoting students' interest in and care for the environment as well as awareness that the application of science can have positive as well as negative effects on the individual, community and the environment (School Examinations and Assessment Board [SEAB], n.d. a) . Students study social, economic and environment impact of the recycling of metals, sources and effects of air pollutants and greenhouse gases in chemistry (SEAB, n.d. a, b). There is greater coverage of sustainable development issues in biology where students learn the effects of pollution to due sewage and inorganic waste, bioaccumulation of insecticides up food chains, conservation of species, biodiversity, management of fisheries and timber production , and the application of genetic engineering in the production of food in biology and its related issues in biology (SEAB, n.d. c, d).

However, education for sustainable development is greatest in geography as it seeks to develop an informed concern about the quality of the environment, the use and management of resources, and the importance of sustainable development at the local and global levels (SEAB, n.d. e). Students study topics such as the sustainable management of natural resources, climatic changes and responses, population and urban issues and challenges and developments in food production (SEAB, n.d. e,f). Howeever, not all students take geography as a subject at the upper secondary level. More of them read Social Studies or 'Combined Humanities' than 'pure' geography. Nevertheless, in the upper secondary SS syllabus, the main knowledge to be learnt is "balancing economic development with environmental management under the unit of "sustaining Singapore's economic development". Sustainable development is the main concept in the unit. In terms of skills, students are required to "understand how environmental management is necessary to ensure economic growth". This assumes that students can describe, explain and evaluate the strategies. It requires students to develop the attitudes similar to those in the lower secondary SS syllabus. However, how these can be achieved is left to the teachers' discretion when enacting the curriculum. In short, both the lower and upper secondary SS syllabus target knowledge, skills and

values required for ESD, while the primary school SS syllabus address the big ideas of human-environment interaction and environmental stewardship.

ESD on Climate Change is only present in the 'pure' Geography subject. The unit on "Weather and climate" features a section on "climate disasters". Here only the knowledge about the impact of climate change related phenomena is included. There is no explicit mention of skills or values that should be learnt with respect to climate change issues. This is the gap in the Geography curriculum, in terms of ESD.

From the description of EE in formal curricula, it can be seen that the concerns of the Ministry of the Environment and Water Resources related to pollution, conservation of resources, energy and the environment, and the effects of climate change are being addressed through the formal education of the students. However, the focus is mainly on the cognitive level in the sciences and the social sciences, and may remain as just knowledge to acquire to pass examinations. Students get to act on their school learning about sustainable development in community projects where they are actively involved in "doing something" for the environment and feel that they can make a difference to the environment. The next section describes how community-based environmental programs complement and supplement formal EE, allowing students to be personally involved and making a tangible difference—education *for* the environment.

In Geography, at the pre-University level, ESD on climate change is only featured at the H2 level (H2 level is equivalent to the difficulty and rigour of the previous GCE 'A'-level). Under the Unit on Atmospheric Processes, Hazards and Management, there is a section on Climate Change and Responses. The entire section is organized around the issue of the problems brought about by global warming induced climate change. Specifically, the section includes knowledge, skills and values that are central to ESD.

The section requires students to learn the causes, impact and adaptation and mitigation strategies of global warming induced climate change. In addition skills such as describing and assessing these strategies are required. Values that are relevant to the issue include Adaptability and Preparedness for any eventuality. Similar to the lower Secondary Geography curriculum, the knowledge, skills and values for this unit target the core concepts in ESD. They allow the students to move from awareness to taking action.

While there is no immediately apparent follow through of the issues on climate change from lower secondary to upper secondary geography syllabi in terms of skills and values, the absence is probably intentional as the social studies (which is a compulsory subject) syllabi has a distinct section on environmental issues for both the lower and upper secondary levels.

Some comments of the exposure of students to EE is appropriate. Whether education for sustainable development or climate change both are assumed to be addressed together in the environmental education component of the school syllabus. In fact environmental education with a slant towards sustainable development was the main focus provided within the syllabus much earlier, and only recently the issue of climate change has come to the fore and made explicit in the revision of the curriclum in recent years. Nevertheless, in the minds of the curriculum planners, and understandably so, both issues are intertwined and not mutually exclusive.

7.2 ESD and the Informal Curriculum

7.2.1 *Nature Learning Camps*

Originating from a local reforestation-stewardship project (Mandai Reforestation Project, 2000), since 2000, the Nature Learning Camp has given hundreds of school children (primary and lower secondary levels) a chance to learn environmental science and conservation values in an outdoor setting. Compared to the largely cognitive goals in the formal curriculum, here affective *and* cognitive learning outcomes are amalgamated through performing environmental science experiments in a primary rainforest located in a water catchment area. Part of its success lies in the commitment of a biologist from the National Institute of Education (a teacher education institute), countless school teachers, and two governmental bodies (National Parks Board and Public Utilities Board) in orchestrating this one-day yearly event whereby selected students can behave like scientists and conservationists.

Among the buffet of pre-planned activities that have changed slightly over the years depending on the school audience, students study forests (e.g., transects, tree studies), freshwater systems (e.g., stream health, invertebrates), and soil chemistry (e.g., pH, profiles). While the initial years saw eight local and international schools participating, 12th November 2007 saw six schools (five elementary and one international secondary school) involved though with no less enthusiasm and rigor in pursuing scientific problems. Believing that interaction with others of diverse backgrounds is desirable, students from each school are reorganized into new groupings (with an accompanying teacher) before they embark on a bussing system across various learning stations. Payment for bus transport, stationery, and some chemicals are borne by each school while ecological field equipment (including the use of a truck and boat!) are usually borrowed from the National Institute of Education or the governmental agencies to save cost. Due to the lack of time, each child would not visit every station although as a whole, each school would collectively have someone visiting every station. Though trainee-teachers, scientists, volunteers, and specialists from government bodies were originally manning these stations, the teachers who have stayed on with this program have gained the same levels of expertise as practicing scientists, and thus, have now assumed responsibility for the organization of the Nature Learning Camp. Other teachers have come on board and learned by watching and assisting in their own ways. This is very typical of the kinds of fluid and contingent knowledge flows between experts and lay people described by Boyer and Roth (2006). It would also not be far from the truth to say that a genuine community of practice has formed with cross-age learning among the teacher-participants (Roth & Lee, 2006). At the end of the Nature Learning Camp, everybody comes together for a debriefing and sharing session where student groups present their results.

Students at the event who were surveyed in 2007 described learning much about the natural environment in Singapore (69 percent in the Strongly Agree category), while 71 percent strongly felt that natural areas in the country had to be protected and about 60 percent planned to visit such areas more often in the future. For children used to living in highly urban environments, these outcomes are very satisfying although the long-term sustainability of such attitudes is unknown given the short history of the program and lack of follow-up with the students. However, based on student blogs from the event in 2001, one realizes that the camp created powerful impressions about the fragility of the natural ecosystem in Singapore and more critically, students felt themselves to be

potential change agents. If there are some drawbacks of the Nature Learning Camp they are that student participation is extremely limited (about 50 each year) due to the shortage of manpower in mounting this event; its location in a protected catchment area that is also biologically sensitive, so needing visitor control measures. Furthermore, the debriefing session is restricted to an hour or so and the findings about the health of the ecosystem do not return into the wider community. As educators, this missed prospect for extended discussion with others who might not necessarily share one's viewpoint about the environment—and there are a multitude of positions, even in Singapore—is certainly regrettable. To involve more students and add value to the environmental data collected, a local research project has recently been initiated that adopts computer-supported collaborative technologies and Knowledge Building pedagogy originating from Marlene Scardamalia and Carl Bereiter from the University of Toronto. Rather than the affective and cognitive learning outcomes that are difficult to quantify, this project will attempt to measure some aspects of student scientific reasoning and attitudes acquired in the program. We are optimistic that the Nature Learning Camp will continue (and evolve) despite being a grass-roots environmental program, and there are plans to increase its frequency to twice a year to accommodate more schools and extend the benefits of real-world applications of environmental concepts (Overholt & MacKenzie, 2005) together with cultivating intergenerational influences among school children who can participate in multiple ways (Ballantyne, Connell & Fien, 2006). It is likely that precisely because the Nature Learning Camp has drawn upon the inherent dynamism among its ardent volunteers rather than being something mandated by some national agency, that it is successful in raising environmental awareness in Singapore.

Issues of climate change have become more prominent in Singapore the last couple of years and because the leadership in government is discussing them in the public arena, the momentum in focusing and addressing them will only accelerate in the future. This recognition of climate change and environmental impact of various kinds due to human action will influence schools to increase its students' focus on them. Already there are some promising signs that this is happening. There are now more frequent and positive reports noting that primary school children were now delving deeper into environmental issues and studying topics such as climate change and renewable energy. For example of Nanyang Primary School (NYPS) is one where students learnt about global warming through using recycled materials to create art during their art lessons. Primary school principals saw more attention being spent on teaching students about these issues because of the growing importance of caring for the environment. At the Balestier Hill Primary School the general awareness of climate change had been widely discussed and promoted through the media and that many schools, through encouragement by MOE, had been actively implementing their own environment program (Today, 20/2/09).

7.2.2 *Community-based Environmental Programs*

Complementing the formal school curriculum on the environment are environmental activities organized on a more ad hoc basis to interest the students and the general public in environmental issues. These activities are organized by a diverse range of organizations from commercial organizations such as banks (e.g., the HSBC Care-for-Nature program which started in 1991, [HSBC, 2007]), non-government organizations such as the Nature Society (Nature Society, 2006), tertiary students' interest groups such as Students' Against the Violation of the Environment [SAVE] (e.g., promoting environmental awareness like recycling among undergraduate populations in the National University of Singapore, [NUSSU, 2005]), governmental agencies such as the

National Environment Agency (NEA) (NEA, 2002) and grassroots organisations such as the town councils.

Most of the environmental programs undertaken by these various organizations are innovative and are aimed to interest the public and students in environmental issues. As early as 1998, programs such as adopting a park or part of a beach ("Be kind," 1998; Lim, 1999) were introduced to schools in Singapore. Students in these schools are responsible for the partial maintenance and cleaning of stretches of beaches or parks on a regular basis as part of their community involvement program. Campaigns with environment themes started carrying slogans like "It's Hip to be Green" (Hooi, 2005) to get teenagers interested in green issues. *Clean and Green Week,* an annual campaign was introduced in 1990 by the Ministry of Environment to promote environmental awareness, as a platform to rally the people together to engender an environmentally proactive and socially cohesive society (Teo, 2004).

Other organizations such as the Singapore Environment Council stepped up their publicity for their Singapore Green Audit program to recognize schools and individuals for their contributions towards the environment (Kaur, 2003). Schools with innovative green programs and individuals who have made an impact in environmental issues will be given recognition for their effort to preserve the environment. Town councils also play their part by initiating novel programs such as getting students and the community involved in gardening by providing spaces for growing vegetables so as to allow better appreciation of nature in a highly urbanized city (Wee, 2001). Efforts by the grassroots also included an attempt by a community organization to grow 100,000 native plants which are unique to Singapore within three years (South West Community Development Council, 2007). The aim of this program is to help prevent indigenous plants from becoming extinct. Even the Singapore Bus Service was involved in an environment program targeting school students; they started a magic bus service that brought students to outdoor learning venues such as nature parks ("Classroom," 2000). Correspondingly, the universities are actively involved in nature programs to translate their expertise and knowledge into community knowledge. They do so through their community outreach programs such as adopting a forest and involving school students in working with scientists (Kaur, 1999). In April, 2008, the National Environment Agency launched a 10% Energy Challenge (NEA, 2008) to raise awareness of energy conservation and how to adopt an energy-efficient lifestyle as part of their daily lives. Singapore residents were challenged to reduce their home energy consumption by 10 percent between May and August 2008 and win prizes in a national lucky draw, the top prize being a fuel-efficient hybrid car. In this way, the NEA hoped to empower Singapore residents to save energy and contribute to collective effort to mitigate climate change. NEA also has regular activities on the environment for pre-school to primary, secondary and even tertiary students by applying different art forms and carnivals and competitions. Usually these events are scheduled for the whole year as shown in Appendix D and E.

As far as climate change awareness is concerned, a National Weather Study to expose thousands of school children to study first-hand the effects of climate change with the help of sophisticated weather-monitoring equipment installed in their own school backyards was held in 2005. This S$1 million project was conceived and sponsored by power generation company SENOKO with support from the Ministry of Education and the National Environmental Agency.

Through the involvement of different organizations and interest groups, students in schools are exposed to a variety of community-based environmental programs to supplement and complement the formal environmental curricula. Involvement in these programs allows students to interact with others in the community, be exposed to diverse views about environmental issues as well as to translate what they learn in school into their own lived experiences. The next section will describe an environmental awareness and learning program, the Nature Learning Camp, and how it complements classroom instruction and affords a greater sense of place-based education.

Singaporeans, by right, ought to be very environmentally conscious as nearly 98 percent of our original rainforests and 99 percent of coastal mangroves have been lost due to (abandoned) agricultural practices beginning in the nineteenth century. In recent years there the remaining refugia have become important places for teaching and learning for all, not just nature enthusiasts. The existence of Chek Jawa, an ecologically-rich mud flat, in light of the threat to use it for development, speaks much of the role of the public who opposed and petitioned the government ("Chek Jawa", 2008). The government not only acceded to the request but also tasked the Ministry of National Development with conserving the area. Apart from the formal school curriculum there are numerous activities and programs which are initiated by governmental agencies, community groups, and other organizations. Environmental literacy, at local and global levels, is likely to be the next step for youth here to develop a mature culture of care and concern for the environment.

8. TERTIARY LEVEL ENVIRONMENTAL COURSES

There are three universities in Singapore namely the National University of Singapore, Nanyang Technological University and the Singapore Management University. At the National University of Singapore, green related courses are found in the various science and geography departments. At the National Institute of Education, Nanyang Technological University, for several years (2001-2005) there was an essential module "Global Issues and Environmental Problems" was made compulsory for all its undergraduate student teachers in the Bachelor of Arts (Education) and Bachelor of Science (Education). This course was designed to be issues based with regard to the global environment to all second year undergraduates in all disciplines in the arts (art, chinese language and literature, english language and literature, geography, history and music) and scineces (biology, chemistry, mathematicfs, physics and physical education and sports science). The issues dealt with and the way the course was taught providing opportunities to visit sites such as incineration plant, the water treatment plant, etc made the course highly relevant to the demands of education for sustainable development. However, when the curriculum was revised to meet new demands in education arising from the school education reform, the enhanced versions of the pre-service curriculum implemented in July 2005 did not have room for this course: only one essential " 'Multicultural Studies" out of three courses was retained. It is a loss that such a course is no longer offerred as students who do not read geography or the sciences would have little encounter with the global environmental issues at an age where they could better appreciate the gravity of the problem and do something about it.

At NUS a Master of Science (Environmental Managament) program, a multi-disciplinary integraqted programme involving seven faculties provide education in environmental management for senior and mid-level managers and for officers in corporations, and

government and non-governmental organisations, in Singapore and the Asia Pacific region (STU, 2008).

At both the National University of Singapore and the nanyang Technological University the faculties of engineering, especially in environmental engineering, the study of technolgy and its application to deal with environmental issues such as waster water treatment, air and sea pollution, etc are course that are offered. So also in the faculties that teach courses on energy, building and design, and others where environmental considerations are important to their core businesses.

9. RESEARCH IN ENVIRONMENTAL EDUCATION

A few studies have been conducted to gauge the impact of environmental education on students and the public. In 1993 a study by Savage and Lau (1993) on ”Green Issues and: Official Policies and student Awareness” based on a sample of undegrdautes, junior college and secondary school showed that the students were aware of air pollution as a problem and that they were committed to activities that would not harm the environment. These aspects reflect their knowledge about environmental issues locally but the same could not be said about their knowledge of environmental issues at the global level. However, living in a city state with little nature around them has also affected the interest of youth in the environment as found out by Kong et al, (1999). To complicate matters, in Singapore’s multicultural setting, even though students are taught environmental science content in a like manner, their understanding of the material will differ based on socio-cultural dimensions that are unique to each individual (Wee et al., 2006).

In another study in 1997, staff of the National Institute of Education developed curriculum materials related to the environment and they found that the teachers were ready to incorporate these materials in their teaching. There was a ready acceptance by teachers of the inclusion of environmental education in the curriculum but the school curriculum is not ready for environmental education as an independent subject (STU, 2008). In 1998 a study by the Ministry of Education and Tan et al (1998) was conducted to find the impact of the Green Plan on the school pupils based on a 55 item instrument and on a sample of 1256 secondary three (Grade 9) and Junior College year one (Grade 11) students. The results showed that the students’ mean knowledge score was almost 80 % and the mean correct response for the environmental fact, concept and generalization subtests were 68%, 68.8% and 78% respectively. A larger number students (53.7%) reported that they gained their knowledge from outside the classroom especially from the printed media and electronic media rather than from formal classes. 30.7 % indicated that they obtained their environmental knowledge from the school. Ho (2002) has conducted a comparative study of recycling behaviour in Singapore and Sweden. The author found out that there were differences in behaviour that may be traced to the way things are done in the two countries. One contrast is that in Singapore, the government prefers using the law and regulations to enforce policies, adopting a top-down approach whereas in Sweden it is the reverse where the citizens engage in recycling based on their own internal motives and initiative, and this has a greater likelihood of persistence in the behaviour. The author also noted that Singapore’s education system is slower in integrating environmental issues into the education system. Wong and Stimpson (2003) found that environmental education in Singapore is very much influenced by the following contextual factors – a pragmatic utilitarian concern for the urban environment of the city state; a school and examination

system that was largely focused on traditional disciplinary knowledge; and the overiding infuence of government in maintaining" a balance between environment, economic development, social stability, nation building and external image." The authors also noted the tensions within the school system in regard to environmental education where high stakes national examinations and accountability measures hold teachers to curricula that are academic and rationalist rather than socially critical and emancipatory in character (STU, 2008; Wong, 2003). With new changes in pedagogy and instruction in school concomitant with the education reform initiatives of critical and creative tinking this position is no longer tenable. A later study involved 291 undergraduaes in three cohorts at the National University of Singapore taking an environmentally related course on natural Hazards (Higgit, 2006) with the objectives of finding out students' general perceptions of sustainability, their awareness of environmental issues in the country and the region, and information on the pervasiveness of sustainability ideas within the education system. What the survey revealed were rather interesting: sustainability concerns were shaped by topicality such as when there was a dispute over transborder tranfer of water from Malaysia to Singapore, many responses reflect a pragmatic, a managerialist attitude to environmental issues founded on an assumption that technology and sound governance will provide solutions, a reflection of the ethos of the nation that is characterised by strong government led inititives and management of every aspect of life. The survey also revealed that while many were in favor of an independent module to be offered by the university, environmental education would make little impact if it is a non-examinable subject, but once made examinable students will engage to pass the exam.

From the above studies some salient points could be drawn. First, while there has been some integration of environmental education in the curriculum with the purpose of bringing some knowledge and awareness to the school children or undegraduates, they remain what it has always been – environmental education. Very little emphasis has been given to the message of sustainable development and climate change and its impact. There is a great need to bring these issues to the fore in the formal curriculum. Second, the way environmental issues are introduced and the way environmental management for the whole island has been designed and implemented tends to be government led and for very pragmatic reasons. While there has been greater participation of individuals and and non-governmental agencies in conservation and environmental issues, the popular base is still small. In many cases, the knowledge of environmental issues is limited and global awareness of the problems still lacking. In addition this knowledge limits the behavioral change that one would have liked to see in the pupils and the public at large. It is no wonder that in a recent survey one in two are ignorant about the issues related to climate change. Third, the Ministry of Education has defined the Desired Outcomes of Education for various levels (DOE) and nowhere in this scheme of things is there a direct reference to environmental care and concern (Wong, 2003). It is thus not suprising that in many schools in Singapore among the mission statements of the schools very few if any state as one of their aims to develop a environmentally conscious and cimmited citizen. Finally, environmental education is infused within the curriculum, but in a very exam-oriented school education system, unless a subject is examinable not only will the emphasis wane, very often teachers' attitude towards the teaching of this component is sacrificed to the more important subjects that have examinations.

10. CONCLUDING REMARKS

From the above discussions a few salient points can be deduced that have bearing on the main theme of ”climate change and sustainable environment: response from education,” from the perspective of Singapore.

Singapore has grown within 40 years from a poor trading outpost during colonial times to a global city and player in world trade, finance and in many other areas and these achievements have been made in a situation of severe lack of natural resources. As a small nation economic considerations had and will continue to take first place in its developmental model. In a sense this has defined the policies of the government and influenced the mindset of its population. Wee (2008) is of the opinion that many Singaporeans will be denied opportunities to engage in conversations and actions related to environmental health, largely because of a cultural mind-set that ranks economic rewards and self-interest above connections with the environment, a point also concurred by Kong et al., (2000) who note that the drive to achieve affluence and success in Singapore, where there is “always a sense of wanting to do better as a country and as individuals,” is likely to have led to environmental education that promotes a particular set of values favoring growth and development over the environment.

Despite the overwhelming importance given to economic development and the need to maintain Singapore’s competitive edge relative to the economies of its Asian neighbours, concern for the environment has been growing and has always underpinned the development plans, as ultimately, the quality of life of Singaporeans is tied to the quality of the environment that the citizens and foreign workers in the various multinational establishments look for when they spend their time on this island. Yet despite the shift in policy towards issues of climate change since 2006 with the signing of the Kyoto Protocol, it is very clear that pragmatic economic considerations and the resilience of ’economics first’ mindset (Hamilton-Hart, 2006) often take priority in its development and that circumscribes the bottom-line of Singapore’s climate policy.

Environmental education is included in the school syllabus but its role is limited in extent both in terms of coverage as well as its status as a non examinable subject. In terms of coverage it is found in subjects such as social studies, geography, moral education and the sciences and all children would have some exposure up to secondary two (Grade 8), after which the subject is taken by students who choose electives such as social studies (combined humanities), pure geography and the sciences. Such patchiness in addressing environmental education in the school curricula is a concern in many education systems just as making it pervasive in the curricula faces its own challenges. Environmental education should be taught in a holistic manner by reaching across all disciplines as it is an interdisciplinary ’outcome-based’ body of knowledge which does not fit into individual subject moulds. Yet since the study of the environment embraces many disciplines it is extremely difficult to systematically integrate it into the entire education system (Foster, 1999).

Education for sustainable development is not explicit in the curriculum but captured under the broad theme of environmental education with the objectives of creating awareness and understanding and ultimately care for the environment. In the context of Singapore, education for sustainable development has some way to go. Taking into account the words of Barraza et al (2003) that education for sustainable development

needs some legitimation in the mainstream followed by reformation and transformation of the education system itself at the micro-level – that of schools – and at the macro-level of policy development and implementation. At the macro-level, this aspect is not evident even within the desired outcomes for education in Singapore as spelt out by the Ministry of Education. On 27 April 09 the national sustainable blueprint of the Inter-Ministerial Committee for Sustainable Development was unveiled that outlines Singapore's key goals and initiatives for sustainable development in the next 10 to 20 years to 2030. Four broad areas were identified and these are: Boosting Our Resource Efficiency; Enhancing Our Urban Environment; Building Our Capabilities; and Fostering Community Action. This document would be a good reference point for efforts towards revising the current environmental education in the various subjects by providing greater focus on education for sustainable development and climate change education.

Climate change is even less dealt with in the education system, partly because as an issue it has come to the fore of public knowledge and debate only recently, and partly because it is seen as a global problem that needed to be fleshed out into concrete issues that Singaporeans could appreciate as urgent and critical to its long term future. The fact that most problems are handled, and handled well by the government, means that the populace tends to be reticent and takes a back seat. 'The government knows best ' is an apt description of Singaporeans' perception of many issues facing the country.

While the formal curriculum has in place topics that deal with the environment much of the awareness that school students obtain about environmental issues are obtained through the informal and extra-curricular activities as well as through the various campaigns, projects and camps mounted by non-governmental agencies.

The above discussions have deliberately avoided the whole issue of research in environmental technology as conducted in the universities particularly in the area of engineering, waste water treatment, air pollution technology, environmental health, etc. This is a huge area that promises much by way of economic returns when these technologies are marketed and applied to solving real problems within as well as outside Singapore. Some of these research are government funded while a substantial portion is privately funded or jointly conducted, even with companies and universities from outside Singapore.

One significant research which has direct relevance to the issue of climate change and sustainable development of cities in particular is the research that was conducted by the Lee Sing Kong, Director of the national Institute of Education, Singapore. His urban farming using aeroponics technology has been singled out as potential green solutions for the future. It was ranked among the top three solutions chosen in the Discovery Channel's Ecopolis series, which explores eco-friendly ways to sustain an overcrowded, polluted world in 2050. (Straits Times, 4 Feb 2009).

As a small country that is a significant player in global economy and trade, and as a very open economy, Singapore's future economic growth lies in free trade agreements with other countries through both multilateral and bilateral agreements especially with its main trading partners. However, in forging these agreements the reasonably foreseeable environmental impacts of trade agreements (both positive and negative), complementarities between trade and environmental objectives, and the appropriate responses if environmental impacts are identified must be made known to policy makers

in FTA countries. In this respect, it is instructive to see the issues that are dealt with in its bilateral FTA with the United States which are contained in the 'Final Environmental review of the US-Singapore Free Trade Agreement' completed in 2003 (2003).

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APPENDIX A

SINGAPORE AND THE UN'S MILLENNIUM DEVELOPMENT GOALS

Environment: Overview

As a densely populated city-state, Singapore subscribes to the principle of sustainable development and actively takes part in international initiatives on the environment. Singapore played an active role in ensuring the successful conclusion of the 1992 Rio Summit through Ambassador Tommy Koh's chairmanship of the Summit's Preparatory and Main Committees. We are committed to doing our part to realise global and sustainable development objectives, including the World Summit on Sustainable Development's Johannesburg Plan of Implementation. Singapore is also a committed participant in global and regional environmental sustainability fora, such as the Global Ministerial Environment Forum (GMEF), the UN Commission on Sustainable Development (UNCSD), the Ministerial Conference on Environment and Development (MCED) and the ASEAN Ministerial Meeting on the Environment.
Singapore recognises that a strong and effective international effort is needed to address climate change and every country must play its part. The UN Framework Convention on Climate Change (UNFCCC) arose from the 1992 Rio Summit. The UNFCCC sets the framework for governments to cooperate on the issue of global warming, and it adopted the Kyoto Protocol in 1997. Singapore ratified the UNFCCC in 1997 and acceded to the Kyoto Protocol in 2006. Going forward, Singapore will continue to support and actively participate in the international climate change negotiations.

Under the aegis of the Singapore Cooperation Programme, Singapore has also hosted several training programmes on urban environmental management, including the

Singapore Technical Assistance Programme for Sustainable Development and the Small Island Developing States Technical Co-operation Programme.

Singapore has ratified or acceded to the following key multilateral treaties on the environment:

- ASEAN Agreement on Transboundary Haze Pollution
- UN Convention on Biological Diversity
- UN Convention to Combat Desertification
- UN Framework Convention on Climate Change (UNFCCC)
- Kyoto Protocol to the UNFCCC
- Montreal Protocol on Substances that Deplete the Ozone Layer and its Amendments
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade
- Stockholm Convention on Persistent Organic Pollutants

Selected Multilateral and Regional Agreements to which the Government of Singapore is a Party

Convention on the International Trade in Endangered Species of Wild Fauna and Flora (11/3-/86
Vienna Convention for the Protection of the Ozone Layer (1/5/89)
Montreal Protocol on Substances that Deplete the Ozone Layer (1/5/89)
MARPOL Protocol for the Prevention of Pollution from Ships (Annexes I, II, II, V) (11/90)
(Singapore ratified Annex VI on August 10, 2000, and is currently working on Annex IV)
1990 London Amendment to Montreal Protocol (3/2/93)
1992 Copenhagen Amendment to Montreal Protocol (9/22/00)
1997 Montreal Amendment to Montreal Protocol (9/22/00)
UN Convention on the Law of the Sea (11/17/94)
Convention on Biological Diversity (12/8/95)
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1/2/96)
UN Framework Convention on Climate Change (5/29/97)
UN Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Paricularly in Africa (4/26/99)

APPENDIX B

ASEAN Declaration on Environmental Sustainability
20 Nov 2007

WE, the Heads of State/Government of Brunei Darussalam, the Kingdom of Cambodia, the Republic of Indonesia, the Lao People's Democratic Republic, Malaysia, the Union of Myanmar, the Republic of the Philippines, the Republic of Singapore, the Kingdom of Thailand and the Socialist Republic of Viet Nam, Member Countries of ASEAN, on the occasion of the 40th Anniversary of ASEAN and the 13th ASEAN Summit in Singapore;

Cognisant of mounting global concern over the environment and ASEAN's obligations to its people in fulfilling the aims of the World Summit on Sustainable Development (WSSD) and to achieve the UN Millennium Development Goals (MDGs), in particular to ensure environmental sustainability in the context of sustainable development;

Determined that ASEAN should complement and support the efforts of global and regional organizations to tackle environmental issues, and in this regard support the APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development, and Indonesia's efforts to host the 13th Session of the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 3rd Session of the Conference of the Parties Serving as the Meeting of the Parties (CMP) to the Kyoto Protocol in December 2007;

Noting with concern the findings of the Inter-governmental Panel on Climate Change's (IPCC) Fourth Assessment Report (AR4) that the warming of the climate system is unequivocal;

Further noting with concern, the adverse impacts of climate change caused by global emissions of greenhouse gases, particularly to the developing countries, such as the loss of biodiversity and severe environmental, social, health and economic consequences;

Reiterating the need to build an ASEAN Community that is economically vibrant and environmentally friendly, so that the present and future generations can enjoy a clean and sustainable environment;

Further recalling the 10 priority areas of environmental sustainability as agreed at the 7th Informal ASEAN Ministerial Meeting on the Environment, and the key areas of Environmental Management and Natural Resource Management outlined for the period 2004-2010 in the Vientiane Action Programme (VAP);

Reaffirming the goals of the Yangon Resolution on Sustainable Development, signed on 18 December 2003 and the Cebu Resolution on Sustainable Development, adopted on 10 November 2006, by the Ministers of ASEAN Member Countries responsible for the environment;

Acknowledging that fossil fuels will continue to be part of the energy landscape, and that ASEAN Member Countries, who are at different stages of economic development, will face various environment challenges and levels of resources needed to effectively address global environmental issues without compromising competitiveness or social and economic development;

Further acknowledging the efforts of ASEAN Member Countries to ratify the ASEAN Agreement on the Conservation of Nature and Natural Resources, signed on 9 July 1985, the ASEAN Agreement on Transboundary Haze Pollution, signed on 10 June 2002, and the Agreement on the Establishment of the ASEAN Centre for Biodiversity, signed on 27 September 2005;

Encouraging the efforts to develop an ASEAN Climate Change Initiative;

Recognising the importance of sustainable forest management in ASEAN, which will contribute significantly to the international efforts to promote environmental sustainability, and to mitigate the effects of climate change as well as transboundary environmental pollution;

Recognising the partnership of the world community in combating land degradation in the context of the United Nations Convention to Combat Desertification (UNCCD), a global instrument which can make a lasting contribution to the achievement of sustainable land management and environment; and

Further recognizing the importance of protecting the natural resource base for economic and social development, including the sustainable management and conservation of soil, water, mineral, coastal and marine resources as well as the improvement in water and air quality for the ASEAN region;

HEREBY DECLARE:

Environmental Protection and Management

1. **To honour and implement** commitments to multilateral and regional sustainable development and environmental agreements, so as to achieve the common goal of a clean and green ASEAN;
2. **To intensify** regional and international cooperation in promoting, sharing and implementing environmentally sustainable practices, including the transfer of environmentally-sound technologies, the enhancement of human and institutional capacities and the promotion of sustainable consumption and production patterns;
3. **To adopt** a holistic approach in fostering regional cooperation on environmental issues, with the participation of all relevant stakeholders; including business, academics, NGOs and civil society organizations;
4. **To expand** on the existing work under the ASEAN Initiative on Environmentally Sustainable Cities;
5. **To intensify** individual and collective efforts to improve the quality of air and water within ASEAN through regional or national initiatives to reduce industrial and transportation pollutions;
6. **To implement** measures and enhance international and regional cooperation to combat transboundary environmental pollution, including haze pollution, through, among other things, capacity building, enhancing public awareness, strengthening law enforcement, promoting environmentally sustainable practices, as well as combating illegal logging and its associated illegal trade;
7. **To endeavour to reduce** by half of the number of people without sustainable access to safe drinking water by 2010 in accordance with the VAP to meet the needs of ASEAN citizens, and significant improvement in the lives of slum dwellers by 2020 in ASEAN Member Countries in accordance with the UN MDGs;

8. **To promote** the sustainable management and use of our soil, forest, coastal and marine environments as part of regional and global efforts on biodiversity conservation, mindful of their important value as our natural heritage, and their contribution towards mitigating the effects of climate change and environmental degradation;
9. **To further promote** cooperation among ASEAN Member Countries in combating land degradation for sustainable land management to support sustainable agriculture and environment;
10. **To call upon** the international community to participate in and contribute to afforestation and reforestation, and to reduce deforestation, forest degradation, and forest fires, including by promoting sustainable forest management and development, and combating illegal logging;
11. **To also call** on the international community to implement debt-for-sustainable development swap arrangements;
12. **To forge** ASEAN-wide cooperation to establish a regional nuclear safety regime, in line with our discussions at the 12th ASEAN Summit in Cebu on 13 January 2007; the Southeast Asia Nuclear Weapon Free Zone (SEANWFZ) Plan of Action adopted by the SEANWFZ Commission in Manila on 29 July 2007; and the agreement of the 25th ASEAN Ministers on Energy Meeting (AMEM) on 23 August 2007;
13. **To contribute** to the UN Decade on Education for Sustainable Development through the ASEAN Environmental Education Action Plan to nurture environmentally conscious ASEAN citizens;

Responding to Climate Change

14. **To work closely** with the international community to better understand and adapt to the adverse impacts of climate change, including, in particular, the related issues of greenhouse gas emissions and carbon sinks;
15. **To agree** that the pursuit of climate change and energy security policies should avoid introducing barriers to trade and investment;
16. **To intensify** cooperation on the joint research, development and deployment of low emission technologies for the cleaner use of fossil fuels, recognising that fossil fuels will continue to play a major role in our energy mix;
17. **To take** concrete measures to promote the use of renewable and alternative energy sources such as solar, hydro, wind, tide, biomass, biofuels and geothermal energy, as well as, for interested parties, civilian nuclear power, while ensuring safety and safeguards that are of current international standards, and environmental sustainability throughout the full life cycle of production and use;
18. **To improve** energy efficiency in key sectors of energy use through capacity building and information sharing of best practices in managing energy use and the adoption of appropriate technologies and practices;
19. **To undertake** effective measures towards open and competitive regional and international markets geared towards providing affordable energy at all economic levels to facilitate the adoption of energy-efficient and low-emission technologies;

Conservation of Natural Resources

20. **To achieve** by 2010, a significant reduction in the current rate of loss of biodiversity, as pledged by countries at the WSSD in 2002 and as envisaged by the Convention on Biological Diversity;
21. **To conserve** our rich biodiversity, by promoting access to, and sustainable utilisation of its components, and the fair and equitable sharing of the benefits from these biological and genetic resources;
22. **To take into account** biodiversity considerations in the mitigation of and adaptation to climate change;
23. **To promote and support** the ASEAN Centre for Biodiversity as a regional centre for biodiversity conservation and management;
24. **To strengthen** efforts to implement the ASEAN Regional Action Plan on Trade in Wild Fauna and Flora, 2005-2010 through mechanisms such as the ASEAN Wildlife Enforcement Network;
25. **To support** the conservation and management of ASEAN Heritage Parks and encourage ASEAN Member Countries to identify more Parks;
26. **To ensure** the effective implementation of the ASEAN Strategic Plan on Water Resources Management;
27. **To promote** conservation and sustainable management of key ecosystems, including forest, coastal, and marine habitats, such as coral reefs, through initiatives, in particular, the "Heart of

Borneo", "Forestry Eleven forum", and the "Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security";

28. **To agree** to collectively work towards achieving an aspirational goal of significantly increasing the cumulative forest cover in the ASEAN region by at least 10 million hectares by 2020; and
29. **Foster** the sustainable management and efficient use of mineral resources and environmentally-sound mining practices.

DONE in Singapore, this Twentieth Day of November in the Year Two Thousand and Seven.

APPENDIX C

Singapore Declaration on Climate Change, Energy and the Environment – 21 Nov 2007

WE, the Heads of State and Government of the Member Countries of the Association of Southeast Asian Nations (ASEAN), Australia, People's Republic of China, Republic of India, Japan, Republic of Korea and New Zealand, on the occasion of the Third East Asia Summit (EAS) in Singapore on 21 November 2007;

Welcoming the regional commitment demonstrated in the Cebu Declaration on East Asian Energy Security adopted on 15 January 2007, the APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development adopted in Sydney on 8 September 2007, the ASEANDeclaration on Environmental Sustainability and the ASEAN Declaration on the 13th Session of the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) and the 3rd Conference of Parties Serving as the Meeting of the Parties (CMP) to the Kyoto Protocol adopted in Singapore on 20 November 2007;

Affirming our commitment to the UNFCCC as the core mechanism for addressing climate change at the global level, and for relevant countries, the Kyoto Protocol as well;

Welcoming the Fourth Assessment Report of the Inter-governmental Panel on Climate Change (IPCC);

Concerned about the adverse impact of climate change on socio-economic development, health and the environment, particularly in developing countries and thus emphasising the need to enhance their adaptive capacities, as well as for the

international community to urgently act to address the growth of global greenhouse gas emissions;

Recognising that rapid economic development, while contributing to sustainable development and poverty eradication in the region, poses new challenges in dealing with greater energy consumption, regional and global energy security concerns; and that growing urbanisation increases the need for environmental management, given the projected doubling of Asia's 1.7 billion urban population between 2000 and 2030;

Reaffirming the need to take an effective approach to the interrelated challenges of climate change, energy security and other environmental and health issues, in the context of sustainable development and that the pursuit of climate change and energy security policies must avoid introducing barriers to trade, investment and socio-economic development;

Cognisant that EAS participating countries are at different stages of economic development and that our economies have varying and in many cases, heavy dependence on fossil fuels, any actions to tackle global environmental issues should take into account diverse national and regional circumstances in accordance with the principle of common but differentiated responsibilities, as well as our respective capabilities;

Appreciating the efforts of various East Asia Summit participating countries, including Australia, China, India, Indonesia, New Zealand, Japan and the ROK, which have contributed to the global debate to address climate change; and

Emphasising the important role that the EAS can play in carrying out collective action to address these challenges for mutual benefit and the common good;

HEREBY DECLARE TO:

1. **Stress** that all countries should play a role in addressing the common challenge of climate change, based on the principles of common but differentiated responsibilities and respective capabilities; and that developed countries should continue to play a leading role in this regard;

2. **Commit** to the common goal of stabilising atmospheric greenhouse gas concentrations in the long run, at a level that would prevent dangerous anthropogenic interference with the climate system;

3. **Support** the work to achieve a common understanding on a long-term aspirational global emissions reduction goal to pave the way for a more effective post-2012 international arrangement;

4. **Acknowledge** that adaptation is a critical issue for the region and as such, emphasis has to be put on both mitigation as well as adaptation measures, and recognize that sustainable development facilitates adaptation;

5. **Carry out** individual and collective actions, in a broad range of sectors, to address climate change, including greenhouse gas emissions, considering the principles

of equity, flexibility, effectiveness, and common but differentiated responsibilities and respective capabilities, as well as reflecting our different social and economic conditions;

6. **Participate** actively in the process of developing an effective, comprehensive, and equitable post-2012 international climate change arrangement under the UNFCCC process; and in this context, reiterate our support for the successful outcome of the 13th session of the COP to the UNFCCC and the 3rd MOP to the Kyoto Protocol to be held in Bali, Indonesia in December 2007;

7. **Deepen** our understanding of the region's vulnerability to climate change and implement appropriate mitigation and adaptation measures, including through:

a. Mobilising financial support and cooperating to build capacity for the developing countries in the EAS region;

b. Encourage the deployment of clean technology in the region through various means, such as investment, technical and financial assistance, and technology transfer ;

c. Exchanging of scientific and technical expertise in partnership with international experts, and enhancing cooperation towards joint research and development of appropriate adaptation measures to minimize the impact of climate change;

d. Commissioning of national and where appropriate, joint studies to assess the impact of climate change and environmental protection efforts within the region;

e. Promoting public awareness of the impacts of climate change and enhancing participation in efforts to mitigate the effects of climate change; and

f. Supporting the development and expansion of policy and measures, including innovative instruments and financing mechanisms for environmental management, to promote sustainable patterns of consumption and production.

8. **Intensify** ongoing cooperation to improve energy efficiency, and the use of cleaner energy, including the use of, renewable and alternative sources, based on the Cebu Declaration and the Joint Ministerial Statement of the 1st EAS Energy Ministers' Meeting on 23 August 2007 by:

a. Working towards achieving a significant reduction in energy intensity;

b. Implementing the measures recommended by the EAS Energy Ministers, including formulation of voluntary energy efficiency goals by 2009, supporting cooperation in developing reference benchmarks for environmentally and socially-sustainable biofuels and energy market integration; and utilising, where appropriate, regional research bodies, such as the ASEAN Centre for Energy (ACE) and the Economic Research Institute for ASEAN and East Asia (ERIA);

c. Encouraging research, development, deployment and dissemination of technologies to enhance energy efficiency and conservation in key economic sectors, including buildings, industrial equipment and processes, vehicles and appliances;

d. Enhancing regional cooperation to develop cost effective carbon mitigation technologies, cleaner fossil fuel technologies including clean use of coal, and to produce environmentally-friendly and sustainable biofuels; and

e. Cooperating for the development and use of civilian nuclear power, in a manner ensuring nuclear safety, security and non-proliferation, in particular its safeguards, within the framework of the International Atomic Energy Agency (IAEA), for those EAS participating countries which are interested.

9. **Promote** cooperation on afforestation and reforestation, and to reduce deforestation, forest degradation and forest fires, including by promoting sustainable forest management, combating illegal logging, protecting biodiversity, and addressing the underlying economic and social drivers, through, among others:

a. Encouraging environmentally sustainable planning and management of the region's forests, while strengthening forest law enforcement and governance to combat illegal logging and other harmful practices;

b. Work to achieve an EAS-wide aspirational goal of increasing cumulative forest cover in the region by at least 15 million hectares of all types of forests by 2020;

c. Renewing support for global and regional avoided deforestation, afforestation and reforestation efforts such as reforestation funds and, as appropriate, debt-for-nature swap arrangements;

d. Continued support for UNFCCC work to stimulate action to reduce emissions from deforestation in developing countries, including through appropriate international incentives and assistance; and

e. Expressing appreciation for regional forest initiatives such as the ASEAN Peatland Management Initiative; the "Heart of Borneo" conservation plan, the Asia Forest Partnership and the Asia-Pacific Network for Sustainable Forest Management and Rehabilitation, as well as global efforts such as the Global Initiative on Forests and Climate, and Indonesia's Forestry Eleven Forum initiative.

10. **Continuing support** for the implementation of United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD) at regional and global levels;

11. **Promote** co-benefit approaches, which addresses global environmental challenges through taking measures for national development concerns, including preventing environmental degradation;

12. **Strengthen** cooperation on management capacity and measures for natural disaster risks raised by climate variability and change and other environmental challenges;

13. **Encourage** the development of adaptation strategies to mitigate weather-related calamities caused by water;

14. **Foster** the conservation and sustainable management of coastal and marine ecosystems and call on the regional and international communities to participate in efforts to avoid marine pollution, such as marine litter, and the destruction of protected and vulnerable areas such as coral reefs, mangroves, seagrass beds, wetlands and seamounts, and welcome the "Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security" as one of these efforts;

15. **Enhance** access to safe drinking water and basic sanitation and promote integrated water resource management through initiatives such as the 1st Asia-Pacific Water Summit in December 2007, the Singapore International Water Week in June 2008, the International Yellow River Forum and the International Year of Sanitation 2008;

16. **Encourage** the well-coordinated and sustainable national management of mineral resources and promote environmentally-sound and efficient mining practices;

17. **Promote** environmental education to enhance human resource capabilities to address the challenges of ensuring sustainable development in EAS participating countries;

18. **Address** the environmental challenges posed by rapidly growing urbanisation in the region, by, among other measures:

a. Pooling our experiences, expertise and technology in areas such as urban planning including transportation, green building, water management, urban greenery and urban biodiversity conservation, sanitation and waste management, 3Rs (Reduce, Reuse and Recycle) and air, noise, water, and land pollution control;

b. Appreciating initiatives such as "Low Carbon Society", "Compact Cities", "Eco-Cities" and "Environmentally Sustainable Transport"; and

c. Welcoming Singapore's proposal to convene an EAS Conference on Liveable Cities in June 2008 to address the interrelated issues of urbanisation, climate change, energy, and the environment.

19. **Task** our relevant Ministers to follow up and act on our discussions on this Declaration, and in this regard:

a. Commend the work of the inaugural EAS Energy Ministers' Meeting in Singapore on 23 August 2007, and welcome Thailand's offer to host the 2nd EAS Energy Ministers' meeting in 2008; and

b. Welcome Viet Nam's proposal to host the inaugural EAS Environment Ministers' Meeting in the fourth quarter of 2008.

Done in Singapore, this Twenty-First Day of November in the year Two Thousand and Seven.

For Brunei Darussalam:

HAJI HASSANAL BOLKIAH
Sultan of Brunei Darussalam

For the Kingdom of Cambodia:

SAMDECH HUN SEN
Prime Minister

For the Republic of Indonesia:

DR. SUSILO BAMBANG YUDHOYONO
President

For the Lao People's Democratic Republic:

BOUASONE BOUPHAVANH
Prime Minister

For Malaysia:

DATO' SERI ABDULLAH AHMAD BADAWI
Prime Minister

For the Union of Myanmar:

GENERAL THEIN SEIN
Prime Minister

For the Republic of the Philippines:

GLORIA MACAPAGAL-ARROYO
President

For the Republic of Singapore:

LEE HSIEN LOONG
Prime Minister

For the Kingdom of Thailand:

GENERAL SURAYUD CHULANONT (RET.)
Prime Minister

For the Socialist Republic of Viet Nam:

NGUYEN TAN DUNG
Prime Minister

For Australia:

JOHN HOWARD
Prime Minister

For the People's Republic of China:

WEN JIABAO
Premier

For the Republic of India:

DR. MANMOHAN SINGH
Prime Minister

For Japan:

YASUO FUKUDA
Prime Minister

For the Republic of Korea:

ROH MOO-HYUN
President

For New Zealand:

HELEN CLARK
Prime Minister

APPENDIX D: Calendar of Pre-school Events 2008

January	
31/01/08	**Registration Opens! Build-up Activities to Clean & Green Singapore Schools' Carnival 2008** • **Pre-school Art & Craft Competition** • **Pre-school Environmental Dance Competition**
April	
24/04/08	**Module 1: Environmental Education Advisors' (EEA) Workshop **For new EEAs only***
May	
15/05/08 **30/05/08**	**Module 2: Environmental Education Advisors' (EEA) Knowledge cum Networking & Visit to an Installation Plant** **Registration Closes! Build-up Activities to Clean & Green Week Schools' Carnival 2008** • **Pre-School Art & Craft Competition** • **Pre-School Environmental Dance Competition**
June	
19/06/08	**Module 3: Environmental Education Advisors' (EEA) Motivational Workshop**

July	
24/07/08 **31/07/08**	**Module 1: Environmental Education Advisors' (EEA) Workshop **For new EEAs only*** **Submission of music CDs for Pre-School Environmental Dance Competition**
August	
14/08/08 **29/08/08**	**Module 2: Environmental Education Advisors' (EEA) Knowledge cum Networking** **& Visit to an Installation Plant** **Preliminary Round for Pre-School Environmental Dance Competition**
September	
11/09/08 **19/09/08** **26/09/08**	**Module 3: Environmental Education Advisors' (EEA) Motivational Workshop** **Results! Build-up Activity to Clean & Green Week Schools' Carnival 2008** • **Pre-school Environmental Dance Competition** **Results! Build-up Activity to Clean & Green Week Schools' Carnival 2008** • **Pre-School Art & Craft Competition**
November – Clean & Green Singapore Schools' Carnival 2008!	
To be confirmed	❖ **Rehearsal for Finalists of Pre-School Environmental Dance Competition** ❖ **Submission of short-listed artworks for Pre-School Art & Craft Competition**
To be confirmed	❖ **Exhibition of short-listed artworks at 'Wonderland' during Schools' Carnival**
To be confirmed	❖ **Judging of the Pre-School Art & Craft Competition** ❖ **Finals for Pre-school Environmental Dance Competition**

APPENDIX E

Calendar of Environmental Events for Schools 2008 : Primary - Tertiary level

January 2008		
Date	**Level**	**Event**
30 January	Primary	Environment Champion Workshop – Module 2: Motivational/Leadership Skill Module 3: Acting & Skit Development Skill
31 January	All Levels	Registration for Build-up Activities for Clean & Green Singapore Schools' Carnival 2008 – OPENS! 1. Creative Percussion 2008 (primary & secondary) 2. Environment Dance Floor ((primary & secondary) 3. Environment Project Competition (for schools under CASP only) 4. Environmental Fashion Show Competition (secondary & open) 5. Green Game Competition (primary & secondary) 6. Living Art Sculpture Competition (Secondary & open) 7. Mr & Miss Teen Earth 2008 (open) 8. Solar City Competition (primary & Secondary) 9. Trans-formation (primary) 10. Video Advertisement 2008 (primary & Secondary) To register for the above competitions, please click here → **Form A**

February 2008

15 February	By Invitation	Appreciation Luncheon for CASP partners
16 & 23 February	All Levels	Environmental Education Advisor (EEA) Networking 2008

March 2008		
23 March		**WORLD METEOROLOGICAL DAY**
23 March		Closing Date – 'Climate Cool in the Urban Jungle' Digital Art Competition on the environment (Organised by British Council)
24 March	All levels	3Rs Award Competition
March	Primary & Secondary	Environment Champion Workshop

April 2008		
22 April		**EARTH DAY**
5 April	Primary & Secondary	National Environment Quiz (organized by Nan Hua High School)
14 April	All Levels	Nomination for Environment Champions Badge 2008 Opens!
18 April (TBC)	All Levels	Schools Green Audit Awards Ceremony and Briefing (Singapore Environment Council)
19 April	All Levels	Youth ECO – Concert (Ngee Ann City Civic Plaza)
28 April to 2 May	For RI students only	Raffles Institution's Earth Day Programme

May 2008		
26 & 29 May	Primary & Secondary	Environment Champion Workshop
9 May	All Levels	Closing Date - Solar City Competition
16 May	Primary & Secondary	National Environmental Tour (organized by Zhangde Primary School)
23 May	All Levels	Closing Date – 1. Creative Percussion 2008 (primary & secondary) 2. Environment Dance Floor (primary & secondary) 3. Environmental Fashion Show Competition (secondary & open) 4. Mr & Miss Teen Earth 2008 (open) 5. Video Advertisement 2008 (primary & secondary)

28 May	Primary & Secondary	1. Just One Earth Seminar (for teachers only) 2. Environment Fair for W7 Cluster Schools 3. National Inter-Primary School Green Competition (organized by Commonwealth Secondary School)
30 May	Secondary levels and up	Closing Date – 1. Environmental Fashion Show Competition 2. Environment Dance Floor 3. Mr & Miss Teen Earth 2008 Competition

June 2008		
5 June		WORLD ENVIRONMENT DAY
June	Primary & Secondary	Environment Champion Networking 2008
16 June	By invitation only	DHS ASEAN Plus (Dunman High School)
29 June	Primary & Secondary	Preliminary for Environment Dance Floor
30 June	Secondary & Open	Submission of Designs (Environmental Fashion Show Competition)
June (TBC)	Primary & Secondary	Teacher's Conference (Singapore Environment Council & Nan Hua High School)

July 2008		
26 July	Secondary and Open	Workshop for Environmental Fashion Show Competition Finalist (1st batch)
12 & 19 July	Primary & Secondary	Workshop for Environment Dance Floor
25 July	Secondary	Green Spelling Bee (Singapore Environment Council & Singapore Polytechnic)

August 2008		
2 August	Secondary and Open	Workshop for Environmental Fashion Show Competition Finalist (2nd batch)
29 August	All Levels (for CASP schools only)	Closing Date - Environment Project Competition

September 2008		
12 & 19 September	All levels	Environment Project Competition (Oral Presentation)
1 & 2 September	Primary & Secondary	Environment Champion Workshop
5 September	Primary & Secondary	Nominations for EC Badge 2008 closed
September	Secondary	National Science Camp (Republic Polytechnic & Singapore Environment Council)

October 2008		
1 October	All	Launch of Clean & Green Singapore 2008 website
20 October to 4 November	Secondary and above	Rehearsal - 1. Environmental Fashion Show Competition 2. Mr & Miss Teen Earth Competition

November 2008		
November	All participants	Rehearsals for stage build-up activities
November	Public	Clean & Green Singapore 2008 Schools' Carnival Finals - 1. Environment Dance Floor 2. Environment Fashion Show 3. Living Art Sculpture Competition 4. Mr and Miss Teen Earth Competition 5. Solar City Competition

<u>Ongoing</u>

- Corporate And School Partnership Programme
- Environment Club Fund
- Litter-Free Ambassador Programme
- Litter-Free Schools Programme
- Recycling Outreach Programme
- Seashore Life Programme

The International Alliance
of Leading Education Institutes

Report from the UK

Climate Change and Sustainable Development:
The Response from Education

Nicole Blum and Chris Husbands
Institute of Education, University of London

IALEI Joint International Research Project 2009
Climate Change and Sustainable Development: The Response from Education in the UK

Contribution from the Institute of Education, University of London
Prepared by Dr. Nicole Blum and Professor Chris Husbands

Introduction

Education in the United Kingdom is administered through separate systems for England, Northern Ireland, Scotland and Wales. As a result, there is some variation between how education is managed in each (especially regarding curriculum and assessment structures), although all the systems have compulsory education at the primary and secondary levels (between the ages of approximately 5 and 16).

Educational programmes and projects about the environment and development have been present across the UK since at least the 1970s. While leadership in the area has historically come from civil society organisations, since the late 1990s UK government has also increasingly promoted sustainable development and education for sustainable development (ESD) at the local, regional and national levels. Government involvement began in response to the adoption of Agenda 21 (1992), and interest in the area from many sectors has recently increased further as a result of the UN Decade of Education for Sustainable Development (2005-2014). Related activities include a range of initiatives known under various terms and definitions, including development education (DE), environmental education (EE), education for sustainable development (ESD) and, more recently, climate change education (CCE). There continues to be very active debate and discussion about the most appropriate content and goals of such educational programmes, both from researchers and practitioners, as well as a continually growing body of research literature in the area. In many ways, these debates parallel much wider historical and contemporary discussions about education in the UK, and especially about the best balance between emphasising acquisition of particular bodies of knowledge, specific skills, or attitudes.

Alongside active efforts to promote learning about and for sustainable development in the UK, however, over the last ten to fifteen years there has also been an increasing emphasis on standardised assessment within formal education. Many educators worry that this trend is undermining the overall quality of education in the UK, and that it poses particular challenges for the mainstreaming of topics such as sustainable development, which require a greater attention to learning processes than to outcomes (cf. Sterling 2001). The current world economic crisis is also resulting in increasing discussion in the UK about the types of skills which adults and young people will need to be prepared for an uncertain future. These debates have been taken up particularly strongly within higher and further education, especially through discussions around the concept of 'global skills' (Bourn 2008b; Scott and Gough 2007).

Both the central UK government and the three devolved administrations – The Northern Ireland Assembly, the Scottish Parliament, and the National Assembly for Wales – have instituted a range of policies related to sustainable development. In the last few years, topics such as climate change, fair trade, energy management and carbon footprints have also received increasing attention in the media and the public sphere, yet awareness of sustainable development among the general population remains relatively low. What awareness does exist is largely attributed to education (ESD, EE, DE) and awareness-raising activities by stakeholders at a number of levels – including educators, policy makers, young people, trade unions, and civil society organisations.

The four UK administrations all have policies on ESD, although each has its own distinct approach. In England, for instance, there is significant activity related to ESD within government-sponsored education (e.g. formal, further and higher education; training and development; youth work) and other related sectors (e.g. the Department for Environment, Food and Rural Affairs; the Department for International Development), although the term itself is not widely used (the terms development education and environmental education are more common). Northern Ireland and Scotland have created bodies and policies dedicated specifically to work on ESD. The Welsh Assembly has placed ESD at the very centre of its frameworks and activities, and made strong links between ESD and its efforts in global citizenship education (known there as Education for Sustainable Development and Global Citizenship or ESDGC).

The complexity and diversity of political, social and educational contexts in the UK can easily lead to confusion about activities and understandings in the area. There is, for example, not a universally recognised or used term within policy and practice on education and sustainable development. Even those who are actively promoting what could be called ESD (e.g. environmental education, development education, and global citizenship programmes) may not use that term to describe their work. Nevertheless, the following report uses 'education for sustainable development' as an umbrella term to refer to this diverse area of research, policy and action. This is because, while acknowledging the importance of debates around multiple terms and definitions, the term ESD has received growing support from international organisations, donors and civil society organisations – as evidenced by the current UNESCO-led UN Decade of Education for Sustainable Development. Use of the term ESD also recognises the importance of the idea of sustainability in contemporary development efforts, and highlights the need for educational approaches which address environmental as well as social and economic concerns, including climate change.

The following report is organised according to the five agreed themes for this years' IALEI joint research project. Where possible, these thematic discussions are further sub-divided into sections on policy (e.g. identification of existing strategies and action plans), research (e.g. discussion of existing quantitative and qualitative research), and reflections on education, climate change and sustainable development in the UK.

Section 1: Education for Sustainable Development – Overall Conceptualisation

A key debate surrounding ESD in the UK surrounds its overall conceptualisation and questions about its linkages to environmental and development issues. Research and evaluation since the 1990s has frequently suggested, for example, that ESD is little more than an extension of previous understandings and work in environmental education. However, some commentators have argued that, in defining ESD in response to the Rio Summit in 1992, there was a recognition that it was in fact a joining of both environmental education and development education agendas (Belgeonne 2003; Downs 1994). Indeed, the two umbrella networks for both areas, the Council for Environmental Education (CEE) and the Development Education Association (DEA), jointly co-ordinated a Forum on Education for Sustainability from 1993 until 1997, and until 2005 organised a number of events, publications and initiatives to demonstrate the interconnectedness between environmental and development perspectives. It is worth noting, however, that the UK has separate government organisations with oversight on environmental and international development issues. Perhaps partly as a result, there is little collaboration between the three main ministries (DEFRA, DCSF and DFID) working on these issues.

This debate about content and linkages is also connected to a second area of tension, this one between knowledge- or content-driven approaches to education and those that build capacity 'to think critically about what experts say and to test sustainable development ideas' (Vare and Scott 2007). In very general terms, this division is often seen as between learning

for sustainable development (acquisition of particular skill sets or knowledge) vs. learning *as* sustainable development (ability to think critically, or analyse and solve problems). Perhaps understandably, this debate reflects much older discussions in the fields of both development education and environmental education in the UK about how best to encourage learning and action for development and environmental protection (cf. Bourn 2008a; Huckle and Sterling 1996).

There is also a limited, but growing, awareness that too much attention is being focused on the promotion of narrow behaviours (i.e. students as private citizen actors – cycling to school and recycling their waste, etc) at the expense of encouraging the development of students as socio-political actors (i.e. capable of interacting, with others, with institutions – political and others – in order to bring about change). A recent report by the UK National Commission for UNESCO (2008), for instance, suggests that most approaches to ESD in the UK currently can be classified as learning *for* sustainable development, with relatively few adopting a more holistic approach or vision of ESD. This may reflect the fact that ESD work has its roots within the NGO sector, where the focus is often more on campaigning and awareness raising than on learning or critical engagement per se.

A further emerging area of discussion is around the links between ESD and education quality. Recent research on quality, for example, has examined what quality learning might entail, and identified a range of knowledge, competencies, skills, attitudes and capabilities which young people need to respond to an uncertain future. This discussion in turn links strongly to debates around the nature of learning through ESD:

> 'Quality education and education for sustainable development seek to achieve similar learning outcomes – those that enable learners to make decisions and choices that foster sustainable development – and are thus complementary' (Pigozzi 2007: 27).

Some researchers argue, therefore, that ESD should be seen as critical to achieving the Millennium Development Goals, Education For All goals, and a range of wider international development agendas (cf. Scott and Gough 2007; Bourn 2008b). This perspective raises a number of key questions for future research about the methods and manner of education provision, and suggests that a change in focus is needed – from a preoccupation with curriculum content to a wider attention to learning processes and environments. However it is worth noting that there is also some concern that too heavy a focus on quality concerns will undermine the strength of ESD as an area of work and action, so these debates are far from finished.

1.1 Policy

In England, in addition to recent revisions to the national curriculum (see section 4), one of the major government initiatives on ESD is the Department for Children, Schools and Families' (DCSF) Sustainable Schools Initiative, which began in 2006. The initiative is organised under the *National Framework for Sustainable Schools*, which identifies three principles for schools to consider: care for oneself, care for each other (across cultures, distances and time) and care for the environment (near and far). It also introduces teachers and schools to eight 'doorways' through which they can initiate activities: food & drink, energy & water, travel & traffic, purchasing & waste, buildings & grounds, inclusion & participation, local well-being, and participation (see DfES 2006).

The Sustainable Schools initiative is linked to the Building Schools for the Future programme, established in 2004. The programme provides funding to refurbish or rebuild all schools (mostly at the secondary level) so that they can significantly reduce their carbon emission rates by 2020. All new schools, both primary and secondary, are expected to aim towards major reductions in this area. Participation in both programmes is optional, however, with the result that relatively few schools have taken these initiatives up in a systematic way,

and there are questions about how much has been achieved by those that have (see section 1.2 for further discussion).

Similar 'sustainable school' or 'eco-school' initiatives have been established in Northern Ireland, Scotland and Wales. More than 80% of Scotland's schools have already signed up for its Eco-schools programme, for instance, while Northern Ireland has recently set a target for at least a quarter of its schools to become Eco-schools, although how actively these programmes are being implemented is a matter for future research. ESD is also prominently included in Northern Ireland's Sustainable Development Action Plan (2006), the goals of which are further supported by a 'good practice' guide and programmes within initial teacher education. Scotland has its own Sustainable Development Action Plan (2006) for education, as well as a Learning and Teaching strategy which is specifically linked to the UN Decade. Work in the area is supported by a dedicated Sustainable Development Education Liaison Group, which is involved in curriculum review and teacher support, the Eco-Schools programme and overall school improvements. Finally, Wales published its first ESD action plan in 2006 – an expansive plan which included action across several areas of education: schools, youth, further education and work-based learning, higher education, and adult and continuing education. Between 2006-2009, priorities have included appointing an ESDGC (Education for Sustainable Development and Global Citizenship) champion to represent those interests within government, conducting a baseline survey of activity in schools and other education settings, and creating a set of ESDGC standards.

There is also significant activity within higher education in the UK. For example, the Higher Education Funding Council for England (HEFCE) – a non-departmental public body through which government funds higher education institutions in England – recently produced a revised strategic statement and action plan (2008; an update from the original published in 2005) which outlines its role in the sector. The organisation's vision is that: 'Within the next 10 years, the higher education sector in this country will be recognised as a major contributor to society's efforts to achieve sustainability – through the skills and knowledge that its graduates learn and put into practice, its research and exchange of knowledge through business, community and public policy engagement, and through its own strategies and operations' (HEFCE 2008: 3). It seeks to do this by supporting research, capacity building, and the development of sustainable management practices within the sector. The UK's government's main body for further education, the Learning and Skills Council, also has a series of policies on ESD, including a strategy entitled *From Here to Sustainability* which recommends action within the sector to embed sustainable development in the curriculum, develop sustainable facility management strategies and techniques, and promote sustainable businesses and communities (LSC 2005).

A related area of policy and work on ESD is supported by the UK Department for International Development (DFID), which is the UK government's major funding and policy organisation for overseas development. As a support to DFID's international work, it has a Building Support for Development Strategy (1999) which aims to embed the 'global dimension' in UK formal education, including through the curriculum. The eight key concepts included in the 'global dimension' are: global citizenship, conflict resolution, diversity, human rights, interdependence, social justice, sustainable development, and values and perceptions. Specific activities include work on curriculum and resource development throughout the UK, the creation of regional education networks, providing support for research, media and communications outreach, and organisation of an international school partnerships programme.

1.2 Research

There is a relatively long tradition of research in the UK in the areas of environmental education, development education and, more recently, education for sustainable

development. This research has been initiated by a range of actors within higher education institutions, government, and NGOs beginning in the 1960s.

Academic research in the area has grown substantially in recent years, and a large number of universities now support research programmes and offer courses related to sustainability. These cover a diverse range of disciplines, from education to engineering to environmental management. The recent survey of ESD in the UK commissioned by the UK National Commission for UNESCO (2008) offers a more detailed list of these initiatives, but a few key examples include:

- London South Bank University – offers an MA in Education for Sustainability and conducts research on sustainable development through its Centre for Cross Curricular Initiatives.
- Institute of Education, University of London's Development Education Research Centre – conducts research on ESD issues, offers an MA in Development Education, and publishes the *International Journal of Development Education and Global Learning*.
- Plymouth University's Centre for Sustainable Futures – one of two HEFCE-funded Centres for Excellence in Teaching and Learning that focus on sustainability; conducts research on sustainability and education issues.
- University of Bath's Centre for Research in Education and the Environment – conducts research and has a range of postgraduate programmes on ESD (MA/ PhD/ EdD) and publishes the journal *Environmental Education Research*.
- Schumacher College – an institution wholly dedicated to teaching, learning and advocacy about sustainability; offers educational programmes and publishes papers on multiple dimensions of sustainable development.
- Centre for Alternative Technology, Wales – independent organisation working on renewable energy, environmental building, energy efficiency, organic growing and alternative sewage systems; offers short courses and postgraduate programmes in partnership with the University of East London; hosts the Wales Institute for Sustainable Education.

Government and other public bodies, as well as private sector institutions and consultants, have also begun to take an increasing interest in sustainability and ESD research. Much of this work has been concerned to assess the awareness of the general public or particular populations (e.g. university students, young people, etc.) about issues of sustainability and development, or to identify and promote sustainability best practice within public organisations, including higher education institutions and government departments. In 2003, Ofsted – the body responsible for school inspective in England – produced a study which surveyed the work of several key government departments. The study found evidence of good practice in curriculum planning and whole-school approaches to sustainability, but concluded that more could be done to fully integrate ESD across the curriculum (Ofsted 2003). In higher education, in 1997 the UK government funded a 2 year project – Higher Education 21 – to explore and assess the work of 25 institutions. Similarly, the Learning and Skills Development Agency, a non-departmental public body for further education, commissioned a research report, *Good Practice in Sustainable Development Education*, which identified key factors for successful ESD in that sector (Blewitt 2002). In 2005, Learning and Teaching Scotland published a study of sustainability within six secondary schools, in order to support integration of ESD into Scottish formal education. The Northern Ireland Department of Education conducted an independent strategic review of education in 2006 which made specific recommendations for the Sustainable Schools policy. And in Wales, Estyn, the Welsh body for education inspection, proactively supports the qualitative assessment of sustainability as part of schools' education quality requirements.

Attention has also been given to awareness of sustainability issues within the general public. In 2004, for example, the Central Office of Information and the UK Department for Environment, Food, and Rural Affairs (DEFRA) commissioned independent research, *The Impact of Sustainable Development on Public Behaviour*, which concluded that public awareness of the term 'sustainable development' was very low – only about a third of respondents claimed to be familiar with it. A recent survey carried out by the Development Education Association and Ipsos MORI Social Research Institute assessed young people's (ages 11-16) perceptions of global learning, and found that while more than half valued learning about global issues, there was considerable demand for more opportunities to learn about these issues in schools (Ipsos MORI and DEA 2008).

A relatively new and emerging area of research in the UK is around the development of ESD indicators. These are understood to be proxy measures to gauge progress for phenomena – such as ESD – which cannot be measured directly:

> ESD indicators do not show progress in ESD directly but rather provide information about a range of ESD attributes that can be considered together to determine overall progress. For example, the direct action of learning cannot be seen. Therefore, indicators are used to measure progress in learning by communicating information about the inputs and outcomes of learning. Thu, ESD indicators provide stakeholders with vital, often difficult to measure, information about the status and quality of policies, activities, processes and their effects (Tilbury and Janousek 2006: 8).

A number of group have been working in this area. The UK's Sustainable Development Commission, for instance, has conducted research on ESD indicators and submitted a series of recommendations to government in 2006, although an agreed set of indicators has not yet been adopted. The Commission's main recommendation was to open dialogue between the involved government departments and with non-government partners about the possibility of conducting a regular survey of performance in sustainable schools. The UK National Commission for UNESCO has also identified a number of key issues for ESD in the UK and developed its own set of suggested indicators (see UK National Commission for UNESCO 2008). Both sets of indicators correspond closely to key strategies identified by the UN Decade for ESD as well as the indicator framework which was recently developed by UNESCO's Asia-Pacific region (see UNESCO Bangkok 2007).

Other key work on these issues has been coordinated by the Centre for Research in Education and the Environment at the University of Bath alongside colleagues from England, Germany, the Netherlands, Spain, and Sweden, and with support from the Anglo-German Foundation. Major points of discussion within this group have included the future uses and designs of indicators (i.e. quantitative vs. qualitative measures), the need for clarity about the purposes of indicators and the interpretive frameworks on which they are based, and agreement that the quality of ESD should not be equated solely with indicator measurements (for a fuller discussion, see Reid, Nikel and Scott 2006).

1.3 Reflections

The discussions above raise at least three key questions which can perhaps be addressed through IALEI's collaborative work:

1. Interest in issues around education, environment and development – i.e. through research and policy on EE, DE and ESD – has grown considerably in the UK in recent years, especially in response to anxieties about climate change. However, ESD still has a relatively low academic profile in the UK and more research is needed on key issues in the field. What practical steps could be taken to address this? What experiences/ evidence from other countries might be applicable in the UK?

2. In the UK there is considerable attention from government and other stakeholders (national and international) for (i) research which shows evidence of the impacts of educational programmes and (ii) for indicators to help measure progress. This can be methodologically very challenging, however. What are we trying to measure – particular skills, mastery of knowledge areas, key attitudes? How best might these be assessed/ measured? Are qualitative or quantitative measures more useful? Might the institutionalisation of indicators/ measures either positively or negatively impact on practices of ESD 'on the ground'?

3. One of the common arguments for establishing EE/ ESD programmes is that they will promote positive change by encouraging more sustainable behaviours and attitudes. What is less well understood is the roles of different educational spaces in this: What is the role of formal education? of informal learning (e.g. through community groups, family, media)? What can education at different stages realistically contribute to achieving sustainable development goals? Furthermore – given the existing structural and institutional barriers to change towards sustainable development (i.e. appropriate legislation, sustainable energy provision, etc.) – is it realistic to assume that education will be enough to bring about the desired changes? What are the possible relationships between, for example, education programmes and public policy/ regulation related to sustainable development?

Section 2: Education for Sustainable Development and Sustainable Development; Climate Change Education and Climate Change

In the last few years, there has been increasing attention to and awareness of the issue of climate change in the UK. In general, there is a broad assumption from educators and policy makers that education is needed to achieve sustainable development and to address climate change, but perspectives about the type of education needed and the manner in which it should be undertaken can vary substantially depending on the source consulted.

Within UK government policy the key messages have been set out in its Sustainable Development Strategy (2005). While much of the emphasis of the strategy is on traditional styles of government regulation to promote sustainability, the strategy also outlines a range of initiatives to promote sustainability through formal education and community development.

A wide range of UK NGOs are also involved in projects which address ESD and sustainability issues, and many of these include an attention to climate change. This work builds on some previous efforts within environmental education, where many educators argue that they have been addressing climate change issues for a number of years. A recent report by the UK National Commission for UNESCO (2008) suggested that climate change is in fact giving additional urgency to discussions and activities related to ESD, and surveyed the work of more than a hundred UK NGOs that organise educational programmes or campaigns, produce learning resources, and/ or conduct research connected to ESD.

One of the key types of activities in the NGO sector is international school linking programmes, which receive significant support from both private and government funding in the UK. Programmes and support are offered, for example, by the British Council, Plan UK, Action Aid, Oxfam, and the Global Campaign for Education. School linking has grown rapidly in popularity partly due to the increasing emphasis on integrating 'the global dimension' into the curriculum (cf. DfES 2004), although these links are by no means problematic (see Leonard 2008). These initiatives are also commonly connected to two important UK policy initiatives – Every Child Matters (see HM Government 2004) and Sustainable Schools – and well as to foreign language learning requirements. A similar growth in interest in the global dimension can be charted within UK further and higher education, particularly as education

institutions search for solutions to the current economic crisis and for ways to provide appropriate skills in the context of increasing globalisation (cf. Bourn 2008b).

There is some emerging, but still limited, discussion of the idea of Climate Change Education in the UK (see section 3 for further discussion).

2.1 Policy

Within UK government policy the key messages on sustainable development have been set out in its Sustainable Development Strategy (2005). In addition to this, each of the UK's devolved administrations have also developed sustainable development strategies, and policy and activities across the UK are organised according to a framework for cooperation (DEFRA 2005). While much of the emphasis of the UK strategy is on government regulation to promote sustainable actions/ behaviours, it also includes a chapter on 'Helping People Make Better Choices' which outlines a range of initiatives to promote community and individual action towards sustainable development. These focus on activities in formal education (see section 1.1) and in community development. Some examples include:

- **Community Action 2020 – Together We Can**: a programme of support for community action on sustainable development which builds upon experience gained from the UK's Local Agenda 21 framework; key areas include improving access to information, advice and training to help communities take action on sustainable development; increasing opportunities for community workers and communities to learn about sustainable development; including sustainable development in National Occupational Standards and accredited units which set out the skills and principles of practice for community development work, and increasing opportunities for individuals within communities to volunteer in sustainable development activity.
- **Climate Change Communications Initiative**: funding of approximately £12 million between 2005-08 to tackle public attitudes to, and understanding of, climate change, and what individuals can do to help reduce their personal contribution to climate change.

The UK Department for International Development (DFID) is also currently in the process of developing a climate change implementation strategy for its international development work. DFID's current over-arching policy objectives on climate change are:

- agreeing a fair and effective post global post Kyoto framework,
- building a low carbon economy, and
- protecting the most vulnerable.

Although the vast majority of DFID's work is focused in other countries, these objectives and an interest in climate change also spill over into DFID's engagement with formal education in the UK. This largely takes place through its Building Support for Development strategy (outlined in section 1.1) – which includes curriculum and resource development, research, media and communications, and an international school partnerships programme.

2.2 Research

Overall, since the 1970s there has been, and continues to be, active debate in the UK about how educational programmes might lead to behavioural or attitudinal change in support of sustainability. These debates have also recently begun to be applied to discussions of education and climate change. Government-funded research and policy tends to take an instrumental approach to education and training in these areas – i.e. that increasing access to knowledge and discussion of topics will result in change. There is strong critique of this approach from some researchers, however, who are concerned that some educational programmes (variously labelled ESD/EE/DE or CCE) in practice are often too instrumental in

their aims (e.g. gaining support for particular perspectives, initiatives or campaigns) because they rely on such an overly simplistic understanding of learning:

> 'ESD policies and policy discourses are replete with deterministic and instrumental outcomes-based rhetoric. There is a need to be mindful of any uncritical construal of education as an instrument for the implementation of sustainable development' (Firth and Winter 2007; see also Jickling 2005).

Furthermore, such approaches often do not account for the wide range of economic, political or social factors which also influence behaviour. New thinking in the area is leading researchers to draw more heavily on existing research on theories of learning, postcolonial theory, postmodern critiques of development, and work on identity formation.

2.3 Reflections

Building on the previous set of reflections as well as the sections above, it is possible to identify a set of key tensions in research and policy related to education, sustainable development and climate change in the UK:

1. More research is needed to examine the relationships between learning, knowledge and action. Does learning about environmental/ sustainability issues necessarily always lead to behavioural or social change, as many programmes implicitly suggest? If so, what are the processes through which this occurs? What structural barriers (e.g. poverty, racism, sexism, lack of support for or opportunities to choose more sustainable lifestyles) might inhibit the impacts of such intended change through learning?

2. Further research is also needed to explore the role of education in the promotion of environmentally-related content (e.g. how to recycle, the dangers of overconsumption, the implications of species/ habitat loss, the need for more sustainable energy production systems) vs. as a process of capacity-building (e.g. critical thinking and problem-solving skills which help people address uncertainty and future change). What international experiences/ evidence of this could be shared?

3. A third tension revolves around the need to focus educational programmes around breadth (e.g. an overview of key environmental/ sustainability issues; awareness of global concerns) vs. depth (e.g. detailed understanding of particular issues such as climate change; knowledge of specific local environmental/ sustainability issues) of knowledge and understanding. What are the potential impacts or outcomes of such choices? And as above, what international experiences/ evidence of this could be shared?

Section 3: ESD and CCE

As mentioned previously, there is some limited evidence of the term 'climate change education' (CCE) being used in popular media and some NGO work in the UK. As yet, this appears to be mostly part of efforts to raise the public profile of climate change as an issue, and the concept has yet to be supported by academic research or government policy. More commonly, climate change issues have simply been added on to existing ESD/ EE agendas. Whether education programmes about climate change will easily integrate with these agendas in the long term remains to be seen. However, robust academic work that looks at the relationships between ESD/ EE and CCE would be of great interest and potential utility.

Although it is also too soon to know how the idea of CCE might develop in future, it is worth noting that there is concern amongst many educators in the UK that it presents a worrying narrowing of ESD aims and agendas. Will anxiety about and increasing attention to

particular climate change issues – especially dramatic environmental disasters (floods, cyclones) undercut broader educational attempts to promote sustainable development and sound environmental management? And will the frightening forecasts of impending environmental disaster lead to education programmes which are focused on behaviour change about single issues (carbon emissions, recycling, transport) to the detriment of holistic ESD goals (for example to encourage critical thinking and democratic participation)? Much of the discussion about ESD in the UK over the last decade has focused on how best to bring diverse and multiple perspectives into ESD programmes, so limiting the discussion to only climate change issues seems – to many – to be a step in the wrong direction.

Section 4: ESD and the Curriculum

There are several opportunities for learning about environmental issues, sustainable development and climate change within the national curriculum across the UK. In 2007, for example, the Qualifications and Curriculum Authority (QCA) in England updated the national curriculum guidelines to include 'global citizenship and sustainable development' as one of its cross-curricular themes. Themes are intended to be integrated into learning in all subjects (see QCA 2007; DfES 2005). This allows schools the option of including related topics in their work with students, but it is not mandatory. More specifically, sustainable development is formally linked to four of the required subject areas (citizenship, design and technology, geography and science), and climate change has recently been identified as a topic to be studied by all secondary school pupils across the UK (Ofsted 2008).

As mentioned previously, the UK Government aims for all schools to become 'sustainable schools', and the goal is to achieve this by 2020. *The National Framework for Sustainable Schools* has close links to several other education policy efforts including 'Every Child Matters' – a framework that aims 'for every child, whatever their background or their circumstances, to have the support they need to be healthy, stay safe, enjoy and achieve, make a positive contribution, and achieve economic well-being' (see http://www.everychildmatters.gov.uk/aims/). The Sustainable Schools framework's guidance for governors, specifically places

> 'the child at the centre of its concerns for a healthy, just and sustainable society. It paints a picture of the kind of place and the kind of school culture where each learner can be healthy, stay safe, enjoy and achieve, make a positive contribution and achieve economic well-being – all within the earth's environmental limits' (cited in Ofsted 2008: 7).

To support this effort, in 2005 the UK Government launched a web-based service (hosted within the teacher-support site www.teachernet.gov.uk) which is intended to provide a 'one-stop shop' for teachers and school leaders interested in building sustainability into their school.

In Northern Ireland, the devolved administration has also formally incorporated sustainable development into the curriculum as one of its thematic units. ESD specifically is also included in the 'Environment and Society' area of learning within Geography and History at the post-primary level. In Scotland, learning for sustainability is similarly being integrated into the formal school curriculum as a central outcome of student learning, and the Scottish government's website highlights sustainable development as a featured topic, including a dedicated page on the UN Decade (UK National Commission for UNESCO 2008: 20). In Wales, the recently revised curriculum includes ESD/ ESDGC as a major focus for teaching and learning.

One of the key feature of progress in the last several years has been the growing strength of regionally based initiatives in England and continued progress in Wales, Scotland and

Northern Ireland. Strategies in several regions in England (the East Midlands, the South West of England, and Yorkshire and Humber) show an increasing level of interest in ESD from a broad range of stakeholders involved in education. These strategies have focused on facilitating networks, providing improved access to research and policy expertise, and promoting sustainable development to both civil society and publicly funded bodies. The initiative in England's East Midlands region, for example, is one of 35 Regional Centres for Excellence on ESD around the world (see Bourn 2008a: 200).

4.1 Research

As environmental and sustainability topics have been increasingly incorporated into curricula in the UK's four administrations, substantial research attention has been devoted to the area. This paper can therefore only provide an outline of some of the key issues being explored. Much of this work on curriculum and learning has been conducted within the area of 'environmental education' research specifically, rather than ESD, but there are clear links between the two areas. For example, topics such as environmental learning in national curricula (e.g. Ross 2007), in teacher education (e.g. Corney 2000, Summers and Kruger 2003), and through participatory curriculum development (Hacking, Scott and Barratt 2007) are of obvious interest to a much broader research audience.

It is worth noting that a significant portion of this research has been produced by advocates of 'education *for* the environment' – also known as socially critical environmental education – which centres on 'an overt agenda of values education and social change' (Fien 1993: 16 cited in Cotton 2006). Environmental education of this type is proposed as a tool for personal and social transformation, and a challenge to dominant ideologies. There is evidence that elements of this perspective have been incorporated into curricula across the UK, particularly in terms of requiring classroom teachers to promote positive attitudes towards the environment. However, as of yet there is only limited research evidence to show that such programmes can lead to long-term attitude or behavioural change (Rickinson 2001).

Furthermore, research suggests that implementation of these programmes can be problematic in a number of ways:

> 'Even if it were possible to identify an agreed set of desirable environmental attitudes, the NCC [National Curriculum Council] document does not make clear *how* teachers are to promote certain specified attitudes, while at the same time encouraging their students to develop 'independence of thought'. Various critics have argued strongly that the role of education should be to encourage independent thought, not to promote a specific world-view.... However, despite these criticisms, in much of the environmental education literature there is a growing expectation that teaching environmental education should be about changing attitudes, or even engaging students in taking action on environmental problems' (Cotton 2006: 68).

Other related difficulties explored in the research literature include the potential for resistance to such programmes from educators, parents and children (cf. Grace and Sharp 2000), as well as constraints on implementation due to lack of time, lack of school support, and lack of staff expertise and motivation (cf. Ballantyne 1999).

There is also a growing body of research evidence of the impacts of EE/ ESD programmes from government-funded evaluations and inspections. A recent Ofsted report on Sustainable Schools provides some useful indications of how ESD learning is being put into practice on the ground:

> In the large majority of the 41 schools inspected, inspectors' initial discussions revealed schools' lack of awareness of sustainable development. Very few headteachers knew about the Sustainable Schools programme and this area was

> rarely a priority for development. Further inspection usually showed some action within the curriculum and through extra-curricular activities such as eco and gardening clubs or recycling projects. However, school leaders acknowledged that little of this work formed part of a coordinated whole-school approach. As a result, the impact on pupils' attitudes and behaviour was less than it could have been (Ofsted 2008: 8-9).

The report also found that limited provision within individual subject areas – including citizenship, geography, science, and design and technology – resulted in few opportunities for the cross-curricular learning which government policy has advocated, although there was more evidence of this kind of learning in primary schools where planning more easily crosses subject boundaries. On the other hand, the report found evidence that many schools were successfully using extracurricular activities to develop students' understandings of sustainable development. These included taking responsibility for maintenance of school grounds and neighbouring open spaces, taking an active part in community projects, and working with local craft, recycling or woodland groups.

4.3 Reflections

Key issues for future research on environmental learning and the curriculum are related to the questions identified previously (see sections 1.3 and 2.3) as well as more specifically to issues such as effective curriculum design, teaching and learning environments, and assessment. These issues are especially key because although sustainability topics are now present in the required curriculum content across the UK, recent research suggests that implementation within classrooms remains limited. Where schools are engaged in the area, research has also noted a tendency to reify ESD and potentially lose the link to sustainability – i.e. schools can focus on 'doing ESD' and fulfilling curriculum requirements without asking themselves how it is contributing / relating to the wider goals of sustainable development. The growing focus on standardised assessment within formal education in the UK may also act to limit the impact of environmental learning because many environmental and sustainability topics are included as cross-curricular themes, and therefore are not formally assessed within national examination systems.

Section 5: ESD, Pedagogical Traditions and Development Tendencies

Policy, practice and research on ESD and related areas of work (DE, EE, etc.) are strongly tied up in long-running debates and discussions of the role of education in UK society more generally. One of the key philosophical debates in the UK, for example, has revolved around the relative strengths and weaknesses of two approaches to pedagogy: a focus on delivery of content knowledge vs. teaching through discussion and argumentation (a focus on development of critical thinking). These two competing foundational perspectives on learning feature strongly within debates and discussion about education about the environment and development. While some policy makers, researchers and educators have argued for the provision of particular content knowledge (e.g. the natural sciences), others often directly seek to also explore the links between education, environment, development and issues such as social justice, respect for diversity, and human rights. There is also likely to be a clear division in this not only related to pedagogical concerns, but regarding disciplinary boundaries/ differences (e.g. teaching and learning in the humanities vs. natural sciences).

This discontinuity also plays out in public policy. In its guidance for teachers to address controversial issues in schools, for example, DCSF comments that:

> The fundamental educational task is to help learners think for themselves, and to sort out and clarify their [understanding of], emotions and values. They therefore need skills in weighing up evidence, choosing between alternatives, thinking about pros and cons, listening and reflecting before coming to a conclusion, developing empathy

for people with whom they disagree, and abiding by rules and conventions of mutual respect and civil argument. (www.teachernet.gov.uk/wholeschool/behaviour/tacklingbullying/racistbullying/preventing/controversialissues/).

At the same time, campaigns from other government agencies focus solely on promoting specific forms of behavioural change through information and public awareness activities (see, for example, DEFRA's 'Are you doing your bit?' campaign at http://www.doingyourbit.org.uk/).

Given the ethical commitments which often underscore this area of work in the UK, there are key questions about the role that such an approach to education can take in promoting change. Are there ethical or moral concerns, for example, about using education to 'scare' people into action on climate change? Is the role of educational programmes to inform, to provide information or to stimulate action? How might teachers and other education practitioners feel about this role? What is the role of government in changing behaviours and/ or attitudes towards sustainability? What are or should be the relationships between formal and informal education?

These questions set a very broad, and quite important, research and policy agenda for ESD in the UK. Furthermore, they provide a potentially informative basis for comparison across national and international contexts: What new, or perhaps just unfamiliar, approaches to learning could be shared internationally? As we are currently confronting a range of shared global economic and environmental threats, are there common educational approaches/ frameworks/ perspectives which can be applied globally?

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The International Alliance
of Leading Education Institutes

Report from the USA

Climate Change and Sustainable Development:
The Response from Education

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A report submitted to the

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INTERNATIONAL ALLIANCE OF LEADING EDUCATION INSTITUTES

This report describes the status of Education for Sustainable Development (ESD) in the United States of America. It was completed in 2009 as part of the work of the International Alliance of Leading Education Institutes (http://www.intlalliance.org/alliance.html), and is one of ten such national reports. In response to the Alliance's charge, this report focuses on formal (school-based) education at the primary and secondary levels. It addresses theoretical concerns as well as research results and the practical realities of American ESD.

The first section introduces the national context, focusing in particular on the decentralized nature of American education governance. It also reviews the history of ESD in the United States and outlines the general trend of growth and diversification. The second section describes in greater detail the historical and contemporary influences on American ESD, including federal and state governments and an array of non-governmental organizations. In the absence of a coherent national strategy for ESD, this section attempts to summarize what American ESD is and is not, and how it got that way. The third and final section offers a selective (rather than comprehensive) tour of research and practice in ESD, commenting on the status of ESD-related curricular and pedagogical models as well as teacher education and whole-school reform.

Part 1: The National Context

Preface: The United States of America

The United States of America is frequently described in superlatives: it has the largest economy of any nation in the world, the most powerful military and (by some reckoning) the most venerable continuously operating democracy. It is among the largest countries in the world in terms of both geographic area and population. It is also among the most culturally and ethnically diverse, a product of massive historical and contemporary immigration from every corner of the globe. In the past century, Americans have increasingly become an urban people, with 79% of the nation's population living in cities and suburbs at the time of the last census (US Census Bureau, 2000). The United States has a highly productive agricultural sector, vast natural resources, and a proud tradition of scholarship and technological innovation.

In the realm of environmental policy and sustainable development, a less proud set of superlatives can be applied. The United States has the highest *per capita* rate of carbon dioxide emissions. It was the greatest overall emitter of carbon dioxide until recently, when it was surpassed by the People's Republic of China. It is the greatest *per capita* producer of municipal waste and of nuclear waste. Although the United States was a cradle of the environmental movement, it has not been a global leader in environmental policy for many years. A close examination of American environmental policy reveals little trace of a national agenda for sustainable development.

Part of this is due to the structure of the American government, which is characterized by a careful balance of powers designed to prevent the concentration of authority in one person, party or agency. The primary manifestation of this is the *federal* nature of governance, in which a national government (often referred to as the federal government) has authority over some regulatory domains specified in the American Constitution, while the remaining domains are regulated independently by the fifty states. Public education, as will be discussed below, is *not* within the regulatory domain of the federal government. The federal government itself is divided into executive, legislative and judicial branches, a system which is reiterated in each state. Although much could be said about this division of powers, the single most relevant factor for the purposes of this report is the inability of the executive branch, led by the president, to create new laws. The president sets a legislative agenda, but it is the legislative branch, whose members represent their states and regions, that crafts and approves (or rejects) new laws. This limitation on executive authority, combined with the delegation of many powers to the states, mean that *national* agendas have a highly attenuated influence on, for example, educational practice.

Is there no such thing as ESD in the United States?

There are two factors that make it difficult to summarize the status of education for sustainable development (ESD) in the United States. The first factor is the *administrative decentralization* of the US education system. Decisions about education are often made at the state or local level, and there are few aspects of American education for which a national agenda directly shapes either curriculum or pedagogy. Thus, although there is no national agenda for ESD – at least, no agenda that has the status of law – neither is there a clear, centrally determined agenda for education in the traditional disciplines.

The second factor, which exerts an equally large influence on American ESD, is the *nomenclatural diversity* of ESD in the United States. Educational projects that have some or all of the hallmarks of

ESD are promoted and conducted under many different names. The most obvious of these is environmental education (EE). There are also strong ESD-relevant projects associated with civic education, place-based education, and education in the traditional academic disciplines (particularly the natural sciences, social sciences and history). Even the projects that correspond best with international principles of ESD typically bear a slightly different name: *education for sustainability*.

In this context, it would be possible to examine the American educational landscape and conclude that there is no national agenda for ESD and little in the way of ESD taking place in schools. Such an assessment would miss the rich but uneven tapestry of educational thought and action directly relevant to ESD. This report focuses on activities that bear the name ESD, but it also attempts to transcend issues of decentralization and nomenclature by considering some particularly relevant projects that have proceeded under other names, particularly *education for sustainability* and environmental education, as well as projects at the local or regional rather than national scale. For scholars and practitioners of EE, this report may feel incomplete. Although it draws on the EE research literature to a limited extent, it does not make an effort to synthesize or summarize that literature in any comprehensive way. Scholars and practitioners of peace education, civic education and the like will also notice the omission of relevant work from their fields. Thoroughness was too great a goal for the scope of the work; usefulness, hopefully, was not.

Decentralization and the nature of federal influence on public education

In the United States, the federal government has very limited constitutional authority to regulate formal education. This authority devolves upon the states, which set educational agendas according to local political will. Although the historical trend is one of convergence, with states becoming more similar in the way they organize and regulate education, there are still meaningful differences in the way formal education is funded and administered from one state to the next. Even basic parameters, such as the minimum and maximum ages of compulsory schooling, vary from state to state. To further complicate the picture, the states themselves exercise different amounts of control over formal education. In "local control states," such as Colorado, school districts[1] make many programmatic decisions about curriculum and pedagogy.

Despite the legal emphasis on local control, federal authorities are often able to influence primary and secondary education by attaching restrictions and conditions to federal funding for education. For most of the history of the United States, federal funding for public education was nearly non-existent. This changed in 1965, with the passage of the Elementary and Secondary Education Act. A key part of then-President Lyndon Johnson's "war on poverty," the Act provided significant funding for (among other things) public schools that served low-income children. It was initially authorized for a limited term of five years, but has been periodically re-authorized ever since. Since Johnson's time, local educational authorities, particularly those that serve high-poverty populations, have come to depend on federal funding. This dependence enables the federal government to exert a disproportionate influence through a comparatively small financial investment (less than 10% of total expenditures on public primary and secondary education). Although it was not President Johnson's original purpose in sponsoring the legislation, the Elementary and Secondary Education Act has substantially increased federal involvement in, and influence over, public education in the United States.

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[1] The school district is a regulatory unit encompassing the network of primary and secondary schools associated with a town, city or settled region. Districts vary enormously in size—at one extreme, the entire city of Los Angeles is comprises a single district—and in the type of control they may exert over formal education.

For the past two decades, the federal government has used this influence to push a program of "standards-based reform." In its most recent incarnation, the No Child Left Behind Act of 2001, states only receive federal funding if they establish academic standards in key areas (reading, mathematics and science) and track the progress of each school relative to those standards. Each state is permitted to set its own standards, but all states are required to enforce their standards by penalizing schools that do not meet yearly goals. This reform strategy has had a number of consequences for American public education, but two in particular are worth noting because of their relevance to ESD. First, the emphasis on achievement in a few of the traditional academic disciplines has caused schools across the country to divert time and resources *toward* those disciplines and *away from* cross-disciplinary programs and disciplines (such as history) that are not included in the annual yearly progress measures (King and Zucker, 2005). Second, the need to test students and monitor test results has forced each state to develop a substantial bureaucracy for testing, and each school to devote a correspondingly large amount of time and attention to administering the tests (Zellmer, Frontier and Pheifer, 2006). Resources devoted to testing are typically taken away from instruction, and pressure to achieve high test scores has the predictable consequence of discouraging innovations not directly related to those outcomes. Both consequences of standards-based reform have made American schools less hospitable for ESD.

Historical roots of ESD in the U.S. Environmental Education movement

American ESD has its roots in education movements that date back over a century. The most widely known of these is the Nature Study movement that began in the 1890s and continues, in a somewhat attenuated form, to the present day. Nature Study is often described as the direct predecessor of environmental education in the United States (Disinger, 2005). An educational movement that is less widely recognized but has at least as much in common with contemporary ESD is Conservation Education, which arose from the agricultural reform projects of the 1920s and 1930s. During these decades, the United States federal government responded to the crisis of widespread soil erosion by founding the Soil Conservation Service—an administrative entity whose mission was to transform agricultural practice through education and demonstration projects (NRCS, 1995). Although the word "sustainability" was never applied to these projects, the idea of preserving the agricultural viability of the land for future generations is obviously compatible with contemporary notions of sustainable development.

More recently—but still half a century ago—William Stapp and his students coined the first formal definition of environmental education (EE). Stapp went on to play a key role in organizing the UN-sponsored conferences on environmental education in Belgrade (1975) and Tbilisi (1977). Although many researchers and educators have remarked on the conceptual differences between EE and ESD (McKeown and Hopkins, 2003; Bonnett, 2002), there can be little doubt that contemporary ESD projects in the United States and elsewhere are the direct descendents of these early efforts.

In evaluating the status of American ESD, EE deserves special consideration. Grassroots EE projects have proliferated in both formal and non-formal educational contexts, and EE has achieved a degree of mainstream acceptance, though it remains peripheral to public education at the primary and secondary levels. Many educators pursuing ESD-related projects in the United States identify their work as environmental education. When state-level educators and administrators were contacted for this project, many of them responded to questions about ESD with references to EE. Although ideological divisions and nomenclatural preferences persist, most American *practitioners*

of EE and ESD agree that their work is of mutual interest, draws upon overlapping content and pedagogical techniques, and serves similar if not identical ends.

The overall picture: Multiple influences on ESD

Although the United States has no national agenda for ESD, and little educational work takes place under that name, many American researchers and practitioners have contributed to ESD at an international level. For example, the ESD toolkit developed by Rosalyn McKeown and her collaborators (McKeown, 2002) has been translated into Spanish, Urdu, Chinese and other languages, and adopted as a teaching tool and program manual around the world. Intended to help new programs understand and apply ESD in locally suitable ways, the toolkit has probably had a far greater impact outside of the United States than within the country. This is emblematic of the paradoxical situation in the United States, where the formidable expertise of individuals and groups is not yet reflected in system-wide change.

American ESD is growing slowly but steadily. Its growth has been shaped by three types of institution: environmental regulatory agencies at the federal level, educational regulatory agencies at the state and local level, and non-governmental organizations of varying scope and ambition. Federal agencies have typically played a background role, establishing and supporting ESD-related practitioner networks and providing modest resources for new ESD-related projects. State and local agencies, where they have played a positive role in the development of ESD, have usually done so by releasing school- and district-level leaders from administrative constraints. A small number of states (Vermont and Washington in particular) have recently taken a more proactive role by adopting curriculum and teacher education standards that are directly relevant to ESD. Non-governmental organizations (NGOs) have exerted the most direct influence on American ESD. NGOs have created, refined and implemented ESD curricula, disseminated academic standards and facilitated the adoption of ESD practices in districts, schools and classrooms.

These three institutional influences on ESD are tightly intertwined. NGOs often receive funding from federal environmental agencies. Conversely, NGO leaders often sit on the advisory boards that direct and evaluate those agencies. In each of the two states that were quickest to adopt ESD-related standards, an NGO played a crucial role in both framing the standards and shepherding them through the legislative process.

The growth of ESD is most strongly in evidence at the level of individual schools and classrooms where dedicated practitioners have adopted, adapted or created ESD programs that suit their local conditions and conform to local political pressures. It is challenging to evaluate the scope or effectiveness of such diverse efforts in the best of circumstances. Even cataloguing ESD projects at the grassroots level presents considerable difficulties. No resources have yet been devoted to that task, and no such comprehensive evaluation has taken place. Unlike countries such as the UK (Huckle, 2009) and Germany (Rode and Michelsen, 2008), no system of ESD indicators is in place or under consideration for the United States.

Part 2. The Conception of Education for Sustainable Development in the United States

Layers of ESD governance

As noted above, there is currently no *legislated* national definition of ESD, and no formal agenda for pursuing it. Nonetheless, it is worth considering three distinct influences on the conception and practice of ESD in the United States:

(1) The federal government, including both the persistent influence of past sustainable development projects from the 1990s and the contemporary influence of federal environmental regulatory agencies, particularly the Environmental Protection Agency (EPA);

(2) State governments, particularly educational regulatory agencies at the state level;

(3) Non-Governmental Organizations (NGOs), including not-for-profit educational organizations, advocacy groups, and professional associations of educators and researchers.

These three influences each contribute a layer to what Elizabeth Bomberg calls *sustainable development governance*:

> Governance refers here to established patterns of rules and norms steering a polity in a stipulated direction. It implies the incorporation of principles, practices and mechanisms which enable a community to be governed even without a government or ruler. It may well include declarations, laws and policies mandated by government or from 'the centre', but it is much broader, including soft law, non-regulatory tools and policy learning. (Bomberg, 2009).

This section describes each of the three layers of ESD governance in turn, examining how ESD is conceptualized by the federal government, state governments, and NGOs, and how it relates to broader notions of sustainable development at each level.

ESD and Sustainable Development at the federal level

SD and ESD in the Clinton era: Sustainability through good citizenship

Although the United States does not currently have a government-sanctioned agenda for either ESD or sustainable development more generally, it *did* have such an agenda ten years ago. The United States was one of about 70 countries to convene a national council for sustainable development in response to *Agenda 21*, the action plan that resulted from the earth conference in Rio. This council, called the President's Council on Sustainable Development (PCSD), had no legislative authority but included prominent representatives from government, industry and non-profit organizations (NGOs). Maurer (1999a) offers a detailed account of the successes and struggles of the PCSD. As Maurer observes, the PCSD was notably successful in establishing a national vision and strategy for sustainable development despite initial tensions between different interest groups (Maurer 1999a, 1999b). This vision and strategy were published in 1996 under the title *Sustainable America: A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future* (PCSD, 1996). Unfortunately, the work of the PCSD had little influence on the legislative process. The PCSD itself was poorly integrated into national policy-making bodies, and progress of sustainability-related legislation was extremely limited due to competing legislative priorities and partisan conflict between the executive and legislative branches of government.

The PCSD was disbanded in 1999, after producing a second report that focused more narrowly on climate change, environmental management, and community policy. It was, by most accounts, a casualty of declining political will, but may also have suffered from the sense that its agenda-setting mission was complete and its consensus-based structure was less well suited for pursuing concrete sustainability goals. The PCSD was not replaced in the eight years of the George W. Bush presidency, and its decade-old recommendations remain, in many respects, the high-water mark of federal sustainability policy. The PCSD's recommendations are echoed in more recent documents (cf. Dernbach, 2009) and continue to exert an influence on local actors. Furthermore, some of the local and regional partnerships established through the community outreach work of the PCSD persist to this day. For example, the Center on Sustainable Communities,[2] a project of the National Association of Counties, organizes a national network of local actors who pursue county-level sustainability policies (PCSD, 1999). The impact of the PCSD should be assessed relative to the contributions it sought to as provide: a platform for timely but contentious discussions, an incubator for new policy ideas (to be pursued in other venues), a source of legitimacy and intellectual support for local efforts, and a symbol of national commitment to sustainable development (PCSD, 1999)

The PCSD's view of sustainable development

The PCSD articulated a nuanced idea of sustainable development that is both similar to and distinct from that presented in the Brundtland[3] report (World Commission on Environment and Development, 1987) and other influential international policy documents. At the highest thematic level, the PCSD's idea of sustainable of sustainable development contains the same two themes that are central to the Brundtland report: intergenerational equity and the "triple bottom line" of environment, economy, and social equity. These themes are clearly visible in the PCSD's vision statement:

> Our vision is of a life-sustaining Earth. We are committed to the achievement of a dignified, peaceful, and equitable existence. A sustainable United States will have a growing economy that provides equitable opportunities for satisfying livelihoods and a safe, healthy, high quality of life for current and future generations. Our nation will protect its environment, its natural resource base, and the functions and viability of natural systems on which all life depends. (PCSD, 1999, p. iv)

An examination of the PCSD's operating principles reveals a somewhat different ideological emphasis, however. In their 1996 and 1999 reports, the members of the PCSD articulated sixteen shared "beliefs that underlie all of our agreements." These beliefs reveal the PCSD's orientation toward technological and global market mechanisms as the means by which a more sustainable future will be achieved. For example, the PCSD placed great emphasis on "market incentives and the power of consumers [that] can lead to significant improvements in environmental performance at less cost." (PCSD, 1999, p. v). Orr (1992) referred to this orientation as *technological sustainability*: a belief that the core problems of sustainable development can be addressed through increased efficiency and technological innovation without the need for a shift in the fundamental values that drive production and consumption.

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[2] This organization is the current incarnation of an earlier collaborative project with the U.S. Conference of Mayors, known as the Joint Center on Sustainable Communities.

[3] Formally titled *Our Common Future: Report of the World Commission on Environment and Development*, this report is more widely known by the last name of the woman who chaired the committee - Gro Harlem Brundtland.

The PCSD did address values and principles, but it did so primarily from a "good citizenship" perspective that emphasized personal responsibility, thoughtful decision-making and collaboration built on mutual compromise. The core message, which can be read as either conservative or pragmatic depending on the reader's political orientation, is that sustainability can be achieved by doing a better job of the things that we are *already* doing, and doing more of the things we know we *should* be doing. In the Council's own words:

> The Council's recent experience reaffirms our view that collaboration, stewardship, and individual responsibility are cornerstones of the path to a more sustainable America. By bringing diverse interests together, we can build the durable coalitions of common beliefs and values needed for a better future. By following the "intuitive and essentially moral commitment Americans have to preserving Earth's beauty and productivity for future generations," we can create a stewardship ethic as our guide. If we "make choices on the basis of a broader, longer view of self-interest… get involved in turning those choices into action; and… be held accountable for [our] actions," we can foster individual responsibility. By working together, we can achieve economic growth, environmental protection, and social justice for ourselves and our children. (PCSD, 1999, p. 8; quotes are drawn from PCSD, 1996)

Another way in which the work of the PCSD both resonated with and departed from the work of international policy-making bodies was its emphasis on community and collaboration. The work of the council was an impressive embodiment of the principles of collaboration and community-based decision-making. Maurer (1999a) singles out the PCSD for its unusually successful integration of multiple stakeholder perspectives, the fruits of which can be seen in the persistence of local and regional sustainability projects that were started or facilitated by the PCSD and its members. Fittingly, the last major initiative of the PCSD before it was dissolved in 1999 was an event called the National Town Meeting for Sustainable Development.

During its existence, the PCSD embodied communitarian and collaborative principles more strongly than many other national councils, such as the UK Round Table for Sustainability and the Finland National Council for Sustainable Development, both of which adopted a more centralized and government-oriented approach to sustainable development. If these latter groups were ultimately more effective in enacting legislative and regulatory change, it is probably because bottom-up, community driven reform is predictably slower and less certain than centralized policy strategies. This tension between community-level democracy and efficient legislative action is a fundamental challenge for sustainable development policy in the USA and worldwide.

ESD in the era of the PCSD: Emergence of an influential paradigm

The PCSD consistently used the phrase *education for sustainability* instead of "education for sustainable development." The former phrase continues to be more common and more enthusiastically embraced in American educational discourse. Practitioners and researchers who favor "education for sustainability" argue that it carries less of the ideological baggage associated with the word "development," including fewer intimations of neo-liberal economic policy and ever-expanding regimes of production and consumption. They contend that development, as traditionally conceptualized, is not sustainable.

The PCSD saw education as part of a larger system defined in terms of information—specifically, the production, management, dissemination, and use of information relevant to sustainable development. Within this system, the role of education was to "give people the tools, skills, and experience they need to understand, process, and use information about sustainable development" (PCSD, 1996). Throughout the reports produced by the PCSD, the word education was used both broadly, to refer to formal and non-formal educational mechanisms, and narrowly, to refer

specifically to formal schooling. The Council maintained its information-centric view throughout, framing educational inequities in terms of "access to information" and "the skills and training necessary to make use of it" (PCSD, 1996).

Curiously, the PCSD explicitly connected the importance of education to market-based mechanisms for promoting sustainability:

> Widely available information will become increasingly important as the United States moves to a new framework that places greater responsibility on individuals and the private sector to work cooperatively in making decisions that promote a balance among economic, environmental, and social issues. Informed decisions will create a more market-based regulatory framework--one that is more effective and flexible and less intrusive than the present system. (PCSD, 1996)

This argument, which reflects the powerful influence of economics on US environmental policy, has a strong internal logic: markets function more efficiently when all participants have access to accurate information. Still, it is unusual to find ESD discussed as a necessary counterpart to market-based mechanisms.

Within the overarching ideological framework described above, the PCSD identified two ways in which education was relevant to sustainable development. First, education serves as a minimum background condition for sustainability, meaning that sustainable development cannot be achieved without a minimum level of general education. Second, education can be a tool for pursuing sustainability, in the sense that education beyond a minimum level can be used more directly to promote sustainability. This dual relevance is captured, albeit in a more subtle form, in one of the PCSD's ten overarching goals: "[to] ensure that all Americans have equal access to education and lifelong learning opportunities that will prepare them for meaningful work, a high quality of life, and an understanding of the concepts involved in sustainable development." (PCSD, 1999). This perspective on ESD persists in the work of McKeown (2006) and others.

The PCSD further articulated the idea education for sustainability by stating a central ideal and a list of principles intended to guide more concrete projects.

> Education for sustainability is the continual refinement of the knowledge and skills that lead to an informed citizenry that is committed to responsible individual and collaborative actions that will result in an ecologically sound, economically prosperous, and equitable society for present and future generations. The principles underlying education for sustainability include, but are not limited to, strong core academics, understanding the relationships between disciplines, systems thinking, lifelong learning, hands-on experiential learning, community-based learning, technology, partnerships, family involvement, and personal responsibility. (PCSD, 1996)

Such a sweeping form of education for sustainability could not possible be *added* to the American educational system; it would have to be *infused throughout* that system. Arguing that "education for sustainability is about connections," the Council recommended a vague but ambitious program of connections (1) among academic disciplines; (2) across school, community and non-formal learning contexts; (3) throughout the lifespan; and (4) across professional, civil and industrial organizations (ibid.). This last point is most unusual in discussions of ESD, but it reflects the PCSD's position that private industry should be integral to all sustainable development initiatives.

Education for Sustainability – an (advisory) agenda from 1996

Although the PCSD included education as a significant component of its strategy for sustainable development in the United States, its recommendations were too broad to constitute a national strategy for ESD. In October of 1994, the PCSD collaborated with the National Science and

Technology Council (NSTC), a cross-departmental government agency that plans and supervises funding for research, to sponsor a National Forum on Partnerships Supporting Education about the Environment "to broaden our concept of education to include sustainable development" (PCSD, 1996b). The hundred-plus participants in this forum were drawn from "business and government, the educational community, and nongovernmental organizations (NGOs)," and included many practitioners of formal and non-formal environmental education (ibid.). Although the forum was formally independent of the PCSD, it was substantively connected to the Council through individuals who participated in both. In particular, one of the co-chairs of the National Forum was Madeleine Kunin, Deputy Secretary of the U.S. Department of Education, who also chaired the PCSD sub-committee that produced the council's recommendations about education.

The forum itself did not produce a national strategy for ESD. Instead, it initiated a consensus-building process that resulted in the report *Education for Sustainability: An Agenda for Action*, released in 1996 as an accompaniment to the main PCSD report from that year. The definition of education for sustainability contained in this document closely resembles the definition in *Sustainable America*:

> Education for sustainability is a lifelong learning process that leads to an informed and involved citizenry having the creative problem-solving skills, scientific and social literacy, and commitment to engage in responsible individual and cooperative actions. These actions will help ensure an environmentally sound and economically prosperous future. (PCSD, 1996b)

Education for Sustainability also offered a list of guiding principles that was similar thought not identical those presented in *Sustainable America*:

> …successful efforts for implementing education for sustainability depend on six core themes. Collectively, these themes outline a course of action to educate for sustainability. They are (1) lifelong learning, (2) interdisciplinary approaches, (3) systems thinking, (4) partnerships, (5) multicultural perspectives, and (6) empowerment.

Comparing this list with the PCSD's list of principles (presented above) reveals the addition of "multicultural perspectives," the omission of "technology," and a shift in language from "personal responsibility" to "empowerment." On the whole, however, *Education for Sustainability* reiterated the conceptual foundations of the *Sustainable America* report, using them as a foundation for a detailed program of policy initiatives nested within broader action areas and overarching policy recommendations. The recommendations, action areas and policy initiatives from *Education for Sustainability* are reproduced in **table 1**, below and on the following pages. This list of initiatives, though lengthy, is of considerable interest because it reveals the ambitions scope of the report, as well as the degree to which many if not all contemporary ESD initiatives in the United States were outlined in this thirteen-year-old document.

Core Themes of *Education for Sustainability: An Agenda for Action*

1. Lifelong learning: The potential for learning about sustainability throughout one's life exists both within formal and nonformal educational settings.

2. Interdisciplinary approaches: Education for sustainability provides a unique theme to integrate content and issues across disciplines and curricula.

3. Systems thinking: Learning about sustainability offers an opportunity to develop and exercise integrated systems approaches.

4. Partnerships: Partnerships forged between educational institutions and the broader community are key to advancing education for sustainability.

5. Multicultural perspectives: Achieving sustainability is dependent upon an understanding of diverse cultural perspectives and approaches to problem solving.

6. Empowerment: Lifelong learning, interdisciplinary approaches, systems thinking, partnerships, and multicultural perspectives empower individuals and institutions to contribute to sustainability.

I. Formal Education

Ensure that the interconnections between the environment, economy, and social structures become an integral part of formal education, starting with kindergarten and continuing through elementary and secondary school and on through training at the college, university, and professional levels.

Action 1: Green Schools
Design and support opportunities for integrating the concepts and principles of education for sustainability into formal educational programs from early grade school through the university level.

INITIATIVE 1.1 - State boards of education should be encouraged to consider the importance of education for sustainability and to include it in licensure, standards, and guidelines for program approval developed at the state level for K-12 teachers and principals.
INITIATIVE 1.2 - Implement partnerships to help institutions of higher education achieve the transition to education for sustainability.
INITIATIVE 1.3 - Support exemplary models of "green campuses," that is, operational practices that engage the learning community in planning and decision-making for achieving sustainable educational environments.

Action 2: Professional Development
Encourage the incorporation of education for sustainability in pre-service and in-service professional development activities.

INITIATIVE 2.1 - Leadership by federal and state governments, institutions of higher education, professional societies, and the private and nonprofit sectors is needed in support of pre-service professional development in education for sustainability.
INITIATIVE 2.2 - Cooperative efforts and partnerships are necessary to insure that all in-service teachers receive training and support in classroom applications of a range of education materials addressing the concept of sustainability.

Action 3: Essential Learnings
Identify and formalize a set of essential skills and knowledge for all students that reflect a basic understanding of the interrelationships among environmental, economic, and social equity issues.

INITIATIVE 3.1 - The North American Association for Environmental Education and its partners are following a critique-and-consensus process for development of learning standards in environmental education that are consistent with the recommendations of the National Education Goals Panel.
INITIATIVE 3.2 - Create a focus group which is representative of formal and nonformal educators, including those who teach adults as well as youth, to develop and continually evaluate indicators of essential learnings for sustainability.

II. Nonformal Education

Expand public access to opportunities to learn about sustainability issues as they relate to the private, work, and community lives of individuals.

Action 4: Public Awareness
Support a campaign to raise public awareness of sustainability, convey information on indicators of sustainable development, and encourage individuals to adopt sustainable practices in their daily lives.

INITIATIVE 4.1 - Foster increased public awareness of sustainability through a public awareness program.
INITIATIVE 4.2 - Support a system of regularly updated, comprehensible national benchmarks of progress toward the goals of sustainability.
INITIATIVE 4.3 - Entertainment media may consider designing a coordinated media campaign to raise youngsters' awareness of sustainability.
INITIATIVE 4.4 - Support the continued outreach to American journalists on issues related to sustainability.
INITIATIVE 4.5 - Establish incentive programs, such as national awards, to recognize successful partnerships within the business community that support educational efforts on sustainability.

Action 5: Sustainable Development Extension Network

Establish an extension network to enhance the capacity of individuals, workforces, and communities to live sustainably.

INITIATIVE 5.1 - Establish a national Sustainable Development Extension Network (SUDENET) to foster access to information, technical expertise, and collaborative strategies that result in action taken by local communities.

Action 6: Community Visioning and Assessment
Encourage partnerships and activities that support community visioning and assessment activities.

INITIATIVE 6.1 - Create a national program in partnership with organizations that may include the National Council of Mayors, the National Governors' Association, and the National Association of Counties, that will provide educational resources and leadership training in support of community visioning and assessment.

Action 7: Workforce Development
Infuse sustainability concepts and practices into development of the U.S. workforce.

INITIATIVE 7.1 - Disseminate effective school-to-work models that emphasize issues of sustainability while encouraging dialogue with the business sector to address sustainability through hiring and recruitment practices.
INITIATIVE 7.2 - Strengthen the partnership between the U.S. Department of Labor and the American Association of Community Colleges to support education for sustainability.
INITIATIVE 7.3 - Use the U.S. Department of Labor's Training Technology Resource Center as the dissemination vehicle for workforce development information on programs, research, and organizations in the area of education for sustainability.
INITIATIVE 7.4 - Examine the feasibility within the Department of Labor's Occupational Information Network (O*NET) of collecting and disseminating information on emerging occupations in energy efficiency and waste reduction.

Action 8: Lifelong Learning
Encourage lifelong learning about sustainability at the individual, household, and community levels.

INITIATIVE 8.1 - Develop community college courses and programs aimed at producing the skills and information needed for contributing to sustainable activities at work and during leisure activities.

III. Cross-Cutting Themes

Institute policy changes at the federal, state, and local levels to encourage education for sustainability; develop, use, and expand access to information technologies in all educational settings; and encourage understanding about how local issues fit into state, national, and international contexts.

Action 9: State and Federal Policy Changes
Initiate strategic state and federal policy changes, including establishing necessary partnerships, as the foundation for a coordinated strategy for education for sustainability.

INITIATIVE 9.1 - Establish a working group within the National Science and Technology Council to devise and coordinate the implementation of broad federal policies for education for sustainability, ensuring an integrated set of federal programs directed to high priority national needs.
INITIATIVE 9.2 - Explore ways to coordinate resources, make education for sustainability more central to agency missions, and increase funding of education for sustainability programs and research.
INITIATIVE 9.3 - Develop consortia to coordinate, both among states and at the federal level, the infusion of education for sustainability into formal and nonformal educational institutions.

Action 10: Technology and Information
Coordinate or enhance existing essential tools for formal and nonformal environmental and sustainable development education, including multimedia computer and telecommunications technologies and an information clearinghouse.

INITIATIVE 10.1 - Enhance existing interactive information and communications networks designed to facilitate the exchange of information on education for sustainability through the Internet, linking educators, students, and policymakers globally.
INITIATIVE 10.2 - Develop, regularly update, and disseminate a videotape or CD-ROM that features the current year's highlights related to successful efforts in education for sustainability, such as partnerships, leaders who have played important roles, curriculum materials, and other information resources.
INITIATIVE 10.3 - Support coordination of existing clearinghouses to offer collaboratively a primary point of contact for incorporating and disseminating the vast array of information resources on education for sustainability available through print and electronic media.
INITIATIVE 10.4 - Make greater use of geographic information systems and other databases related to the environment and sustainability in educational curricula.

Action 11: Multicultural Perspectives
Emphasize and reflect multicultural perspectives at all levels of formal and nonformal education.

INITIATIVE 11.1 - Increase professional development among teachers who are incorporating education for sustainability in urban and rural settings that are characterized by diverse cultural groups.
INITIATIVE 11.2 - Support efforts to introduce all educators and students to the issues and perspectives of the environmental justice movement.

Action 12: Global Perspectives
Continue to expand international linkages for environmental education and education for sustainability.

INITIATIVE 12.1 - Educate for global sustainability by: (1) introducing all students to issues raised at the Stockholm and Tbilisi

conferences, and by the Brundtland Report and Agenda 21 of the United Nations Conference on Environment and Development (UNCED); (2) sharing sustainability approaches used by other nations, both their successes and challenges, through distance learning and other forms of communication; and (3) exposing students to the responsibilities shared by industrialized and developing countries for providing solutions to environmental, economic and social challenges. INITIATIVE 12.2 - Support the convening of an international congress on education for sustainability to take place early in the next decade as a catalyst for strategic planning for the remainder of the 21st century. INITIATIVE 12.3 - Participate in global partnerships on education for sustainability that build on the progress since the 1972 Stockholm Conference, while being tailored to reach generations of the 21st century.

Table 1. Summary of themes, recommendations, actions and initiatives from *Education for Sustainability* (PCSD 1996b)

Like the reports of the PCSD, *Education for Sustainability* was an advisory document, with no immediate legislative or regulatory implications. Although the authors appealed for changes in state and national policy, they envisioned a broader audience for their work, and were openly suspicious of the limits of central authority to realize change:

> Educational change cannot follow purely from mandates, whether state or federal, although such efforts can be effective as catalysts. Instead, change will emerge from grassroots initiatives, as the history of environmental education clearly demonstrates.

Accordingly, the policy initiatives in *Education for Sustainability* referred to numerous institutions and groups, including institutions of higher education, media outlets, and nation-wide professional networks in addition to state and federal policy-makers. Initiatives such as the selection of content standards ("essential skills and knowledge"), which would be within the purview of government in other nations, were portrayed by the PCSD as tasks for NGOs and community partnerships. This reflects the realities of the decentralized American education system, but it also reveals an ideological commitment to the local or *contextual* nature of sustainability. Although the authors of *Education for Sustainability* began with a set of core principles, they also argued that the principles should evolve over time, and that sustainability itself would mean different things to different people:

> Furthermore, educational programs should be rooted in the actual experiences of people in their own communities. These programs should not assume a common understanding of sustainability's political and social context.

This idea—that *sustainability* itself is a variable construct— goes one step beyond the more widely accepted notion that sustainable development should be rooted in community context. It also poses serious questions about the national government's role in promoting ESD. In *Education for Sustainability*, that role was limited to providing funds, coordinating collaboration and facilitating the exchange of information:

> Grassroots activities will continue to drive progress through the bottom-up approach that has characterized the field to date. Government can assist, however, by continuing and improving its coordinating role, and funding innovation and research.

Although limited in scope, the role of government was also seen as essential to the growth of community-derived ESD projects. In light of what actually happened in the twelve years following the publication of *Education for Sustainability*, the following synopsis of government's role in promoting ESD seems prophetic:

> While there are many successful education efforts underway across the federal government, there is an opportunity for officials to address the lack of effective coordination among the educational activities of individual agencies. Duplication of efforts among agencies as well as a steady decline in fiscal support limit efforts to advance education for sustainability.

Indeed, the years since *Education for Sustainability* have provided an extended test of that report's faith in the viability of grassroots mechanisms. Some of the policy initiatives have been carried to completion and are beginning to exert an impact on educational practice today. Notable among these is the standards project of the North American Association for Environmental Education (see **initiative 3.1**). The scope of this project, and its relationship to ESD, are discussed in more detail below. Other policy initiatives met with short-term success, but have since suffered setbacks. A key example here is the withdrawal of the U.S. Conference of Mayors from the Joint Center for Sustainable Communities (see **initiative 6.1**). Still other policy initiatives, including most of the initiatives that required action at the federal level, were never begun. In balance, though *Education for Sustainability* has fallen from view in recent years, its recommendations are still wholly relevant to ESD in the United States today.

Other federal support for ESD, past and present

In response to the PCSD's educational agenda, the Clinton administration established an Office of Education for Sustainability in the US Department of Education in 1996. The office was closed two years later due to lack of funding and the absence of a clear mandate. Before and after that two-year interval, ESD-related efforts at the federal level have been sponsored by a patchwork of agencies with little coordination and no central conceptual framework.

The closest thing to a comprehensive inventory of the federal involvement in ESD was the EPA's systematic survey of federal agencies that support environmental education,[4] conducted in 2002. The EPA found EE programs in fourteen different agencies, including agencies in the Departments of Agriculture, Commerce, Energy, Education, Transportation and the Interior, as well as the National Aeronautics and Space Administration and the National Science Foundation. The authors of the EPA survey observed that these programs typically had an *ad hoc* quality:

> …EE is frequently a by-product or inherent aspect to a program or activity with a broader goal. For example, most of the activities and programs listed are not specifically for EE, but rather include it as one activity that might be included. (EPA 2002, p. 2)

The U.S. Department of Education has been minimally and indirectly involved in EE, mostly through its ongoing investment in science and mathematics education. EE initiatives in other agencies have typically focused on environmental conservation (e.g., the educational projects of the National Park Service) or environmental science (e.g., the extensive curriculum materials produced by the National Aeronautics and Space Agency). Two notable exceptions can be found in the Departments of Energy and Agriculture, both of which sponsor educational programs that emphasize the balance between environmental and economic concerns. The Department of Agriculture is one of the few federal agencies to maintain the language of sustainability, most obviously in the Sustainable Agriculture Research and Education program. This program, which works to "advance farming systems that are profitable, environmentally sound and good for communities through a nationwide research and education grants program" (SARE, 2009), devotes most of its attention to adult and non-formal education, and provides few resources primary and secondary education.

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[4] In this case, EE is a reasonably good proxy for ESD because all comprehensive ESD programs would have ostensibly included an EE component.

The main federal sponsor of EE has been the EPA itself. Since the passage of the second National Environmental Education Act in 1990, the EPA has included a Division of Environmental Education, whose mission is to

> Ensure that environmental education, based on sound science and effective education practices, is used as a tool to promote and protect human health and the environment and to encourage student academic achievement. (EPA, 2008)

The location of the Division of Environmental Education within the EPA, rather than the Department of Education, reflects the emphasis of the1990 act, which conceptualized EE as a supplement to K-12[5] education, rather than an integral component. The first National Environmental Education Act, passed in1970, attempted to integrate environmentally-relevant content into primary and secondary education. It was poorly funded and poorly received among school administrators, and was discontinued 1975.

The EPA serves a capacity-building role with respect to EE. It does not attempt to regulate the implementation of EE, and disburses the bulk of its funds to local, state and regional authorities as grants to support EE research and practice. The EPA's Division of Environmental Education also seeks to add coherence to the broad range of educational projects conducted by other federal agencies. The 2002 survey of EE activities in other federal agencies is part of this effort. The EPA is legally responsible for "effective coordination of programs related to environmental education, including environmental education programs relating to national parks, national forests, and wildlife refuges" (EPA, http://www.epa.gov/enviroed/iag.html).

Since its first funding cycle in 1992, the Environmental Education Division has disbursed about thirty million dollars in EE funding (EPA, 2009). Although this is a small amount relative to the scope of total federal expenditures on education, the EPA has consistently required their grant recipients to find other matching funds and encouraged the dissemination of best practices and research findings through professional networks. The end-result of this funding strategy has been a tightly networked EE community that is increasingly capable of sharing information while remaining locally relevant.

What is the relationship between ESD and the EE activities of the EPA? The EPA's definition of EE focuses on "public awareness and knowledge about environmental issues or problems," and notes that "a primary desired outcome of environmental education programs is environmental literacy" (EPA, 2008). This definition, as well as other EPA materials on EE (see **table 2**), lacks any explicit mention of economic development or social equity—hallmarks of ESD at both the national and international level. In general, the EPA places a strong, programmatic emphasis on the "environment" component of ESD's triple bottom line. Although some recipients of EPA grants have focused on economic development or on health outcomes that are crucial to social wellbeing, the sole unifying feature of the EPA's educational activities is a concern for "environmental quality" (NEEAC, 2005).

Environmental education increases public awareness and knowledge about environmental issues or problems. In doing so, it provides the public with the necessary skills to make informed decisions and take responsible action. A primary desired outcome of environmental education programs is environmental literacy. Through the many programs funded and led by EPA, people of all ages and backgrounds are being provided multiple experiences that foster development of the combination of knowledge, skills, and attitudes required to be environmentally literate.

[5] K-12 is an abbreviation for "kindergarten through twelfth grade," encompassing both primary and secondary education.

Because environmental education is a process, it cannot in itself improve the environment, such as by enhancing local air or water quality. Instead, environmental education provides the capability and skills over time to analyze environmental issues, engage in problem solving, and take action to sustain and improve the environment. As a result, individuals are more capable of weighing various sides of an environmental issue to make informed and responsible decisions.

The components of environmental education are:

- Awareness and sensitivity to the environment and environmental challenges
- Knowledge and understanding of the environment and environmental challenges
- Attitudes of concern for the environment and motivation to improve or maintain environmental quality
- Skills to identify and help resolve environmental challenges
- Participation in activities that lead to the resolution of environmental challenges

Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills.

http://www.epa.gov/enviroed/basic.html (accessed 23 April, 2009)

Table 2. EPA statement on the purposes of Environmental Education

This may be changing. Working documents of the National Environmental Education Advisory Council (NEEAC), which advises the EPA's on EE, suggest that a broader idea of sustainability is establishing a foothold in the EPA's work. For example, the working title of the forthcoming NEEAC report, at the time of writing, *Stewardship and Sustainability: The Role of Environmental Education* (http://epaneeac.blogspot.com/, accessed 4/23/09). It remains to be seen whether or not this reflects a more wholesale adoption of the idea of sustainability, as conceived in international documents or in *Education for Sustainability: An Agenda for Action*.

Intimations of the future federal role in ESD governance

As described above, the U.S. federal government does not currently have a formal agenda for ESD, but exerts an influence on ESD through the uncoordinated actions of many different agencies. The new administration of President Barack Obama is unlikely to drastically alter the American ESD landscape in part because of the constitutional limits on federal authority over education and in part because ESD, *per se*, has not yet emerged as a major issue for the new administration. Although it is too soon to predict the long-term impact of the Obama administration on American ESD, there are some early indications of the role that the federal government will and will not play in the next four years. These indications suggest that (1) ESD will continue to lack a formal place in the Department of Education's national strategy, but also that (2) ESD *will* have a small but secure place in the sustainability initiatives of other departments.

Neither education nor sustainability was a central issue in the presidential election of 2008, which was dominated by debates about economics and national defense. Since the election, the evolving economic crisis has pushed education even lower down the list of priorities: at the time of writing, the new president had only given one major speech on the topic. Sustainability has fared somewhat better. Although the phrase "sustainable development" almost never appears in the administration's official statements, President Obama is pursuing twin policy initiatives focused on "green jobs" and "sustainable energy." The details remain to be hammered out by legislators, but both initiatives emphasize the linkage between economic prosperity and environmental wellbeing. More promising still, the administration has just announced an energy education initiative under the title RE-ENERGYSE (REgaining our ENERGY Science and Engineering Edge). This initiative, funded through the Department of Energy and the National Science Foundation, is clearly relevant to ESD.

Before discussing RE-ENERGYSE, it is worth examining the Obama administration's nascent education agenda, as this agenda will determine the context in which ESD-related projects unfold. In a speech to the Hispanic Chamber of Commerce on March 10, 2009, the President outlined his priorities for education reform in the coming years (Obama, 2009). This speech contained no reference to sustainability, but nonetheless has two significant implications for ESD. First, President Obama emphasized the familiar themes of standards and accountability, indicating that the current regime of standards-based, assessment-driven reform will either continue or intensify.

> …I'm calling on states that are setting their standards far below where they ought to be to stop low-balling expectations for our kids. The solution to low test scores is not lowering standards -- it's tougher, clearer standards… (Obama, 2009)

As described in the first section of this report above, standards-based reform creates a hostile climate for ESD programs that operate at or beyond the margins of the core academic areas. If states do institute "tougher, clearer standards" (Obama, 2009) in response to federal pressure, It will become more and more difficult to run such programs. Under these conditions, ESD will be only survive in formal schooling if (1) it can be justified as a strategy for improving outcomes in traditional academic disciplines or (2) it is integrated into state or local standards, as is happening in a small number of states.

American ESD advocates are often quick to argue that ESD requires institutional and pedagogical change as much as curricular change. From this perspective, the Obama administration's commitment to "charter schools" offers some cause for optimism.

> One of the places where much of that innovation occurs is in our most effective charter schools. And these are public schools founded by parents, teachers, and civic or community organizations with broad leeway to innovate… I call on states to reform their charter rules, and lift caps on the number of allowable charter schools, wherever such caps are in place. (ibid.)

Charter schools, which are primarily an American phenomenon, are publicly financed schools that operate under special charter from state or local authorities. In exchange for a commitment to meet certain academic goals, they are granted greater operational flexibility. Many charter schools around the United States have sought to increase instructional coherence by adopting a central theme, and a small but growing number have chosen environment- or sustainability-related themes. Indeed, both the "green schools" and "sustainable schools" movements, discussed later in this report, have taken root and grown through the participation of charter schools.

Other features of the national education agenda, as outlined in this speech, have uncertain implications for ESD. The President's focus on science and mathematics education, for example, promises to strengthen the disciplinary contexts in which ESD topics are, at present, most frequently addressed. On the other hand, a narrowing of science standards could negate this advantage by increasing the emphasis on canonical science principles at the expense of socio-scientific issues. Likewise, the President's commitment to career and technical education, in the context of his demonstrated interest in developing a "green economy," could foreshadow a new burst of ESD-related projects at the post-secondary level. This would require significant innovation at technical colleges and training schools around the country, however, and its concrete consequences will depend on specifics of the President's initiative that are not yet known.

Like the President's overall education agenda, the RE-ENERGYSE initiative awaits legislative action. RE-ENERGYSE is unlikely to be controversial, though, as it is situated within larger spending bills

that emphasize the sort of investment in research and technology that typically receives bipartisan support. The Obama Administration describes RE-ENERGYSE as:

> A joint initiative by the Department of Energy and the National Science Foundation that will inspire tens of thousands of American students to pursue careers in science, engineering, and entrepreneurship related to clean energy – with programs and scholarships from grade school to graduate school. (The White House Office of the Press Secretary, 2009)

As this description indicates, RE-ENERGYSE is far from a holistic approach to sustainability. Instead, it focuses on involving young people in scientific and technological research and development, with the specific aim of expanding the "transition to a low carbon economy," a transition that President Obama refers to as "the single most important challenge of their generation" (ibid.).

In many respects, the RE-ENERGYSE initiative reflects a characteristically American approach to sustainability—an approach that emphasizes technology and entrepreneurship, and assumes that solutions will arise through public-private collaborations and the incentive-driven choices of consumers. The other characteristic feature of past American sustainability projects, an emphasis on community and local decision-making, is absent. With respect to ESD, the RE-ENERGYSE initiative represents neither a new approach nor a particularly complete one—but it *does* represent a rare and concrete commitment to education with a broader federal initiative focused on sustainable development. No such program has been seen in the United States since the dissolution of the President's Council on Sustainable Development in 1999.

A note about climate change education

By 1999, Climate Change was already a central focus for sustainable development projects in the United States. This is evident in the PCSD's 1999 report, which featured climate change as one of four foci selected from a considerably larger list of topics in the Council's 1996 report. Today, in many cases, climate change projects and climate change rhetoric have effectively supplanted sustainable development projects and rhetoric. This is true at national, state and local levels of governance. For example, after withdrawing from the Joint Center on Sustainable Communities in 2005, the U.S. Conference of Mayors launched the U.S. Conference of Mayors Climate Protection Center. On the webpage formerly dedicate to the Joint Center, the Conference of Mayors notes:

> The Joint Center for Sustainable Communities is no longer in existence. However, The U.S. Conference of Mayors is still interested in promoting the issue of sustainable development. Please go to the Municipal Waste Management Association web site for more information.

The reduction of sustainability to a waste management concern is telling.

All this said, Climate Change Education (CCE) in the United States is in its infancy. Within research and practice on formal (K-12) education, CCE is interpreted as "education about the scientific understanding of global climate change," and, as such, is the near-exclusive province of science educators and science education researchers. Very little research on CCE has been conducted in educational contexts. A search of the educational database ERIC revealed only a handful of empirical research articles.[6] Most of these focused either on the use of debate and discussion as

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[6] Searching within the ERIC database for "climate change" or "global warming" produces 71 peer-reviewed articles. Most of these articles appeared in practitioner journals, rather than research-oriented publications, or did not concern American K-12 classrooms. The number of US-based research articles on climate chance education, or even research articles mentioning climate change, was vanishingly small and appeared almost exclusively in journals of science education.

pedagogical strategies in science classrooms or on explicit instruction in the nature of science. In both cases, climate change served merely as a salient example of appropriate content. Although CCE will not be examined in detail in the remained of this report, there is little doubt that it will play a sizable role in shaping the future of American ESD.

ESD and Sustainable Development at the state level

In the past decade, states have increasingly stepped in to fill policy gaps left by the federal government's inaction on sustainable development (Rabe, 2004). More recently, a few states have begun to do the same for ESD. Because state and local agencies have legal authority for education in ways that the federal government does not, their decisions will play a critical role in shaping the future of ESD practice in the United States. Because most states are still doing little to advance ESD, however, it is neither practical nor necessary to examine the policies of all fifty states. Instead, this section describes a few general features that characterize state-level ESD, then offers a slightly more detailed descriptions of ESD policy in two states (Vermont and Washington) that are addressing ESD in more formal and comprehensive ways. These examples are far from typical, but they represent important precedents that other states may emulate in the future. Local governance at the city or county level, though crucial to the implementation of ESD, is too complex a topic to be dealt with in any detail here.

The most obvious ESD-related work in many states takes place under the heading of environmental education. Almost all states support EE in some capacity, although the level of support varies widely, from the designation of a coordinator or contact person within an existing state agency (often but not always the agency in charge of education) to the establishment of independent administrative offices with considerable autonomy and some, albeit limited, financial resources. In its 2005 report, the National Environmental Education Advisory Council (NEEAC) published a figure outlining a hypothetical "comprehensive state-level EE program." No state currently has such a program, but the NEEAC figure (reproduced in **Figure 1** below) reveals much about the degree to which states are perceived as responsible for the implementation of EE.

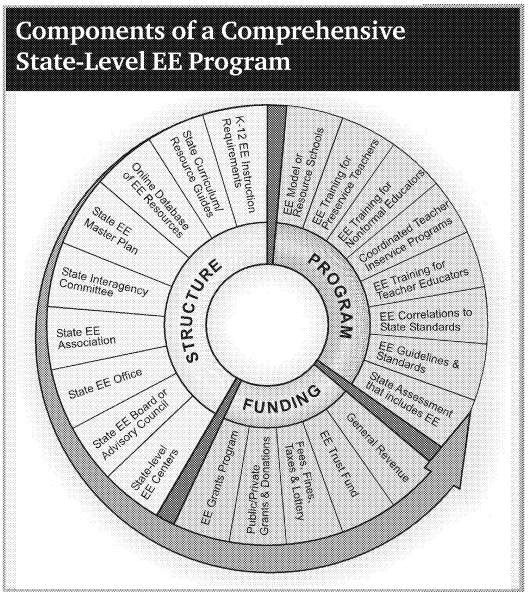

Figure 1. a hypothetical representation of a comprehensive state EE program (NEEAC, 2005)

The most typical component of state-level EE/ESD governance is a network of practitioners, coordinated or supported by state officials to a greater or lesser extent. In this respect, state governments mimic the role of the federal agencies, such as the EPA, that attempt to enhance EE from the bottom up by strengthening practitioner networks and encouraging dissemination of effective practices. Some states, such as Minnesota, also emulate the EPA by offering block grants to support EE projects in schools and communities.

A small but increasing number of states have enacted laws or otherwise altered their primary and secondary education policies to include EE and ESD. This is typically done in three ways:

- **Establishing EE or ESD content standards as a way of influencing instruction.**[7] Such standards specify either the material that should be taught or the outcomes that should be achieved. State standards can be advisory or mandatory. Progress toward meeting mandatory content standards is often, though not always, assessed through the use of standardized tests.
- **Establishing teacher education requirements that focus on EE or ESD.** Such requirements are now fairly common, but in most states they remain vague, leaving teacher education programs with substantial leeway in choosing how to meet them. As a result, the practical impact on teacher training can be disappointing (Mastrilli, 2005).
- **Providing flexibility through charter school legislature.** Forty states currently have active laws granting administrative flexibility to schools that obtain a special charter (Center for Education Reform, 2009). Although these laws do not specifically mention EE or ESD, charter schools in many states have used the additional flexibility to adopt practices relevant to sustainability, both in and out of the classroom.

States that are frequently cited as EE *innovators* include California, Massachusetts, Minnesota, Oregon, Vermont, Washington and Wisconsin. At the time of writing, only two[8] of these states, Vermont and Washington, had integrated the language of sustainability into formal education policy. Both states reference internationally prominent ideas of ESD. It is worth discussing each of these cases in more detail.

Vermont

The state of Vermont, in the northeastern corner of the continental United States, has been a consistent innovator in American ESD policy and practice and was the first to adopt state standards that explicitly addressed sustainability. Vermont's standards originated through a grassroots process driven by educators who wished Vermont's educational standards to reflect their concern for sustainability. These educators, who worked in both formal and non-formal educational settings, convened a series of community meetings to articulate the meaning of sustainability with respect to Vermont. In 2000, the State Board of Education accepted the two resulting standards, which require primary and secondary schools to pursue the following outcomes:

> **Sustainability:** Students make decisions that demonstrate understanding of natural and human communities, the ecological. economic, political, or social systems within them, and awareness of how their personal and

[7] It is worth noting that *many* states include ESD-relevant disciplinary material, such as environmental science or economics, in content standards for traditional academic disciplines.

[8] Oregon also uses the language and ideas of ESD in the *Sustainable Oregon Schools Initiative*. This program, though admirable, is voluntary, and the state has yet to adopt formal sustainability standards or similar education policies.

collective actions affect the sustainability of these interrelated systems.

Understanding Place: Students demonstrate understanding of the relationship between their local environment and community heritage and how each shapes their lives. (Vermont Department of Education, 2000)

Each standard is accompanied by more specific outcomes and practices intended for particular grade levels. These grade-level outcomes and practices are notable for their focus on practical action that is deeply integrated in local context. Thus, in grade 5-8, students must:

> Identify and practice ways to repair, re-use, recycle (e.g., collect and redistribute leftover household paint), and design and implement a plan to monitor community resource consumption (e.g., survey community water, electric, and/or fuel use). (Vermont Department of Education, 2000)

The interlinked influence of federal, state and NGO influences on American ESD, part 1

The growth of education for sustainability in the State of Vermont is an excellent example of the way in which federal agencies, state agencies and NGOs combine to influence American ESD. Vermont was the first state to institute academic standards that directly address sustainability. It did so in on the recommendation of educational NGOs such as Shelburne Farms, which both mobilized popular opinion in favor of new standards and drafted standards for consideration by the state. Shelburne Farms, in turn, received funding from the federal government (through the Environmental Protection Agency) to develop curriculum materials and build local capacity for environmental education. In short: federal support empowered a non-governmental organization to propose policy changes, which were then implemented by the state.

In the years following adoption of the standards, a partnership was established among NGOs, government agencies, the University of Vermont to support teachers in implementing the standards. This partnership, called Vermont Education for Sustainability, provides tools, training and out-of-school enrichment resources that help K-12 educators meet the Sustainability and Understanding Place standards. It is also deeply involved in the recent, ongoing efforts to establish public schools that "use sustainability as an integrating context for curriculum, community partnerships, and campus practices" (http://www.sustainableschoolsproject.org/about/).

Washington

The state of Washington, in the northwestern corner of the continental United States, is developing a number of ESD-related policies and resources that, when complete, will represent the most comprehensive approach to ESD found in any state. Among the policies in development are content standards, teacher education standards, and curriculum projects that focus on integrating sustainability into particular areas of instruction. One recently completed course offers secondary students in career and technical education programs an introduction to green industries with a focus on green design and technology.[9] Another curriculum project encourages teachers to teach sustainability concepts through design projects in core academic subject areas.[10]

In Washington State, both the forthcoming standards and existing curriculum projects use the language of "education for environment and sustainability," or EES.[11] This language is a clear

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[9] http://www.k12.wa.us/CareerTechEd/pathways/TechIndustry/curriculum.aspx

[10] http://www.k12.wa.us/curriculumInstruct/EnvironmentSustainability/SustainableDesign.aspx

[11] Official documentation in Washington State actually alternates betwen two phrases: "education for environment and sustainability" and "environmental and sustainability education." This inconsistency appears to reflect the newness of the program rather than any ideological divide. For the sake of simplicity, I have chosen to use the first phrase only.

compromise between historical EE language and a newer explicit emphasis on sustainability. The terms in which the program is defined leave little doubt as to the influence of international ESD policy statements, as well as the Clinton-era PCSD:

> The quality of life for all people, now and in the future, will ultimately depend upon the individual's comprehension of the interdependency of environmental, economic, and social systems, and of how individuals interpret their personal role in the total scheme of life… Education for Environment and Sustainability is one way to frame this integrated system of interdependency, as it takes into account environmental stewardship, economic viability, and social justice. The goal of EES is to develop capacity for society to meet the needs of today while assuring intergenerational equity – that is, to not limit the opportunity for optimal living in future generations. (Washington OSPI, 2009).

Washington's content and teacher education standards reflect the state's commitment to teaching EES content across the traditional disciplines rather than in stand-alone courses. Thus, the academic content standards consist of overarching EES standards that are connected to specific grade-level content standards *in the disciplines.* To ensure that teachers are capable of connecting disciplinary content to overarching EES principles, OSPI is creating guidelines and illustrative materials that demonstrate how disciplinary content can be taught in the context of sustainability. Washington's teacher education standards for EES reflect a similar commitment to EES as a cross-curricular theme. There are two relevant sets of standards. The first, already in place, mandates that *all* teachers "prepare [k-12] students to be responsible citizens for an environmentally sustainable, globally interconnected and diverse society" (Washington OSPI, 2009). The second, still under development at the time of writing, offers guidelines that *some* pre-service teachers will follow to obtain an EES certification in addition to their subject matter certification. Just as there are no EES content standards outside of the disciplines, it will not be possible for teachers in Washington to receive a license for EES *only*.

The role of Non-Governmental Organizations (NGOs)

NGOs have played a crucial role in advancing American ESD. In the absence of a national agenda, it is NGOs that have taken the lead in establishing guidelines for ESD practice, advocating for ESD policy at the state level and building capacity in schools and communities. Although many of these organizations have a national or international audience for their work, their impact can be seen most vividly in local projects:

- In Vermont, the non-profit educational organization Shelburne Farms was instrumental in organizing the community meetings that led to the adoption of Vermont's sustainability standards (VT-EFS, 2000). Since the adoption of the standards, Shelburne Farms has played a central role in the state's ESD capacity-building efforts, providing ESD-related trainings and resources to primary and secondary educators.
- In Washington State, the development of curriculum and teacher education standards in 2008-9 was influenced by the standards and principles created by an non-profit organization called the US Partnership for Education for Sustainable Development (Wheeler, 2009).
- In New York, the Putnam/North Westchester Board of Cooperative Educational Services hired a non-profit organization called The Cloud Institute for Sustainability Education to develop K-12 curriculum modules that are now used in dozens of schools.

Because these NGOs exert a powerful influence on ESD practice, it is worth examining how several of the most influential organizations define ESD.

Shelburne Farms

Shelburne Farms, which describes itself as "a membership-supported, nonprofit environmental education center" is housed in a working demonstration farm in Shelburne, Vermont (Shelburne Farms, 2003). Its onsite programs include experiential learning activities for students and professional development courses for educators, as well as agriculture- and sustainability-focused workshops for adults. An annual summer institute on Education for Sustainability brings together "educators from all disciplines and levels to delve into EFS topics, issues, and concepts, using the lens of sustainability to investigate local human and natural communities" (ibid.). Through partnerships with other Vermont organizations, including the University of Vermont and the state government, Shelburne Farms supports the development of resource materials for educators who wish to implement ESD. Although Shelburne Farms deliberately focuses the bulk of its attention on *local* sustainability and ESD projects, the summer institute and the resources developed by the staff of Shelburne Farms have reached a wider clientele.

A practitioner manual, entitled *The Vermont Guide to Education for Sustainability*, reveals how ESD is conceptualized by Shelburne Farms and its Vermont-based collaborators. Although the *Guide* explicit refers to the Brundtland Report (World Commission on Environment and Development, 1987), its authors are careful to re-frame the idea of sustainability in terms of local values and traditions, thus:

> When we say *sustainability*, we're simply using a new term for a long-standing Vermont tradition: "Improving the quality of life for all within the capacity of the earth to provide that life for current and future generations" (VT-EFS, 2004, p. 4)

Within this broader conceptual context, education for sustainability is defined as follows:

> The goals of sustainability are often referred to as environmental integrity, economic prosperity, and social equity. Education for Sustainability, or EFS, tries to bring these three goals of sustainability closer to reality. It promotes understanding the interconnectedness of environment, economy, and society. EFS links this knowledge with inquiry and action to help students build a healthy future for their communities and the planet. (ibid., p. 5)

The *Guide* describes, in considerable detail, the characteristic goals and practices that define education for sustainability. **Table 3** (following page) summarizes these goals and practices.

Taken as a whole, the idea of education for sustainability articulated by Shelburne Farms and its collaborators is quite similar to that outlined in the 1996 report *Education for Sustainability,* but includes a new and notable emphasis on *local* problems as well as a distinctly activist pedagogy called service learning. One characteristic approach that is central to the *Guide* but not included in Table 3 is the use of sustainability as an integrating theme across disciplines, ideally involving the entire school. This "schoolwide approach" is an emergent feature of ESD and, to some extent, EE in the United States, and is discussed in a later section.

Characteristic features of education for sustainability
as outlined in *The Vermont Guide to Education for Sustainability* (VT-EFS, 2004)

Education for Sustainability fosters:	Key elements
• The ability to integrate scientific, social, and economic thinking and knowledge; • Real-world skills applied toward responsible ends; • Appropriate applications of technology that help solve, not create, problems; • Equity, justice, inclusivity, and respect for all people; • A pedagogy that encourages creativity, vision, compassion, cooperation, and collaboration in every student and teacher.	**1** Uses sustainability as an integrative concept. (i.e., overarching/essential question incorporates some aspect of the concepts, principles, issues, or skills/strategies of sustainability.) **2** Builds understanding of the meaning and/or principles of sustainability **3** Involves students in thinking about creating a sustainable future **4** Connects past, present and future perspectives, contexts and/or impacts **5** Prompts students to consider impacts of personal and communal decisions **6** Examines local and/or global perspectives, contexts and/or impacts **7** Involves action—prompts or requires students to apply learning to a real issue, concern or situation **8** Connects classroom learning to community organizations, resources, initiatives, or needs **9** Involves inquiry—open-ended, student centered questioning **10** Demonstrates interdependence of economic, environmental, and social systems
Central practices	
Experiential Education "creating opportunities for students to experience the content of their curriculum, to make it relevant and connected to the "real world." Place-based learning "…we need to cultivate student awareness and understanding of our natural and human communities. From that understanding or 'sense of place,' they can begin to comprehend the complex interactions of local (and later global) environmental, economic, and social needs…" Service learning "…a strategy that combines the principles of experiential learning with service to the community in support of the student's personal, academic and social development."	

Table 3. Education for sustainability, as conceptualized by Shelburne Farms and collaborating organizations.

The US Partnership for Education for Sustainable Development

In the fall of 2003, an organization called the US Partnership for Education for Sustainable Development (USPESD) was formed to "leverage the UN Decade to foster education for sustainable development in the United States" (USPESD, 2009). Despite its formal-sounding title, the USPESD is an NGO operating without government mandate or financial support through the voluntary collaboration of participants from public, private and non-profit institutions. Although it has had a relatively small impact on primary and secondary education so far, the USPESD's influence on sustainability standards in Washington State is indicative of the organization's potential role in shaping American ESD over the coming years.

The USPESD advocates for policy change at the local, state and national level, but its primary role is to influence ESD practice by connecting practitioners with resources and with each other:

> Participants decided that the Partnership would not design or implement programs of its own. Rather, it would serve as a clearing house - helping to connect, highlight, and foster collaboration among partners - and serving as a catalyst to convene groups and build community to support existing and emerging initiatives. (USPESD, 2009)

As one might anticipate given the USPESD's overt affiliation with the UN Decade, the concept of ESD that permeates the organization's materials is essentially identical to the concept of ESD found in UN documents. A notably broad idea of education characterizes the USPESD's efforts:

> "Education for Sustainable Development" encompasses all forms of learning -- formal and informal - that help achieve the "triple bottom line" of healthy environments, thriving economies, and just societies. (USPESD, 09)

In keeping with this broad idea, formal education is only part of the USPESD's purview. In addition to a "sector team" focused on primary and secondary education, the USPESD includes sector teams focused on the private sector, on faith communities, and on higher education. The higher education sector team is perhaps the most active.

The USPESD has used three strategies to facilitate change in primary and secondary education: (1) strengthening practitioner networks through commonly used tools such as email lists and an ESD resource clearinghouse, (2) convening a nationwide "professional organizations summit" (USPESD, 2008a), and (3) authoring academic content standards intended to guide ESD practice (USPESD, 2008b). The summit drew an impressive array of representatives from organizations such as the National School Boards Association, the National Council for the Social Studies and the American Association of Colleges of Teacher Education. The academic content standards, officially titled *National Education for Sustainability K-12 Student Learning Standards*, are intended to serve as a model for the development of state and local standards. They are built around three essential understandings, and also include lists of ESD-related concepts organized by grade level. The essential understandings are shown in **Table 4**, below.

EfS Standard 1
Students understand and are able to apply the basic concept of sustainability (i.e.: meeting present needs without compromising the ability of future generations to meet their needs). They develop an understanding of the historical context in which the definitions, concepts, and principles of sustainability and sustainable development have emerged over time.

EfS Standard 2
Students recognize the concept of sustainability as a dynamic condition characterized by the interdependency among ecological, economic, and social systems and how these interconnected systems affect individual and societal well-being. They understand and experience their connection to and interdependence with the natural world.

EfS Standard 3
Students develop a multidisciplinary approach to learning the knowledge, skills, and attitudes necessary to continuously improve the health and well-being of present and future generations, via both personal and collective decisions and actions. They understand and can describe their vision of a world that is sustainable, along with the primary changes that would need to be made by individuals, local communities, and countries in order to achieve this.

Table 4. Essential understandings from the *National Education for Sustainability K-12 Student Learning Standards*

The effectiveness of these three strategies remains to be seen, although the influence of USPESD standards on the EES standards in Washington State is an encouraging sign. Because the USPESD has chosen to act on a national scale, its efforts are necessarily more diffuse than those of Shelburne Farms and other, more locally concentrated organizations.

The Cloud Institute for Sustainability Education

The Cloud Institute for Sustainability Education is a small non-profit organization based in New York City and

> …dedicated to the vital role of education in creating awareness, fostering commitment, and guiding actions toward a healthy, secure and sustainable future for ourselves and for future generations. (Cloud Institute, 2009)

The Cloud Institute defines sustainability and ESD (which the Institute refers to as "sustainability education") in ways that echo the central tenets of intergenerational equity and the "triple bottom line" espoused elsewhere in American ESD. Like Shelburne Farms, however, the Cloud Institute further elaborates the idea of sustainability education with a set of principles and pedagogical strategies, and offers a set of key characteristics of sustainability education, shown in **Table 5**.

Characteristics features of sustainability education
As outlined in the documents of the Cloud Institute for Sustainability Education

Habits of mind that students will demonstrate	Core content that students will study
Understanding of Systems as the Context for Decision Making The extent to which one sees both the whole system and its parts as well as the extent to which an individual can place one's self within the system	Ecological Literacy Science principles and natural laws that help us to understand the interconnectedness of humans and all of the Earth's systems...
Intergenerational Responsibility The extent to which one takes responsibility for the effect (s) of her/his actions on future generations	System Dynamics/"Systems Thinking" Understanding systems as the context for decision-making...
Mindful of and Skillful with Implications and Consequences The extent to which one consciously makes choices and plans actions to achieve positive systemic impact	Multiple Perspectives Truly valuing and learning from the life experiences and cultures of others...
Protecting and Enhancing the Commons The extent to which one works to reconcile the conflicts between individual rights and the responsibilities of citizenship to tend to the commons	Sense of Place Connecting to and valuing the places in which we live…
Awareness of Driving Forces and their Impacts The extent to which one recognizes and can act strategically and responsibly in the context of the driving forces that influence our lives	Sustainable Economics An evolving study of the connections between economic, social and natural systems...
Assumption of Strategic Responsibility The extent to which one assumes responsibility for one's self and others by designing, planning and acting with whole systems in mind	Citizenship (Participation and Leadership) The rights, responsibilities, and actions associated with participatory democracy toward sustainable communities...
Paradigm Shifter The extent to which one recognizes mental models and paradigms as guiding constructs that change over time with new knowledge and applied insight	Creativity and Visioning The ability to envision and invent a rich, hopeful future...

Table 5. Sustainability Education, as conceptualized by the Cloud Institute.

Even on cursory examination, this vision of ESD is noticeably *more* oriented toward action and decision-making than other ESD frameworks, and somewhat less oriented toward reflection and critical thinking. This is in keeping with the Cloud Institute's "Framework for Education for Sustainability," which portrays individuals and classrooms as change agents within a set of nested social systems (see **Figure 2**, below).

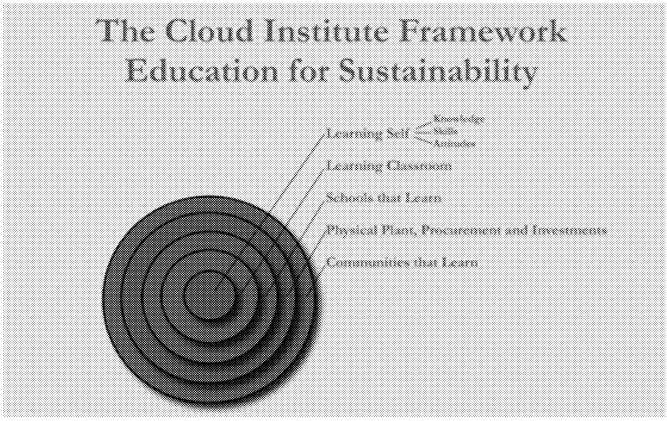

Figure 2. The Cloud Institute Framework

Like the other NGOs described above, the Cloud Institute produces ESD resources, such as two secondary school courses on sustainable design and sustainable enterprise that it developed on behalf of the New York City public schools. Unlike many other NGOs, the Cloud Institute plays an unusual role as a sustainability consulting service for school systems that are attempting to adopt sustainability as a central theme in their pedagogy and policies. The exact nature of this service varies from project to project, but it typically involves a prolonged on-site consultation process with school staff, in which staff are required to develop both a shared understanding of sustainability and what the institute's director, Jaimie Cloud, refers to as "a personal rationale for why they should do [sustainability education]" (Cloud, 2009b).

The North American Association for Environmental Education

Of all American NGOs, the North American Association for Environmental Education (NAAEE) has probably had the greatest influence on EE practice—and, by extension, on American ESD. The NAAEE was founded in 1971 under a slightly different name: the National Association for Environmental Education. Although it is now the most prominent professional association for environmental educators across the continent, its founders were representatives from a small group of two-year community colleges who planned to use the new association to disseminate college-level curriculum materials. According to Disinger (2005), the organization's expansive title attracted a wide range of practitioners, and its goals grew and changed with its membership. NAAEE has remained strongly committed to EE practice throughout its history, and has a more limited record of fostering and disseminating high-quality research. Disinger argues that the organization's desire to be "inclusive of all who expressed an interest in environmental education" has historically led to a "lack of focus," but that the NAAEE has recently "demonstrated increasingly creative leadership" (ibid., p. 148).

The most compelling signs of NAAEE's leadership are its thriving annual conference, which now includes sessions devoted to research, and its increasingly prominent, consensus-driven efforts[12] to raise the quality of EE practice around the country. The central component of NAAEE's efforts is the landmark document *Environmental Education Materials: Guidelines for Excellence*. First published in 1996 and revised in 2004, the *Guidelines*

[12] Two of these efforts, the *Environmental Education Collection* and the NAAEE's collaboration with the National Council for the Accreditation of Teacher Education, are described in later sections.

> aim to help developers of activity guides, lesson plans, and other instructional materials produce high quality products, and to provide educators with a tool to evaluate the wide array of available environmental education materials. (NAAEE, 2004)

The *Guidelines* are not a summary of research on "what works." They are the fruit of a consensus process, involving more than a thousand practitioners, that was intended to produce "a *common understanding* of effective environmental education" (ibid., emphasis added). As such, they offer some clear indications of what American EE practitioners consider to be good practice. The six key characteristics that form the backbone of the document are reproduced in **Table 6**.

Key characteristics of effective environmental education materials From Environmental Education Materials: Guidelines for Excellence (NAAEE, 2004)
Fairness and Accuracy EE materials should be fair and accurate in describing environmental problems, issues and conditions, and in reflecting the diversity of perspectives on them.
Depth EE materials should foster awareness of natural and build environment, and understanding of environmental concepts, conditions, and issues, and an awareness of the feelings, values, attitudes, and perceptions at the heart of environmental issues, as appropriate for different developmental levels
Emphasis on Skills Building EE materials should build lifelong skills that enable learners to prevent and address environmental issues.
Action Orientation EE materials should promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental issues as a basis for environmental problem solving and action.
Instructional Soundness EE materials should rely on instructional techniques that create an effective learning environment.
Usability EE materials should be well designed and easy to use.

Table 6. Excerpts from Environmental Education Materials: Guidelines for Excellence (NAAEE, 2004)

The six key characteristics, later divided into 28 recommendations, are noticeably broad—a necessity, given the NAAEE's desire to create guidelines that applied to both school-based and out-of-school learning experiences, adult-oriented and child-oriented programs of all varieties. They also highlight the differences between mainstream American EE and ESD, in both its international and American incarnations. Unless one defines "environmental problems, issues and conditions" as *inherently* inclusive of economic and social equity concerns (which some EE practitioners do), none of the six principles address either of these central concerns of ESD.

This has not gone unobserved within the NAAEE. Some of the association's members have formed a Sustainability Education Commission within the NAAEE. The Commission is still a minority branch within the NAAEE, and sees internal advocacy as a crucial part of its mission, aiming to "promote sustainability as both an operational and content priority at annual NAAEE conferences" (NAAEE-SEC, 2006).

Part 3: American ESD in Research and Practice

Critical context: EE, ESD and schooling

This section of the report addresses three areas of school-based ESD: curriculum and pedagogy (which are practically inextricable), teacher education and whole-school approaches to ESD. The substantial body of research on curriculum and pedagogy merits its own discussion and is therefore separated out from the discussion of curricular and pedagogical practice. On the other hand, research on ESD-related teacher education and on whole-school approaches to ESD is relatively scarce, so what little research as exists on those topics is integrated into discussions of practice. Most of the available data on ESD and EE, both research and practice, is local and program-specific. As a result, this section may feel more fragmentary than the previous sections.

Because so few educational projects in the United States bear the label ESD (or education for sustainability, or sustainability education), most of this chapter will focus on educational programs and research implemented under the heading of environmental education. This strategy is consistent with the rest of the report, and reflects the substantial overlap between ESD and EE in the United States, but it is a particularly uncomfortable compromise in discussions of curriculum, where the differences between ESD and EE are most obvious.

When considering the status of EE in primary and secondary schooling, it is important to keep in mind that formal and informal traditions of EE in the United States are equally venerable. Because EE has never gained a substantial foothold in the primary or secondary curriculum, the American EE community has come to be dominated by educators and who work outside of schools. Furthermore, many of the most active and widely cited EE researchers focus on informal or non-formal learning environments (Dillon, 2003). These educators and researchers have maintained a vital and innovative program of activities, most of which is outside the purview of this report.

The state of practice in ESD curriculum and pedagogy

Prominent models of EE pedagogy

Even within the subset of the EE community that focuses on primary and secondary education, EE in the United States is historically a decentralized field. One great advantage of this is the degree to which EE programs around the country reflect local issues and local cultural norms. One disadvantage is the lack of national-level *data* that results from decentralization. Although there is little doubt that American EE has grown consistently throughout the past two decades (NEEAC, 2005), there are few statistics on the prevalence of EE in the United States, and those statistics that do exist are difficult to interpret. For example, Coyle notes that "nearly half of all K-12 teachers indicate they teach EE during the school year" (Coyle, 2005, p. 68), but most indicated that they spent little time on environmental topics, and no data is available of the topics taught or the pedagogical strategies used.

In the past, perhaps the most common means of providing EE through schools was to take children out of them. Field trips and outdoor excursions enable school-based educators to collaborate with informal educators who often have more training in EE, and they remain a popular tool for school-

based EE. The outdoor emphasis of EE is reflected in a potentially revolutionary piece of pending[13] federal legislation called the No Child Left Inside Act, or NCLI (a play on the No Child Left Behind Act of 2001, described in the first section of this report). If passed, NCLI will provide support for a EE both within the traditional disciplines and outside of them; it will also support "field education" programs as an integral part of school-based EE.

There is no standard pedagogy for school-based EE. Amid the tapestry of instructional approaches, however, a number of distinct models are becoming established. One such model, which bears the awkward name of Investigating Environmental Education Issues and Actions (IEEIA), is based on the behavior change theories of Harold Hungerford and Trudi Volk (e.g., Hungerford and Volk, 1990). According to Volk and Cheak (2003), IEEIA is

> a skill-development program, designed to help learners take an in-depth look at environmental issues in their community, to make data-based decisions about those issues, and to participate in issue resolution (Volk and Cheak, 2003, pp. 12-13).

IEEIA is among the most thoroughly documented pedagogical strategies in EE. It is characterized by a core set of instructional elements that are integrated into a flexible, open-ended program emphasizing complex environmental problems that touch in the lives of students. The core elements are shown in **Table 7.** One of the unique features of IEEIA is the involvement of students in systematic collection and analysis of data through surveys and questionnaires.

Chapter I. Environmental Problem Solving
- Students learn about their interactions with the environment.
- Students explore the impact of beliefs and values on environmental issues.
- Students analyze environmental issues.

Chapter II. Starting Issue Investigation
- Students identify environmental issues and write research questions.
- Students learn how to access information from print, electronic and human sources.
- Students compare and evaluate information sources.

Chapter III. Using Surveys, Questionnaires & Opinionnaires
- Students learn how to access information using first hand methods of investigation.
- Students learn how to develop and evaluate research instruments.
- Students systematically collect and record data using surveys, questionnaires and opinionnaires.

Chapter IV. Interpreting Data In Environmental Issue Investigations
- Students learn how to produce and interpret data tables and graphs.
- Students learn how to draw conclusions, make inferences and formulate recommendations.

Chapter V. Investigating An Environmental Issue
- Students select and investigate environmental issues.

Chapter VI. Environmental Action Strategies
- Students learn four major methods of citizenship action.
- Students analyze individual and group actions.
- Students develop and evaluate action plans

Table 7. Instructional elements of IEEIA (CISDE, 2009)

Another distinct pedagogical movement is referred to as Environment-Based Education[14] (EBE). EBE encourages the use of environmental themes to enhance instruction within and across the

[13] NCLI was most recently introduced to the both houses of the United States Congress on April 22, 2009; it has substantial bipartisan support but is unlikely to be a high legislative priority in the coming year.
[14] An organization called the State Environment and Education Roundtable (SEER) has pursued EBE under a trademarked name: Environment as an Integrating Context™ (e.g., Lieberman and Hoody, 1998). EIC™ is treated here as a particularly well-articulated and well-documented *form* of EBE, rather than a separate entity.

traditional academic disciplines. The pedagogy of EBE it is typically described as "interdisciplinary, collaborative, student-centered, hands-on and engaged" (NEETF, 2000). **Table 8** offers a more complete list of characteristics associated with a particular form of EBE called Environment as an Integrating Context, or EIC. From a curricular perspective, the crucial feature of EBE is *integration*: the use of environmental topics to integrate instruction across multiple learning contexts. In the archetypal EBE lesson, teachers from multiple disciplines coordinate their planning so that students repeatedly address a complex and compelling environmental problem using different disciplinary tools as they travel from class to class. This integrative strategy is similar to that favored by most American proponents of ESD. Although EBE is sometimes criticized within the EE community for its use of EE as a means to disciplinary ends, rather than an end unto itself, the constraining pressures of standards-based educational reform make it an attractive option for schools seeking to pursue ESD without sacrificing achievement in the traditional disciplines.

Local Natural and Community Surroundings as Context

A. Use local natural and community surroundings as a context for interconnecting all of the educational practices of the EIC Model™ into a comprehensive school improvement strategy; and,
B. Use local natural and community surroundings as a context for standards-based instruction.

Natural and Social Systems

A. Develop students' understanding of natural systems in their community;
B. Develop students' understanding of social systems and their community's cultural characteristics; and,
C. Develop students' understanding of interrelationships and interactions among natural and social systems and their components.

Community-based Investigations

A. Offer students opportunities to apply skills and knowledge in local surroundings;
B. Provide students with opportunities to investigate real-world community problems and issues;
C. Encourage use of higher-level thinking and creative problem-solving skills to achieve comprehensive understanding of the complexity of real-world problems and issues involving the interaction of their natural surroundings with diverse cultural, economic, and political perspectives and interests; and,
D. Provide students with opportunities to pursue authentic issues of personal interest to them.

Integrated, Interdisciplinary Instruction

A. Provide students with opportunities to explore connections between subject area disciplines and, among natural and social systems;
B. Coordinate students' learning between subject areas and class periods; and,
C. Cross traditional disciplinary boundaries to develop comprehensive understanding of natural and social systems.

Service-Learning

A. Support students as they undertake and monitor service-learning activities;
B. Require students to reflect on their service-learning activities and communicate their findings to classmates, teachers and other appropriate audiences both inside and outside of their community; and,
C. Creates a continuum of learning that crosses grade levels and allows students to conduct multi-year research and service-learning projects that contribute to their community.

Collaborative Instruction

A. Involve students and community members in planning and instructional delivery;
B. Provide opportunities for teachers to model positive team relationships; and,
C. Allow teachers to have regularly scheduled team meetings.

Learner-centered, Constructivist Approaches

A. Take into account students' individual learning styles, multiple intelligences and cultural background to insure effective instructional design and practices in the context of the local community;
B. Assist students as they initiate self-directed courses of study;
C. Allow students to construct their own understandings; and,
D. Support students as they define specific learning goals and objectives.

Cooperative and Independent Learning

A. Facilitate students as they form teams to work on projects and investigations;
B. Assure that student teams include a wide range of learning styles and ability levels; and,
A. C. Help students develop group membership skills.

Table 8. The EIC Model™, reproduced from http://www.seer.org/pages/eicdetail.html

Recently, the EBE program has been adapted, re-interpreted and elaborated under a slightly different name: Place-Based Education (PBE). Although the overlap between EBE and PBE research is substantial, with researchers citing each as evidence for the other, Place-Based Education is more theoretically sophisticated. Powers (2004) integrates a number of constructs into an explicit "theory of change" for place-based education, shown in **Figure 3**.

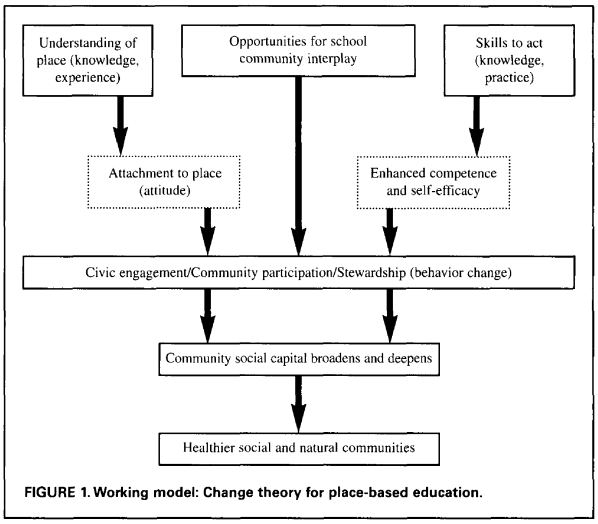

Figure 3. Theory of change for Place-Based Education, reprinted from Powers, 2004 (p. 20)

Place-Based Education is also more explicitly connected to sustainability. According to The Promise of Place, an online clearinghouse for relevant materials, PBE is

> a holistic approach to education, conservation and community development that uses the local community as an integrating context for learning at all ages. It fosters vibrant partnerships between schools and communities to both boost student achievement and improve community health and vitality--environmental, social and economic. Project-focused and inherently tailored by local people to local realities, place-based education is relevant to anyone, anywhere. (Promise of Place, 2009)

This definition is undeniably and deliberately similarity to commonly cited definitions of ESD.[15] The Place-Based Education Evaluation Collaborative, a collection of the NGOs that have been most active in studying and promoting PBE, cites the Brundtland Report in its conceptual overview and notes that "PEEC wants to further examine the confluence of ideas between 'place-based' and 'education for sustainability'" (PEEC, 2003, p. 4). In focusing on community issues and the need to adapt education to local conditions, PBE reflects the strong emphasis on community and local participation that has consistently characterized ideas of ESD in the United States.

Resources and standards: the progress of EE and ESD curriculum in the United States

In the United States, it is quite normal for curriculum reform to proceed through an unplanned "push-pull" process, in which the content of instruction is shaped by legislative "pushes" from state and local government and "pulls" in the form of resources from independent curriculum developers. This process, which seems terribly inefficient to outside observers, is a natural consequence of the fact that most American teachers have substantial autonomy in choosing what

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[15] Shelburne Farms, an NGO described in detail above, is one of the national innovators in PBE, and also one of the leading voices for ESD in the United States.

to teach. Federal, state and local authorities constrain teacher autonomy by setting standards or, more rarely, by requiring teachers to use particular textbooks or resources. Working within these constraints, teachers often choose to adopt or adapt existing curriculum materials rather than develop their own—particularly when they lack confidence or expertise in subject they are required by law or moved by principle to teach. Because most teachers lack adequate training in EE and ESD, as will be discussed below, the menu of externally produced resources has a significant impact on practice.

There is no shortage of groups, including university-based research groups, for-profit companies and NGOs, that produce EE and ESD-relevant curriculum resources. Some of these resources, such as the water education materials produced by Project WET (http://www.projectwet.org/), have reached millions of children in the United States and other countries. The diverse array of resources presents a challenge in its own right: teachers must choose from a bewildering selection of materials. It is not surprising, in these circumstances, that many of the most widely used EE curricula are disseminated by organizations that also offer teacher training or other forms of professional support.

Many NGOs have attempted to assist practitioners by collecting and indexing EE resources. The most ambitious of these attempts is the online clearinghouse established by the NAAEE, officially called *The Environmental Education Collection: A Review of Resources for Educators*. After soliciting hundreds of EE resources from public and private sources, the NAAEE implemented a peer review process in which each resource was evaluated by "teams of classroom teachers, content experts, and environmental educators" (NAAEE, 2004b), using the NAAEE's *Guidelines for Excellence* as evaluation criteria.

The interlinked influence of national, state and NGO influences on American ESD, part 2

The Environmental Education Collection represents another clear case of the way in which federal agencies, state agencies and NGOs combines to affect ESD practice. The NAAEE, the largest professional association of environmental educators in the United States, is funded in part through the support of its members and in part through project-specific grants from the federal government. The *Environmental Education Collection* benefited from federal support, as did many of the peer-reviewed resources it contains. The adoption of these resources by primary and secondary teachers is constrained by standards and requirements at the state level.

As might be expected, EE curriculum resources vary widely in their relevance to ESD. A strong *programmatic* focus on social equity is notably absent from many of the most prominent EE curricula. Although there has always been a thread of concern for equity and social justice within the broader field of environmental education (cf. Cole, 2007), Kushmerick, Young and Stein (2007) found that this concern was only addressed rarely in mainstream EE resources. Framing their analysis in terms of environmental justice, they noted that

> these curriculum guides often address issues related to environmental justice (e.g. environmental health impacts on humans); however, they rarely present the issues within an explicit environmental justice context. The guides also rarely address issues traditionally considered to be environmental justice issues. The results show many missed opportunities to incorporate environmental justice, indicating that lessons could be adapted easily to be more inclusive. (Kushmeric, Young and Stein, 2007, p. 385)

Expanding popular support

Although the NAAEE and other organizations have succeeded in adding a degree of coherence to the chaotic marketplace of EE curriculum resources, the implementation of EE and ESD is still a piecemeal affair. Teachers who were personally committed to ESD adopted EE or ESD materials as supplements to the core academic curriculum *or* pursued isolated EE and ESD content goals in the

context of disciplinary instruction. Coyle, surveying a decade's worth of national survey data on EE, noted that "EE it is still mostly considered an educational 'extra' – grafted on to a core syllabus as an enhancement" (Coyle, 2005, p. 51). When EE and ESD materials are included in instruction, they typically appear in the disciplinary context of science. This is true despite the fact that American advocates of EE and ESD see both as interdisciplinary endeavors, having as much to do with the arts and humanities as the natural and social sciences. The only environmentally focused course that is available in a significant number of American public schools today is environmental science.[16]

This may be changing. Perhaps the most significant outcome of past school-based EE and ESD is a foundation of popular support for more coordinated and substantive school-based EE and ESD in the future. Community support for EE has expanded significantly in recent years, to the point that 95% of Americans support some form of EE as part of public schooling (ibid., p. 65). Although this cannot be attributed entirely to classroom-based EE, the isolated efforts of classroom teachers in previous years have probably contributed to the broad cultural acceptance of EE. This expansion of community support has, in turn, been reflected in the adoption of statewide standards that address "environmental literacy" objectives. Because no state has instituted a rigorous assessment of its EE or ESD-related standards, thought, there is little pressure to devote instructional time or resources to EE or ESD, and no way of knowing the overall impact of the new state standards.

Research on ESD curriculum and pedagogy

Effectiveness and the importance of behavior change in American EE and ESD

Discussions about "what works" in EE are inevitably controversial due to pervasive disagreement about the desirable outcomes of EE. According to the NAAEE, the primary goal of EE is "environmental literacy," a broad construct that includes

> affect, ecological knowledge, socio-political knowledge, knowledge of environmental issues, skills, environmentally responsible behaviors, and determinants of environmentally responsible behaviors. (Simmons, 1995, cited in NAAEE, 2007).

This definition excludes very little. Other writers (e.g., Coyle, 2005) have emphasized the non-behavioral aspects of environmental literacy as distinct from behavioral outcomes. The NAAEE's emphasis on behavior is consistent with the history of American EE, which has been significantly influenced by scholars such as Hungerford and Volk, who argue that "the ultimate *aim* of education is shaping human behavior" (Hungerford and Volk, 1990; emphasis in original). This perspective appears to be a throwback to behaviorist psychology, but actually has more in common with contemporary research in public health. Like public health researchers, behavior-oriented EE researchers acknowledge the importance of cognitive, emotional and motivational variables, but argue that changes in these variables are only significant if they lead to positive material developments—in this case, positive environmental developments (ibid.). They are behaviorists only with respect to *outcomes*, not processes.

Some researchers and educators object to this approach on the grounds that it is undemocratic—that the behavior change approach to EE implies that environmental educators already know what problems are important, what behaviors are best, and when behavior change is necessary. In

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[16] Enrollment in the (elective) Advanced Placement exam in Environmental Science has increased 75% since 2003—one more sign of the increasing interest in EE-related material within the K-12 school system. (College Board, 2008).

response, proponents of the behavior change perspective, such as Chawla and Cushing (2007), have offered a more nuanced model in which the goal is to develop students' capacity to determine when change is needed, and to change their behavior only in these circumstances. This model of *strategic environmental behavior* has its own challenges. For example, it is difficult to imagine how educators might evaluate the latent capacity of their students to do something that is not called for at present. Still the model of strategic environmental behavior is more compatible with the official position of government agencies involved in EE, such as the Environmental Protection Agency. In the EPA's materials, EE

> …increases public awareness and knowledge of environmental issues, does teach individuals critical-thinking, does enhance individuals' problem-solving and decision-making skills, *[but] does not advocate a particular viewpoint*. (EPA, 2008)

In addition to the disagreement over outcome measures, the fragmentary nature of ESD-related research makes if difficult to draw general conclusions about effectiveness. Rickinson, who conducted one of the only comprehensive reviews of K-12 EE, observed that:

> …there is research on a variety of foci but there are few connections made in the literature between these concentrations of evidence. There are few cross-references made by individual studies to other pieces of work, there are few review-style articles seeking to present and synthesise findings from different studies, and there is little conceptual discussion between different kinds of approaches. (Rickinson, 2001, p. 217)

Participants in NAAEE's research symposium reached similar conclusions at the end of the symposium's third year, noting that "environmental education research is still in early development of a professional perspective," and that "more meaningful dialogue" between researchers was necessary (Meyers et al., 2007). Given these circumstances, this report will not attempt a comprehensive review[17] of American EE research, focusing instead on a few key findings.

Research findings

Regardless of their theoretical stance on behavior change, most EE researchers in the United States use knowledge and attitudinal[18] outcome measures rather than behavioral outcome measures. For some, these variables are a proxy for behavior change. For others, they are a viable outcome in their own right. In either case, they are often most useful as program evaluation tools and offer far less value as measures of effectiveness for more general curricular or pedagogical practices. This is because very few studies contain sufficient qualitative or quantitative data to reveal which aspects of a given intervention were critical to its success.

Given the fragmentary nature of the research, as described by Rickinson (2001) and Meyers, et al. (2007), the most that can be said from reading across these studies is that some interventions are successful in improving environmental attitudes *or* knowledge with some students, some time, and that relatively few interventions do both. Interventions that focus on specific curricular content tend to improve knowledge without changing attitudes (e.g., Milton et al., 1995), while interventions that focus on vivid, minimally structured experiences (typically outdoor experiences)

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[17] Admirable but incomplete efforts to the review the EE research literature can be found in Rickinson (2001) and Coyle (2005). The detailed *responses* to Rickinson's review, particularly the response by Dillon (2003), also provide useful overviews of the field from very different perspectives.

[18] The word "attitudinal" is an inadequate shorthand for the host of motivational and affective variables that EE researchers have measured, including such characteristic EE constructs as "environmental sensitivity," which Hungerford and Volk (1990) define as "an empathetic perspective toward the environment."

tend to change attitudes without budging knowledge scores. (e.g., Smith-Sebasto and Senrau, 2004; Farmer, Knapp and Benton, 2007). In sum, most EE research is disappointingly quiet on the more general question of "what works."

The most promising exceptions are those already described above: Investigating Environmental Education Issues and Actions, Environment-Based Education/Place-Based Education. Each of these instructional strategies is grounded in clear theoretical premises and has been subject to multiple tests across different contexts. Although the outcome measures and the quality of outcome data vary widely from study to study, the results have been remarkably consistent.

At the 2000 annual meeting of the NAAEE, Hungerford, Volk and Ramsey summarized the research on IEEIA. They cited fourteen papers describing eleven separate tests of IEEIA conducted over twenty years. Although their summary revealed persistent methodological weaknesses[19] in the research on IEEIA, it also conveyed the uniformly positive nature of the results. In each of the eleven cases, the students participating in IEEIA exhibited some type of environmentally relevant behavior change. In most of the cases, behavior change was accompanied by shifts in other skill, knowledge and attitudinal variables (Hungerford, Volk and Ramsey, 2000). Research on IEEIA continues: Volk and Cheak (2003) offer a detailed account of the impact of IEEIA on middle school students in Molokai, Hawai'i, describing for the first time the broader effects of the IEEIA intervention on the surrounding community. Methodological flaws notwithstanding, it is difficult to ignore the consistent success of IEEIA in catalyzing changes in environmental behavior across multiple contexts.

The evidence for EBE is equally compelling, perhaps moreso, but relies on a very different sort of data. Unlike IEEIA, which targets environmental behavior, EBE is explicitly framed as a strategy for improving academic performance in core academic fields. In 1998, Lieberman and Hoody synthesized data from 40 schools implementing EBE in 12 states across the country. For fourteen of these schools, students participating in EBE programs could be compared with their peers in non-EBE programs. The results were unequivocal: student achievement was higher in subjects such as social studies, math and science; reading scores also improved, sometimes dramatically (Lieberman and Hoody, 1998). In addition to the academic gains, many schools showed motivational gains, reductions in disruptive behavior, and qualitative shifts in student engagement (ibid.). A later study in California compared four schools implementing EBE with four demographically and academically matched schools, with similarly impressive results (SEER, 2005).

As with the research on IEEIA, it is possible to find conspicuous weaknesses in the methods used to study EBE. In particular, schools that are not implementing any sort of comprehensive reform are a poor comparison group for schools that are. Nevertheless, the size and breadth of the documented effect is impressive, and has been supported by quantitative data from more recent research (Athman and Monroe, 2004) and evaluation studies (Falco, 2004), as well as qualitative data from case studies documented by the National Environmental Education and Training Foundation (NEETF, 2000). Studies conducted under the rubric of PBE have added to the picture by expanding the range of positive outcomes. Whereas research on EBE has consistently emphasized academic achievement, PBE researchers focus on a host of new outcomes, including improved community-school relationships, stronger collaboration between teachers and improved

[19] For example, almost all of the studies relied on post-only comparisons between intact groups. In addition, the comparability of comparison groups and the appropriateness of comparison conditions were imperfectly established in most studies.

outcomes for students with special needs (Powers, 2004). Most recently, Duffin, Murphy and Johnson (2008) have even taken the first step towards demonstrating a connection between PBE programs and local environmental quality.

The importance of local participation

As noted above, the fragmentary state of evidence on American EE and ESD makes it difficult to say what pedagogical and curricular strategies are and are not effective. It is reasonably clear, however, that field trips and outdoor experiences, as typically practiced, do not produce reliable results. The same could be said for a single-minded focus on environmental science. Hungerford, Volk and Ramsey argue that

> Needless to say, what people *know* is important. Yet, *knowing* will not provide the learner with what we refer to as *ownership* and *empowerment.* If we want learners to become actively involved in issue investigation and evaluation as well as active citizenship outside of school it appears rather clear that ***they must own the issues on which they focus and both feel and be empowered to do something about them.*** (Hungerford, Volk and Ramsey, 2000, p. 3, emphasis in original)

The most likely route to empowerment—and to a range of other positive outcomes including enhanced academic achievement and pro-environmental behavior—appears to be sustained participation in complex environmental projects that cut across disciplinary lines. Furthermore, the intervention strategies that have achieved the most compelling and well-documented success have all focused on participation in local community contexts. Each of these interventions is multi-facetted and difficult to summarize, but the common emphasis on community is undeniable.

A steady trickle of findings from outside the established instructional movements (IEEIA, EBE and PBE) supports this theory. Educational programs that emphasize active participation in conservation activities (Leeming, 1997; Randler, Ilg and Kern, 2005), particularly when those activities are embedded in the local natural and social context (Barnett, Lord and Strauss, 2006; Bodzin, 2008) produce broad motivational and academic gains. They may even have a ripple effect throughout the community (Volk and Cheak, 2003; Duvall and Zint, 2007).

ESD and teacher education: Research and practice

EE, ESD and teacher education

The ideas of sustainability and ESD are even less well developed in American teacher education than they are in curricular and pedagogical reform. Nolet (2009) has made an important first attempt to outline what teacher preparation for ESD might look like, but his work is essentially unique in the academic literature. As a result, this section focuses almost exclusively on teacher education efforts associated with EE.

In the entire public school system of the United States, there are very few teachers who teach *only* EE or ESD.[20] Yet, according to a 2000 study conducted by the NAAEE and the Environmental Literacy Council (reported in Coyle, 2005), 83% of elementary teachers and 44% of secondary teachers offer *some* EE in their classrooms. Because most EE degrees in the United States emphasize out-of-school learning, these teachers received little or no pre-service training in EE.

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[20] As previously mentioned, there is a small and growing cadre of teachers who specialize in environmental *science*; some states, though by no means all, require a separate certification for this subject area.

The next generation of teachers, including those currently enrolled in teacher preparation programs, is slightly better off. In response to the rise in public acceptance of EE, and the rising social prominence of environmental and sustainability topics, many states have modified their teacher certification requirements to include some exposure to environmental curriculum and pedagogy. This flurry of state-level legislation has, in turn, led colleges and schools of education to offer EE coursework and use EE materials in the context of their teacher preparation programs. McKeown-Ice (2000) conducted a survey of teacher preparation programs nationwide, and reported that about half offered some form of EE. The mere existence of EE in pre-service teacher preparation does not guarantee that graduating teachers are sufficiently prepared, however. In less than 15% of cases were EE courses required, rather than optional, and about two-thirds of responding institutions ranked the effectiveness of their own EE preparation as "poor" or "adequate" rather than "good" or "excellent" (ibid.). A similar survey by Heimlich et al., four years later, found the situation largely unchanged (Heimlich et al., 2004).

This is not to say that the programs have had *no* effect. A 2001 comparison of elementary school teachers in the state of Wisconsin (which mandated some EE as part of certification) and the state of Ohio (which did not) found that teachers in Wisconsin were incorporating more EE materials into their classroom activities, and seemed more confident about their ability to do so effectively (Plevyak et al., 2001). On the other hand, both this study and another, more recent study in Pennsylvania found that many teachers received no EE preparation despite the certification laws in those two states (Plevyak et al., 2001; Mastrilli, 2005).

Why is progress so slow, given the rising tide of legislation that promotes or requires EE as a component of teacher education? Teacher certification in the United State is a governed by a patchwork of state and local regulation that is, if anything, less coherent than the process that governs curriculum. It has been argued that the idea of "alternative certification" is nonsensical in the American context simply because there is no such thing as standard or traditional certification. Most states set basic criteria that new teachers must meet in order to teach in public schools. Teacher preparation programs strive to meet these criteria in their own idiosyncratic ways, loosely regulated through accreditation procedures run by both the state and by nation-wide NGOs such as the National Council for Accreditation of Teacher Education (NCATE). The means by which new teachers are assessed vary widely, and laws are often changed (to include EE, for example) without accompanying changes in statewide assessment procedures. When there are no mechanisms in place for enforcing compliance, EE competence remains firmly at the bottom of the long list of teacher preparation priorities (Powers, 2004b). Teacher education faculty from around the country also report that the disciplinary segregation of teaching methods coursework makes it difficult to encourage cross-disciplinary pedagogy, and that newly certified teachers find few EE role models among practicing teachers (ibid.).

In this grim context, there are two reasons for optimism. First, NCATE has recently endorsed a set of teacher education standards created by NAAEE to regulate the quality of EE teacher preparation (NAAEE, 2007). Although membership in NCATE is voluntary, more than half of the teacher preparation programs in the United States voluntarily submit to the NCATE certification process. For those programs, any EE degrees or coursework that they offer will now be subject to uniform quality standards. Although this may do little to encourage the development of new EE programs, it is likely to increase the consistency and coherence of EE in existing teacher preparation programs.

The second cause for hope is the widespread availability of professional development opportunities for practicing teachers. Duffin, Murphy and Johnson (2008) note that:

> Programs such as Project Wild and Project Wet have trained more than one million teachers, and environmental curriculum packages focusing on a range of topics are widely available to educators at limited or no cost. (Duffin, Murphy and Johnson, 2008, p. 10)

In short, whether or not new teachers emerge from pre-service training with adequate EE preparation, they have an increasing number of opportunities to gain competence on the job.

Research on teacher preparedness and professional development

In recent years, ESD-related research has increasingly focused on teacher education, and, in particular, on the environmental knowledge and beliefs of pre-service and in-service teachers. As a whole, this research suggests that teachers reflect the general population: they are concerned about environmental problems and hold positive attitudes toward pro-environmental behaviors and policies, but are relatively uninformed about specific topics (e.g., Desjean-Perrotta, Moseley and Cantu, 2008). This is significant because there is also reasonably compelling evidence that lack of knowledge, particularly environmental knowledge, prevents teachers from using EE materials and strategies. For example, Ernst (2007) conducted a survey-based study of 287 teachers and concluded that

> environmental literacy knowledge and skills and environmental sensitivity are important in teachers' decisions to use and their abilities to implement environment-based education. (Ernst, 2007, p. 15)

In a later study, Ernst found that teachers' use of particular materials and strategies, such as EBE, was best predicted by teachers' knowledge of the research on those materials and strategies (Ernst, 2009). The implication is that more generic EE training could increase the use of EE materials in general, but strategy-specific training is necessary for teachers to particular pedagogical or curricular approaches. This is reasonably intuitive, and many NGOs that develop curriculum materials for EE and ESD already seek to disseminate knowledge about their effectiveness and train teachers in their use.

Given that practicing teachers are inadequately preparation for EE and ESD projects, it should not be surprising that participation in EE and ESD projects can be discouraging for them. Moseley and Utley (2008) report that teachers who took part in one federally funded project (the GLOBE project: http://www.globe.gov/r), in comparison with a similar group of teachers who did not participate, were more likely to believe in the effectiveness of EE overall but less likely to believe that they personally could be effective in implementing EE. Haney, Wang, Keil and Zoffel (2007) found that teachers who developed and implemented place-based education improved their own sense of efficacy but became more pessimistic about the likelihood of obtaining administrative support for such efforts. Other studies suggest that PBE, one of most promising interventions from the perspective of student outcomes, also shows considerable promise as a mechanism for teacher professional development (Meichtry and Smith, 2007; Kenney, Militana and Donohue, 2003).

The whole-school approach to ESD

Whereas the idea of sustainability has made few inroads into American teacher education, it is surprisingly prominent in whole-school reform efforts. Apart from the whole-school implementations of EBE and PBE referred to above, dozens if not hundreds of schools around the

United States have instituted reforms based on what they identify as sustainability principles. Many of these schools, which are often called "sustainable schools" or "green schools,"[21] are private or charter schools.[22] As such, they are relatively independent local public school networks. Instead, they participate in national associations such as the Green Schools Alliance and the National Association of Independent Schools that support their sustainability-oriented programming.

Public schools that adopt sustainability principles rarely do so in isolation. In some cases, they are constituent members of districts or regions that have chosen to collectively pursue sustainability-based reform (such as the Putnam/North Westchester Board of Cooperative Educational Services in New York State, which is working with the Cloud Institute for Sustainability Education). In other cases, they are members of more diffuse statewide networks that share materials and expertise. Statewide networks of public schools with a sustainability focus can be found in states such as Vermont (http://www.sustainableschoolsproject.org/), Oregon(http://sustainableschools.org/), California (http://www.green.ca.gov/GreenBuildings/schools.htm), and New Jersey (http://www.globallearningnj.org/ssn.htm).

Both the national networks for independent schools and the statewide public school networks attempt to leverage local expertise and educational resources (often in the form of NGOs) to enhance school-based ESD. Thus, the idea sustainability is shared by all but has different connotations and implications in each network. For example, the National Association of Independent Schools (NAIS) uses the word sustainability to refer to the long-term viability of the school as well as to sustainable development writ large. Through the NAIS network (http://www.nais.org/sustainable/index.cfm?ItemNumber=147756), private and charter schools can access resources on:

- **Financial Sustainability**: becoming more efficient and less costly
- **Environmental Sustainability**: incorporating sustainability practices into teaching and practice; becoming more green and less wasteful
- **Global Sustainability**: becoming more networked internationally and less parochial in outlook
- **Programmatic Sustainability**: becoming more focused on the skills and values that the marketplace of the 21st Century will seek and reward, and less narrowly isolated in a traditional disciplines approach to teaching and learning
- **Demographic Sustainability**: becoming more inclusive and representative of the school-age population and less unapproachable financially and socially

Although NAIS is "committed to being a leader, model, and moral force for environmental sustainability in its member schools" (NAIS, 2009), it aims to do so through fostering practitioner collaboration and sharing resources rather than more explicit policies or principles.

The Green Schools Alliance (GSA) takes a narrower but more aggressive stance, focusing its efforts on the problem of global climate change. To become members of the GSA, schools must commit to:

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[21] Originally, the green schools movement was exclusively focused on the physical school building, its properties and their relationship to student health and performance; most of the research on "green schools" to date has focused on their health implications (BICE, 2006).

[22] The relationship between the charter school movement and American ESD was discussed, briefly, earlier in this report.

> …signing the Green Schools Climate Commitment at one of the following levels: 1) Climate Champion: Reduce my school's carbon footprint by at least 30% within 5 years, and achieve Carbon Neutrality by 2020; or 2) Climate Steward: Calculate my school's carbon footprint by establishing an energy and carbon emissions baseline, and achieve carbon reductions over time. (Green Schools Alliance, 2009)

To date, over 1500 schools have made one of these two commitments. Although significant in its own right, the narrow goal of reducing carbon emissions is intended to be the core of a more comprehensive effort to engage students, teachers and administrators in sustainability-related projects. According to the GSA's mission statement (ibid.) the Alliance aspires to (among other things):

- INSPIRE environmental stewardship, personal responsibility, leadership and cooperation
- EMPOWER schools to be agents of environmental change in their own communities
- ENGAGE all school community stakeholders in the fight against global climate change
- INTEGRATE education and action through diverse grassroots and institutional incentive programs.

The GSA's emphasis on "green" building and energy-use practices, and the idea that these practices can be a centerpiece of broader ESD efforts, is characteristic of whole-school ESD projects in the United States. Higgs and McMillan examined four schools that define their educational programs in terms of sustainability, and found that facilities and operations were a key way in which schools represented sustainability for their students. By involving students in school-wide efforts to use resources more sustainably, these four schools were able to catalyze significant shifts in awareness and engagement with sustainability issues, as well as behavior change (McMillan and Higgs, 2003, 2006). The pedagogical focus on the *physical* school can be seen as a form of Place-Based Education, in which the initial emphasis on the school community becomes a foundation for later action in the larger communities to which students, teachers and administrators belong. Because the research on whole-school approaches to ESD is in its infancy, very little can be said about its scope, successes and failures. No separate section on research has been included in this report.

Concluding notes

American ESD is in a comparatively early stage of development. Despite an expanding base of popular support, its growth is constrained by the absence of institutional commitment across all sectors of formal education. It is also hampered by internal ideological conflicts and by the historical ambivalence of the EE community regarding large-scale school-based educational programs. Although more teachers are attempting to incorporate EE or ESD materials in their teaching, there is little indication that they are well-prepared to do such work. It is hard to know whether or not their fragile efforts will survive in a political climate that emphasizes high-stakes assessment and traditional disciplinary measures of academic achievement.

There are signs of progress. Local innovation has produced several powerful working models. A small number of states have begun to address the challenges of bringing ESD into the mainstream—challenges that require coordinated policy change at all levels from teacher preparation to student assessment. In this context, and in light of the unanticipated fiscal stresses of the current economic downturn, it is particularly important that research is beginning to demonstrate the benefits of ESD, both in terms of sustainability outcomes and traditional academic measures.

There are two likely paths forward. The first assumes no change in the overall picture of ESD governance—no new federal initiatives, no alteration in the current state-by-state assessment regime, and no radically different activity from ESD-related NGOs. In this scenario, the tentative progress of states like Vermont and Washington will probably spread to a handful of other states that already have strong EE traditions and are expressing interest in ESD—states such as Oregon, Maryland and Wisconsin. A small number of teacher education programs will produce teachers capable of meeting the needs of those states, while the rest will do an incrementally better job of preparing ESD-capable teachers, in keeping with the new NCATE/NAAEE standards. The number of independent schools that emphasize ESD is likely to increase only slowly, unless one of the prominent charter school networks, such as KIPP (http://www.kipp.org/), adopts ESD or place-based education as an organizing strategy. In short, ESD will flourish in isolated archipelagos of practice, enabled by a combination of supportive NGOs and ESD-friendly (or hands-off) state policy. The only unpredictable factors in this picture are the professional networks, networks such as the National Science Teachers Association and the National School Board Association. Although these networks exert a weak and irregular influence on classroom practice, they are capable of spreading key ideas and expanding opportunities for interested practitioners on a national scale. If NGOs such as the USPESD, the Cloud Institute or Shelburne Farms are able to capture the interest of these networks despite competing priorities, ESD practice could spread across the country more rapidly.

The second path relies on some sort of unanticipated central influence, ostensibly though not necessarily from the federal government. This influence could take the form of expanded block grants for local innovation, an emphasis on ESD-related models for new charter school initiatives, or even federally supported infrastructure projects that hearken back to the original "green schools" movement. The most powerful change, without question, would be the inclusion of ESD in the rhetoric and policy of standards-based reform. The single incontestable legacy of the No Child Left Behind Act of 2001 has been a renewed awareness of the power of assessment to shape educational practice. If the federal government adopted benchmarks and indicators for ESD, or required states to do so in order to receive federal funding, ESD would rapidly become an integral piece of American public education. The consequences of *that* change would, of course, depend on the nature and quality of the indicators. In formulating an ambitious plan for the future, American advocates of ESD should pay careful attention to the formulation and implementation of nation-wide ESD indicators in other countries around the globe.

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