SOCIAL AND CULTURAL SUSTAINABLE DEVELOPMENT AND EDUCATION AND ENGINEERING PRACTICE

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ABSTRACT

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Sustainable development, as it is understood and accepted presently, has been embraced by nearly the entire world; however, the complexities of economic, environmental, social, cultural and other related issues and the interactions between them have not yet been fully comprehended. While the economic and environmental aspects of sustainable development have received much attention since the introduction of the concept, the socio-cultural aspects remain conceptually less developed. The objective of this thesis is to explore the notion of social sustainability as well as the role of culture in sustainable development. Elimination of the conceptual and analytical barriers of socio-cultural aspects of sustainable development along with the integration of social sustainability and incorporation of culture into the sustainable development agenda are needed to address the main challenges of sustainable development, especially in developing countries.

Furthermore, education has been identified as a key social strategy for promoting sustainable development. By fundamentally changing the educational system at all levels to incorporate the principles, values and lifestyles required for sustainable development, a more sustainable future in terms of environmental integrity, economic viability and a just society can be created. Engineering education, particularly at higher levels for decision-makers, researchers and teachers needs to be reoriented towards sustainable development aimed at cultivating environmentally-aware attitudes, skills and behaviour patterns, as well as a sense of ethical responsibility.

Over the last two decades the world has witnessed an increase in frequency and impact of natural and man-made disasters. By increasing the capacity of nations to prepare for or cope with these disasters, the international community can limit the major loss of human lives and livelihoods,

the destruction of economic and social infrastructure, as well as environmental damages, It can also progress more effectively towards the achievement of sustainable development.

The significance of the socio-cultural aspects of sustainable development as well as the role of education for building a culture of safety and resilience have been presented as a case study of Haiti.

RÉSUMÉ

LE DÉVELOPPEMENT SOCIAL ET CULTUREL DURABLE ET DE L'ÉDUCATION ET LA PRATIQUE D'INGÉNIERIE

MAHNAZ SADRI

Le développement durable, comme il est compris et accepté présentement, a été adopté par presque tout le monde entier; mais les complexités économiques, environnementales, sociales, culturelles et autres sujets connexes et leurs interactions n'ont pas encore entièrement compris. Les aspects économique et environnemental du développement durable ont reçu assez d'attention depuis l'introduction de l'idée, mais l'aspect socioculturel reste pratiquement moins développé. L'objectif de cette thèse est de découvrir l'idée de durabilité sociale et le rôle de la culture dans le développement durable. On croit que l'élimination des obstacles conceptuels et analytiques de l'aspect socioculturel en développement durable, avec l'intégration de durabilité sociale et l'incorporation de la culture dans le programme du développement durable, sont les clés pour faire face aux défis principaux du développement durable surtout dans les pays en développement.

En outre, l'éducation a été identifiée comme une clé stratégique sociale pour promouvoir le développement durable. En changeant foncièrement le système de l'éducation en tous les nivaux pour intégrer les propres principes, valeurs et modes de vie nécessaires pour le développement durable, aussi un avenir plus durable en matière de l'intégrité environnementale, viabilité économique et société juste peut être crée. L'éducation de l'ingénierie, surtout au niveau de prendre des décisions, les chercheurs et les enseignants ont besoin de se diriger vers le développement durable avec le but de renseigner une conscience, des compétences et des habitudes écologiques, ainsi un sens de responsabilité éthique.

A travers les deux derniers décennies le monde a témoigne une croissance dans la fréquence et l'impact des catastrophes naturelles et les catastrophes causées par les être-humains. En augmentant la capacité des pays à se préparer contre et faire face aux catastrophes, la commaunite international ne peut pas se limiter aux pertes majeures des vies et alimentations,

des dommages économiques et sociales, et les dégâts en l'environnent, mais aussi plus effectivement vers le chemin du développement durable.

L'importance de l'aspect socioculturel du développement durable et le rôle de l'éducation pour établir une culture de sécurité et une résistance contre les risques, sont présentés dans l'étude de cas sur la catastrophe en Haïti.

To the darkest of all hours,

that is nothing but a promise of a dawn

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LIST OF ABBREVIATIONS

AAES	American Association of Engineering Societies
AoC	Alliance of Civilizations
BNDES	Brazilian National Development
CDD	Community-Driven Development
CDM	Clean Development Mechanism
CLT	Culture Sector - UNESCO
COP7	Seventh session of the Conference of the Parties
CSA	Corporate Sustainability Assessment
CSCE	Canadian Society for Civil Engineering
CSD	Commission on Sustainable Development
DAC	Development Assistance Committee
DESD	Decade of Education for Sustainable Development
DKKV	German Committee for Disaster Reduction
DOTS	Directly Observed Treatment Short Course
DRR	Disaster Risk Reduction
EDDR	Education for Disaster Risk Reduction
EDUCAIDS	The Global Initiative on Education and HIV & AIDS
EE	Environmental Education
EESD	Engineering Education for Sustainable Development
EFA	Education for All
ESD	Education for Sustainable Development
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GNI	Gross National Income
HDI	United Nations Human Development Index
HFA	Hyogo Framework for Action
HIPC	Heavily Indebted Poor Countries
HUSAR	Heavy Urban Search And Rescue
ICOM	International Council of Museums
ICT	Information and Communication Technology
IIS	International Implementation Scheme
INTERPOL	International Criminal Police Organization
IPCC	Intergovernmental Panel on Climate Change

ISDR	International Strategy for Disaster Reduction
IUCN	International Union for Conservation of Nature
LDC	Least Developed Countries
LIFE	Literacy Initiative for Empowerment
LWB	Librarians without Borders
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MDG-F	MDG Achievement Fund
MEEG	Monitoring and Evaluation Expert Group
MS	United Nations Member States
NGO	Non-Governmental Organization
OAS	Organization of American States
ODA	Overseas Development Assistance
OECD	Organization for Economic Co-operation and Development
OO	Overarching Objectives
PPP	Purchasing Power Parity
PPP	Public-Private Partnership
SAM	Sustainable Asset Management
SPO	Strategic Program Objectives
SudVEL	Sudan Virtual Engineering Library
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO/TNEP	Natural Edge Project
UNFCCC	United Nations Framework Convention on Climate Change
TPK&E	Thematic Platform on Knowledge and Education
UNISDR	United Nations Office for Disaster Reduction
UNLD	United Nations Literacy Decade
UNU-IAS	United Nations University- Institute of Advanced Studies
WFEO	World Federation of Engineering Organizations

CHAPTER 1. INTRODUCTION

1.1 Background

Presently, sustainable development has been defined in several ways. One of the most commonly accepted definitions comes from the 1987 Brundtland Commission Report which defines sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (1). For years, the initial concept of development was focused principally on economic growth, represented by the per capita increase in GDP. Since the 1980's, the focus on economic sustainability has been followed by a lower emphasis on environmental sustainability, and was gradually replaced by broad notions of development as a human-centred rather than a commodity-centred process (2).

However, a review of the literature shows that of the main pillars of sustainable development, namely, economic, environmental, technical and socio-cultural, the latter is conceptually the least developed. Consequently, despite the fact that the idea of human development has become the primary focus of development thinking, incorporation of culture in development policies and processes, and integration of social development in the sustainability debate remain weak. Consequently, there is a need to clearly define social sustainability as well as the role of culture in sustainable development.

The social dimension of development normally implies development of society with the goal of enabling people, through empowerment, inclusion and security to make the societies more equitable, efficient and sustainable. Community-Driven Development program (CDD) is a program presently in action that can help create responsive, resilient, and reliable communities, ideal for social sustainable development by supporting participatory decision making, local capacity building and community control of resources. Capacity building at the individual, institutional and societal levels of communities has been identified as one of the main principles for enhancing the effectiveness and sustainability of CDD programs. It is suggested that Community-Driven Development programs, particularly in developing countries like Haiti, can significantly help strengthen human resources as well as institutional capacities which can lead to the sustainable recovery and development of the country.

Furthermore, any development strategy must be sensitive to the cultural assets of the community to address its interlinked economic, environmental, social and technical problems. It is argued that, "culture should not be viewed as the fourth pillar but as the central pillar of sustainable development" (3). By bringing culture in from the periphery of development thinking and placing it at center, any sustainable development strategy would have a greater potential in achieving social justice, self-reliance and ecological balance. Moreover, as highlighted by Irina Bokova, Director-General of UNESCO (2011) "it is through *quality education*, through *culture*, and through *science*, that the least developed countries will be able to achieve their development goals and defend their rights" (4).

Education is a fundamental human right and it has been identified as a critical social strategy for promoting sustainable development and improving the capacity of people to address environmental and development issues. Education for Sustainable Development (ESD) emphasizes the role of education and learning in achieving a more sustainable future and it promotes the values of sustainable development in all forms, and at all levels of education. ESD focuses on addressing the key challenges of sustainable development through education. A number of challenges undertaken by ESD programs are (5):

1. "Education for Water Sustainability
2. Strengthening the Educational Response to Climate Change Internationally
3. Advancing Sustainable Lifestyles and Responsible Consumption through ESD
4. ESD and Disaster Risk Reduction: Building Disaster-Resilient Societies
5. Educating for Food Security: the Contribution of ESD
6. AIDS, Health and ESD
7. Mainstreaming Biodiversity into Education and Learning
8. The Economic Pillar of Sustainable Development: Educational Approaches".

The review of the recent history of sustainable development confirms that, despite significance of the socio-cultural aspects of sustainable development and the fundamental role of education in addressing the key challenges of sustainable development, these elements have received considerably little attention as compared with the economic and environmental pillars of sustainable development.

1.2 Recent History of Sustainable Development

The recent history of sustainable development for the era from before the Industrial Revolution to the present is summarized by Barking and Dagenham (2003). A brief summary is presented here for completeness:

(a) Pre-Industrial Revolution Period (Prior to 1750)

Before the Industrial Revolution, there were no cars or major roads, and several of the modern modes of communication had not been developed. People were self-reliant and lived in small towns and villages, consuming locally produced food and clothing. Consequently, the resources were utilized on a small local scale, with a minimum of waste. Most of the goods were manufactured using local natural resources and wind or hydraulic power, in the absence of electricity or gas. Thus, these communities truly practiced basic sustainable development.

(b) Industrial Revolution

The Industrial Revolution led to major changes in most countries, with many natural resources, such as coal, iron ore, clays, etc., mined on such an extensive scale that it left significant scars on the landscape. Several factories cropped up; railways, navigation docks and harbors evolved and helped with moving raw resources and manufactured goods and people; this led to large population increases in most cities and towns. The extraordinary economic progress was coupled with the disposable lifestyle with goods and products being discarded in landfills, which represented a new landscape feature.

(c) 1950's and Early 1960's Era

In the late 1950's and early 1960's, it was realized that the effects of technological developments and economic growth were not always positive and had some side effects, such as pollution of land, water and air, and steady depletion of natural resources.

(d) Post-1960's Era

1972 **The Stockholm United Nations Conference on the Human Environment** was the first major international conference on environmental issues, and forms an important milestone in international environmental politics (6). The participants from 113 countries

and more than 400 inter-governmental and non-governmental organizations contributed significantly to increased awareness of global environmental issues. The participants concurred on a declaration with 26 principles which included an Action Plan related to the global environment and development with 119 recommendations and a resolution (7). The Conference proclaimed that "man is both creature and moulder of his environment, which gives him physical subsistence and affords him the opportunity for intellectual, moral, social and spiritual growth" (6). The well being and quality of life of all humans and economic development around the world depend strongly on man`s capability to protect and ameliorate the human environment. However, wrong and needless applications could damage the human environment, for example, serious levels of land, water and air pollution, disturbance of ecological balance of the biosphere, depletion of renewable natural resources, and other major deficiencies could be harmful to the physical, mental and social health of man, in the man-made environment.

Lack of proper development has caused serious environmental problems and "millions continue to live far below the minimum levels required for a decent human existence, deprived of adequate food and clothing, shelter and education, health and sanitation" (6). Consequently, developing countries must focus on development and assign a high priority to protect and ameliorate the environment. Simultaneously the industrialized countries must attempt to reduce the gap between themselves and the developing countries.

The Conference noted the on-going negative impact of continuous population growth on the environment and recommended adoption of appropriate policy measures to combat the resulting problems. In addition, they asserted that "of all things in the world, people are the most precious. It is people that propel social progress, create social wealth, develop science and technology and through their hard work, continuously transform the human environment" (6). The goals of protection, amelioration and wise management of the environment, conservation of nature including wild life and its seriously endangered habitat, present a special responsibility to man who must consider it with appropriate importance in planning and implementation of economic development, which, in turn, influences humans in term of quality of life, the wild life and the global environment.

After the above proclamations highlighting the problems of pollution, depletion or exhaustion of resources, damage to the environment, danger to species and the need to enhance the human social well being, the UN Conference on the Environment adopted twenty-six principles aimed at developing recommendations for the above issues, along with sparing the man and the environment the effects of nuclear weapons and of other means of mass destruction (Principle 26). These principles ensured that all development was sustainable (without mentioning the word), and emphasized the necessity for shared principles and attitudes to inspire and guide all people of the world to preserve and ameliorate the environment.

1987 In the early 1980's, the United Nations General Assembly was concerned about long-term sustainable development, cooperation between developed and developing countries, more effective management of global environmental issues and concerns, and long-term perspective for protecting and enhancing the environment. In late 1983, this led the Secretary General to ask Mme Gro Harlen Brundtland, then the Prime Minister of Norway to establish and chair the World Commission on Environment and Development with the goal of formulating a global agenda for change [(8), (9)].

After working for three years, the commission produced **The Brundtland Report** published as a book entitled "Our Common Future" in 1987. The report identified some common concerns such as "threatened future, sustainable development and the role of the international community", besides examining "common challenges", including "population growth, food security, biodiversity and energy choices, as well as how to make industry more efficient". The report also listed some common endeavors, such as "managing the commons, maintaining peace and security while not suspending development or degrading the environment, and changing institutional and legal structures". It also included one chapter on each of these "concerns, challenges and endeavors" (10).

The Brundtland Commission noted that economic development by itself leads to deterioration and not an amelioration of the quality of life of citizens. They also realized that because economic development is new, it is not necessarily better for everyone.

Their report brought forward the concept of sustainable development on the international scene, defining sustainable development as "any development which meets the needs of the present without compromising the ability of the future generations to meet their own needs". The commission noted two principle issues as part of this concept. Firstly, development should not only be about larger profits and higher standards of living for a minority, but also be about improving the quality of life for everyone now and in the future. Secondly, any development must not involve wreckless consumption of natural resources, destruction of the natural habitat, or pollution of the environment. Consequently, environmental sustainable development focuses on eliminating poverty and involving everyone in their future prosperity. The current vast differences in wealth and opportunity throughout the world have resulted in everyone contemplating short-term survival, without any serious planning for the long-term.

In summarizing the report findings in a speech in 1989, Mme Brundtland emphasized the key concepts of the report "that development must be sustainable, and the environment and the world economy are totally and permanently intertwined." She asserted further that "the world's financial and political institutions are simply out of step with nature", and that "these concepts transcend nationality, culture, ideology and race." She warned strongly that "present trends cannot continue. They must be reversed".

A major part of the commission work concentrated on policy issues, dealing with long-term multi-faceted population problems, requiring solutions in terms of effective incentive systems to augment production, especially food crops. The report noted that the problems facing the world are closely interlinked; however, the various nations and "institutions that face these challenges tend to be independent, fragmented, working closely to relatively narrow mandates with closed decision processes" (10).

The report emphasized dealing with the debt crisis in developing countries, arguing strongly that poverty is directly linked to environmental deterioration. Extreme poverty would always lead to ecological and other catastrophes. It was recommended further that security issues should be characterized in environmental terms rather than in military

strategies. A gradual transition from fossil fuels to “low energy” alternatives from renewable resources was also highlighted in the report.

Emphasizing the large differences between developed and developing nations, based on energy use, environmental degradation and urban growth, the report recommended effective international cooperation to solve the problems. The report represents a strong documentation of the road map for a new era of economic growth - an era of sustainable, non-destructive growth.

All of the basic issues raised by the 1987 Brundtland Commission were discussed and recognized by the United Nations General Assembly, which led to the adoption of Resolution 44/228 of December 11, 1987 on the environmental perspective to the year 2000 and beyond, and Resolution 44/187 also of December 11, 1987 on report of the World Commission on Environment and Development. In addition, the General Assembly recognized that new and additional financial resources would be needed by developing countries “to ensure their full participation in global efforts for environmental protection”. The General Assembly resolved to convene a two-week long United Nations Conference on Environment and Development, encouraging the highest level of participation.

The principal goal of the Conference was “to elaborate strategies and measures to reverse the effects of environmental degradation with world-wide efforts to promote sustainable and environmentally sound development in all countries”. To improve the quality of life of all peoples, while the states have the sovereign right to exploit their own resources, guided by their national policies, they would be responsible, subject to the national and international laws “for the damage to the environment and natural resources caused by activities within their jurisdiction, or control through transboundary transactions”.

The General Assembly also reaffirmed that “the serious indebtedness of developing countries and that the serious debt-servicing problems have to be addressed in an efficient and urgent manner in order to enable those countries to contribute fully and in accordance with their capacities and responsibilities to global efforts to protect and enhance the

environment". Some of the world-wide concerns in achieving environmentally sound and sustainable development were:

a. "Protection of the atmosphere by combating climate change, depletion of the ozone layer and trans-boundary air pollution;
b. Protection of quality and supply of freshwater resources;
c. Protection of the oceans and all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and protection, rational use and development of their living resources;
d. Protection and management of land resources by, inter alia, combating deforestation, desertification and drought;
e. Conservation of biological diversity;
f. Environmentally sound management of wastes, particularly hazardous wastes, and of toxic chemicals, as well as prevention of illegal international traffic in toxic and dangerous products and wastes;
g. Improvement of the living and working environment of the poor in urban slums and rural areas, though the eradication of poverty by, inter alia, implementing integrated rural and urban development programs, as well as taking other appropriate measures at all levels necessary to stem the degradation of the environment;
h. Protection of human health conditions and improvement of the quality of life."

1990 The U.K. developed a comprehensive strategy in a white paper on the Environment, entitled **"This Common Inheritance, Britain's Environmental Strategy"** (11). This strategy provided several of the ideas for **"Sustaining Our Common Future"** (12).

1992 The first International Earth Summit (United Nations Conference on Environment and Development) was held in Rio de Janeiro, Brazil, with more than 180 participant countries, resolving to address the "urgent problems of environmental protection, social and economic development" and how to achieve sustainable development (13). **The Rio Earth Summit** resulted in several major agreements and established the United Nations Commission on Sustainable Development (which meets annually), along with some important U.N. documents, such as:

- **The Framework Convention on Climate Change** limiting emissions of greenhouse gases (GHG's), carbon dioxide (CO_2) and methane gas (CH_4).
- **The Framework Convention on Biological Diversity** making the countries responsible for conserving diversity of species and using biological resources in a sustainable manner.
- **The Rio Declaration and the Forest Principles** setting out the principles of sustainable development and pledging to reduce deforestation.
- **Agenda 21** presented a major action plan for achieving sustainable development in the 21st century and recommended that "all countries should produce natural sustainable development strategies" (14). It also recommended reducing poverty by providing people access to resources to support themselves. Developed nations agreed to assist the development of other nations to minimize the environmental impact of their economic growth. Agenda 21 emphasized "reduction of pollution emissions and use of precious natural resources". The various governments were urged to lead this change and to tackle unsustainable practices. Thus, local actions could lead to the solution of global problems.

1992 The European Union adopted the **Fifth Environmental Action Plan**, aimed at including environmental concerns into the various policy areas to achieve sustainable development (15).

1994 The U.K. became the first country to develop a national sustainable development strategy, entitled: **"Sustainable Development: The U.K. Strategy"** (16)**.**

1997 **Kyoto Climate Change Protocol:** The governments met in Kyoto, Japan, to review the progress on Agenda 21 (Rio+5) and renewed the call for all countries to develop their national strategies for sustainable development and have them in place by 2002 (Rio+10) (17). The conference also re-examined the problem of global warming. The previous agreements attempted to limit emissions of carbon dioxide to the levels in 1990; several countries were unable to achieve even this small decrease, with the exception of the UK and Germany. A new set of targets was adopted in an international agreement, which is linked to the United Nations Framework Convention on Climate Change (UNFCCC) to

reduce the emissions of the following six major greenhouse gases by 2012 to below the 1990 levels for the target period 2008-2012:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulphur hexafluoride (SF_6)
- Hydrofluorocarbons (HFC_s) and
- Perfluorocarbons (PFC_s)

The principal difference between the Protocol and the Convention is that the Convention encouraged industrialized countries to reduce and stabilize greenhouse gas (GHG) emission, while the Protocol committed them to do so. The participants agreed that over the previous 150 years of industrial development and activities, developed countries (which are more industrialized) were largely responsible for the present high levels of GHG emission and the resulting environmental pollution (18). Consequently, the Protocol placed a larger burden or responsibility on the developed countries, based on the principle of common but differentiated responsibilities. The Protocol set binding targets for 37 industrialized countries and the European Union (15 countries) to reduce their GHG emissions to an average of 5.2 percent against the 1990 levels over the five year period 2008-2012. These assigned amounts or emission limits did not include the international aviation and navigation emissions, and are in addition to the industrial gases, chlorofluorocarbons (CFC_s) which were the subject of the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. These emission levels were accepted by the Conference of the Parties of UNFCCC as values of global warming potential derived from a model based on the Second Report of the International Panel on Climate Change (IPCC). These emissions were converted into CO_2 equivalents ($CO_2 - eq$) in evaluation of overall sources and sinks.

Adopted in Kyoto, Japan, on December 11, 1997, the Kyoto Protocol came into force on February 15, 2005. The detailed rules for Protocol implementation also known as Marrakesh Accords, had been adopted at the Seventh session of the Conference of the Parties (COP7) in Marrakesh, Morocco, in 2001. While each country was responsible for

meeting their target through their own national policies and measures, the Protocol provided for three flexible market-based mechanisms to meet their targets (18):

- "Emission trading (the carbon market)
- Clean development mechanism, and
- Joint implementation".

These flexible mechanisms were aimed at stimulating green investments, besides helping with the achievement of emission targets in efficient and cost-effective ways.

The Protocol requires that the countries monitor their actual emissions and keep precise records of the emissions and the trades undertaken using any of the above three mechanisms. A U.N. Registry, based in Bonn, Germany, would keep a record of all annual emissions inventories along with the annual reports; a compliance system would verify that the commitments are being fulfilled and help any countries that need any assistance. In the case of any lack of compliance with the emissions limits, the country would be required to make up the difference during the following commitment period along with a penalty of an additional 30% of the commitment. Moreover, the country would not be able to benefit from transfers under the emissions trading program.

The Kyoto Protocol and the Convention can assist countries to adapt to the various negative effects of climate change by facilitating and providing assistance for "development and deployment of techniques that can help increase resilience to the impacts of climate change" (18). A special Adaptation Fund with a share of the Clean Development Mechanism (CDM) project activities was established to help finance adaptation projects and relevant programs in developing countries who were parties to the Kyoto Protocol.

1999 **Dow Jones Sustainability Indexes** were introduced to track the annual performance of the leading sustainability-driven companies worldwide. The index members are selected from the various sectors based on the comprehensive SAM (Sustainable Asset Management) Corporate Sustainability Assessment (CSA) of long-term economic, environment and social criteria (19).

2000 In September 2000, leaders of 193 United Nations member states and at least 23 international organizations agreed to adopt eight **Millennium Development Goals** (MDG) with 21 targets and take steps to achieve them by 2015. According to the UN Secretary-General, Ban Ki-Moon (2010), these goals represent a significant milestone in international operation, involving enormous development efforts aimed at improving the lives of people around the world. These goals represent basic human needs and rights which every human being "should be able to enjoy- freedom from extreme poverty and hunger; quality education; productive and decent employment; good health and shelter; the right of women to give birth without risking their lives; and a world where environmental sustainability is a priority, and men and women live in equality" (20).

Goal 1: Eradicate extreme poverty and hunger

- Target 1A: Halve the proportion of people living on less than $1 a day
  - *Proportion of population below $1 per day [Purchasing Power Parity (PPP) values]*
  - *Poverty gap ratio [incidence x depth of poverty]*
  - *Share of poorest quintile in national consumption*
- Target 1B: Achieve Decent Employment for Women, Men, and Young People
  - *GDP Growth per Employed Person*
  - *Employment Rate*
  - *Proportion of employed population below $1 per day (PPP values)*
  - *Proportion of family-based workers in employed population*
- Target 1C: Halve the proportion of people who suffer from hunger
  - *Prevalence of underweight children under five years of age*
  - *Proportion of population below minimum level of dietary energy consumption*

Goal 2: Achieve universal primary education

- Target 2A: By 2015, all children can complete a full course of primary schooling, girls and boys
  - *Enrollment in primary education*
  - *Completion of primary education*
  - *Literacy of 15-24 year olds, female and male*

Goal 3: Promote gender equality and empower women

- Target 3A: Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015
  - *Ratios of girls to boys in primary, secondary and tertiary education*
  - *Share of women in wage employment in the non-agricultural sector*
  - *Proportion of seats held by women in national parliament*

Goal 4: Reduce child mortality rates

- Target 4A: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
  - *Under-five mortality rate*
  - *Infant (under 1) mortality rate*
  - *Proportion of 1-year-old children immunized against measles*

Goal 5: Improve maternal health

- Target 5A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio
  - *Maternal mortality ratio*
  - *Proportion of births attended by skilled health personnel*
- Target 5B: Achieve, by 2015, universal access to reproductive health
  - *Contraceptive prevalence rate*
  - *Adolescent birth rate*
  - *Antenatal care coverage*
  - *Unmet need for family planning*

Goal 6: Combat HIV/AIDS, malaria, and other diseases

- Target 6A: Halt by 2015 and begin to reverse the spread of HIV/AIDS
  - *HIV prevalence among population aged 15–24 years*
  - *Condom use at last high-risk sex*
  - *Proportion of population aged 15–24 years with comprehensive correct knowledge of HIV/AIDS*

- Target 6B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it
  - *Proportion of population with advanced HIV infection with access to antiretroviral drugs*
- Target 6C: Halt by 2015 and begin to reverse the incidence of malaria and other major diseases
  - *Prevalence and death rates associated with malaria*
  - *Proportion of children under 5 sleeping under insecticide-treated bednets*
  - *Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs*
  - *Prevalence and death rates associated with tuberculosis*
  - *Proportion of tuberculosis cases detected and cured under DOTS (Directly Observed Treatment Short Course)*

Goal 7: Ensure environmental sustainability

- Target 7A: Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources
- Target 7B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss
  - *Proportion of land area covered by forest*
  - *CO_2 emissions, total, per capita and per $1 GDP (PPP)*
  - *Consumption of ozone-depleting substances*
  - *Proportion of fish stocks within safe biological limits*
  - *Proportion of total water resources used*
  - *Proportion of terrestrial and marine areas protected*
  - *Proportion of species threatened with extinction*
- Target 7C: Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation (for more information see the entry on water supply)
  - *Proportion of population with sustainable access to an improved water source, urban and rural*

- *Proportion of urban population with access to improved sanitation*

- Target 7D: By 2020, to achieve a significant improvement in the lives of at least 100 million slum-dwellers
  - *Proportion of urban population living in slums*

Goal 8: Develop a global partnership for development

- Target 8A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
  - *Includes a commitment to good governance, development, and poverty reduction– both nationally and internationally*

- Target 8B: Address the special needs of the Least Developed Countries (LDC)
  - *Includes: tariff and quota free access for LDC exports; enhanced program of debt relief for HIPC (Heavily Indebted Poor Countries) and cancellation of official bilateral debt; and more generous ODA (Overseas Development Assistance) for countries committed to poverty reduction*

- Target 8C: Address the special needs of landlocked developing countries and small island developing States
  - *Through the Program of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly*

- Target 8D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term
  - *Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and Small Island Developing States.*
  - *Official development assistance (ODA):*
    - *Net ODA, total and to LDCs, percentage of OECD/DAC (Organization for Economic Co-operation and Development/Development Assistance Committee) donors' GNI (Gross National Income)*

- *Proportion of total sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation)*
- *Proportion of bilateral ODA of OECD/DAC donors that is untied*
- *ODA received in landlocked countries as proportion of their GNIs*
- *ODA received in small island developing States as proportion of their GNIs*

- *Market access:*
  - *Proportion of total developed country imports (by value and excluding arms) from developing countries and from LDCs, admitted free of duty*
  - *Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries*
  - *Agricultural support estimate for OECD countries as percentage of their GDP*
  - *Proportion of ODA provided to help build trade capacity*
- *Debt sustainability:*
  - *Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative)*
  - *Debt relief committed under HIPC initiative, US$*
  - *Debt service as a percentage of exports of goods and services*

- Target 8E: In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries
  - *Proportion of population with access to affordable essential drugs on a sustainable basis*

- Target 8F: In co-operation with the private sector, make available the benefits of new technologies, especially information and communications
  - *Telephone lines and cellular subscribers per 100 population*
  - *Personal computers in use per 100 population*
  - *Internet users per 100 Population*

The 2010 UN Report shows the progress made, in attaining the MDG goals; however, it emphasizes that "the Goals are achievable when nationally owned development strategies, policies and programs are supported by international development partners". The report notes the slow improvement in the lives of the poor, and some of these hard-won gains could be significantly eroded by the impact of climate change and the food and economic crisis.

The Secretary-General emphasizes that "meeting these goals is every one's business. Falling short would multiply the dangers of our world- from instability to epidemic diseases to environmental degradation. But achieving these goals will put us on a fast track to a world that is more stable, more just and more secure" (20).

The world leaders are constantly reviewing progress in achieving MDGs and evaluating the obstacles and gaps, and developing solid strategies and action plans to attain the eight MDGs by 2015.

2002 **Johannesburg 2002 "Rio + 10"** The countries met in Johannesburg, South Africa (21) to review progress towards sustainable development, and focused on poverty and access to safe drinking water and sanitation (21). The conference resolved to:

- Reduce the number of people without access to clean drinking water from over one billion to 500 million by 2015.
- Reduce by half the number of people without proper sanitation to 1.2 billion.
- Increase the use of sustainable energy and restore depleted fish stocks.

There were several environmental groups present at Johannesburg Conference to protest the lack of progress since the 1992 Rio Summit. However, the politicians noted that the Summit had progressed from issues like biodiversity and climate change to tackling poverty and poor living conditions.

2009 By adopting resolution 64/236, United Nations General Assembly agreed to hold the "Rio+20" Conference on Sustainable Development in 2012, with the following objectives (22):

- "Securing renewed political commitment to sustainable development;
- Assessing the progress and implementation gaps in meeting already agreed commitments; and
- Addressing new and emerging challenges".

2012 **Rio de Janeiro "Rio + 20"** In June 2012, 20 years after the Earth Summit, world leaders, along with thousands of participants from governments, the private sector, NGOs and other groups, once again gathered in Rio de Janeiro, Brazil for the United Nations Conference on Sustainable Development to renew political commitment for sustainable development, assess the progress to date and the remaining gaps in the implementation of the outcomes of the major summits on sustainable development, and address new and emerging challenges. The Conference also focused on the following two themes (23):

- "A green economy in the context of sustainable development poverty eradication; and
- The institutional framework for sustainable development".

Following are the suggested means for strengthening institutional frameworks for sustainable development:

1. "Strengthening the three dimensions of sustainable development;
2. Strengthening intergovernmental arrangements for sustainable development;
3. Environmental pillar in the context of sustainable development;
4. International financial institutions and United Nations operational activities".

The Conference highlighted the need for strengthening the three dimensions of sustainable development –social, environmental and economic; for their integration in institutional frameworks in sustainable development. The Conference however, did not focus on the cultural aspect of sustainable development which as examined in the following chapters, is argued to be the central pillar of sustainable development framework. Moreover, the following chapter is an effort in clarifying and strengthening the social pillar of sustainable development.

1.3 Present Situation

The summary of the recent history of sustainable development presented above validates the recognition of significance of the concept of sustainability by the international community and confirms their aspiration and determination to move towards the path of sustainable development. However, as mentioned earlier, the lack of emphasis on socio-cultural aspects of sustainable development as well as the role of education in promoting the values of sustainable development and addressing its key challenges have hindered the effectiveness of the initiatives taken towards sustainable development.

A knowledgeable and healthy society with strong cultural values has the tools to demand and build what is best for itself and for its future generations. While in a global context, these characteristics are defined in relative terms, the socio-cultural challenges of the developing countries as well as the developed countries are witnessed in day to day life.

On June 23, 2012, a section of the rooftop parking lot of the Elliot Lake mall in Northern Ontario collapsed and trapped about 30 people. The Toronto HUSAR (Heavy Urban Search And Rescue) team initiated the search shortly after the collapse. However, two days later, HUSAR announced that the Ministry of Labor had decided that due to the possibility of another collapse the site was too dangerous for rescue workers to continue, and despite the detection of signs of life hours earlier, rescue efforts were halted. This decision provoked an angry response from the local community from whom a group was gathered with a plan to barge into the mall themselves (24). Later that night, with the intervention of Ontario Premier Dalton McGuinty, officials changed their plans and the rescue efforts were resumed. McGuinty argued: “I’m sure if that was your mum or your daughter or your brother and somebody came to you and said how far should we push . . . we’d all say we need to go as far as we possibly can to rescue these individuals” (25).

The Elliot Lake mall roof collapse claimed the lives of two women, one of whom was detected to be alive, just hours before the rescue efforts were halted (26). Even though the decision to end the search cost the rescue team a few hours, one can not help but wonder that it also cost the community the life of a person. There lies a social problem that was also strongly opposed by the members of the community but unfortunately the outcome remained the same. Nothing is more precious than a human life which should be paramount in all decisions.

Although the cause of the collapse is under investigation, there are numerous reports of complaints about the leaks in the roof by the tenants. In 2007, a falling piece of drain pipe that was connected to the roof, had injured a mall employee badly. Even though there are reports which confirm that an ongoing maintenance program was in place to patch the leaks and identify its source, the outcome proves that they were clearly not sufficient. This is not the first time that the impact of a non-existing or delayed maintenance has resulted in tragic social costs. The existing culture of differed maintenance -or as stated by Professor Mirza (2007), the flawed 'design, build, and forget' formula- is one of the reasons behind the terrifying state of infrastructure in Canada, as well as United States.

Over the past two decades the world has witnessed a dreadful increase in the frequency as well as the impact of natural and man-made disasters. "This, compounded by increasing vulnerabilities related to changing demographic, technological and socio-economic conditions, unplanned urbanization, development within high-risk zones, under-development, environmental degradation, climate variability, climate change, geological hazards, competition for scarce resources, and the impact of epidemics, points to a future where disasters could increasingly threaten the world's economy, and its population and the sustainable development of developing countries" (27).

The worst disasters over the past two years alone claimed the life of about 335,000 people and cost over $550 billion. The natural and man-made disasters of the twenty-first century along with their devastating impacts in terms of fatalities and economic losses are presented in Appendix A for completeness [(28), (29), (30)]. Moreover, the losses due to disasters are not limited to these factors. The tangible and intangible damages to people and society as a whole which are often overlooked in the cost assessment of such events must also be reckoned and evaluated. The direct and indirect social costs of natural and man-made disasters go beyond the number of recorded fatalities.

Table 1-1 highlights the impact of the worst earthquakes of the twenty first century in terms of their death toll or magnitude in developing countries as well as a developed country like Japan. As illustrated in the table while the 9.0 M_w earthquake in Japan resulted in 18,400 casualties, according to the Haitian government, the 7.0 M_w earthquake in Haiti resulted in 316,000

fatalities. The massive gap in these death tolls is representative of the gap that exists between the capacity of the developed country and its society to prepare for and cope with these disasters compared with that of a developing country. The following sections will examine the ways to improve this capacity and to increase the resilience of nations and communities as well as their infrastructure, to minimize losses in face of natural and man-made disasters.

Date	**Country**	**Disaster**	**Fatalities**	**Economic Costs**
2004/Dec.26	Indonesia; Sri Lanka; India; Thailand; Maldives	- Earthquake (Magnitude: **9.1** $\boldsymbol{M_w}$) (Depth: 30 km) - Tsunami	**275,950**	>$15 B
2010/Jan.12	Haiti, Port-au-Prince	Earthquake (Magnitude: **7.0** $\boldsymbol{M_w}$) (Depth: 13 km)	**316,000**	$7.8 B
2005/Oct.8	Pakistan, Azad Kashmir, Muzaffarabad	Earthquake (Magnitude: **7.6** $\boldsymbol{M_w}$) (Depth: 26 km)	**74,500**	$5.4 B
2003/Dec.26	Iran, Kerman, Bam	Earthquake (Magnitude: **6.6** $\boldsymbol{M_w}$) (Depth: 69.2 km)	**26,271**	$1 B
2001/Jan.26	India, Gujarat	Earthquake (Magnitude: **7.7** $\boldsymbol{M_w}$) (Depth: 16 km)	**20,005**	$2.6 B
2011/Mar.11	**Japan**	**- Earthquake (Magnitude: 9.0** $\boldsymbol{M_w}$**) (Depth: 30 km)** **- Tsunami** **- Nuclear accidents, radiation releases**	**18,400**	**$309 B**

Table 1-1 Impact of the Worst Recorded Earthquakes of the Twenty First Century in Developing and Developed Countries

1.4 Present Needs

As mentioned earlier, while natural and man-made disasters have caused serious setbacks in achieving the sustainable development objectives, they have also brought into perspective the significance of building strong, resilient, responsive, and reliable communities that would be able to prevent, or prepare for and cope with these disasters. Consequently, presently, more than ever, the importance of sustainable development as well as the need for a greater focus on its socio-cultural aspects, alongside the economic, environmental and technical dimensions has been reckoned.

In 2005, during the World Disaster Reduction Conference, in Kobe, Hyogo, Japan, 168 Member States of the United Nations adopted the Hyogo Framework for Action- a ten year action plan to build the resilience of nations and communities to disasters, spanning from 2005 to 2015. The HFA underscores the following five priorities for action along with the guiding principles and practical means for achieving disaster resilience (ISDR, 2007):

1. "Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. ***Use knowledge, innovation and education to build a culture of safety and resilience at all levels.***
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels".

As highlighted in the priorities for action of HFA, education and learning play a crucial role in Disaster Reduction by raising awareness of natural hazards as well as existing vulnerabilities and threats faced by the communities and through building a culture of safety and resilience at all levels. Figure 1-1 is an illustrative example of the impact of long term resilience and preparedness programs in strengthening the resilience of nations to disasters or crisis (31).

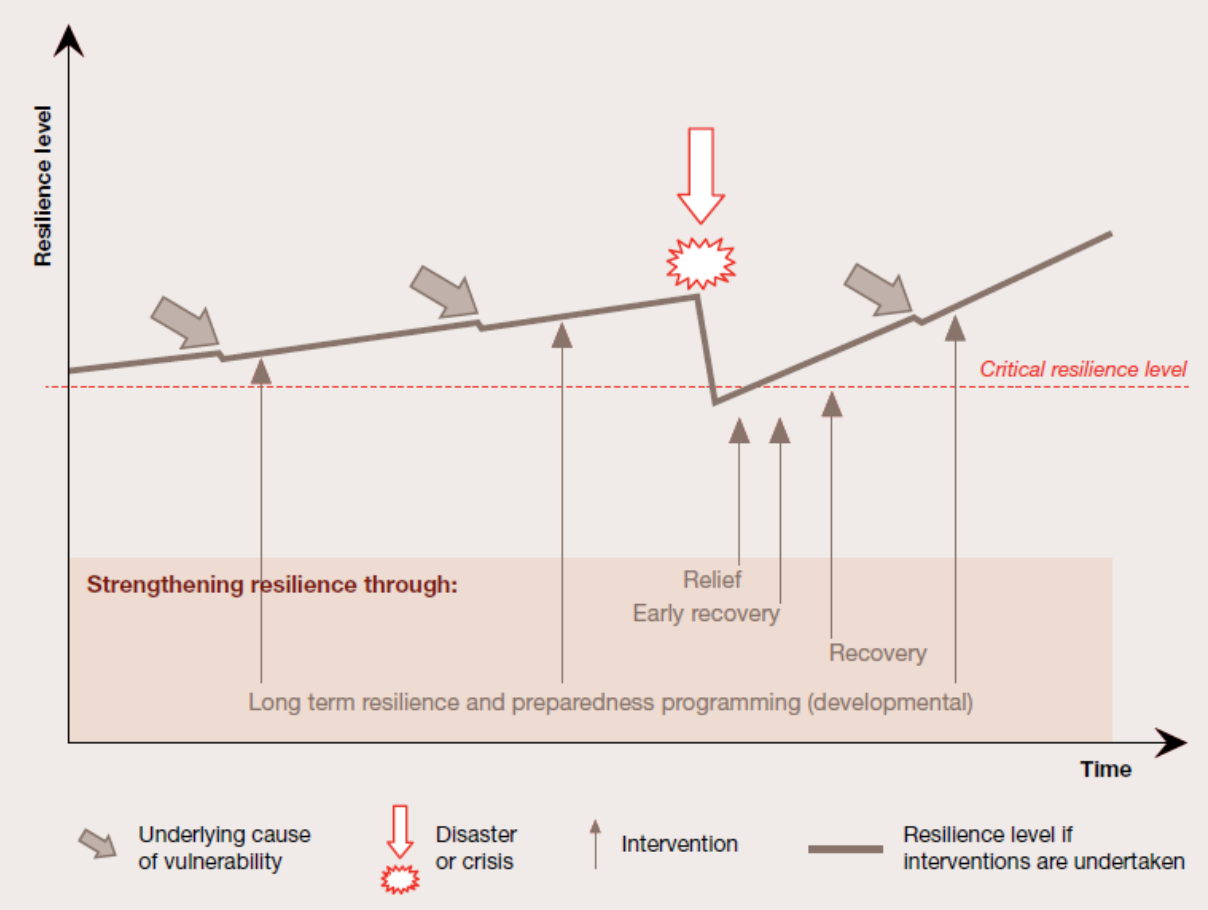

Figure 1-1 Interventions to Strengthen Resilience (31)

Moreover, the catastrophic outcomes of natural and man-made disasters, have underscored the need for more comprehensive design strategies that would increase the redundancy and resiliency of infrastructure and minimize the impact of such events on infrastructure and ultimately on society. Erickson (2010) argues that resilient infrastructure makes a resilient nation and highlights the relationship between resiliency of a nation and its prosperity: "Resiliency is the foundation of preparedness. A resilient society can withstand and/or recover from natural disasters, terrorist attacks, and infrastructure failures. A resilient society can face the challenges of the upcoming decades. Resiliency goes hand-in-hand with capacity. As we improve our resiliency, we simultaneously improve reserve capacity and can design for future demand. Resiliency is a core component of quality of life, prosperity, competitiveness, and security".

In December 2010, *Designing for a Resilient America: A Stakeholder Summit on High Performance Resilient Buildings and Related Infrastructure* was held in Washington D.C., to focus on issues concerning the resilience of buildings and infrastructure against natural and man-made disasters. During the summit the resilience of buildings and infrastructure was addressed through the following four design-related approaches (32):

1. High Performance: e.g. development of new advanced materials and products that exhibit high-performance attributes;
2. Codes and Standards: Incorporation of resilience and high-performance factors in design codes and standards to provide guidance for the building community in design and construction processes;
3. Continuity of Operations: Additional adjustments in codes and standards to guarantee the continued operation of critical building and infrastructure in times of crisis, which will save lives and result in enormous cost savings;
4. Integrated Design: Designing the infrastructure in an integrated way to withstand all hazards, with the highest levels of performance attributes and in the most cost-effective manner.

Moreover, a major challenge concerning the resilience of building and infrastructure is the issue of progressive collapse. "A progressive collapse initiates from a local structural failure and propagates, by a chain reaction mechanism, into a failure that involves a major portion of the structural system" (33). The tragedy of September 11, 2001, once again emphasized the need for enhanced designed strategies and implementation of required provisions in national codes and standards to control the likelihood of progressive collapse. Ellingwood (2002) suggests that even though it is not possible to eliminate the risk of progressive collapse, the following can minimize its probability:

- "Structural engineers must understand the issues involved and think the unthinkable at the conceptual design stage.
- Structural engineers must strive to communicate concerns regarding consequences of extreme events on building performance to building developers, architects, owners and occupants. Risk communication must become a significant part of arriving at acceptable strategies for

progressive collapse prevention, and its importance in arriving at both socially acceptable and technically feasible solutions cannot be overemphasized.

- Structural engineers must be educated to think in terms of system behavior and design rather than member behavior and design".

As pointed out earlier, increasing the resiliency of infrastructure can dramatically reduce the fatalities as well as economic and social losses in the face of natural and man-made disasters. While the following sections focus on socio-cultural aspects of sustainable development as well as the role of education in promoting the values of sustainable development and addressing its key challenges, they will also touch upon the significance of a resilient society in times of crisis.

1.5 Thesis Objectives

It is argued that in order to address the main challenges of sustainable development, especially in developing countries, the conceptual and analytical barriers of socio-cultural aspects of sustainable development must be eliminated. **First objective** of this thesis is to explore the notion of social sustainability as well as the role of culture in sustainable development to further highlight their significance and facilitate their integration into sustainable development programs.

Furthermore, education has been identified as a key social strategy for promoting sustainable development. **Second objective** of this thesis is to provide the reader with information on programs in place which support the right to education and aim to promote the principles, values and lifestyles required for a sustainable development through education and learning in all forms and at all levels of educational systems.

United Nation's Decade of Education for Sustainable Development (DESD) (2005-2014) program is further examined with the focus on its contributions to Sustainable Development to date as well as the existing challenges along its way. The review of the program illustrated the lack of emphasis in professional education and higher education. **Third objective** of this thesis is to provide suggested means to improve the engineering education in particular, by introducing and expanding on multiple aspects of sustainable development within the engineering programs.

Finally, as mentioned earlier, over the last two decades the world has witnessed an increase in frequency and impact of natural and man-made disasters. By increasing the capacity of nations to prepare for or cope with these disasters, the international community can limit the major loss of human lives and livelihoods, the destruction of economic and social infrastructure, as well as environmental damages. It can also progress more effectively towards the achievement of sustainable development. **Fourth objective** of this thesis is to explore the significance of the socio-cultural aspects of sustainable development as well as the role of education, in building a culture of safety and resilience. This objective is also highlighted through the case study of Haiti.

CHAPTER 2. SOCIAL SUSTAINABLE DEVELOPMENT

2.1 Definition

The initial concept of sustainable development (Club of Rome, 1972), and the United Nations World Commission Report (1987) dealt principally with the impact of rapid economic growth on the environment, and on increasing poverty and lack of development in poorer developing countries. Commencing in the 1980's, this concept of economic growth was reflected in the per capita GDP with the focus on economic sustainability, followed by a lower emphasis on environmental sustainability, and was gradually substituted by the broad notions of development as a human-centered rather than a commodity-centered process. Social development normally implies development of society, with the goal of enabling people, especially the relatively poorer people, to take action to help themselves. The social dimensions of development include **empowerment**, **inclusion** and **security**, aimed at making the societies more **equitable**, **efficient** and **sustainable** [(34) , (35)]. Consequently, the mostly materialistic development indicators used internationally were expanded to include quality of nutrition, health, literacy and education of the population, comprising the development of social sustainability, and the local environment.

It must be emphasized that both economic and social dimensions are important as they represent two sides of the poverty reduction problem. Economic dimensions with investment in climate and growth, along with "pro-poor growth" and social dimensions of empowerment, social inclusion and participation, and security, complete the virtuous circle of equity and efficiency that leads to sustainable poverty reduction. Social inclusion involves removal of institutional barriers between communities and government, civil society and the private sector to promote effective governance. This makes development more sustainable and responsive to poor peoples' needs, aspirations and to the development context, reliable in efficiently delivering what it promises – building social capital, and resilient to shocks, providing lasting benefits.

A review of the literature clearly shows the on-going neglect of social sustainability, which is conceptually the least developed of the three main pillars of sustainability– economic, environmental and social. The ambiguity and abstractness of the concept of social sustainability have severely compromised its importance and utility, and therefore, a clear understanding of

social sustainability and its relevance and impact on the society is essential. In an attempt for such clarification, Vallance et al. (2011) proposed three sub-categories of social sustainable development, comprising 'development', 'bridge' and 'maintenance' social sustainabilities which will be reviewed briefly.

(a) Development Social Sustainability

The Brundtland Report (1987), Our Common Future, emphasized one of the main social concerns of sustainable development that only when people's basic needs are met, they can initiate active engagement in addressing other social, environmental, economic, technical and political concerns. It is evident that issues such as poverty, inequity and illiteracy in both developed and developing countries act as barriers to securing improved social and environmental outcomes. Development social sustainability focuses on issues ranging from tangible, very basic human needs consisting of clean water, safe shelter and healthy food, to less tangible requirements involving education, equity and justice. It emphasizes the role poverty and inequity play in environmental degradation and suggests that alleviation of the basic human needs is vital for the environmental well-being. In other words, it would be unrealistic to expect people to care about global warming when they are hungry, cold, or seeking shelter.

(b) Bridge Social Sustainability

While development social sustainability addresses the basic needs through the creation of social capital and justice, bridge social sustainability focuses on nature and explores ways to promote 'eco-friendly' behavior and stronger environmental ethics to achieve bio-physical environmental goals. Bridge sustainability examines the essential social conditions ranging from transformative to non-transformative approaches that support ecological sustainability. Vallance et al. (2011) distinguished between the two approaches: the transformative approaches seriously re-imagine people's relationships with the environment, other humans and non-humans, and demand fundamental changes in the relationship of the people to the world around them, while non-transformative methods are more conventional and limited in scope, aimed at making small, incremental changes and often involve an adoption of technological innovations such as hybrid vehicles or alternative energy resources.

(c) Maintenance Social Sustainability

While addressing the concerns of the existing development and bridge social sustainabilities, special attention is needed to develop and maintain the ways in which such practices can be maintained. Maintenance social sustainability involves *preservation* of socio-cultural characteristics in the context of social and economic changes, and the people's response to these changes. "Such maintenance occurs through habit, movement and protest in the face of both local and global connections, and the influence they exert via technological innovation, resource shortage, immigration, employment opportunities, and other forces of change". It is argued that sustainability policies that have limited social acceptance can lead to adverse environmental outcomes. People prefer to live in sustainable communities. Ironically, if the sustainability policies are unrealistic and at odds with the local context, those with the means will depart for communities with superior sustainable environments. Consequently, the most disadvantaged will be left to struggle with such policies which would be contrary to the tenants of sustainable development. Figure 2-1 demonstrates the three subcategories of social sustainability in the context of sustainable development.

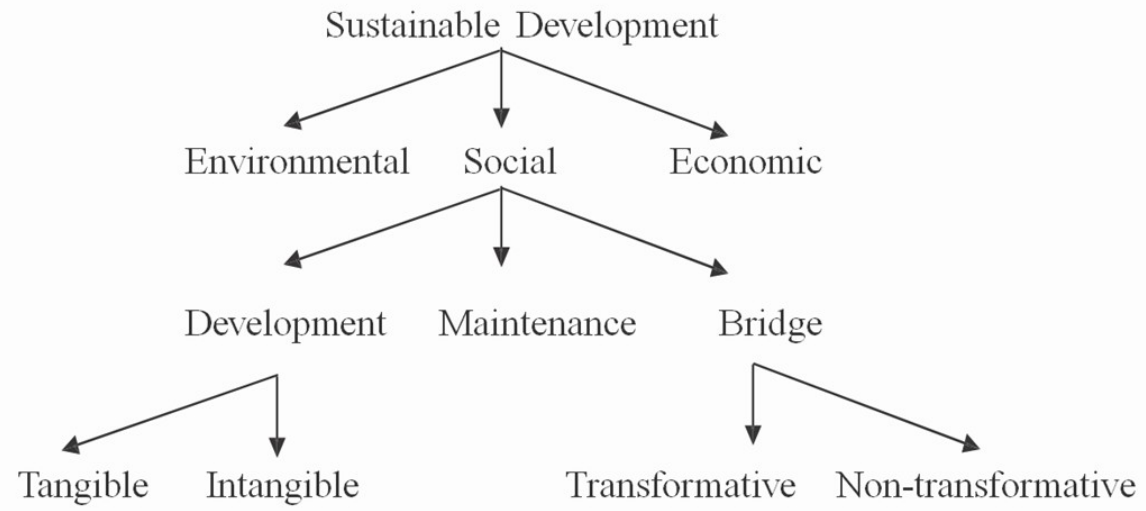

Figure 2-1 Three Strands of 'Social Sustainability' (36)

2.2 Main Challenges in Social Sustainable Development

For years, social dimension of development was hindered by the belief that the complex problems of poverty and income inequity were restricted to the realm of economic development;

however, consultations with people and development practitioners showed that poverty is about more than just low income; it also includes *vulnerability*, *exclusion, isolation*, *unaccountable institutions*, *illiteracy*, and *powerlessness* (34). Hence, any social development strategy aimed at making societies more equitable, efficient, resilient, and sustainable, must embrace the principles of *security*, *empowerment*, *inclusion* and *accountability* (37). Consequently, the key components of a social sustainability framework should include: (a) social capital, (b) social infrastructure, (c) social justice and equity and (d) engaged governance (38).

(a) Social Capital

Social capital provides a theoretical starting point for social sustainability. The World Bank (1998) defines social capital as: "the institutions, the relationships, the attitudes and values that govern interactions among people and contribute to economic and social development. Social capital is not simply the sum of institutions, which underpin the society; it is also the glue that holds them together. It includes the shared common sense of 'civic' responsibility that makes society more than just a collection of individuals". Social capital is a precondition for economic development as well as for effective governance, and it facilitates the communities to advance smoothly towards strong, resilient, healthy or socially sustainable communities.

(b) Social Infrastructure

Social infrastructure provides an opportunity to implement social sustainability. It should be noted that social infrastructure is not limited to the tangible aspects of *hard* infrastructure but also includes the less tangible *soft* infrastructure that embraces both provision of community services and capacity building of citizens and community groups to work together with the governments to achieve a sustainable community. Cuthill (2009) identifies the outcomes of 'capacity building' as development of informed and active citizens and civil society, which contribute to strong local governance with the potential to provide broad benefits resulting in a net return on public investment. In the United Kingdom for example, for every $1 invested in community networks and services, $10 were saved in health costs, reduced crime and better employment outcomes. Critical elements and the means for capacity building are reviewed later.

(c) Social Justice and Equity

The social justice and equity framework provides an ethical foundation for social sustainability both at the planning stages and during the implementation processes. It emphasizes the just distribution of infrastructure, services and resources provided for a community. Some of the main principles included in a social justice framework as explained by Cuthill (2009) are:

1. "Equity – fairness in the distribution of resources, particularly for those most in need;
2. Rights – equality of rights established and promoted for all people;
3. Access – fair access for all people to economic resources, services and rights essential to their quality of life;
4. Participation – opportunity for all people to genuinely participate in the community and be consulted on decisions that affect their lives".

(d) Engaged Governance

It is argued that each of the three aspects of the social sustainability framework ultimately rely on the engaged governance processes to ensure the support and participation of the stakeholders to develop an informed and appropriate social sustainability policy, planning, and practices. Engaged governance can act as the foundation of social sustainability by "facilitating the development of shared understanding, commitment and ownership, and helps build human and social capital".

The suggested social sustainability framework is an ideal type, describing an interdependent and self-reinforcing relationship between its four key components: 1) social capital, 2) social infrastructure, 3) social justice and equity, and 4) engaged governance. A program in action presently, in accordance with such framework is Community-Driven Development (CDD). CDD programs put communities in control of decisions and resources for the community groups and by embracing the operational principles of inclusion, empowerment, and accountability, these programs can provide the means for both developed and developing countries to achieve their vision of social sustainable development. The reasons for support of CDD programs and their enhancement follow.

2.3 Community-Driven Development

"Community-Driven Development (CDD) is an approach to development that supports participatory decision making, local capacity building, and community control of resources. The five key pillars of this approach are community empowerment, local government empowerment, realigning the center, accountability and transparency, and learning by doing. With these pillars in place, CDD approaches can create sustainable and wide-ranging impacts by mobilizing communities and giving them the tools to become agents of their own development" (39).

(a) Pros of CDD in Social Sustainable Development

Social sustainable development requires a responsive (*reflecting people's needs and aspirations-especially of the poor and marginalized groups*), reliable (*delivering the goods and meeting the aspiration of the people*), and resilient (*able to withstand shocks and negative trends*) environment. CDD promotes the inclusion of women, indigenous people, isolated communities and minority groups through its rules and incentives; it also allows communities to define their own needs and provides them with control over planning and resources, which results in the empowerment of the communities along with an enhancement of their social capital. Moreover, CDD effectively works in reducing corruption and strengthening the demand for accountability by local governments through its transparency and accountability mechanisms (34). Consequently, by embracing the operational principles of inclusion, empowerment, and accountability, CDD creates a responsive, resilient, and reliable environment, ideal for social sustainable development.

(b) CDD and Disaster Risk Reduction

As mentioned earlier, over the last few decades, there has been a dramatic increase in both the frequency and impact of natural and man-made disasters. According to the World Bank's evaluation, Hazards of Nature, Risks to Development (2006), communities are usually in the first line of fire in natural disasters and their active participation in project planning and implementation has been a key factor in the success of many Bank disaster management projects (40).

Similarly, the international experience has shown that (40),

- "The effects of a disaster are first felt at the level of the community, and the community is the first to respond to a disaster.
- Disaster risk reduction measures are most successful when they involve the direct participation of the people most likely to be exposed to hazards.
- Investments in community-based preparedness and early warning systems have proved to save lives, protect property, and reduce economic losses.
- Failure to understand the risk behaviour and culture of communities can lead to badly designed early warning systems and risk awareness-raising campaigns.
- The involvement of local people promotes self-reliance and ensures that emergency management plans meet local needs and circumstances.
- Local communities are essential sources of indigenous knowledge regarding hazards and mitigation.
- Disaster relief and recovery responses that do not directly involve the affected communities in deciding their own needs and priorities frequently provide inappropriate and unsustainable forms of assistance.
- A community-level focus facilitates the identification of vulnerable groups".

Burton (2009) argues that the characteristics of CDD programs enable them to effectively reduce the risks and impacts of natural hazards. CDD projects focus on inclusion and empowerment of marginalized groups and communities, who are also the most at risk of being affected by a natural disaster. Since CDD programs are already established and operate at national and local levels, they can play an effective role in coordination and cohesiveness of disaster risk reduction and response, especially in difficult-to-reach communities across a country. Moreover, CDD projects include community-level construction and civil works programs that can be used for emergency rehabilitation and reconstruction of basic infrastructure and facilities following a disaster. CDD operations have proven efficient management practices and the flexibility of their operations for procurement and disbursement can aid in quicker mobilization of resources, after a disaster. Finally, the monitoring and evaluation systems of CDD programs can be effective in planning and assessing post-disaster recovery solutions.

(c) CDD in Poverty Reduction Strategies

CDD also makes poverty reduction efforts more responsive to demand, more inclusive, more sustainable, and more cost-effective than traditional centrally led programs (41). By achieving immediate and lasting results at the grassroots level, CDD complements market and public sector activities and provides an effective strategy for poverty reduction. As discussed earlier, CDD enhances sustainability by making the services responsive and inclusive of the needs and interests of the poor and vulnerable people. It also empowers poor people, builds social capital and strengthens governance. Moreover, as CDD devolves the responsibilities and resources to the local level, given the support and appropriate knowledge, it allows poor communities to simultaneously pursue their poverty reduction aspirations, leading to large-scale poverty reduction. Finally, CDD can improve the efficiency and effectiveness of the development programs. Practical examples are valid for infrastructure - *lower cost and more productively employed assets*, education - *more participation of children as well as better service delivery by providers on account of parental involvement*, and national resource management.

(d) Principles for Supporting CDD

Analysis of successful large-scale CDD programs and consultation with leading practitioners (41) has identified the following principles to enhance the effectiveness and sustainability of CDD programs:

1. "Establish an enabling environment through relevant institutional and policy reform;
2. Make investments responsive to informed demand;
3. Build participatory mechanisms for community control and stakeholder involvement;
4. Ensure social and gender inclusion;
5. **Invest in capacity building of community-based organizations;**
6. Facilitate community access to information;
7. Develop simple rules and strong incentives, supported by monitoring and evaluation;
8. Maintain flexibility in design of arrangements;
9. Design for scaling up; and
10. Invest in an exit strategy".

2.4 Capacity Building

As stated previously, capacity building of community based organizations has been identified as one of the main principles for supporting Community-Driven-Development programs. The 1991 symposium on "A strategy for water sector capacity-building" defined capacity-building as (42):

a) Creation of an enabling environment with appropriate policy and legal frameworks;
b) Institutional development, including community participation (of women in particular); and
c) Human resources development and strengthening of managerial systems.

The United Nations Department of Economic and Social Affairs (UNDESA, 2009) recently defined capacity as the ability of people, organizations and society as a whole to manage their affairs successfully, and defines capacity building (development) as the process by which people, organizations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time. "At the individual level, capacity-building involves establishing the conditions under which public servants are able to embark on a continuous process of learning and adapting to change — building on existing knowledge and skills and enhancing and using them in new directions. This requires a new approach to human resources management and also points to the importance of knowledge management as the new vehicle for increased learning. At the institutional level, a similar approach needs to be applied. Rather than creating new institutions, often based on foreign blueprints, support should focus on the modernization of their machinery, with a priority on systems and processes. In this process, capacity development for policy support, organizational effectiveness and revenue and expenditure management are crucial. Finally, capacity development at the societal level is required to support the paradigm of a more interactive public administration that learns equally from its actions and from the feedback it receives from the population at large. Societal change is required for public administration to be seen as a responsive and accountable service provider, whose performance needs to be monitored (42). Figure 2-2 presents the relationship between the individual, institutional and societal levels in the context of capacity building and illustrates the different areas of needed actions for each level to be cultivated.

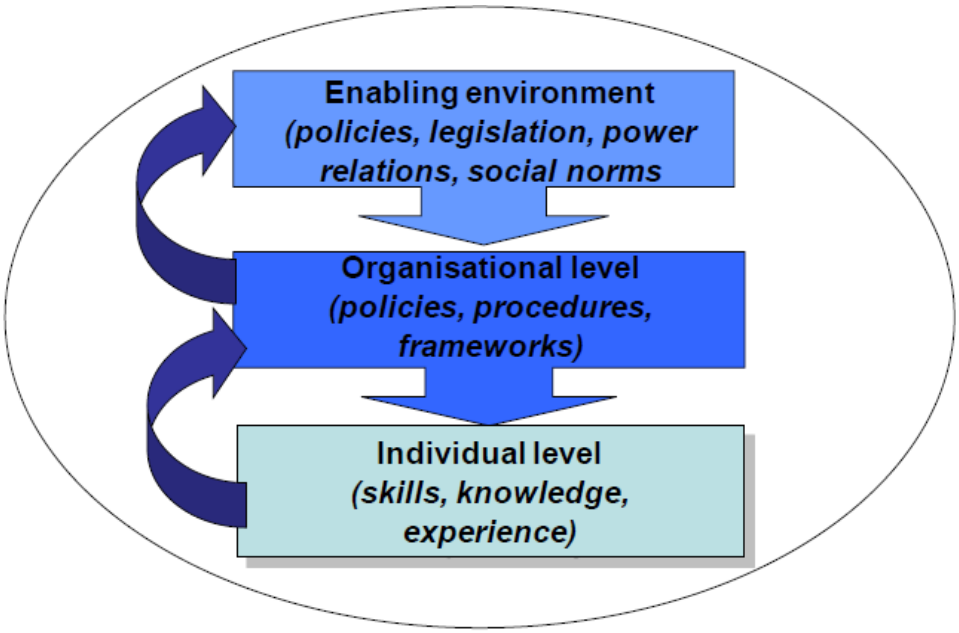

Figure 2-2 Capacity Building at Individual, Organizational and Societal Levels (38)

The commission on sustainable development acting as the preparatory committee for the world summit on sustainable development defined the following critical elements for capacity building (2002):

- "Good governance, with participatory, transparent and democratic decision-making mechanisms;
- Partnerships between States and stakeholders in decision-making processes that focused on building mutual capacities;
- Access (to basic services for vital human needs, education, information, modern technology and finance);
- Rights-based approach to sustainable development;
- Prior informed consent in the design and implementation of strategies;
- Science-based decision-making;
- Genuine partnerships with a level playing field and local ownership of the process;
- Common but differentiated responsibilities;
- Workers rights, freedom of association and collective bargaining;
- Respect for cultural diversity".

Moreover, the following means were suggested for capacity-building (43):

- "Education for sustainable development and the eradication of illiteracy;
- Dissemination of information (in local languages, gender-disaggregated);
- Access to information technology and related training;
- Decentralization of resources and responsibilities;
- Enabling environment for employment and income generation;
- Building and maintaining scientific capacity in all countries;
- Human capacity creation as a basis for innovation;
- Trade related technological assistance;
- Strengthened local authorities".

Presently, the World Bank, the United Nations, and many other international organizations have included capacity building in their development programs. The UNDP has also focused on capacity building for reaching the MDGs. Following is an example of this initiative:

"In Bangladesh almost half the population remains poor and the country faces many challenges in achieving its MDG targets for 2015. For instance, the Government of Bangladesh is committed to achieving 100% sanitation coverage by 2010 and 100% safe water supply coverage by 2011. Yet the public procurement system still suffers from a number of major weaknesses, including a lack of a procurement monitoring framework, insufficient advisory services or guidelines, and no established procurement training programs. The Embassy of Denmark is supporting the Government in aligning its procurement activities with the nationals systems of Bangladesh through the water supply and sanitation sector programs. Union Parishads are elected bodies and form the lowest local government unit in the rural areas of Bangladesh; the Unions are the focal point for implementation of all these activities. With the support of the UN Procurement Capacity Development Centre, the local Union in Baldhara conducted the procurement for 29 dug wells, five rainwater harvesting systems and 10 deep tube wells. To date more than 600 families in Baldhara have benefited from this initiative. The news has spread that the water from the new pumps is good and the demand is now increasing from other villages for similar hand pumps. Mr. Mia and his colleagues are now preparing a new proposal for funds for additional wells and the replacement of latrines" (44).

CHAPTER 3. CULTURAL SUSTAINABLE DEVELOPMENT

3.1 Global Initiatives in Culture for Development

As mentioned earlier, the initial concept of sustainable development was focused on the environmental consequences of rapid economic growth along with the growing poverty and lack of development in developing countries. Since the 1970s, the perception of development as mere economic growth has been expanded to include intellectual, emotional, moral and physical aspects of self and the society. This perception strengthens the correlation between development and culture. Sen (1990) further boosted this notion by portraying development as "human capability expansion", which improves the quality of life through access to cultural resources and participation. In 1988, with the launch of World Decade for Cultural Development (1998-1998), the role of culture in sustainable development was emphasized (45). Moreover, in 1995, the World Commission on Culture and Development highlighted the cultural dimension of human development and recommended focusing on culture, instead of treating it as a peripheral issue in "development" (46).

The International Conference on Cultural Policies for Development held in Stockholm, in 1998, recommended that the 149 participating national governments adopt the following five policy objectives (47):

1. " To make cultural policy one of the key components of development strategy;
2. Promote creativity and participation in cultural life;
3. Reinforce policy and practice to safeguard and enhance the cultural heritage, tangible and intangible, movable and immovable, and to promote cultural industries;
4. Promote cultural and linguistic diversity in and for the information society; and
5. Make more human and financial resources available for cultural development".

The national governments agreed to include cultural policy as a key component of the development processes, recognizing it as one of the central factors in endogenous and sustainable development strategies. However, in spite of the near unanimity on the subject, the practice of including economic and environmental sustainability in policy-making was rarely extended to include culture. The linkages between economic and cultural development were also not

considered (47). This led the 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions to focus on the need to take a holistic view of the development process, bringing the cultural dimensions of development together with economic and environmental objectives within a sustainability framework. The Convention incorporated the following guiding principles (48):

- "Respect for human rights and fundamental freedoms;
- Equal dignity of and respect for all cultures;
- International solidarity and cooperation;
- Complementarity of economic and cultural aspects of development;
- Sustainable development – Cultural diversity is a rich asset for individuals and societies. The protection, promotion and maintenance of cultural diversity are an essential requirement for sustainable development for the benefit of present and future generations;
- Equitable access to a rich and diversified range of cultural expression from all over the world and access of cultures to means of expression and dissemination; and
- Openness and balance by States to support the diversity of cultural expressions from other cultures of the world".

Article 13 of the Convention dealt with integration of culture in the development policies of the participating Member States at all levels to create conditions conducive to sustainable development, and to protect and promote the diversity of cultural expression. The Convention also recommended the needed actions to implement the Convention principles, including collaborative arrangements among the various parties, namely, the public and private sectors and non-profit organizations (48).

The UNESCO Culture for Development Indicator Suite project, running from 2009 to 2012, contributes to the implementation of Article 13, by establishing a set of indicators highlighting how culture contributes to development at the national level fostering economic growth, and helping individuals and communities to expand their life choices and adapt to changes (49).

Moreover, in 2007, during UNESCO's 34th General Conference, Member States unanimously agreed to adopt the Medium-Term Strategy for 2008-2013, comprising of a strategic vision and a programmatic framework for UNESCO's action in all its domains at the global, regional and

country levels (50). The Medium-Term Strategy included UNESCO's revised mission statement, along with a set of overarching and strategic program objectives as shown in Figure 3-1.

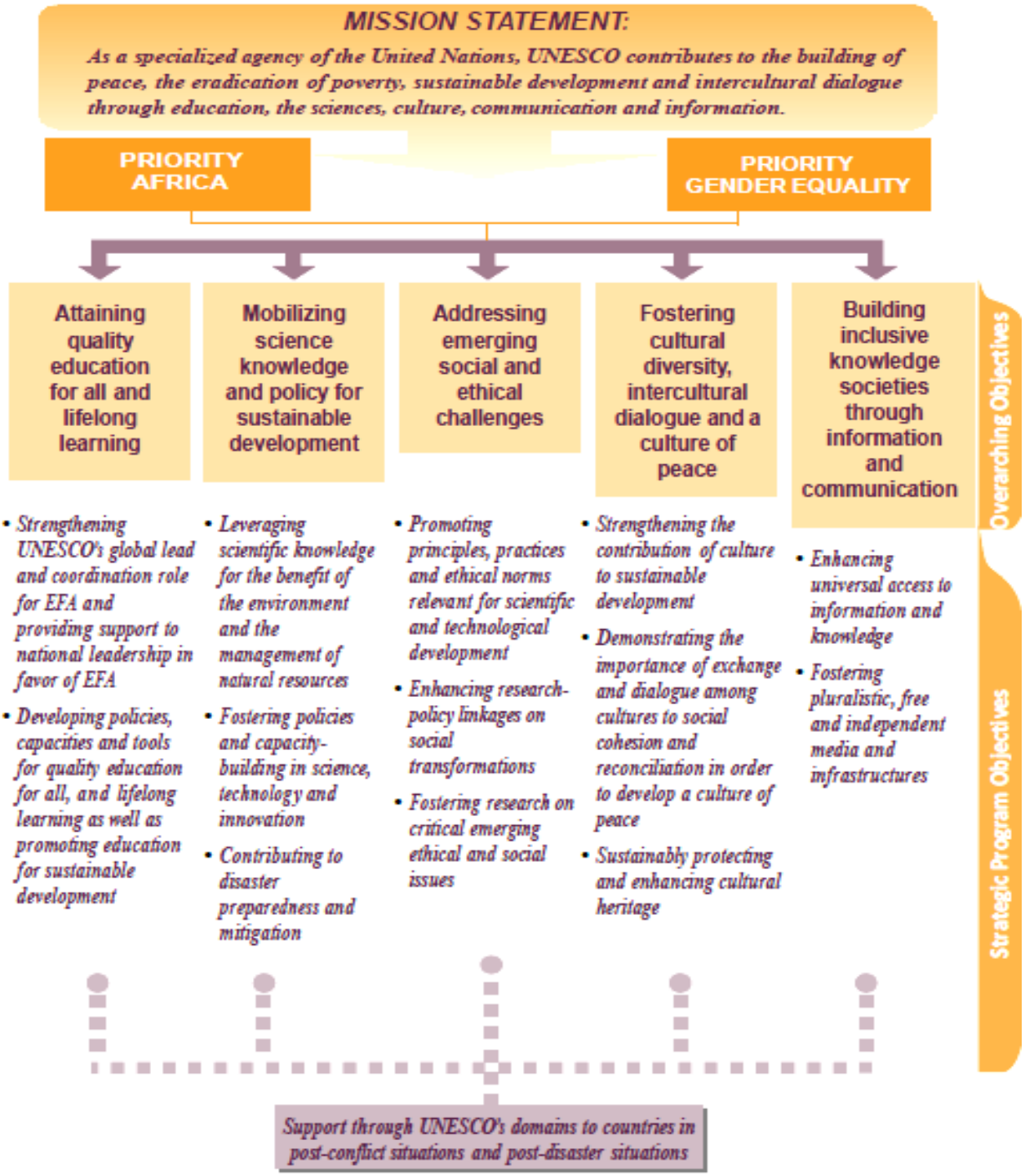

Figure 3-1 UNESCO's Mission Statement, Its Five OOs and the 14 SPOs (50)

As illustrated in Figure 3-1, one of the main Overarching Objectives (OOs) of UNESCO is to foster cultural diversity, intercultural dialogue and a culture of peace. The Strategic Program Objectives (SP0s) 9, 10, and 11, were proposed by UNESCO (2008) as means of accomplishing this Overarching Objective:

- SPO 9: Strengthening the contribution of culture to sustainable development;
- SPO 10: Demonstrating the importance of exchange and dialogue among cultures to social cohesion and reconciliation in order to develop a culture of peace; and
- SPO 11: Sustainably protecting and enhancing cultural heritage.

The final report on the external evaluation of SPO's 9 and 10 in 2011 revealed that despite some significant regional successes, the overall progress towards achievement of the SPOs in the biennium has been limited (51).Table 3-1 and Table 3-2 represent the expected outcomes of SPO 9 and SPO 10 and assessment of the progress made towards them respectively.

SPO 9 Expected Outcomes	Summary Assessment of Progress
"Principles of cultural diversity integrated into policies, mechanisms and practices at national and regional levels.	Good progress on ratification of 2005 Convention. Limited progress by UNESCO on development and effective use of tools and support to MS (UNESCO Member States) in this area. Reporting from MS on levels and kind of integration into policies not yet started and therefore not known.
Cultural development reflected in national development plans and legislation.	UNESCO working with a weak governmental sector; culture rarely explicit in national development plans in developing or least developed countries. Some regional progress under MDG-F (MDG Achievement Fund).
The role of culture in development and principles of cultural diversity reflected in South-South cooperation initiatives.	Limited progress in stimulating South-South cooperation where government and civil society partners are relatively weak and best practice models not established. Some progress evident in inter-sectoral work (e.g. water, ESD) and under MDG-F joint programmes.
Awareness about the cultural contribution of indigenous peoples to sustainable development enhanced.	Some progress during Decade of the World's Indigenous People through international stakeholder collaboration.
New cooperative mechanisms, including public-private partnerships, based on the principles of-cultural diversity, developed for cultural industries and best practices in this area collected and recognized by UNESCO.	Limited progress in stimulating new mechanisms and partnerships because of limited resources and lack of clarity around UNESCO aims and objectives in cultural tourism, for example; and lack of CLT (UNESCO Culture sector) experience in dealing with private sector."

Table 3-1 Summary of Progress towards Achieving SPO 9 Expected Outcomes 2008-09 (51)

SPO 10 Expected Outcomes	Summary Assessment of Progress
"Emerging challenges and obstacles to a sustained dialogue among civilizations and cultures identified.	Limited regional progress in collaboration with Alliance of Civilizations (AoC).
Methodologies, procedures and networks promoting dialogue among professionals developed.	Very limited progress; best practice models not clearly established and mechanisms not yet effective or in place.
Mutual understanding strengthened in several regions and sub-regions through dialogue-related activities.	Limited progress using existing tools (e.g. General Histories) and collaboration with Alliance of Civilizations (AoC). Need for review and updating of UNESCO approaches, methods and mechanisms.
Intercultural dialogue integrated as part of quality education in curricula and learning materials.	No discernable progress.
Lisbon Roadmap on Arts Education implemented together with other partners.	Some regional progress in promoting and embedding Roadmap (e.g. in SE Asia)."

Table 3-2 Summary of Progress towards Achieving SPO 10 Expected Outcomes 2008-09 (51)

The above literature illustrates that despite the international agreements and goodwill, the role of culture in sustainable development and its translation into appropriate policies has not been fully established. One of the reasons behind this issue is the complexity and multiple interpretations of the concept of culture in development. The other major factor is the risks involved in funding cultural initiatives which results in the lack of such investments, especially in developing countries. A review of each of these factors along with recommendations for moving forward follows.

3.2 Culture as the Fourth Pillar of Sustainable Development

As mentioned above, the ambiguity of both concepts of culture and development have presented a challenge in incorporation of culture into sustainable development. Williams (1981) argued that "Culture is one of the two or three most complicated words in the English language" and it has at least four contested definitions:

1. "A developed state of mind – as in 'a person of culture', 'a cultured person';
2. The processes of this development – as in 'cultural interests', 'cultural activities';
3. The means of these processes – as in 'the arts' and 'humane intellectual works'; and
4. Lastly, as 'a whole way of life', 'a signifying system' through which a social order is communicated, reproduced, experienced and explored".

With respect to sustainable development, it has been common practice to limit the interpretation of the term 'culture' to preservation of the arts and heritage. As Hawkes (2006) points out, "the tacit acceptance of the arts and heritage version of culture has marginalized the concept of culture and denied theorists and practitioners an extremely effective tool". Culture should also be viewed as a whole way of life which shapes human behaviour and their interaction with the world. Moreover, it should be emphasized that culture also shapes the meaning of development. Development is also a complex word with multiple meanings (3). In the context of sustainable development, it is vital to look beyond the notion of development as 'Modernization' and 'Western European Road to Development' to also include "GDP growth, employment creation, regional development, urban revitalization and social cohesion" and to understand the contributions of the cultural sector to achievement of such economic and social objectives (47).

With such perception of culture, comprising of all four definitions presented above, it can be argued that the framework for sustainable development should have culture not just as its fourth pillar among other pillars of social, economic and environmental, but as its central pillar that is also fully integrated into the other three, as illustrated in Figure 3-2. Nurse (2006) noted that by putting culture at the centre of the sustainable development paradigm, this framework allows for greater diversity in policy choices and breaks out of the universalistic and dependency-creating development thinking and promotes the following values:

- Cultural identity (the social unit of development is a culturally defined community and the development of this community is rooted in the specific values and institutions of this culture).
- Self-reliance (each community relies primarily on its own strength and resources).
- Social justice (the development effort should give priority to those most in need).
- Ecological balance (the resources of the biosphere are utilized in full awareness of the potential of local ecosystems as well as the global and local limits imposed on present and future generations.

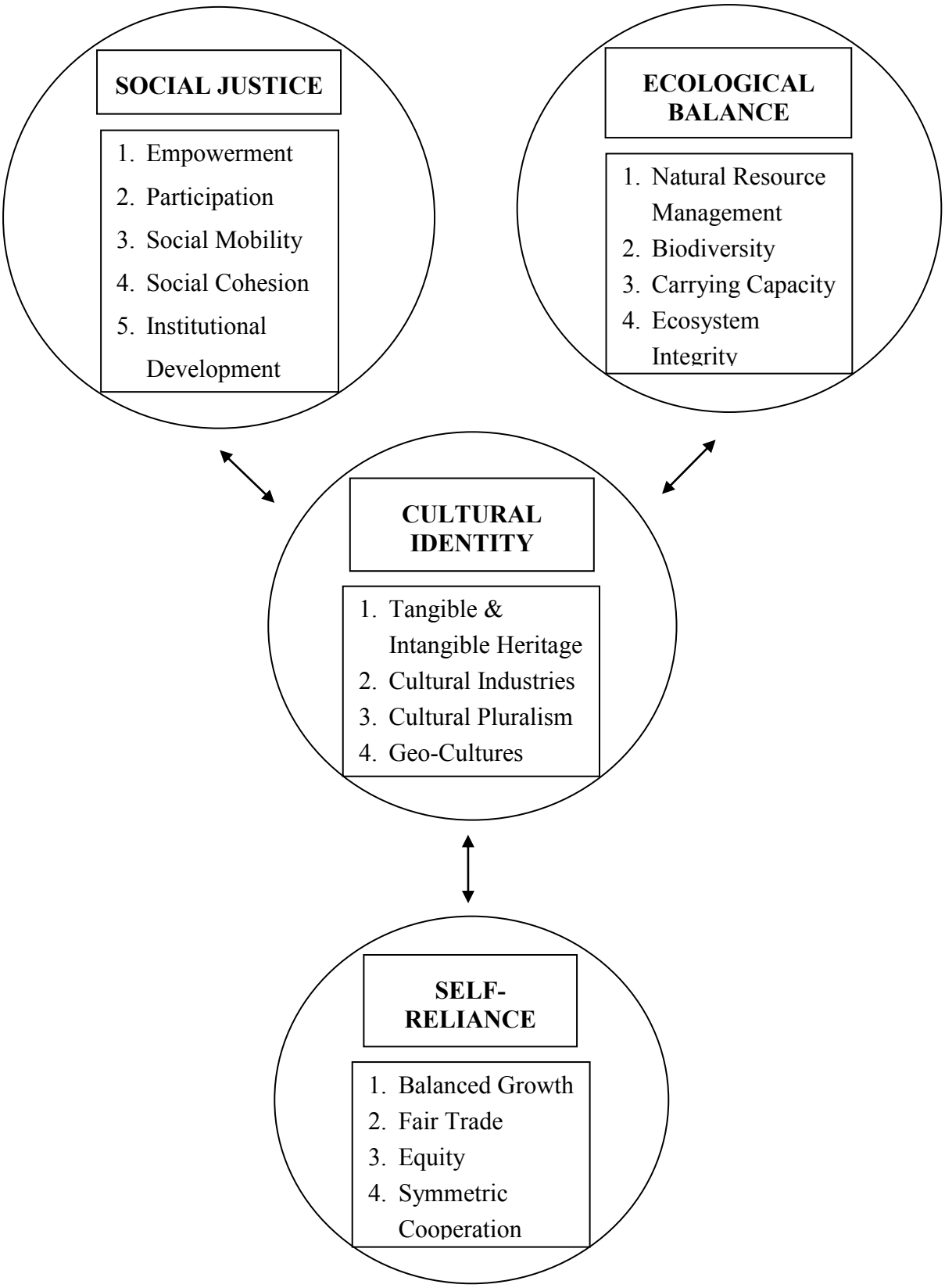

Figure 3-2 Culture as Central Pillar of Sustainable Development (3)

3.3 Funding Culture

As discussed earlier, culture has the potential to have a positive impact on social cohesion and to add value to social life. It can also contribute to economic development and poverty reduction. As Saouma-Forero (2010) pointed out during the Funding Culture, Managing the Risk symposium, presently, the cultural and creative sector represents 3.4 per cent of global GDP and contributes to national economic growth and development. However, despite the growing evidence to the contrary, investments in cultural programs are considered more risk-prone and the trio of international development stakeholders, political and economic decision-makers and private investors remain reluctant to invest in this field. Consequently, the sector suffers from insufficient funding, especially in developing countries. In 2007, for example, the cultural programs received only 1.7 percent of international development assistance.

In April 2010, UNESCO, with the support of the Government of Spain, held an international symposium along with a global online discussion with the theme of "Funding Culture, Managing the Risk", to address the challenges and opportunities of investing in culture, both in developed and developing countries. During the symposium, participants explored the following themes in three round tables (52):

a) Challenging the perception of risks associated with funding culture;
b) Reviewing the existing risk management mechanisms; and
c) Developing a new financial framework to encourage the investment in cultural sector.

(a) Risks in Funding Culture

When it comes to project investments, risk perception and analysis are at the heart of all decision-making processes. It is evident that a perceived risk, even if not real, can significantly hurt the funding of a project, program, or an enterprise. In case of investment in cultural programs, perceived risks are not limited to the financial outcomes of the project, similar to many of other development interventions. They also include the by-products of financing – risk of failure, risk of non-completion of a project, political risks, etc. One reason could be that governments have been viewing culture as low priority, as opposed to essential and central to national and development policies. Moreover, the long-term impacts of cultural programs have been severely compromised due to the short-term funding cycles and inconsistent political

planning. During the symposium, the following were identified as specific risks related to cultural program investments (53):

- "Creativity is inherently unpredictable. This can be a risk since investors prefer predictability;
- Cultural operators tend to have limited management training, expertise and experience, leading to weak management and business skills;
- Weak infrastructure to support the sector (especially in terms of access to capital, human resources, institutions and facilities);
- Weak legal frameworks to protect cultural and creative products;
- Overdependence on international/national public subsidies and grants which tends to distort the sector, at least from the point of view of private investors;
- Lack of transparency and accountability of public intervention, which can lead to mismanagement of resources;
- Commercial viability and success depends on specific markets and audiences: markets of developing countries (excluding Brazil, India, China) tend to be smaller and their cultural sectors struggle to be profitable; and
- Returns on investment are not immediate: profitability may only occur after several years. This is particularly the case for large-scale projects".

(b) Dealing with Risk: What Works?

The second round table of the symposium was focused on financial models that had been proven to be successful in development of the cultural sector on local, national and international levels. It presented the lessons learned in risk management of cultural initiatives and revealed the best mechanisms to manage these risks. "Such mechanisms include risk-sharing models (involving guarantee funds), investment mechanisms directly managed by financial organisms, allocation of funds for capacity building and other innovative financial models" (53). Following are a number of successful financial and organizational models presented during the symposium:

- "Inter-ministerial coordination at the national level: national strategic planning, projected on the long term, results in a commercially viable and strong cultural sector. China's interventions and the success of their sector (boasting one of the most impressive growth

rates in the world) reflect the importance of coordination of government actors (Ministries of Culture, Industry, Economy, etc) in terms of policy decision-making.

- The Brazilian National Development Bank (BNDES) highlighted the significance of specializing in strong cultural sub-sectors in to create profitable industries.
- The numerous small-scale initiatives that exist in the cultural sector would benefit from a greater number of calls for tender from donors and a wider dissemination and availability of information on funding.
- Financial packages and policies specifically designed for different sub-sectors: portfolio approaches, dedicated financial teams working closely with entrepreneurs, tailor-made risk analyses, tailor-made repayment policies, tax incentives, investment loans.
- Information and Communication Technology (ICT) is continuing to change the face of cultural industries and their financing by making consumers the producers. This trend represents an important potential for seeking future support for the sector.
- Lack of understanding of the sector increases wariness amongst private sector investors. There is a need to raise awareness amongst private-sector bodies to the opportunities (based on economic data and analysis) and to increase dialogues between representatives of governments, development banks, international NGOs and the private sector to facilitate the establishment of public-private partnerships (PPPs)".

(c) How to Encourage Investments in the Cultural Sector

Building on the many ideas, strategies, and successful models presented in the preceding sessions of this symposium, the final round table with the theme of *developing new financial framework to encourage the investment in cultural sector,* concluded with strong emphasis on the role of governments in development of the cultural sector at the national level, through provision of legislation, taxation, etc. and by supporting the three pillars of the cultural sector: infrastructure, training and access to capital. It also highlighted the need for strategies suitable to the specific nature of the cultural sector considering its unique challenges and opportunities. Finally, it emphasized the value of partnerships and alliances for funding culture.

3.4 Cultural Infrastructure

One of the key priorities and needs of the cultural sector as highlighted in the achievements of UNESCO symposium on "Funding Culture, Managing the Risk" is its infrastructural needs (53). The Creative City Network of Canada (2009) defined cultural infrastructure "as physical assets and spaces—whether full-time or part-time, single purpose or multipurpose, historic or contemporary—that support cultural products and activities, and that accommodate and satisfy the requirements of cultural activities and cultural industries". Cultural infrastructure includes purpose-built spaces (i.e. theatres) which are designed and constructed for a specific function or number of functions from the beginning, as well as multipurpose spaces (i.e. auditoriums), which are designed and constructed for a variety of art forms and/or other purposes. Cultural infrastructure also includes adaptive reuse spaces that are designed and constructed for one function but are readapted for a new or different cultural purpose (i.e. abandoned schools readapted to studios and galleries) (54).

In general, cultural infrastructure has suffered from a lack of analysis of planning perspectives, approaches, and development strategies (55). Drawing from literature on cultural facilities, cultural planning, and infrastructure planning, Dang and Duxbury (2007) highlighted the following three key interconnected analytical frameworks that can be used to broadly categorize or analyze municipal and regional efforts to plan for cultural infrastructure:

1. "Planning perspectives on cultural infrastructure [building-centred vs. people-centred (Figure 3-3) , clustering vs. decentralization]
2. Planning approaches to cultural infrastructure [site-specific vs. community-wide, integrated vs. culture-specific (Figure 3-4)]
3. Development strategies for providing cultural infrastructure [centralized vs. decentralized, integrated vs. specialized (Figure 3-5)]"

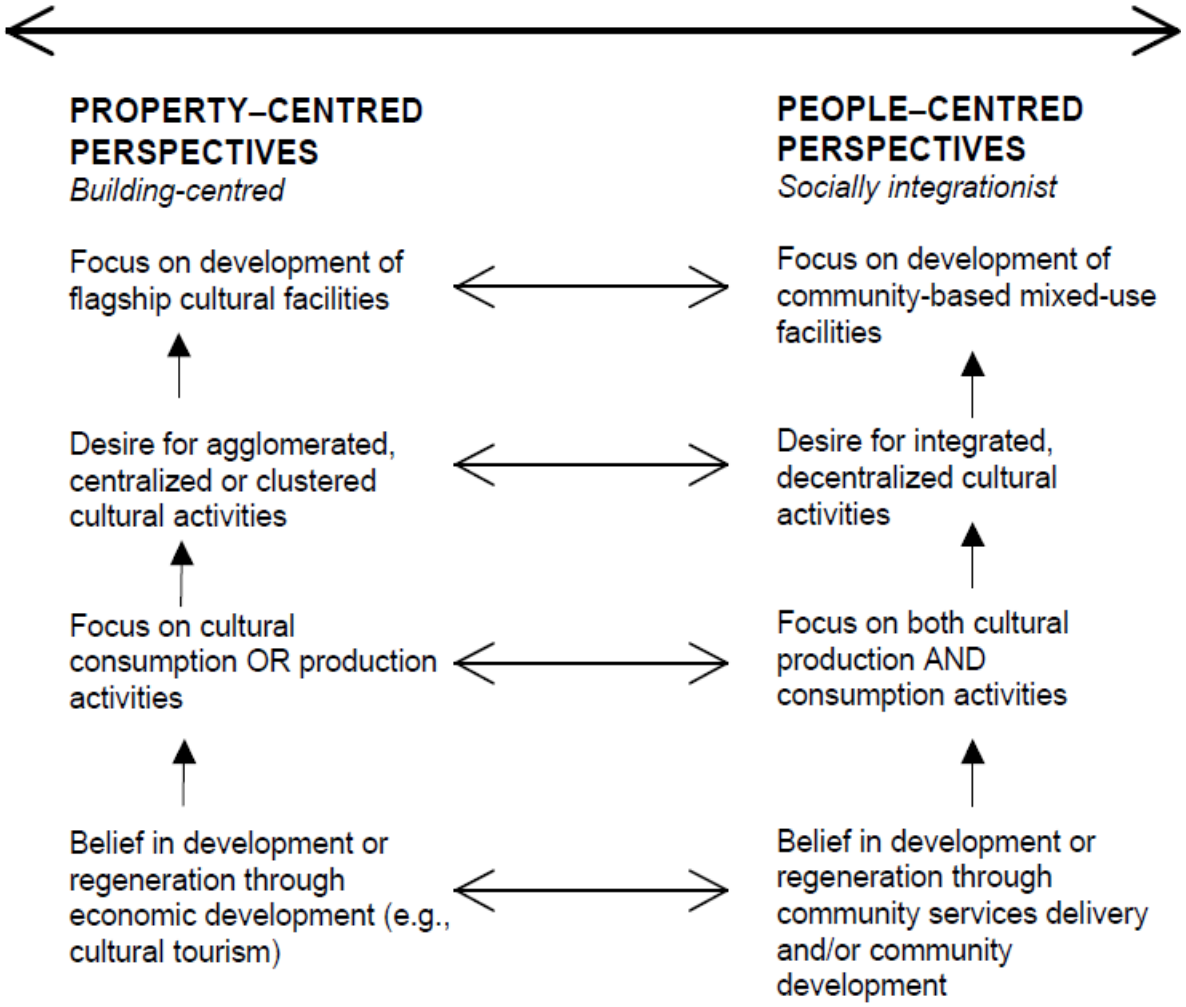

Figure 3-3 General Perspectives that Influence Planning for Tangible Cultural Infrastructure (3)

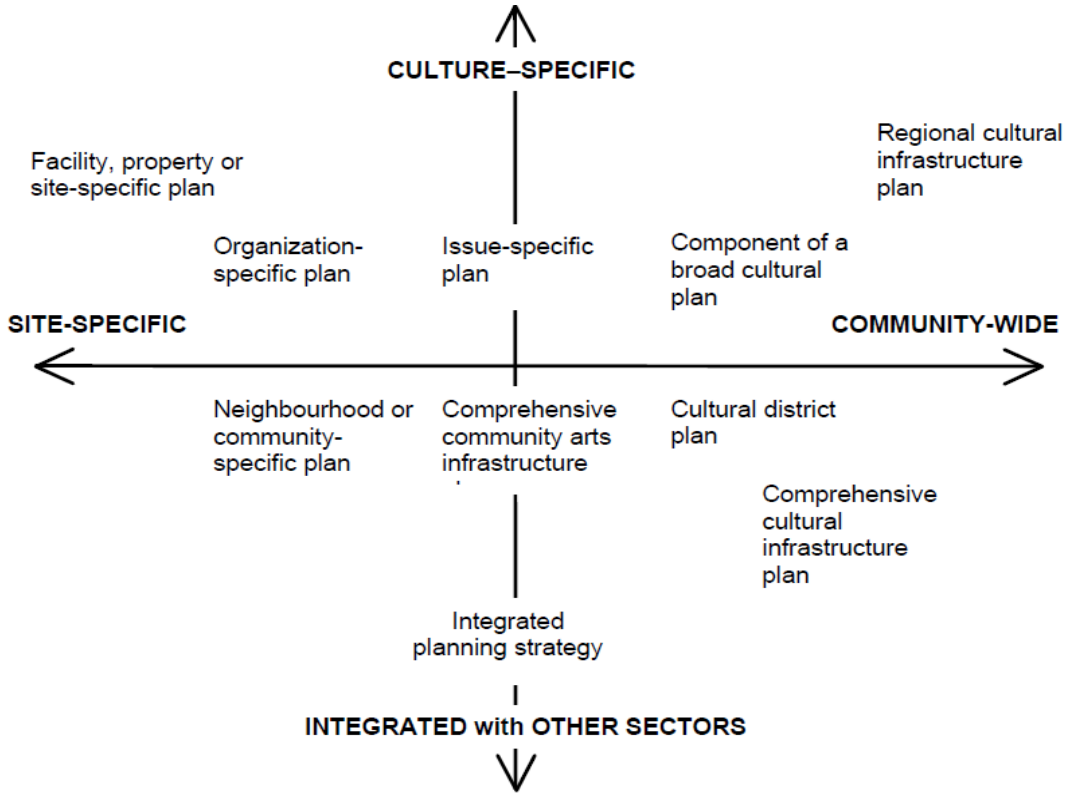

Figure 3-4 Comparison of Planning Approaches/Types of Plans (3)

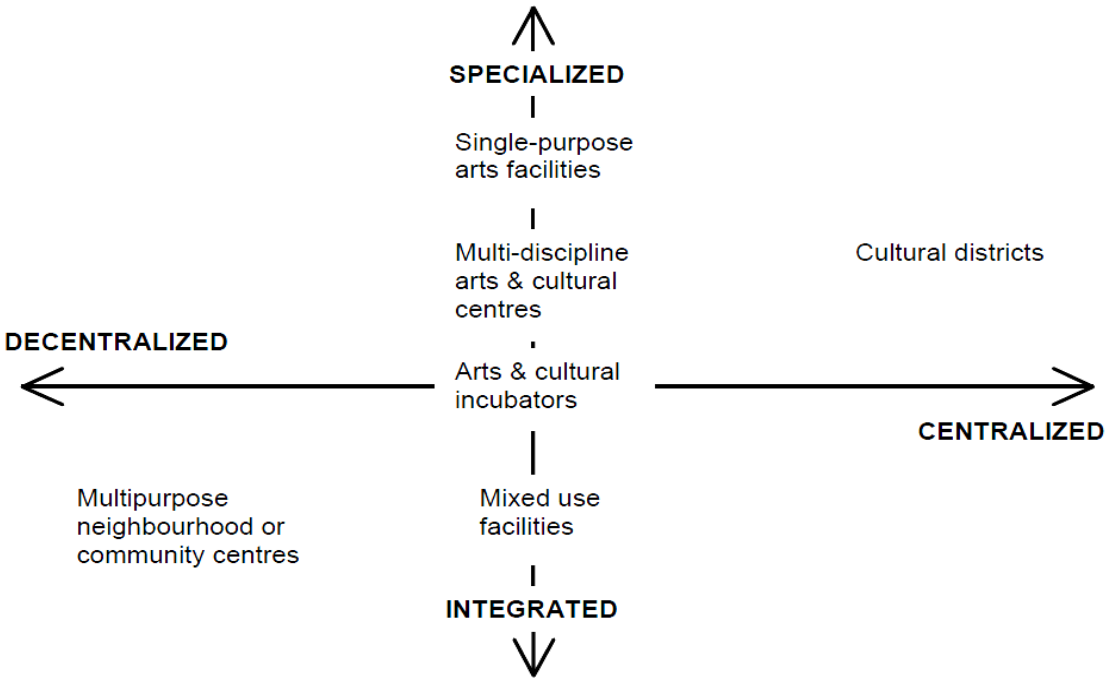

Figure 3-5 Comparison of Cultural Development Strategies (3)

Presently, with the increased recognition of culture as the central pillar of sustainable development and its interdependencies with social, economic and environmental aspects, there is a need for a more comprehensive, broadly based, and long-term planning approach for cultural infrastructure with balanced perspectives, approaches, and development strategies. Dang and Duxbury (2007) argued that addressing the following key issues and challenges involved in more comprehensive planning for cultural infrastructure on a municipal or regional scale would significantly expand the planning exercise beyond the incremental, reactive, opportunistic, and site-specific norms:

1. "*Broadly defining cultural infrastructure and its interests* – including the full range of a community's potential cultural infrastructure amenities and assets, cultural production and cultural consumption chains, and the connections between them;
2. *Building organizational and systemic capacities* – addressing critical "intangible" infrastructure issues (organizational capacities; communications and community networks; fostering innovation, collaboration, and a creative milieu; talent development, succession, and labor markets; and property and finance issues);
3. *Addressing issues of access and diversity* – to infrastructure for both cultural production and consumption;
4. *Considering various planning scales and coordinating planning efforts* – planning scales in terms of geography, time, and integration with other policy sectors;
5. *Mediating potentially competing interests* – including economic and social or community development objectives) and the distribution of benefits; and
6. *Balancing development strategies for providing cultural infrastructure* – both centralized and decentralized strategies, and both culture-specific and more integrated strategies".

As discussed earlier, culture has the potential to positively impact social cohesion and add value to social life. It can also contribute to economic development and poverty reduction. Subsequently, one can argue that, culture can play an important role in the recovery of nations affected by natural or man-made disasters. The case study of Haiti presented in the last chapter will further examine this role of culture.

CHAPTER 4. EDUCATION FOR SUSTAINABLE DEVELOPMENT

4.1 Introduction

Agenda 21, adopted by 178 countries at the United Nations Conference on Environment and Development in Rio de Janerio, 1992, identified education as a critical social strategy for promoting sustainable development and improving the capacity of the people to address environment and development issues (14). Education for sustainable development requires a solid foundation and it must embrace all related issues and diverse disciplines, such as environmental sciences, economics, social sciences, cultural issues, management, and all branches of engineering. This education must start at the nursery and primary schools with children being taught the basics of sustainable development with simple exercises in Reducing, Reusing and Recycling. Special courses with gradually increasing level of rigor can be offered for the secondary, high schools and college students. The university students can be given specialized interdisciplinary courses dealing with the basic issues involved; additionally, the principles of sustainable development must be incorporated in as many courses in professional and other faculties as possible so that consideration of sustainable development becomes a second nature. It should be emphasized that a sudden change or revolution in education is not possible and the above transformation would require rapid evolution from the current state of affairs to a sustainable way of life on the planet. Also, every segment of the society in different countries needs education consistent with their local needs and practices, and understanding of the various issues.

Over the last two decades, United Nations and UNESCO have adopted a number of global initiatives in education aimed at improving the quality and accessibility of basic education. The United Nations Decade of Education for Sustainable Development (2005-2014) represents an example of such initiatives, emphasizing the role of education and learning in achieving a more sustainable future in terms of *environmental integrity, economic viability and a just society.*

4.2 Global Initiatives in Education

Education is a fundamental human right and is essential for development (56). With over 100 million youth and 800 million adults with no chance for literacy and education, the need for a comprehensive plan of action towards a substantial change is evident (57). UNESCO is one of the most active International Organizations working to improve education worldwide believing it to be the key to social and economic development. "The Organization aims to help build a sustainable world with just societies that value knowledge, promote peace, celebrate diversity and defend human rights, achieved by providing education for all" (58). UNESCO's Education Sector (2011) follows the framework work determined by the goals adopted by the UN and UNESCO which include:

- "The six Education for All (EFA) goals adopted in the Dakar Framework for Action, 2000-2015;
- The UN Millennium Development Goals (MDGs), especially Goal 2 and Goal 3;
- The UN Literacy Decade (UNLD), 2003-2012;
- The UN Decade of Education for Sustainable Development (DESD), 2005-2014; and
- The EDUCAIDS Global Initiative on Education and HIV/AIDS".

The EFA, MDGs, UNLD and DESD are all initiatives that emphasize the importance of the quality and easy accessibility to basic education. Taken together, however, they could be confusing (57). The following is an attempt at clarifying and distinguishing the basis for each goal and its impacts.

(a) Education for All – EFA (2000-2015)

The Education for All movement was first initiated in the World Conference on Education for All in 1990 in Jomtien, Thailand, where representatives from 155 countries and 150 organizations pledged to provide education for all by the year 2000 (56). In 2000, with many countries far from reaching their goals, there was a follow-up conference in Dakar, Senegal, where the international community met again and affirmed their commitment to a set of education goals which aims to meet the learning needs of all children, youth and adults by 2015 (57).

There are six main goals in the Dakar Framework of Action (59):

1. "Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children;
2. Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to and complete, free and compulsory primary education of good quality;
3. Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life-skills programs;
4. Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults;
5. Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality;
6. Improving all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy and essential life skills".

To produce results and achieve these goals, the international community represented at the World Education Forum uses clear strategies, including (57):

- "Promoting commitment on the part of governments and international agencies;
- Involving civil society and non-governmental organizations;
- Linking education policies with development; and
- Regularly monitoring progress".

(b) Millennium Development Goals – MDGs (2000-2015)

In September 2000, United Nations General Assembly adopted the Millennium Declaration as a way of expressing common worldwide priorities, namely, poverty reduction and the provision of basic social services, in formulating development policies (60). As mentioned previously, these priorities were formulated into the eight Millennium Development Goals with targets for 2015 and were approved by all 192 UN Member States (61):

- "Goal 1 - Eradicate extreme poverty and hunger;
- ***Goal 2 - Achieve universal primary education;***
- ***Goal 3 - Promote gender equality and empower women;***
- Goal 4 - Reduce child mortality;
- Goal 5 - Improve maternal health;
- Goal 6 - Combat HIV/AIDS, malaria and other diseases;
- Goal 7 - Ensure environmental sustainability; and
- Goal 8 - Develop a global partnership for development".

Of the eight MDGs, two are directly related to education. MDG 2 calls for achievement of universal *primary education* by 2015. It does not refer to adult literacy or non-formal education. MDG 3 calls for promotion of gender equality. It specifically calls for gender equalities in primary and secondary school levels by 2005 and across all education levels by 2015.

Good education can also contribute to the remaining MDGs, as it is fundamental to social and economic development by providing the required knowledge and skills and increasing individual and collective empowerment. In September 2010, UNESCO demonstrated how rapid advances in education could help achieve all of the MDGs (60). The positive impact of ESD-*Education for Sustainable Development* will be explored in the following sections.

(c) United Nations Literacy Decade – UNLD (2003-2012)

Basic education is recognized as a fundamental human right. As UNESCO3 (2011) explains, literacy is at the heart of basic education for all, and essential for eradicating poverty, reducing child mortality, curbing population growth, achieving gender equality and ensuring sustainable development, peace and democracy. The present statistics on youth and adult literacy expose the violation of the right to basic education for a large proportion of humanity. On a global scale, one in five adults cannot read or write, and two-thirds of these are women. In 2003, the United Nations General Assembly launched a Decade of Action with the vision of *literacy for all*, to empower all people everywhere, girls and boys, women and men in both developing and developed countries. UNESCO leads the United Nations Literacy Decade (UNLD), and to

express the different aspects and value of literacy, it has adopted five biennial themes for the decade (62):

- "Literacy and Gender, 2003-2004;
- Literacy and Sustainable Development, 2005-2006;
- Literacy and Health, 2007-2008;
- Literacy and Empowerment, 2009-2010;and
- Literacy and peace, 2011-2012".

The main goals of the UNLD are (60):

- To contribute to the Education for All (EFA) goal to increase literacy rates by 50% by 2015, targeting the poorest and most marginal social groups, including women;
- To develop a new vision for literacy that would include the ability of learners to think critically and use information effectively in a variety of ways;
- To help all learners use their literacy in creative ways, in schools and communities, and to play a meaningful part in their society by learning their rights and duties.

To achieve these goals in an effective and sustainable manner, UNESCO3 identifies the need for well-designed programs with the various key components (2011):

1. "*Relevant content and materials* – A literacy program must respond to changing literacy needs and assimilate to the learner's environment, circumstances and prior learning, with respect to gender, linguistic and cultural diversity;
2. *Appropriate pedagogical approaches* – Children, adolescents and adults learn in different ways and bring different perspectives to literacy instruction. Programmes need to adapt according to learners' profiles and learning goals. Formal, non-formal or informal approaches may characterize literacy programmes;
3. *Training of literacy personnel* – Well-trained facilitators are essential for effective programme delivery. The profile of literacy facilitators needs to be enhanced through effective and systematic pre- and in-service training;
4. *Beyond basic literacy* – Literacy is closely linked to development and improving quality of life. It offers the chance to combine other skills training with literacy learning. In

addition, learners may acquire a certificate recognizing a level of competencies equivalent to formal schooling; and

5. *A literate environment* – The sustainability of literacy skills relies on a literate environment. Fostering local writing and the use of ICT (Information and Communications Technology) and other media contribute to strengthening the literate environment".

In 2005, UNESCO launched the Literacy Initiative for Empowerment (LIFE) as a framework for achieving the Decade's goals. LIFE targets eighty-five percent of the world's illiterate population residing in 35 countries that have literacy rates of less than fifty percent, or a population of about 10 million illiterate people.

The report of the UNLD assessment by UNESCO and its partners embracing the Decade's achievements, processes and impacts along with a post-Decade literacy vision and action will be presented at the UN General Assembly at its 2013 session (62).

(d) United Nations Decade of Education for Sustainable Development (2005-2014)

In December 2002, United Nations General Assembly adapted Resolution 57/254 on the United Nations Decade of Education for Sustainable Development – DESD (2005–2014) to emphasize the role of education and learning in achieving a more sustainable future in terms of *environmental integrity, economic viability and a just society* (63). At the beginning of the Decade, the overall vision of DESD to provide opportunities for everyone to learn the principles, values and lifestyles required for a sustainable development through education, was formulated into the following four objectives (64):

1. "To facilitate networking, linkages, exchange and interaction among stakeholders in Education for Sustainable Development – ESD;
2. To foster an increased quality of teaching and learning in ESD;
3. To help countries progress towards and attain the Millennium Development Goals; and
4. To provide countries with new opportunities to incorporate ESD into education".

International Implementation Scheme (IIS)

Resolution 57/254 designated UNESCO as the lead agency of the Decade to coordinate the efforts of the various UN agencies to advance the DESD goals. It requested UNESCO to establish an International Implementation Scheme (IIS) that would clarify the relationship of DESD with the existing UN-supported global initiatives in education, some of which were mentioned above (e.g. EFA, UNLD). In September 2005, the United Nations General Assembly approved the finalized version of the IIS (64). The links between DESD and the other related international initiatives in education which are documented in the final report of IIS will be discussed further in the following sections.

Role of UNESCO in ESD

Through its coordination role as the lead agency of the Decade, UNESCO identified a number of required actions including (63):

- Encouraging new partnership with the private sector, the youth and media groups;
- Establishing a framework for monitoring and evaluation of the Decade;
- Sharing good ESD practices;
- Linking MS (Member States) with developed ESD curricula, policies and research with those MS in need of help and guidance for pursuing such initiatives; and
- Establishing an agenda for ESD research and serve as a forum for them.

Role of Stakeholders Involved in ESD from Local to Global

Being such a broad and far-reaching endeavor, DESD calls for the participation of stakeholders at all levels – from local to international. Table 4-1 through Table 4-4 (adopted from UNESCO, 2006 - The International Implementation Scheme for the Decade in brief) illustrate an indicative listing of these key stakeholders in ESD along with their respective responsibilities and their ways of cooperation with other stakeholders.

Local stakeholders	Responsibilities	Cooperation with the various stakeholders
Government State/provincial/district departments of education and development sectors Municipal authorities Schools, adult education programs **Civil society and NGOs** Community organizations, local NGO sections, denominational groups, town development committees, adult education groups, clans and families **Private sector**, firms	Incorporate ESD into ordinary educational activities and curricula Define and implement learning strategies	Identify local sustainable development problems Incorporate local knowledge and skills into ESD Exchange ESD experience and use it to improve practices

Table 4-1 Local Stakeholders and Their Roles in ESD (65)

National stakeholders	Responsibilities	Cooperation within the national ESD task force
Ministry of Education and other competent ministries	Provide a national policy framework for ESD Budget and mobilize resources Support sub-national services Foster public awareness of ESD and sustainable development	Examine and recommend ESD policy options that reflect local experience and problems Include ESD in planning for EFA and the United Nations Literacy Decade, in the context of the EFA Forum Provide a forum for the exchange of positive and negative ESD experiences Draw up a list of ESD research issues and plan joint research projects Identify capacity-building needs and the stakeholder best placed to meet them Devise relevant ESD monitoring indicators
NGOs, NGO and civil society networks and alliances	Facilitate the exchange and sharing among members of information on ESD practices and experiences	
Media groups and agencies	Incorporate awareness-raising in support of ESD and sustainable development into media strategies	
Private sector firms and professional associations	Provide a forum for the identification of the sustainable development challenges that they face and draw up a list of education needs to be met	

Table 4-2 National Stakeholders and Their Role in ESD (65)

Regional stakeholders	Tasks specific to each stakeholder	Cooperation within the regional ESD group
Representatives of national governments	(See national level)	Hold regional consultations on DESD priorities Pool policies, practices, knowledge and advances Identify common challenges Learn from various strategies Work out a consensus on regional problems and actions Organize international training and capacity-building
Regional intergovernmental organizations	Support the formulation of national policies Promote the exchange of experience and information	
Regional civil society and NGO networks, coalitions and alliances	Promote exchanges and learning among member networks and organizations	
Regional media groups	Establish joint media strategies for sustainable development and ESD	
Regional private sector associations	Promote cooperation between the private sector and other ESD stakeholders	
Regional representatives of international institutions	Learn and disseminate lessons from international experience Facilitate international exchanges on ESD	
Regional representatives of bilateral cooperation	Determine means of supporting national and regional ESD initiatives	

Table 4-3 Regional Stakeholders and Their Role in ESD (65)

International stakeholders	Tasks specific to each stakeholder	Cooperation in various forums
International ad hoc working group	Gather information on ESD developments and emerging priorities Promote the DESD	Advise UNESCO on ESD developments and emerging priorities Assist UNESCO in establishing partnerships and in developing projects in support of the Decade
Intergovernmental institutions (United Nations and others)	Contribute to the inter-agency task force Include ESD planning in relevant work plans and initiatives Participate in international and regional forums	Ensure that ESD remains a priority on the agenda of the Commission on Sustainable Development (CSD) Mobilize the political will and strengthen mutual commitment through the CSD or an inter-agency task force Include ESD in the EFA agenda (Monitoring Report, High-Level Group and Working Group) Encourage the exchange of information on practices, policies and progress Organize international, regional and subregional capacity-building workshops, and conferences to promote DESD and ESD goals
UNESCO (DESD lead agency)	Promote and build capacities of ESD and DESD in and across UNESCO sectors Advocacy and communication with the international community Building partnerships and collective momentum	
Civil Society and NGO Networks	Promote interregional exchange and learning Inform members of ESD developments	
Bilateral and multilateral development agencies	Include ESD in programs and budgets Promote ESD research	

Table 4-4 International Stakeholders and Their Role in ESD (65)

Moreover, stakeholders at all levels and in all context can incorporate the following seven strategies into their own institutional frameworks along with the networks and alliances in which they function (63):

1. "Vision-building and advocacy;
2. Consultation and ownership;
3. Partnership and networks;
4. Capacity-building and training;
5. Research and innovation;
6. Use of Information and Communication Technologies (ICTs); and
7. Monitoring and evaluation".

Monitoring and Evaluation Expert Group (MEEG)

As mentioned earlier, the International Implementation Scheme (IIS) identifies Monitoring and Evaluation (M&E) as one of the key strategies shared between all stakeholders. Accordingly, in 2007, UNESCO established a Monitoring and Evaluation Expert Group (MEEG) that provides advice on appropriate monitoring mechanisms to asses the "global progress in the implementation of the DESD along with UNESCO's own contribution to the implementation of DESD" (64). The two phases of the DESD Monitoring and Evaluation which have been completed to date are (63):

1. Phase I (2007-2009): Contexts and Structures of ESD
2. Phase II (2010-2011): Processes and Learning for ESD

The outcome of these assessments has been used in UNESCO's mid-decade review report which highlights the challenges that the countries from various regions of the world had faced in the creation of provisions and structures for the development of ESD accompanied with ways to overcome them (64).

Given the clear frameworks and programs in place in support of DESD, one issue that still remains the subject of worldwide debates is the precise meaning of ESD. The following section is an attempt to clarify and elaborate the meaning of Education for Sustainable Development.

4.3 The Emergence of ESD

In 1992, the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro, resulted in a landmark publication called Agenda 21 which was adopted by 178 countries. Chapter 36, one of the most significant parts of Agenda 21, declared education to be critical in achieving sustainable development. While the roots of ESD could be traced back to the early 1970s, it was only after such comprehensive action plan that its first development occurred (64). Chapter 36 of Agenda 21, with its focus on promoting education, public awareness and training identified four goals (64):

- Promote and improve the quality of education – Refocus education to meet the needs of citizens to improve their quality of life;
- Reorient the curricula – From pre-school to university, reorient education with the added value of sustainable development;
- Raise public awareness of the concept of sustainable development; and
- Train the workforce – Develop human resources and facilitate the transition to a more sustainable world.

These four goals are ESD's areas of emphasis which have been accepted worldwide. Unlike these goals, the meaning of ESD has not yet reached a widespread consensus among the international community. However, similar to the concept of Sustainable Development, there is not a single correct interpretation and use of ESD. One can argue that the various definitions of ESD applicable to the various regions, allows for multiple locally relevant but globally connected ways of addressing the current key challenges. Wals (2009) noted that, "ESD can be seen as the total sum of diverse ways to arrive at a 'learning society' in which people learn from and with one another and collectively become more capable of withstanding setbacks and dealing with sustainability-induced insecurity, complexity and risks".

Although it is acceptable and perhaps beneficial to leave room for multiple interpretations and meanings of ESD, it is important to seek a common understanding and agreement over a range of key principles and characteristics embracing the scope, purpose and practice of ESD, to allow for and encourage societal and governmental support (64).

4.4 Meanings of ESD

(a) Key Principles and Characteristics of ESD

As discussed earlier, Education for Sustainable Development has gained a wide range of interpretations that is rooted in the existing regional, national and local differences. UNESCO4 (2011) summarizes a set of essential characteristics of ESD that allow for the localized and contextualized implementation of ESD programs, which include the following:

"Education for Sustainable Development:

- is based on the principles and values that underlie sustainable development;
- deals with the well-being of all four dimensions of sustainability – environment, society, culture and economy;
- uses a variety of pedagogical techniques that promote participatory learning and higher-order thinking skills;
- promotes lifelong learning;
- is locally relevant and culturally appropriate;
- is based on local needs, perceptions and conditions, but acknowledges that fulfilling local needs often has international effects and consequences;
- engages formal, non-formal and informal education;
- accommodates the evolving nature of the concept of sustainability;
- addresses content, taking into account context, global issues and local priorities;
- builds civil capacity for community-based decision-making, social tolerance, environmental stewardship, an adaptable workforce, and a good quality of life;
- is interdisciplinary. No single discipline can claim ESD for itself; all disciplines can contribute to ESD".

Moreover, the shared key principles covering the scope, purpose and practice of ESD can be identified in the general definitions of ESD. Exploiting the input of the various international stakeholder networks [Asia/Pacific Cultural Centre for UNESCO, Earth Charter International, IUCN's Commission on Education & Communication, DESD Inter-Agency Committee for the DESD, United Nations University- Institute of Advanced Studies (UNU-IAS), Youth Action for

Change, and the CSD Education Caucus], Wals (2009) highlights the commonalities of their interpretations:

> Education for Sustainable Development is:
>
> - "a transformative and reflective process that seeks to integrate values and perceptions of sustainability into not only education systems but one's everyday personal and professional life;
> - a means of empowering people with new knowledge and skills to help resolve common issues that challenge global society's collective life now and in the future;
> - a holistic approach to achieve economic and social justice and respect for all life;
> - a means to improve the quality of basic education, to reorient existing educational programs and to raise awareness".

Another definition of ESD identifies these key principles in the DESD Monitoring and Evaluation (M&E) guidelines document (64) as:

> "Education for Sustainable Development (ESD) is a learning process (or approach to teaching) based on the ideals and principles that underlie sustainability and is concerned with all levels and types of education. ESD supports five fundamental types of learning to provide quality education and foster sustainable human development – *learning to know*, *learning to be*, *learning to live together*, *learning to do* and *learning to transform oneself and society*.
>
> Education for Sustainable Development must be seen as a comprehensive package for quality education and learning within which key issues such as poverty reduction, sustainable livelihoods, climate change, gender equality, corporate social responsibility and protection of indigenous cultures, to name a few, are found. The holistic nature of ESD allows it to be a possible tool for the achievement of the Millennium Development Goals (MDGs) and the Education for All goals. Both of these initiatives have a set of objectives to be achieved by a certain time limit. ESD could be perceived as the vehicle for achieving those objectives".

(b) Roots of Differences in Interpretations of ESD

Traditions in Governance

Although, analysis of the various meanings of ESD provided in the regional synthesis report from different countries, illustrates convergence towards the definition provided above, there exists an important difference on the emphasis: *E* in ESD versus *SD* in ESD, depending on the country's *tradition in governance*.

Countries like Chile that follow a more pedagogical orientation– stress on Education in ESD, tend to focus on developing the capacities and qualities people need to be able to actively, critically and meaningfully contribute to sustainable development, while countries like China that follow a more instrumental orientation towards ESD, put more emphasis on changing people's behaviors and lifestyles in a scientifically agreed upon direction. Table 4-5 and Table 4-6 highlight these differences by illustrating the definitions of ESD provided by countries following either tradition towards ESD– *Pedagogical* (stressing on E in ESD) VS *Instrumental* (stressing on SD in ESD) (64).

	Country	Meaning of ESD
Pedagogical Orientation towards ESD	**Chile**	"A fundamental part of citizenship education, an opportunity to satisfy human needs through a pedagogy that fosters the cultural transformation towards a sustainable society and which permits education to re-think itself and to work in favour of the democratization of knowledge, and collective construction of an ethic of human action which promotes the development of participatory and supportive educational communities.
	Botswana	ESD is education that places emphasis on equipping learners and the public with skills that will sustain them in future. It involves the acquisition of knowledge, skills, right attitudes and values in such a way that learners will be able to use their environment productively and in a sustainable manner so as to improve the quality of their life and to become productive members of their society."

Table 4-5 Meaning of ESD; Countries with Pedagogical Orientation towards ESD (64)

	Country	Meaning of ESD
Instrumental Orientation towards ESD	**Arab Region**	ESD contributes to "the acquisition and practice of knowledge, values and skills that ensure balance between the economic, social and environmental aspects of development and the observance of both individuals and society development and progress in life". (UNESCO Beirut, Regional Guiding Framework of ESD for the Arab Region, 2008).
	China	In accordance with the common scientific understanding, ESD is viewed as a kind of education that develops values that support sustainable development, with the intention to help people learn relevant knowledge and values and to develop the right and healthy habits and lifestyle which will lead to sustainable development for the whole society (adapted from Asia-Pacific regional report).

Table 4-6 Meaning of ESD; Countries with Instrumental Orientation towards ESD (64)

Challenges Faced by a Country or Region

Depending on the existing challenges to sustainable development in different regions, countries are likely to focus differently on the content of ESD. For example, DESD in Sub-Saharan Africa is committed to contribute to the achievement of the Millennium Development Goals as extreme poverty is the main challenge in the region. In Europe and North America, the key challenges of Sustainable Development include, 'poverty alleviation, citizenship, peace, ethics, responsibility in local and global contexts, democracy and governance, justice, security, human rights, health, gender equity, cultural diversity, rural and urban development, economy, production and consumption patterns, corporate social responsibility, environmental protection, climate change, prevention and adaptation, natural resource management, biological and landscape diversity.' By contrast, Asia-Pacific region is the largest in terms of size, population and diversity and consequently, the geographic size of the larger countries in the region, along with large populations and diversities, create barriers in networking, transportation, communication and delivery of services. To compensate for these contextual differences in each of the six UN-defined regions, (sub-Saharan Africa, the Arab States, Europe and North America, Asia and the Pacific, and Latin America and the Caribbean) regional strategies for development and implementation of ESD have been developed (64).

History of Environmental Education

As mentioned earlier, over the last decade many sustainability issues have been included in education. Some of the emerging 'adjectival' education programs addressing such issues include: peace education, global education, development education, AIDS education, citizenship education, intercultural education and holistic education and long-existing education programs such as environmental education and health education. According to Walls (2009), *the broader is the interpretation of these 'single issue' educations*, the more they resemble ESD as expressed in the IIS.

Through analyzing the regional synthesis report, the DESD mid-Decade review illustrates that, among the many SD-related education programs, ESD holds a particular relationship with Environmental Education (EE). The link between EE and ESD is not surprising as EE has been firmly established in many regions around the world over the past few decades. The relationship between EE and ESD can be perceived in three different ways which are rooted in the historic role of EE (prominent or marginal) and its interpretation (broad or narrow) in a country. The three different views are further examined in the following (Figure 4-1 through Figure 4-3) (64):

Case 1

In countries with a strong history of more broadly defined EE, such as the forward-looking Tbilisi Declaration embracing the socio-economic and political aspects along with its focus on preservation of nature and environmental protection, ESD and EE have become almost identical. The broad interpretation of EE allows for inclusion of issues such as poverty, inequity, values, ethics, etc. In these countries, the introduction and development of ESD might actually play a negative role and slow down the progress achieved under EE, by appealing as a more up-to-date and relevant field to donors and policy makers. However, in some countries, like USA, since people can better identify with EE than with ESD, EE continues to advance and remains popular. Other countries have seen the emergence of EE for sustainable development, e.g. Taiwan, or EE for sustainable societies, e.g. Brazil, by adapting ESD without any significant alteration in their EE practices, and hence they remain qualified for funding and government support.

Figure 4-1 Relationship between EE and ESD in Countries with *Prominent History* and a *Broad Interpretation* of EE (64)

Case II

In countries with a strong EE tradition, but where EE has been interpreted narrowly to focus on *environmental protection, natural resource management and the conservation of nature*, there is a need for reform and expansion of EE to embrace all issues of environment and sustainability. As Wals (2009) points out, ESD and EE are distinct, although they do overlap, both are legitimate and necessary, and the government support for ESD should not be at the expense of EE. In countries like the Netherlands and Canada, parallel policy streams and support mechanisms exist to ensure the development and success of both EE and ESD.

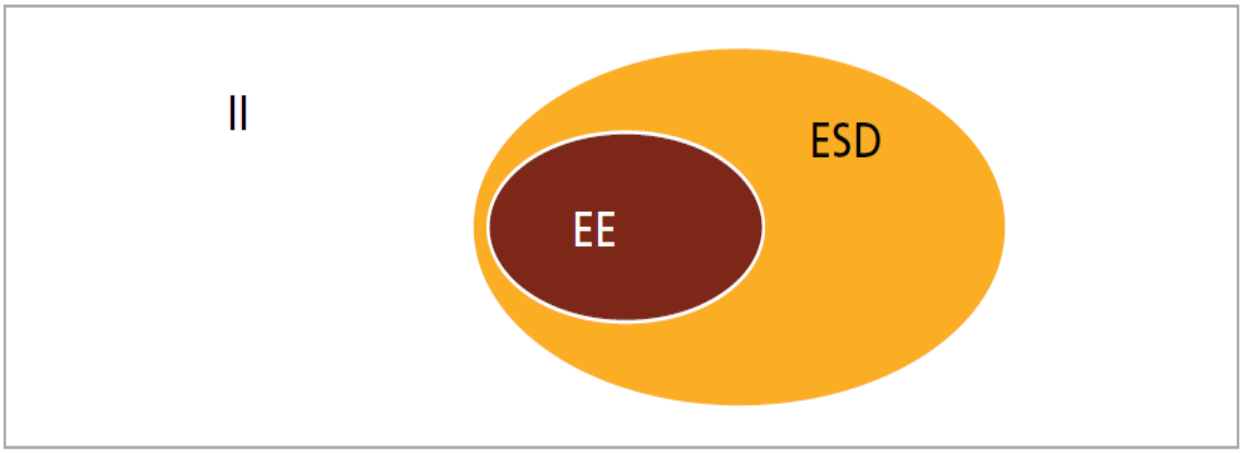

Figure 4-2 Relationship between EE and ESD in Countries with *Prominent History* and a *Narrow Interpretation* of EE (64)

Case III

In countries with no or marginal EE tradition, ESD can be developed and given a meaning on its own terms. In such countries, the emergence of ESD can also be seen as an opportunity for EE to grow and develop as well (e.g. Vietnam, many Arab countries).

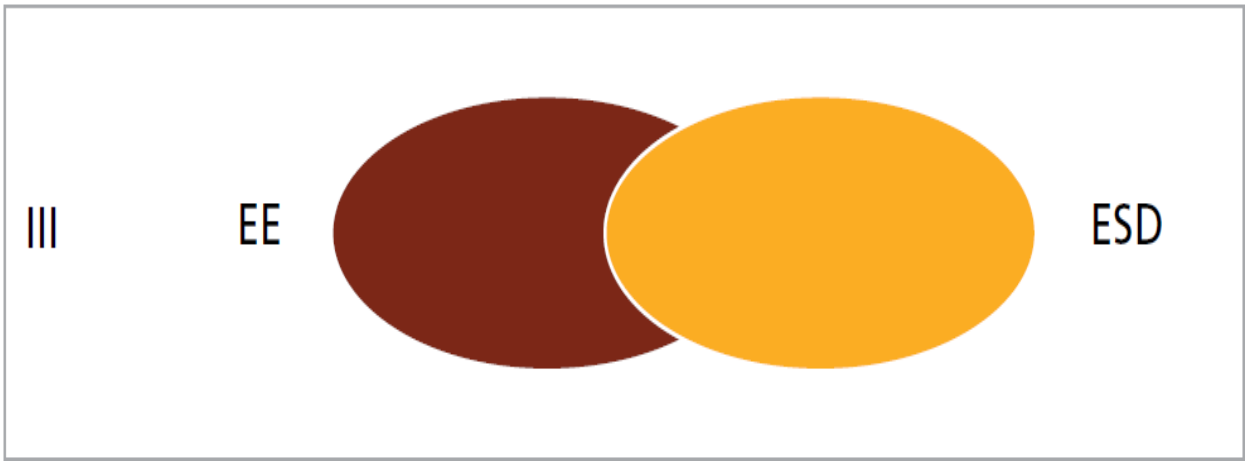

Figure 4-3 Relationship between EE and ESD in Countries with *Marginal History* of EE (64)

(c) Ways Forward

As mentioned earlier, there is no consensus yet on the meaning and interpretation of ESD. A country's tradition in governance, its concrete challenges along with its history and interpretation of EE, are some of the reasons behind the multiple interpretations of ESD. To encourage societal and governmental support, it is important to increase the awareness and understanding of ESD and seek a common agreement over a range of key principles and characteristics embracing the scope, purpose and practice of ESD. *National* and *local* debates can be useful in reaching consensus over the meaning of ESD. Moreover, in countries where a strong history of EE is lacking or where EE is interpreted narrowly, *multi-stakeholder dialogues between individuals and organizations* can play a crucial role in signifying the social, cultural, economic and environmental aspects of SD. Finally, efforts need to be made to *better communicate ESD more creatively* so that the diversity of ESD and SD is fully understood. The involvement of the media needs to be strengthened (print-based and non-print/web-based) in communicating ESD and SD and in creating (open-source) dialogues about ESD and SD among the different audiences, particularly with young people across the world (64).

4.5 Contributions of ESD to Sustainable Development

As discussed earlier, ESD seeks to address key sustainable development challenges and create a more sustainable future in terms of *environmental integrity, economic viability and a just society* by (66):

- "re-orienting the aims and purpose of education and training;
- bringing new values focus to education, training and public awareness; and
- improving the quality of education and learning".

In April 2009, the midpoint of DESD, the "UNESCO World Conference on Education for Sustainable Development – Moving into the Second Half of the UN Decade" was held in Bonn, Germany. One of the objectives of the Conference was to highlight the relevance of Education for Sustainable Development to key sustainable development challenges, which was addressed through nine of the twenty-two workshops coordinated by a wide range of stakeholders from civil society, governments, and UN agencies. The nine workshops focused on the following challenges (5):

1. "Education for Water Sustainability
2. Strengthening the Educational Response to Climate Change Internationally
3. Advancing Sustainable Lifestyles and Responsible Consumption through ESD
4. ESD and Disaster Risk Reduction: Building Disaster-Resilient Societies
5. Educating for Food Security: the Contribution of ESD
6. AIDS, Health and ESD
7. Mainstreaming Biodiversity into Education and Learning
8. The Economic Pillar of Sustainable Development: Educational Approaches"

Throughout the workshops, by joining together and sharing visions, ideas and best practices, stakeholders once again emphasized the positive impact of re-orienting education and introducing sustainable development issues into all areas of education, and stressed that without such, successfully confronting issues like water and climate change, among many others, will not be possible. The workshops also illustrated the importance of engaging students and learners and stimulating their motivation and interest to improve their learning experience.

Moreover, Phase II of the 2011 UNESCO Monitoring and Evaluation report, focussed on processes and learning initiatives related to ESD, and observed changes at several levels: social, economic, environmental and educational in many of the ESD projects analyzed in the document.

(a) Social Change

As Tilbury (2011) explains, "at the heart of the ESD initiatives, is an assumption that current social frameworks and practices are exploiting people and their environments. Thus the attainment of sustainable development requires transformative change at the social and/or cultural level". The case studies provided in the M&E Phase II report, highlighted the following social changes through different ESD initiatives:

1. Empowerment of different social groups- from business leaders to vulnerable/socially excluded communities, through capacity-building and by challenging one's vision, lifestyle, personal and professional practices, etc.;
2. Creation of social capital; and
3. Promotion of new social frameworks with capacity building that is responsive to local needs and cultures.

(b) Economic Change

Many of the case studies provided in the M&E Phase II report, also illustrated the various forms of economic changes through different ESD initiatives. Apart from the economic change outcomes of such programs, the analysis of the case studies also emphasized the important role of the following factors in achieving ESD's economic aspirations:

1. Enhancement of economic literacy alongside environmental literacy;
2. Development of new economic models, sensible to people and environment; and
3. Capacity-building to develop new skills and experiences of individuals and groups to practice more sustainable forms of development.

(c) Environmental Change

The environmental outcomes of the case studies presented in the M&E Phase II report, were mostly not the main focus for success of the projects as ESD recognizes socio-economic or

educational results as means to achieving environmental change in the long-term. Nevertheless, as Tilbury (2011) points out, many of these initiatives did make direct and indirect contributions to environmental change. These contributions ranged from improving environmental management practices of schools and universities to protecting biodiversity and natural resources in small rural communities; reducing the environmental impact of businesses; adoption of environmental friendly technologies in government; improving environmental health in excluded communities; and reducing ecological footprints and vulnerability to climate change.

By following through with the DESD's framework, UNESCO has been able to make climate change education an effective and visible element of the global response to climate change (67). The climate change education for sustainable development program aspires to reorient education to address the causes and consequences of climate change and build capacity in society to mitigate the causes and adapt to its visible, predicted and unknown impact. Consequently, the program aims to develop and nurture new values, critical thinking and social transformation skills (68).

(d) Educational Change

The majority of the ESD initiatives analyzed in the M&E Phase II report had challenged the existing educational systems, structures and/or processes and had sought a reorientation of education aligned with sustainable development by means of the following actions (69):

1. "the adoption of new ways of thinking about teaching and learning;
2. the active engagement of the learner in an exploratory learning process which builds capacity as well as knowledge;
3. changing education policy and curricula;
4. changing the professional development of facilitators and the education of teachers;
5. creating a culture of organisational learning and change towards sustainable development;
6. creating a culture of social learning where informal contexts provide; and,
7. opportunities to extend understanding of, and engagement with, sustainable development".

4.6 Linkage between ESD and Other Global Initiatives in Education

As mentioned earlier, DESD was introduced at a time when other related global initiatives in education were in place. The EFA, MDGs, UNLD and DESD are all initiatives that emphasize the importance of the quality and easy accessibility to basic education. However, if the four initiatives were the same there would be no need for all of them. The IIS report in 2005 summarizes some of their significant differences:

- "The eight goals and 18 targets of the Millennium Development Goals constitute an over-arching framework for international development cooperation, agreed at the level of the United Nations. The provision of primary education and gender equality in education are the two areas where the MDGs overlap with the EFA agenda – other aspects of basic education, such as literacy, quality and non-formal education, are implied as conditions for the realization of the MDGs.
- The six EFA goals are concerned with extending the reach of basic education to every child and adult and with the nature of such provision – it should be available to both female and male learners of all ages, offering relevant learning and life skills and striving for ever-increasing quality. While basic education is clearly intended to have a positive impact on the quality of life and on deprivation, the nature of this impact – and the content of education, which might be most appropriate to achieve it – is a broader question. In other words, the role and provision of education are central, and this drives the EFA agenda forward; the underlying purpose of education is either assumed or considered to be a matter for wider socio-political debate.
- The UNLD situates itself within the EFA movement, where literacy is a thread through all six goals and a condition for their attainment. As a key instrument of learning, it must be factored into the realization of all forms and stages of education. There is no meaningful access to structured learning opportunities without close attention to the acquisition of literacy of sufficient quality. In some respects, the UNLD goes beyond the educational process, by demonstrating strategic links to other aspects of life – the acquisition and uses of literacy have an impact on mother and child health, on fertility rates, on income levels, as well as on less tangible effects such as an increase in self-confidence, initiative and participatory citizenship".

Finally, Education for Sustainable Development is more concerned with the content and purpose of education and emphasizes on the role of education and learning in achieving a more sustainable future in terms of *environmental integrity, economic viability and a just society* (63). It promotes adaptation of processes and approaches that foster the values of sustainable development in all forms and levels of education (70). While EFA and UNLD aim to address the needs of all learners, specifically those who do not have access to quality basic education, ESD addresses the relevance and necessity of education for sustainable development for all people, including the privileged positions in societies who might have the most to learn about sustainable consumption practices. ESD can also contribute to achievement of MDGs by (UNESCO7, 2009):

- "Supporting the education and learning goals of the MDGs;
- Enhancing knowledge of MDG issues in society;
- Developing action competence that strengthens political leadership and governance for service delivery related to the MDGs;
- Enhancing women's empowerment and action competence to make decisions about their own and their children's health and well-being;
- Developing knowledge and action competence for natural resource management, ecological sustainability, and sustainable living practices;
- Developing knowledge and action competence of sustainable agriculture to reduce hunger and improve food security;
- Developing critical thinking and evaluation skills to consider tensions that exist in development decision making;
- Developing creative thinking skills for new development solutions; and
- Engaging the corporate sector in promoting sustainable production and consumption".

The distinctive advantages of each of the four initiatives can be summarized (UNESCO Education Sector, 2005):

- "the MDGs provide a set of tangible and measurable development goals within which education is a significant input and indicator;
- EFA focuses on ways of providing quality educational opportunities to everyone,

- the UNLD concentrates on promoting the key learning tool for all forms of structured learning; and
- the DESD promotes a set of underlying values, relational processes and behavioural outcomes, which should characterize learning in all circumstances".

4.7 ESD and Disaster Risk Reduction

As mentioned earlier, over the last decade, the World has witnessed a significant rise in number and magnitude of disasters and their horrific impacts not only on the affected regions but also on a global scale. "This, compounded by increasing vulnerabilities related to changing demographic, technological and socio-economic conditions, unplanned urbanization, development within high-risk zones, under-development, environmental degradation, climate change, geological hazards, competition for scarce resources, and the impact of epidemics such as HIV/AIDS, points to a future where disasters could increasingly threaten the world's economy, and its population and the sustainable development of developing countries (27)".

In 2005, during the World Disaster Reduction Conference, in Kobe, Hyogo, Japan, 168 Member States of the United Nations adopted the Hyogo Framework for Action- a ten year action plan to build the resilience of nations and communities to disasters, spanning from 2005 to 2015. The HFA underscores the following five priorities for action along with the guiding principles and practical means for achieving disaster resilience (ISDR, 2007):

1. "Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels".

As highlighted in the priorities for action of HFA, education and learning play a crucial role in Disaster Reduction by raising awareness on natural hazards as well as existing vulnerabilities and threats faced by the communities and through building a culture of safety and resilience at all

levels. ISDR (2007) points out that Education for Disaster Risk Reduction (EDRR) utilizes all aspects of raising public awareness, education and training to create or enhance a culture of prevention by identification and understanding of risks, learning of risk reductions measures, and disaster response.

Also, as stated earlier, the framework of ISS identifies Disaster Risk Reduction as one of the key sustainable development challenges to be addressed under the Decade of Education for Sustainable Development; however, a broad implementation is still lacking. It is argued that Disaster Risk Reduction (DRR) is imperative for Sustainable Development and that DRR supports Education for Sustainable Development in three important ways (71):

- "Education for disaster risk reduction is interdisciplinary. Therefore, important consideration is given to the impacts on, and relationship between, society, the environment, economy and culture.
- Education for disaster risk reduction promotes critical thinking and problem solving and other social and emotional life skills that are essential to the empowerment of stakeholder groups threatened or affected by disasters.
- Education for disaster risk reduction supports the Millennium Development Goals. Without considering Disaster Risk Reduction in development planning, all efforts including, decades of development initiatives could be destroyed in seconds".

Moreover, the following recommendations reflect how Education for Disaster Risk Reduction can contribute to the achievement of the main objectives of DESD (DKKV and UNISDR TPK&E, 2009):

1. "Motivate political commitment and strengthen legal frameworks;
2. Promote Capacity Building at all levels;
3. Clarify responsibilities and promote networking and exchange between stakeholders;
4. Developing effective education strategies to achieve quality education and learning; and
5. Develop and apply minimum standards for safe and disaster-resistant schools and educational infrastructure".

4.8 ESD and Formal Education

As mentioned earlier, Education for Sustainable Development is not limited to the classrooms, but it also occurs in a wide variety of social contexts. Community learning practices, for example, have been proven to provide an effective and valuable method of learning in ESD. This section deals principally with the various levels of formal education and ESD.

Education for sustainable development should begin as early as pre-school so that children can become individuals with responsibility and care about others and the world around them. The Monitoring and Evaluation Expert Group (MEEG) mid-point review of the Decade of Education for Sustainable Development reveals that in many parts of the world, the role of early childhood education in developing and implementing ESD is not emphasized and its learning outcomes are lacking (64).

There is a clear need for a comprehensive program at all levels of education, aimed at implementing the values and principles of sustainable development to develop sustainable societies around the world. To explain the needs at different levels of education, the example of sustainability of the water system is used. Figure 4-4 shows some proposed measures for implementation of Education for Sustainable Development from primary education to higher education.

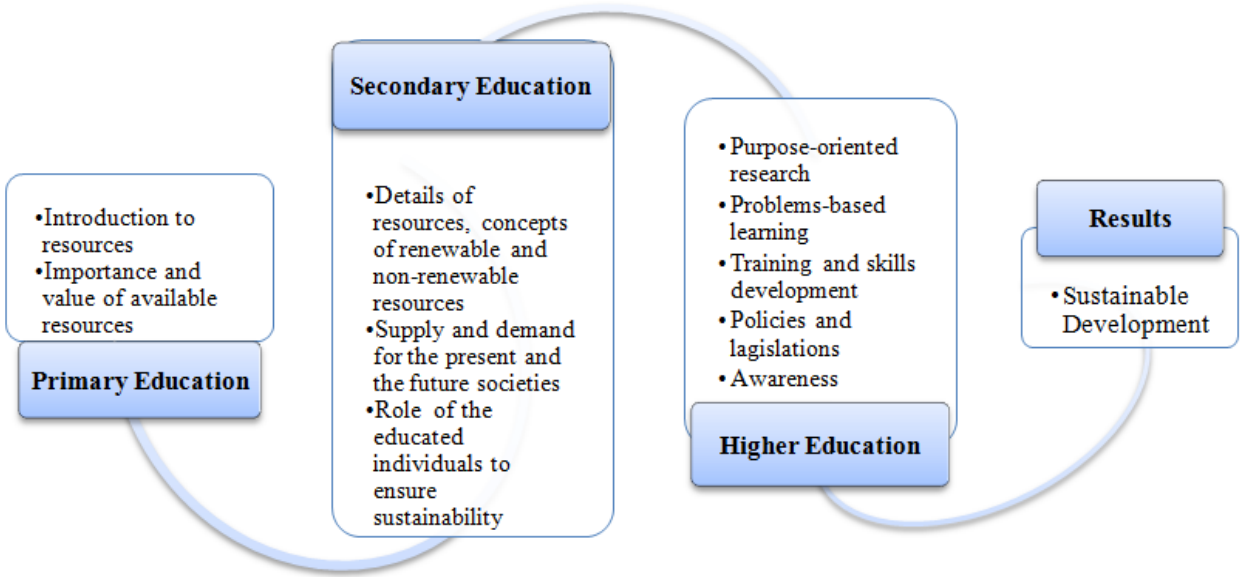

Figure 4-4 Implementing Values of Sustainable Development at Different Levels of Formal Education

At the primary education level, a basic introduction to water, water resources and their "preciousness" should be emphasized. Proper use of water, according to the regions and cultures should be taught and students should be taught to absolutely avoid wastage of water. The concepts of hygiene and water should be taught in simple understandable terms. This is the level, where better sustainable habits can be developed at a relatively young age through training and education, and these will continue through the entire life.

At the secondary education level, there should be detailed consideration of water resources, needs, availability, population growth and limitation of these resources, pollution and contamination of water resources, possible remedial measures, and the role of the individuals to assist with improved, safe and optimized use of water. The possible impacts and consequences of "incorrect" and unsustainable practices in this area should be highlighted and teachers should receive special training, to enable them to properly educate the young students.

At the higher education level, especially in universities, goal-oriented research aimed at making the society sustainable, should be emphasized. Social aspects of water, its uses and its future should be addressed in relevant courses, especially in social sciences. In economics, the focus should be on defining the value of water and its impact on the economy and economic growth and its sustainability. The students should be taught that incorrect use of water or its misuse should be considered unethical, criminal, and against the interests of both the present society and the future generations. Lack of appropriate water resources could possibly lead to international wars in the future, and therefore, appropriate steps should be taken immediately to prevent these future tragedies. Similarly, other issues relevant to the sustainable development of all societies and nations should be addressed using multidisciplinary and interdisciplinary approaches.

The MEEG's mid-Decade review also illustrates that most of the expected learning outcomes of the ESD programs were not covered at the level of professional education, teacher education and higher education (64). The following sections provide suggested means of improving curricula at the universities by introducing and expanding on multiple aspects of sustainable development within the programs.

CHAPTER 5. ENGINEERING EDUCATION FOR SUSTAINABLE DEVELOPMENT

The 2002 International Conference on Engineering Education for Sustainable Development (EESD) agreed that human exploitation of the biosphere was seriously threatening its existence and delicate balance. The problems of depletion of resources, clean water, poverty and malnutrition present a serious risk to the safety and stability of the society and exert a tremendous pressure on the global environment, with the society's outcry for sustainable development. The Conference argued that engineering education, particularly at higher levels for decision-makers, researchers and teachers should be oriented towards sustainable development aimed at cultivating environmentally-aware attitudes, skills and behaviour patterns, as well as a sense of ethical responsibility. This would require assisting the engineering institutions to set targets for reforming their educational program.

Engineering Institutions with expertise in several fields of technological research and design, currently train the future generations of engineers; they need to improve existing technological systems to fulfill the society's needs in an environmentally sound manner, besides developing new systems to promote sustainability in the longer term. The engineering institutions must commit their resources towards research and development to trans-disciplinary research for sustainable development. Besides reflecting critically about traditional engineering paradigms, new paradigms need to be developed aimed at evolving a sustainable society, enhancing new engineering and academic careers from integrated discipline-oriented approaches, closing the gap between engineering and social sciences.

It must be emphasized that engineering in a sustainability context is more than environmental engineering, requiring integration with social, cultural and economic sciences to allow for a more tangible decision making in a highly materialized society. This necessitates adoption of problem-oriented and function-directed education along with inter-disciplinary and trans-disciplinary approaches in engineering courses. To be effective partners in interdisciplinary co-operation, social, cultural and economic scientists need to be simultaneously familiarized with the basics of engineers' approach. The evolving programs in developed countries must be shared with the institutions in developing countries.

The education for engineering students must enable them to recognize global problems, whether they are social, political, economic, environmental or technical, and allow them to harness technology to solve such problems. The engineering students must realize the limitations of the technology, acquire basic knowledge of social sciences and be involved with interdisciplinary projects with students in social sciences. The currently well-established teaching practices can be extended to develop new teaching approaches towards sustainable development, involving basic courses, integration into the various disciplines and specialization in systems approaches. The institutions should be encouraged to exchange their experiences to improve quality of the curricula and courses offered.

A 2006 International Workshop on Engineering Education for Sustainable Development (EESD) at Tsinghua University, Beijing, China dealt with issues including (72):

- Education in engineering and environment;
- Civil engineering;
- Chemical and materials engineering;
- Information and intelligent engineering; and
- Electrical engineering

The Workshop also included a session with young engineers and engineering students on the subject of green engineering education at Tsinghua University.

The Beijing Workshop emphasized the need for:

- Engineers to assume greater responsibility and commitment to create and apply technology to preserve and enhance the health of humanity and the environment, distinct from resource consumption, waste and pollution;
- Higher standard and ethics of professional practice, aimed at an integrated, creative, interdisciplinary holistic approach to EESD, promoting all areas and issues of concern to all, including those related to young people and women;
- Improved learning and teaching, and research and scholarship in EESD and application of sustainable development in engineering practice;

- Advocacy, lobbying, networking and co-operation at national and international levels to exchange and share knowledge and good practice to promote technology applications for health, wealth and promotion of peace and sustainable development.

The Workshop suggested that these partnerships and networking can be implemented by:

- Exploring existing networks and the need for a network of excellence in EESD;
- Creating an integrated, international journal for EESD;
- Developing virtual libraries on EESD, e.g. the UNESCO sudVEL (Sudan Virtual Engineering Library) project;
- Developing learning and teaching material on EESD, e.g., the UNESCO/TNEP (The Natural Edge Project, an Engineering for Sustainable Development and Climate Change program); and
- Promoting innovative teaching methods and approaches to EESD, e.g., activity-based learning.

The Workshop also called upon UNESCO and WFEO (World Federation of Engineering Organizations) to adopt strong leadership positions with other national and international partners, networks and organizations to develop and address the challenges of sustainable development through development and application of engineering.

The Workshop noted that the environment in countries around the world continues to deteriorate, along with an increased frequency of natural and man-made disasters, criticality of depletion of natural resources and a widening of the gap between the rich and several poor countries. Engineering education, research and practice can alleviate all of these problems which constitute major threat to global prosperity, security, stability and sustainable development. Many countries recognize these problems and the role of engineering, and related issues of poverty reduction and other Millennium Development Goals, and are encouraging and supporting all engineering disciplines in the challenge for sustainability. One of the greatest challenges facing engineering is to promote engineering and related policy and advocacy, as part of the solution for sustainable development, rather than as part of the problem, as it is occasionally perceived (72).

5.1 Role of Engineers

Over the ages, engineers have contributed to the quality of life through provision of better water supply and sanitation, improved solid and hazardous waste disposal and development of natural resources, food, energy, transportation and communications systems. The accelerating population growth and the consistently increasing environmental degradation has made it mandatory for all engineers irrespective of their specific discipline to provide leadership and to work with all interested and related parties towards achievement of sustainable development to fulfill the long-term needs of future generations throughout the world without inflicting any further damage on the earth's ecosystems (73). According to the International Federation of Consulting Engineers (FIDIC) (1994), this requires the future engineer to:

- Carefully evaluate the environmental impact of any proposed project
- Reduce the use of non-renewable resources
- Increase reuse of materials
- Reduce waste production
- Improve transportation and distribution systems
- Recycle waste products
- Adopt sound agricultural and land management practices
- Restore damaged land, polluted water supplies, and deteriorated and disturbed ecosystems

The natural systems, such as the hydrological and food cycles, "function" as "closed loops", evolving quite slowly with time. By contrast, most of the human activities utilize a "linear approach" using extracted materials as if their supply is inexhaustible, and processing them ingeniously to develop products which occasionally have no natural counterparts (74). Figure 5-1 demonstrates the linear approach of the current construction processes of infrastructure facilities, including the extraction of raw materials from earth and their processing, which results in significant energy consumption and waste generation. At the end of each phase in Figure 5-1 and the service life, these infrastructure facilities are decommissioned and demolished, and the resulting debris is transported and deposited in landfills – construction waste comprises about 40-50 percent of the total landfill waste in some communities (74).

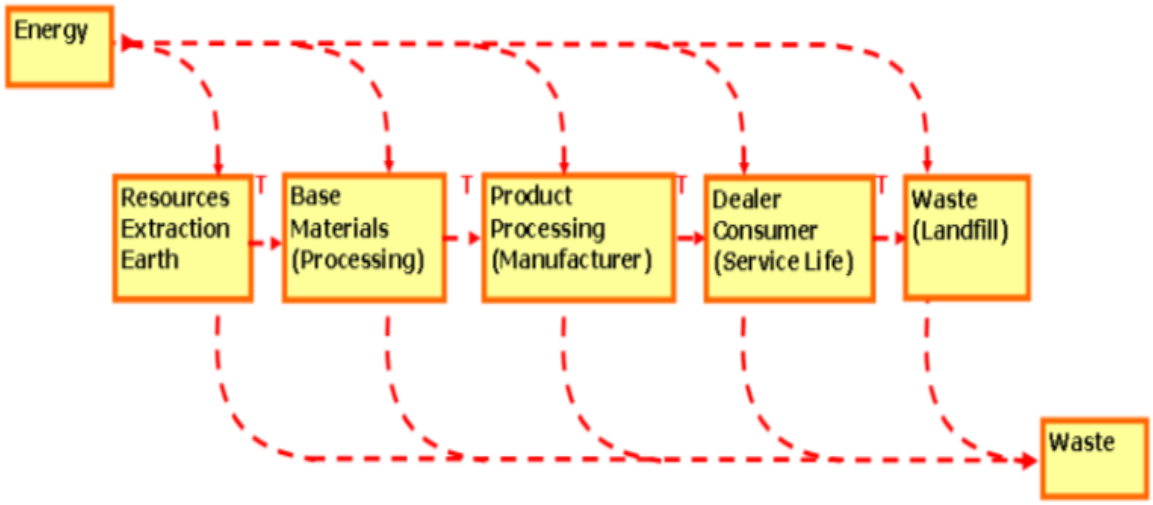

Figure 5-1 Linear Approach in Current Infrastructure Systems (74)

Figure 5-2, on the other hand, represents an ideal solution which replaces the current linear cycle with a closed loop, where all materials are derived from the existing products, obviating the need for new raw resources from the Earth. The processing, transportation and utilization of resources flows continuously through a closed loop, instead of an only once-through cycle. Here, the outer loop involves recycling of the discarded materials before being dispatched to the landfills, thereby reducing the need for new materials; however, the consumption of energy may still continue to be high. The inner loop entails reuse of components and products after some necessary repair and reconditioning, requiring a considerably lower energy consumption.

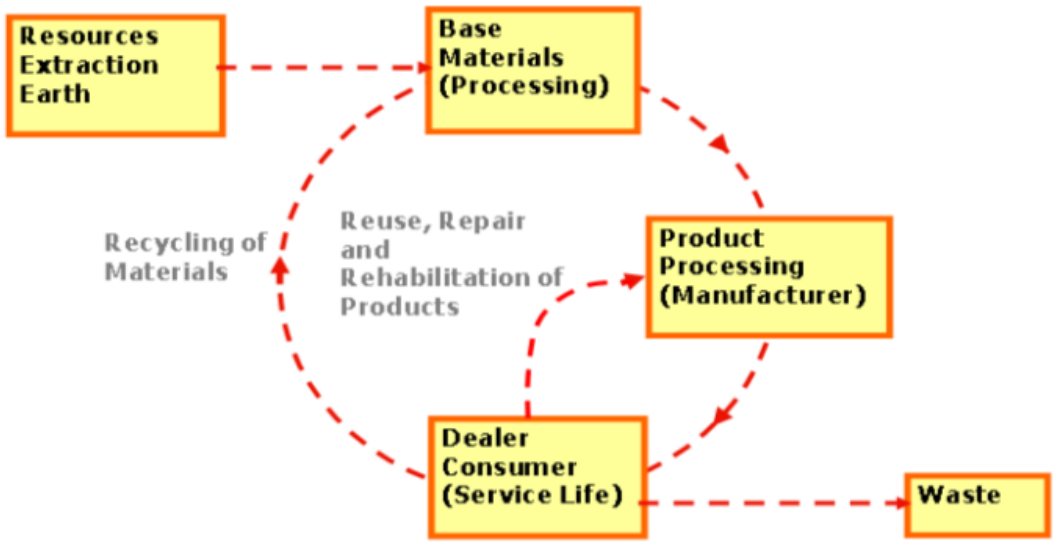

Figure 5-2 A Proposed Closed-Loop System for Infrastructure Activities (74)

The unlimited production capacity and consumption with continually increasing transportation are sources of enormous waste and energy consumption leading to problems of acid rain, pollution, depletion of ozone layer and climate change – all of which have serious consequences for the future of mankind.

Fulfillment of the various tasks required for environmental protection and amelioration will necessitate reorientation of technology which is the link between mankind and nature. The basic engineering science knowledge related to the degrading environment is not expected to change much; however, the attitude and practices of the society must change significantly (73). Engineers would have to be involved with policy development aimed basically at protective and restorative strategies, requiring a thoughtful review of the technological needs, along with the ability to work creatively and efficiently as part of inter-disciplinary teams with strong social interests. Unfortunately, the needed developments have not kept pace with the escalating crisis, and engineers need to be urgently involved in the development of strategic solutions aimed at ensuring a sustainable future for the human race.

Moreover, engineers must emphasize cleaner technologies, using resources with greater efficiency and minimizing off-site treatment of waste. The design and its implementation must consider recycling of all materials used. The concepts of life-cycle analysis and total life-cycle costs, efficiency of resource and energy issues, and performance in all relevant environments from ‘cradle’ to “cradle”, rather than from “cradle” to “grave”, employing effective reuse and recycling of these products should be adopted urgently. This should become the basis of purchase by the public willing to pay more for the products with an environmental guarantee. Suitable data-bases are being developed providing world-wide access to the basic information on cleaner technologies; these centers are receiving appropriate attention at universities, research and development institutions and some leading progressive organizations.

The successful role of the civil engineer in designing, constructing, maintaining, operating and preserving the infrastructure facilities with professional concern for achieving safety, economy and efficiency has been well established over the past several decades. However, most of the related decisions were made without much serious concern for the future performance of the facilities. Unfortunately, the present construction practices of ‘design, build and forget’ (75),

coupled with deferred maintenance, have caused considerable deterioration in several of the infrastructure facilities, involving very large repair or rehabilitation costs. The infrastructure deficit or the needs, above the resources available, have been estimated to be $2.2 trillion in U.S.A., in 2009 (76). The deficit to upgrade the existing deteriorated municipal infrastructure in Canada to an acceptable operating level has been estimated to be $123 billion in 2007 (77). In light of these circumstances, the above role of the civil engineer has changed considerably. In the 21th century, as in the past, the civil engineer is expected to ensure safety, economy and efficiency of infrastructure facilities; however, in addition, the practicing civil engineer is expected to spend more time on non-technical issues, dealing with government agencies and other bodies, regarding permits, legal issues, labour relations, financing and other related matters. These complexities require the civil engineer to ensure that all technological solutions comply with the relevant environmental, social, economic, legal and political requirements and regulations. To function successfully in such a complex environment, and to ensure fulfillment of the principles of sustainable development, the civil engineer, in addition to a sound technical background, must possess reasonable managerial talents, communication and negotiation skills, political astuteness and the ability to interpret the applicable legal regulations.

After considering the basic issues involved, the Canadian Society for Civil Engineering (CSCE) has developed guidelines for civil engineering practice as a commitment to develop and promote a sustainability ethic leading to sustainable development, and the need to recognize the interdisciplinary nature of engineering. Johnson and Kramer (1994) recommended that for a sustainable future, the engineers must avoid environmental degradation and consider conservation at all planning and development stages, the environmental and social costs along with the regular market costs; this constitutes the total cost of a product to the society. The engineering practice must consider long-term planning and gains and include effective public participation in informed decision making. All design decisions should treat natural resources as something that is to be replaced as it is depleted. Focus should be shifted to emphasize product durability, energy efficiency and recycling. Finally, quality of life considerations must be taken into account in all decision making processes.

The American Association of Engineering Societies (AAES, 1994) views environment, technology and economic development as interdependent concepts which address industrial competitiveness and ecological sustainability as complementary aspects of a common goal. As agents for implementation of change, engineers along with other professionals should be adapting to this changing environment. They must become facilitators of sustainable development, through the information they provide, and the decisions they make, and through those that they influence. In addition, unlike the past trends, the engineer has ceded the responsibility for major decisions, developing policy and future direction and basic responsibility for large projects to administrators and politicians who have very little knowledge of infrastructure, including important areas such as urban transportation, housing crisis, toxic emissions, etc. The fragmented civil engineering community does not have the same cohesive force required to influence policy and direction as the leaders of the automobile or the electronics industry. The civil engineers must immediately change their perceived role and assume a more assertive and proactive role in defining and shaping a desirable future and they must address the following hard questions:

- What new tools/processes must be developed to attain sustainable development?
- What must individuals/organizations do to achieve this goal?
- How should the prioritization/ implementation targets be established?

If this challenge is not met, the engineers will be left behind in the decision-making processes that will influence the future of the world. In summary, engineering for a sustainable future will require engineers to engage more actively in political, economic, technical and social issues, discussions and processes to help set a new direction for the world and its development (78).

5.2 Sustainable Design Concepts

To meet the challenge of sustainable development, Hatch (1994) suggested the following eight design concepts for building the foundation and framework for sustainable engineering:

- **Education:** The deficiencies in the current undergraduate engineering curriculum must be eliminated to provide the student with a solid understanding of environmental and economic issues, problems and especially the risk and potential impact of every decision and action.
- **"Ecosystem" Thinking:** Engineering practice should consider approaching sustainable development in a manner imitating the natural processes, using engineering as a unifying and not as a partitioning discipline.
- **Aggregate Consequences of Recommendations:** Careful consideration should be given to the long-term consequences of each decision in terms of both time and space by understanding the net contribution of the impact of each individual decision.
- **Environmental Economic Tools to Integrate Environment and Social Conditions into Market Economics:** A market economy based on free enterprise can attain the required level of global economic development to support growing populations and sustainable development. This requires the engineers to understand, develop and practice "environmental economics".
- **Sustainable Alternatives:** The regular engineering practice normally adopts a narrow circumscribed approach without development of environmentally sustainable alternatives. The decisions taken normally determine whether or not problems will be created. Life-cycle consequences run through the project's entire time dimensions, from planning through design, construction, operation, deactivation, demolition and disposal.
- **Sustainable Technologies:** Sustainable technologies are needed to solve problems in the past and to develop solutions to new problems in the future.
- **Dynamic Process:** Sustainable development is a dynamic process that responds to the continuously changing needs and base of the society, culture and community served.
- **Multidisciplinary Team:** It is important to bring together the knowledge, skills and insights of the needed physical and social sciences.

5.3 Revised Civil Engineering Curriculum

As mentioned earlier, the challenges of the infrastructure crisis and sustainable development need the engineer, especially the civil engineer, to be multidisciplinary in education and thinking, requiring the basic training to go beyond the conventional engineering courses, and include courses on sustainable development, financing, politics, law and sociology in the curriculum. Areas of management, economics and urban planning are normally covered in the undergraduate civil engineering curricula at most universities. Increasing focus on rehabilitation and retrofitting of structures suffering from the various modes of deterioration, and shortcomings to resist the loads due to revised occupancy and mechanical resistance requirements than on the construction of new infrastructure (bridges, buildings etc.) places more emphasis on new caretaking and management skills needed to deal with increasing complexity and competiveness of the public service environment. Universities have generally lagged in providing courses and training related to maintenance and rehabilitation of infrastructure. A significant change is needed in the undergraduate and graduate curricula to train future engineers who will be required to play critical leadership roles as facilitators of sustainable development. This would require expansion of knowledge and understanding of areas such as environmental economic science, sustainable technologies and processes integrated systems and expanded multi-disciplinary partnerships that can address multidisciplinary cultural and social issues and differences (79). In summary, professional education, training and apprenticeship must be altered significantly to prepare engineers for the future new technology and practice aimed at achieving sustainable development.

While the current engineering curriculum has produced good engineers who have served the society well, the rapidly changing societal needs and demands, and increasing international competition require a critical review of parts of the undergraduate programs as follows (80):

- **Synthesis**: Universities teach too much content and not enough process; students are not exposed adequately to synthesis and open-ended problem solving techniques.
- **Interdisciplinary Content**: Most curricula tend to be compartmentalized without adequate interdisciplinary content.

- **Delivery Style**: These are mostly outdated and do not effectively utilize modern information technologies; more attention is required to the differences of learning style and cultural/ethnic diversity.
- **Concurrent Engineering**: Concurrent application of multiple disciplines through the design cycle requiring team design exercises, is largely absent in the present curriculum.
- **Industrial Experience**: Inadequate in the current curriculum.
- **Laboratory/Hands on training**: Undergraduates get inadequate hands on and laboratory experience.
- **Curriculum Turnover**: It is too slow and mechanisms for introducing new research and technologies into the classroom are lacking.
- **Social Context**: Engineers must have the ability to evaluate and communicate social implications of technology; the societal factors are lacking in the conventional curriculum.
- **Communication**: Oral and written skills of the graduating students need to be improved.

As Yao (1996) suggested, undergraduate engineering education must emphasize broad and general engineering education with a strong foundation in sciences and it must be expanded to include courses on humanities, economics, and sociology and work orientation skills. In addition, elements of deterioration science, assessment technology, renewal engineering and institutional effectiveness and productivity should also be incorporated the curriculum.

CHAPTER 6. CASE OF HAITI

6.1 Background

Haiti is one of the poorest countries in the world and the most poor country in the western hemisphere. It is the third hungriest country after Somalia and Afghanistan. The healthy life expectancy is 53 years for men and 55 years for women (81). Adult literacy for males between ages 15 and above is 53%, slightly higher than 45% for females (39). Haiti ranks 145 out of 169 in the ranking of United Nations Human Development Index (HDI) (82). The January 12, 2010 catastrophic magnitude 7.0 M_w earthquake in Haiti caused over 220,000 deaths and more than 300,000 injuries, besides destroying or severely damaging over 300,000 homes, institutional, government and other buildings (83). Although the international community has offered and attempted to help Haiti at many levels, Haitian people continue to suffer in the aftermath, including the serious cholera epidemic, which caused another 7000 deaths since its outbreak in October 2010 (84).

Although when compared to hurricanes, earthquakes have been relatively rare in the history of Haiti, the 2010, 7.0 $M_w$earthquake was no surprise to geologists. The island of Hispaniola, home to both Haiti and the Dominican Republic is situated on the Caribbean plate which is surrounded on three sides by the North American and South American plates, both of which are moving westwards in relation to the Caribbean Plate (85). In the northern boundary of the Caribbean plate, where the Haitian earthquake occurred, the two plates (North American Plate and Caribbean Plate) slip past each other, making strike-slip faulting (Figure 6-1) (86). The two fault zones of Septentrional and Enriquillo-Plantain Garden are also presented in Figure 6-2.

For years scientists had thought of the north coast of Hispaniola as being more prone to earthquakes compared to the south coast where Haiti is located. However, it has been more than a decade that this perception has changed. Scientists found that the southern fault zone was just as likely to produce earthquakes. It is argued that despite the presence of these facts the Haitian government could not act accordingly because of its lack of resources to quake-proof buildings and structures and to put in place an emergency response strategy (87).

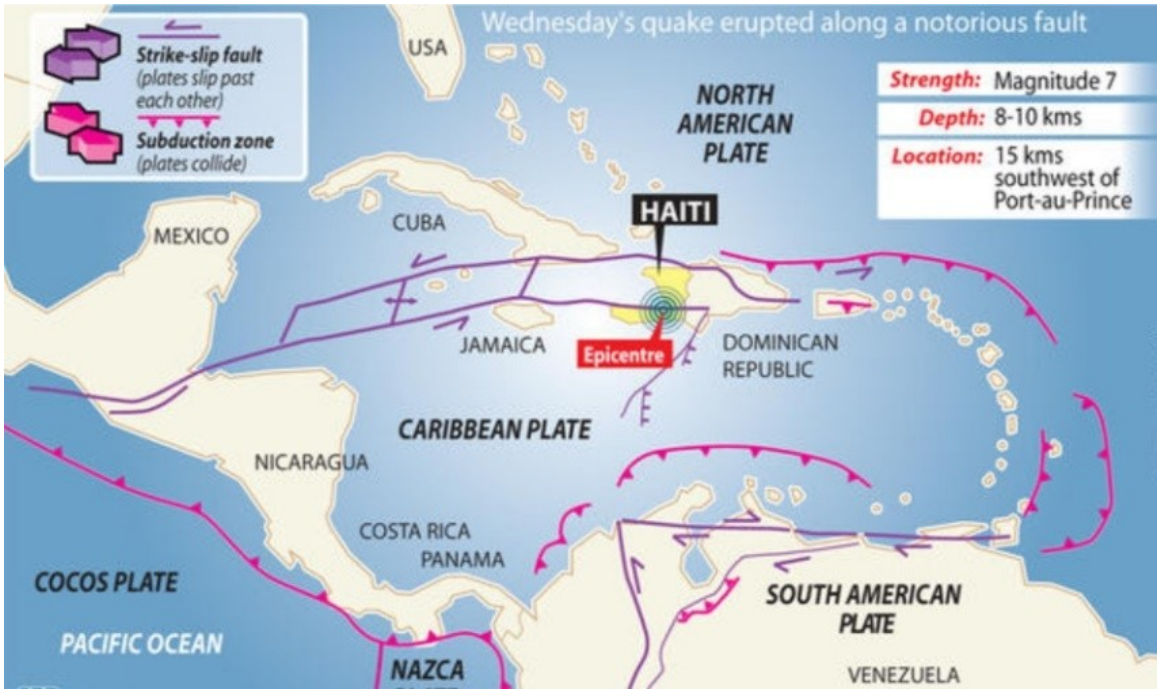

Figure 6-1 Haiti's Vulnerability on the Caribbean Tectonic Plate (88)

Figure 6-2 The Horizontal East/West Strike-Slip Faults at the Boundary between the Caribbean and the North American Tectonic Plates (89)

The catastrophic outcomes of the January 2010 earthquake become even more devastating knowing that Haiti has had a long history of natural disasters. Following is the timeline of worst natural disasters to hit Haiti in the past which also highlights the increase in the frequency of these disasters over the last decade (90):

- **1770 –** Port-au-Prince was a French colony and was literally destroyed by an extremely strong earthquake.
- **1842 –** Earthquake destroyed several Haitian cities and cities in the Dominican Republic.
- **1935 –** At least 2,000 Haitian people were killed when a storm hit the country. The storm then moved on to Florida as hurricane, taking the lives of 400 people.
- **1946 –** A magnitude 8.1 earthquake hit Haiti and the Dominican Republic, causing a tsunami which eventually killed 1,790 people.
- **1954 –** Hurricane Hazel struck and took the lives of hundreds of people.
- **1963 –** Hurricane Flora struck and killed more than 6,000 people in Haiti and Cuba.
- **1994 –** Hurricane Gordon caused the deaths of hundreds of people.
- **1998 –** Hurricane Georges destroyed about 80 percent of Haiti's crops, and killed over 400 people.
- **2004 –** (May) Three days of heavy rains caused floods responsible for the deaths of at least 2,600 people.
- **2004 –** (September) Hurricane Jeanne brought massive floods and landslides that killed 1,900 people, and left at least 200,000 people homeless.
- **2007 –** 57 Haitians were killed by Tropical Storm Noel
- **2008 –** In a two month period three hurricanes and a storm killed 800 people, devastated crops and caused $1 billion in damages.

The tragic outcome of these disasters can be attributed to a number of factors. As Richard Olson, director of Disaster Risk Reduction in the Americas project claims, Haiti represents the worst case scenario for disasters in the Western hemisphere. Olson summarized the factors involved to be the hurricane tracks, tectonics, environmental degradation and extreme poverty (87). Borenstein (2010) argued that “while the causes of individual disasters are natural, more than anything what makes Haiti a constant site of catastrophe is its heart-tugging social ills. It starts

with poverty, includes deforestation, unstable governments, poor building standards, low literacy rates and then comes back to poverty".

Haiti has suffered from years of dictatorship and military rule that has pushed the country in to substantial debt. In 1990, a former catholic priest, John Bertrude Arasteed was elected president, but was overthrown by the military in 1994. Ten years later, after some economic changes, including cutting the tariffs on foreign rice from 50% to 3%, that resulted in the job loss of many farmers, with the help of the U.S. Marines, Arasteed was put back into power. Since then, an elected leadership is in place. However, the country still suffers from violent confrontations between rival gangs and political groups. As pointed out earlier, multiple hurricanes and an earthquake hit Haiti in the twenty-first century that caused losses over a billion dollars and resulted in further economic issues and poverty.

As stated earlier, Haiti's poor infrastructure was a major factor behind the heavy death toll of the 2010 earthquake. As Watkins (2010) noted, a study by the Organization of American States (OAS) concluded that many of the buildings in Haiti were so shoddily constructed that they were unlikely to survive any disaster, let alone an earthquake like the one that devastated Port-au-Prince. Even buildings such as hospitals, schools and the presidential palace that should have been constructed in a way to withstand such catastrophes to allow for some continuity in the operations had collapsed. The review of the state of structures in Haiti highlights the lack of proper foundation, insufficient steel reinforcement and use of improper building practices. It should be noted that, as in much of the Caribbean region, Haiti does not have building codes and even if it did, the existing level of poverty would not allow people to build structures that could withstand earthquakes and hurricanes. Moreover, because of the existing high level of corruption, there are no supervisions on construction methods and materials used. Cletus Springer, director of the Department of Sustainable Development at OAS in Washington highlights the need to work with the Haitian authorities to develop a building code that is suited to Haiti and its unusual conditions, including its location on the fault line and in the path of hurricanes. He also suggested that the country should work with the private sector and the banking sector to create a low-income building ethic for Haiti (91).

Haiti also lacks the ability to prepare for and cope with disasters. Even before the earthquake hit, Haiti did not have a real disaster relief agency that could respond to emergencies. Many of the people who had initially survived the earthquake lost their lives due to lack of adequate medical care. The closest functional hospital was said to be about 70 miles outside of Port-au-Prince. The roads were also blocked by debris and rubble and hence non-functional, and despite the history of natural disasters in Haiti, the country still lacks heavy equipment required to remove such rubble (92). Due to the lack of emergency routes which should remain functional even under the worst circumstances, many lives were lost as the existing international aid could not reach those in immediate need of care.

Over the years, the international community has proven to be determined in helping Haiti recover from the aftermath of the disasters it has suffered. While such efforts ease the path towards a more sustainable recovery for Haitians, they are clearly not sufficient. The review of literature on social and cultural sustainable development along with the highlighted impact of the role of education for disaster risk reduction, offers a comprehensive framework to enhance the effectiveness and sustainability of development programs. This time, by implementing the fundamental changes required, the international community can help Haiti move towards the path of sustainable recovery and development.

6.2 Social Sustainability in Haiti

The distressing data presented earlier on issues like poverty, illiteracy, inequity, poor health, poor infrastructure, etc., can be attributed to the lack of good governance and its capacity to govern, and effectively involve its people in building their country. According to Freeman (2011), in Haiti's case, "such capacity has been limited by decades of corruption, huge disparities in wealth and nonexistent investment in the country's infrastructure".

As discussed earlier, building the capacity of individuals, institutions, and society can support the enhanced involvement of communities in the planning and implementation processes through Community-Driven Development approaches which, in turn, allow for a more sustainable social and economical growth. These CDD programs can create a responsive, resilient, and reliable environment, ideal for sustainable development by embracing the operational principles of inclusion, empowerment, and accountability. UNDP and other non-profit organizations have

been supporting Haiti's CDD programs for human development and achievement of Millennium Development Goals in the past (44). Similar efforts have taken place after the January 2010 earthquake to move Haiti towards self-sufficiency and to reduce its reliance on international aid. UNDP's work has focused on four key areas in Haiti which are (93):

- "Providing jobs for the Haitian people through its cash-for-work programs;
- Preparing for the onset of the hurricane season;
- Re-establishing the Government's capacity to deliver basic justice; and
- Strengthening government institution in aid management and the post disaster needs assessment".

Freeman (2011) points out, "building capacity in a time of crisis is far harder than making the investment over time to strengthen the systems and processes that allow organizations (and, in Haiti's instance, an entire country) to function". However, by incorporating the principles of CDD and capacity building, the generous aid of the international community can offer Haitians the tools to become agents of their own development which allows for a more sustainable recovery and development, and strengthens the country's resilience towards natural disasters.

6.3 Culture for Social and Economic Development

UNESCO is another leading international agency that holds a long history of productive cooperation with the people of Haiti, since 1946. After the devastating Earthquake of 2010, UNESCO continued their cooperation by responding to the short-term, urgent needs of the Haitian people, along with the long-term needs of the country with its focus on educational and cultural aspects of reconstruction and development (4).

Culture has always played a central role in Haitian life, both economically and socially. With ten percent of Haitians earning a living as artists on one hand and the strong potential for development of sustainable tourism on the other, cultural sector can provide a strong pillar for Haiti's economic development. It can also play a fundamental role in Haiti's social cohesion (94). Moreover, it is argued that culture can have a powerful impact on social stability, reconciliation, as well as reconstruction in post-conflict and post-disaster situations. All parts of Haiti's cultural life were hard hit by the earthquake. Shortly after the earthquake, UNESCO

started its work in cooperation with the authorities and local communities to revitalize Haiti's cultural life. In light of UNESCO's actions, the Haitian government included an entire chapter on culture in the "Action Plan for National Recovery and Development of Haiti" to signify the role of culture both economically and socially. The following actions were undertaken by UNESCO after the earthquake to restore and improve the cultural sector of Haiti (4):

- "Protecting collapsed heritage sites from looting, removing rubble and providing technical assistance to safeguard movable objects from 5 different collections
- Coordinated action with the world's largest international police organization, INTERPOL, to prevent illicit trafficking of art, thanks to international warnings with the International Council of Museums (ICOM)
- Reconstitution and long-term protection of Haitian archives
- Rebuilding the Library Sector in Haiti
- Rebuilding the Museum Sector in Haiti
- Youth and culture: Voice of the future – The school of art and culture in Jacmel
- Towards a revised cultural policy framework in Haiti
- International consultation on legislation concerning the safeguarding of Haitian cultural property
- Technical and financial support for the establishment of a Department for Intangible Heritage within the Ministry of Culture and Communication and conducting of a pilot project: Inventory of the intangible cultural heritage in Léogâne
- Safeguarding Rara, as a symbolic tradition of Haiti cultural identity"

By following through with the above framework of actions, UNESCO along with the Haitian government works closely to allow Haiti's cultural sector to have a positive impact on its social cohesion and contribute to its economic development and poverty reduction. The fundamental role of culture in Haiti as a force of social and economic development can be used as an example in other developing countries.

6.4 Education for Disaster Risk Reduction

The earthquake also had a severe effect on Haiti's already suffering education system. It ruined about 80% of the educational establishments in Port-au-Prince, and took the lives of 38,000 students and over 1300 teachers. In an attempt to reconstruct the devastated education system, UNESCO took the following initiatives (4):

- "Training for reconstruction: UNESCO launched a pilot project in Camp-Perrin to train 500 masons in techniques that will help save many lives in case of an earthquake. A book in French and Creole containing explanations illustrated with diagrams was published and distributed to building professionals around the country;
- Equipment for 28 schools: 100 desks for teachers, 106 filing cabinets for the administration, 2800 pocket dictionaries, 280 maps of Haiti, and 280 geometry kits for teachers were distributed to help get teaching in secondary schools started again.
- Psychosocial support for secondary school children: In June and July 2010, some 1700 school teachers in the Ouest department, which was affected by the earthquake, were given training in the prevention of and response to the risks of natural disasters in the classroom. The training will be repeated in six other departments seriously affected by the earthquake.
- Emergency syllabus for schools: Children in Port au Prince began returning to school three months after the deadly earthquake on 12 January 2010. But their normal lessons were replaced by a special syllabus developed by UNESCO and the Haitian Ministry of Education to take into account the trauma and disruption experienced by both children and teachers. Under the new syllabus, the education of 600,000 pupils was resumed in stages starting with psychosocial activities, such as singing, dancing, and creative expression, to help children cope with the extreme stress they experienced as a result of the earthquake. They also learned about earthquakes as a natural phenomenon.
- Rebuilding and equipping secondary schools and vocational colleges since December 2010 in Port-au-Prince, Carrefour, Croix des Bouquets, Thomazeau and Grand Goave.
- A children's book and reading in Creole: Distribution of a book and reading sessions in refugee camps; establishment of a partnership with Librarians Without Borders (LWB)".

Furthermore, as stated earlier in the priorities of Hyogo Framework for Action, education and learning play a crucial role in disaster reduction by raising awareness on natural hazards as well as existing vulnerabilities and threats faced by the communities and through building a culture of safety and resilience. By implementing Education for Disaster Risk Reduction in Haiti's formal and non-formal education system, one can create a culture of prevention through identification and understanding of risks, learning of risk reductions measures, and disaster responses (27).

As stated earlier, it has been clear that the international community is quite serious about the amelioration of the current situation in Haiti. The extent of the damages to the country can in a sense offer hope in fundamentally changing how it is built. By strengthening the social and cultural sectors in Haiti and through raising the knowledge and awareness of Haitians, the international community can help Haiti lessen its dependency on aid and strengthen its resilience towards natural disasters. Otherwise, as Borenstein (2010) argues, if Haiti is rebuilt the same fashion as it is now our children are going to have this same conversation.

CHAPTER 7. SUMMARY AND CONCLUSIONS

Sustainable development, as it is understood and accepted presently, has been embraced by nearly the entire world. The initiatives undertaken by the international community in all aspects of sustainable development, namely, economic, environmental, technical and socio-cultural, validate their aspiration and determination to move towards a more sustainable world. However, a review of the literature shows that social and cultural pillars of sustainable development are conceptually the least developed. The lack of consensus on the definition and role of social and cultural pillars of sustainable development has negatively influenced the effectiveness of these initiatives.

The social dimension of development normally implies development of society with the goal of enabling people, through empowerment, inclusion and security to make the societies more equitable, efficient and sustainable. Community-Driven Development program (CDD) is a program presently in action that can help create responsive, resilient, and reliable communities, ideal for social sustainable development by supporting participatory decision making, local capacity building and community control of resources. Capacity building at the individual, institutional and societal levels of communities has been identified as one of the main principles for enhancing the effectiveness and sustainability of CDD programs. It is suggested that Community-Driven Development programs, particularly in developing countries, can significantly help strengthen human resources as well as institutional capacities which can lead to sustainable recovery and development of the country.

Culture has the potential to have a positive impact on social cohesion and to add value to social life. It can also contribute to economic development and poverty reduction. Any development strategy must be sensitive to the cultural assets of the community to address its specific interlinked economic, environmental, social and technical problems. It is argued that culture should be viewed as the central pillar of sustainable development. By bringing culture in from the periphery of development thinking and placing it at center, any sustainable development strategy would have a greater potential in achieving social justice, self-reliance and ecological balance.

Education is another key factor in social and economic development. A set of goals adopted by UN and UNESCO, which emphasizes the importance of the quality and easy accessibility to basic education follows:

- The six Education for All (EFA) goals adopted in the Dakar Framework for Action, 2000-2015;
- The UN Millennium Development Goals (MDGs), especially Goal 2 and Goal 3;
- The UN Literacy Decade (UNLD), 2003-2012;
- The UN Decade of Education for Sustainable Development (DESD), 2005-2014; and
- The EDUCAIDS Global Initiative on Education and HIV/AIDS.

Education has also been identified as a critical social strategy for promoting sustainable development and improving the capacity of people to address environmental and development issues. Education for Sustainable Development (ESD) emphasizes the role of education and learning in achieving a more sustainable future in terms of *environmental integrity, economic viability and a just society* and it promotes the values of sustainable development in all forms, and at all levels of education. ESD focuses on addressing the key challenges of sustainable development through education. A number of challenges undertaken by ESD programs are:

1. Education for Water Sustainability
2. Strengthening the Educational Response to Climate Change Internationally
3. Advancing Sustainable Lifestyles and Responsible Consumption through ESD
4. ESD and Disaster Risk Reduction: Building Disaster-Resilient Societies
5. Educating for Food Security: the Contribution of ESD
6. AIDS, Health and ESD
7. Mainstreaming Biodiversity into Education and Learning
8. The Economic Pillar of Sustainable Development: Educational Approaches.

As highlighted in Phase II of the 2011 UNESCO Monitoring and Evaluation report, ESD projects have resulted in several social, economic, environmental and educational changes at different levels.

As mentioned earlier, ESD occurs in a variety of social contexts, from community learning to formal education, as well as all levels from pre-school to higher education. The 2002 International Conference on Engineering Education for Sustainable Development (EESD) emphasized the need for reorientation of engineering education, particularly at higher levels for decision-makers, researchers and teachers towards sustainable development aimed at cultivating environmentally-aware attitudes, skills and behaviour patterns, as well as a sense of ethical responsibility. The education for engineering students must enable them to recognize global problems, whether they are social, political, economic, environmental or technical, and allow them to harness technology to solve these problems. Civil engineering education in particular must go beyond the conventional engineering courses, and include courses on sustainable development, financing, politics, law and sociology in the curriculum. Increasing focus is required on rehabilitation and retrofitting of structures suffering from the various modes of deterioration, and shortcomings, any revised occupancy and mechanical resistance requirements than on the construction of new infrastructure (bridges, buildings etc.); this places more emphasis on new caretaking and management skills needed to deal with increasing complexity and competiveness of the public service environment.

As mentioned earlier, the international community has undertaken several initiatives to move towards the path of sustainability. The recent increase in frequency and impact of natural and man-made disasters over the last decade has slowed down the progress achieved under these initiatives.

Since the risk in relation to disasters is related to vulnerability of the society and its infrastructure facilities as well as the probability and intensity of the disaster, by increasing the resilience of the society, its infrastructure and critical facilities, its government administration and by preventing or reducing the impact of disasters (especially in case of man-made disasters or natural disasters like drought and floods), this risk could be decreased. By limiting the impact and frequency of natural and man-made disasters, the international community can limit the major loss of human lives and livelihoods, the destruction of economic and social infrastructure, as well as environmental damages. It can also progress more effectively towards the achievement of sustainable development.

Community-Driven Development (CDD) programs have proven to be effective in reducing the risks and impacts of natural disasters by embracing the operational principles of inclusion, empowerment, and accountability and creating a responsive and resilient environment. Communities are usually in the first line of fire in disasters and their active participation in project planning and implementation has been a key factor in the success of many disaster management projects.

Lack of awareness among the public and decision-makers about factors and human activities that contribute to environmental degradation and disaster vulnerability can intensify the risk of natural disasters. Education and learning can play a crucial role in Disaster Risk Reduction (DRR) by raising awareness of natural hazards as well as of existing vulnerabilities and threats faced by the communities and through building a culture of safety and resilience.

A summary of the means suggested throughout this thesis for Disaster Risk Reduction in developing countries as well as the developed countries follows:

1. Invest in capacity building programs at individual, institutional, and national levels by establishing a comprehensive legal framework that clarifies the roles of all stakeholders and covers all aspects of disaster risk management;
2. Raise public awareness through formal and non-formal education;
3. Invest in specific mitigation plans relative to the specific needs of different disaster prone areas;
4. Improve and enforce building codes and construction standards relative to the specific needs of different disaster prone areas, with special attention to the critical infrastructure; and
5. Invest in cultural infrastructure and programs to strengthen the social cohesion as well as economic development, specifically in developing countries.

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APPENDIX A

Date	Country	Disaster	Fatalities	Economic Costs
2012/Mar.20	Mexico, Oaxaca	Earthquake (Magnitude: 7.4 M_w) (Depth: 20 km)	2	N/A
2012/ Feb.29 Mar.2	United States, Illinois; Indiana; Kentucky	Tornado, EF4 (Wind Speed: 267-322 km/h)	56	$1-2 B
2012/Feb.6	Philippines, Off the coast of Negros Oriental	Undersea Earthquake (Magnitude: 6.7 M_w) (Depth: 11 km)	105	$1 B
2011/Dec.13-19	Philippines	Tropical Storm Washi	1286	$48.4 M
2011/Oct.23	Turkey, Van	Earthquake (Magnitude: 7.1 M_w) (Depth: 16 km)	604	$0.5-1 B
2011/Sept.18	India-Nepal Border Region	Earthquake (Magnitude: 6.9 M_w) (Depth: 19.7 km)	111	$19.95 B
2011/Sept.13	Pakistan	Flood	434	N/A
2011/Sept.5	Somalia	Drought, famine, May kill 750,000	N/A	N/A
2011/Aug.27-28	United States, Virginia; N.J.; N.Y.	Hurricane Irene Category 3 (SSHS) (Wind Speed: 178-208 km/h)	47	$7 B
2011/June	China	Floods caused by heavy rains	239	$6.65 B
2011/May23	United States, Missouri, Joplin	Tornado Joplin, EF5 (Wind Speed: > 322 km/h)	160	$2.8 B
2011/Apr.25-28	Southern United States, Alabama	Tornado, EF5 (Wind Speed: > 322 km/h)	330	$11 B
2011/Mar.11	Japan	- Earthquake (Magnitude: 9.0 M_w) (Depth: 30 km) - Tsunami - Nuclear accidents, radiation releases	18,400	$309 B

Date	Country	Disaster	Fatalities	Economic Costs
2011/Feb.21	New Zealand, Christchurch	Earthquake (Magnitude: 6.1 M_w) (Depth: 5.9 km)	185	$20 B
2011/Jan26 Feb.3	Australia, Queensland	Tropical Cyclone Yasi Category 4 (SSHS) (Wind Speed: 209-251 km/h)	1	$3.6 B
2010/Dec. 2011/Jan.	Australia, Queensland	Flood	35	$30 B
2010/Oct.25	Indonesia, Sumatra	Earthquake (Magnitude: 7.7 M_w) (Depth: 20.6 km)	435	$30 M
2010/July	Pakistan	Flood	1985	$7.1 B
2010/Apr.20 July15	Gulf of Mexico	Deepwater Horizon Oil Spill	11	$30 B
2010/Apr.14-20	Iceland	Volcanic eruptions; Extensive disruption of air travel	N/A	N/A
2010/Apr.13	China, Qinghai, Yushu	Earthquake (Magnitude: 6.9 M_w) (Depth: 17 km)	2,698	$4.7 B
2010/Apr.5	Brazil, Rio de Janeiro	Flood	249	$13.3 B
2010/Feb.27	Chile, Maule	Earthquake (Magnitude: 8.8 M_w) (Depth: 35 km)	525	$15-30 B
2010/Jan.12	Haiti, Port-au-Prince	Earthquake (Magnitude: 7.0 M_w) (Depth: 13 km)	316,000	$7.8 B
2009/Sept.30	Indonesia, Sumatra	Earthquake (Magnitude: 7.6 M_w) (Depth: 81 km)	1115	$625 M
2009/June-Sept.	West Africa	Flood	193	$152 M
2009/Aug.2-11	Taiwan	Typhoon Morakot Category 1 (SSHS) (Wind Speed: 118-153 km/h)	789	$6.2 B

Date	Country	Disaster	Fatalities	Economic Costs
2009/Apr.6	Italy, Abruzzo, L'Aquila	Earthquake (Magnitude: 6.3 M_w) (Depth: 8.8 km)	307	$5.3 B
2009/Feb.7 Mar.14	Australia, Victoria	Bushfires 4500 km^2 area burned	173	$4.5 B
2008/Nov.	Brazil, Santa Catarina	Flood	128	N/A
2008/Nov.7	Haiti, Petionville	School collapse	97	N/A
2008/Oct.29	Pakistan	Earthquake (Magnitude: 6.4 M_w) (Depth: 15 km)	215	N/A
2008/Sept.8	China, Shanxi	Mud and rock slide at an unlicensed mine	267	N/A
2008/Sept.1-14	United States; Cuba; Haiti	Hurricane Ike Category 4 (SSHS) (Wind Speed: 209-251 km/h)	112; 7; 74	$29.6 B; $7.3 B; N/A
2008/Aug.25 Sept.4	United States; Cuba; Jamaica; Haiti	Hurricane Gustav Category 4 (SSHS) (Wind Speed: 209-251 km/h)	53; 0; 15; 77	$4.3 B; $2.1 B; $210 M; N/A
2008/ Aug.18	India, Bihar	Flood	434	N/A
2008/May.12	China, Sichuan	Earthquake (Magnitude: 7.9 M_w) (Depth: 19 km)	69,195	$146.5 B
2008/Apr.27 May 3	Burma	Cyclone Nargis Category 4 (SSHS) (Wind Speed: 209-251 km/h)	138,366	$10 B
2008/Feb.5-6	Southern United States	Tornado, EF4 (Wind Speed: 267-322 km/h)	57	>$1 B
2007/Nov.11 Nov.16	Bangladesh	Cyclone Sidr Category 5 (SSHS) (Wind Speed: >252 km/h)	~10,000	$1.7 B

Date	Country	Disaster	Fatalities	Economic Costs
2007/Oct.28 Nov.2	Dominican Rep.; Haiti; Jamaica	Hurricane Noel Category 1 (SSHS) (Wind Speed: 118-153 km/h)	223	$580 M
2007/Oct.20 Nov.9	United States, California	Wildfires 2000 km^2area burned	14	N/A
2007/Sept.15-19	China; Japan; Taiwan	Typhoon Morakot Category 4 (SSHS) (Wind Speed: 209-251 km/h)	20	$1.3 B
2007/Sept.14-17	14 countries in West, Central and East Africa	Floods	250	N/A
2007/Aug.31 Sept.5	Nicaragua; Venezuela; Honduras; Guatemala	Hurricane Felix Category 5 (SSHS) (Wind Speed: > 252 km/h)	130	$720 M
2007/Aug.13 Aug.23	Haiti; Mexico; Dominican Rep.; Dominica; Jamaica	Hurricane Dean Category 5 (SSHS) (Wind Speed: > 252 km/h)	45	$16.9 B
2007/Aug.15	Peru	Earthquake (Magnitude: 8.0 M_w) (Depth: 39 km)	519	$539 M
2007/July.3 Aug.15	India; Bangladesh; Pakistan; Afghanistan	Hurricane Gustav Category 4 (SSHS) (Wind Speed: 209-251 km/h)	2051; 1230; 526; 296	$840 M;
2007/ Aug.1	United States, Minnesota	Mississippi Bridge Collapse	13	N/A
2007/June1 July25	United Kingdom	Flood	14	$8.5 B
2007/June21-26	Pakistan; India; Afghanistan	Cyclone Yemyin Tropical Storm (SSHS) (Wind Speed: 63-117 km/h)	983	$2.1 B

Date	Country	Disaster	Fatalities	Economic Costs
2007/June1-7	Oman; U.A.E.; Iran; Pakistan	Cyclone Gonu Category 5 (SSHS) (Wind Speed: > 252 km/h)	78	$4.4 B
2007/Mar.6	Indonesia, Sumatra	Earthquake (Magnitude: 6.4 M_w) (Depth: 19 km)	68	$160 M
2007/Feb.2 Feb.12	Indonesia, Jakarta	Flood	54	$400 M
2006/Nov.25 Dec.5	Philippines; Vietnam; Thailand; Malaysia	Typhoon Durian Category 4 (SSHS) (Wind Speed: 209-251 km/h)	1,497	$13.5 B
2006/Aug.4-11	China; Philippines; Taiwan	Typhoon Saomai Category 5 (SSHS) (Wind Speed: > 252 km/h)	458	$2.5 B
2006/July17	Indonesia, Java	- Earthquake (Magnitude: 7.7 M_w) (Depth: 34 km) - Tsunami	659	N/A
2006/May26	Indonesia, Java	Earthquake (Magnitude: 6.3 M_w) (Depth: 10 km)	5,782	$3.1 B
2006/Feb.17	Philippines, Southern Leyte	Mudslide	1,126	N/A
2006/Jan.28	Poland	Katowice Trade Hall roof collapse	65	N/A
2006/Jan.5	Saudi Arabia, Mecca	Hostel collapse	76	N/A
2005/Oct.8	Pakistan, Azad Kashmir, Muzaffarabad	Earthquake (Magnitude: 7.6 M_w) (Depth: 26 km)	74,500	$5.4 B
2005/Oct.1-5	Guatemala; El Salvador; Mexico	Hurricane Stan Category 1 (SSHS) (Wind Speed: 118-153 km/h)	1,513; 69; 36	$1 B; $355 M; $2.5 B

Date	Country	Disaster	Fatalities	Economic Costs
2005/Sept.18-28	United States, Texas; Florida; Louisiana; Mississippi	Hurricane Rita Category 5 (SSHS) (Wind Speed: > 252 km/h)	120	$12 B
2005/Aug.23-30	United States, Louisiana; Mississippi; Florida;	Hurricane Katrina Category 5 (SSHS) (Wind Speed: > 252 km/h)	1833	$108 B
2005/Aug.24	Romania	Flood	79	$1.3 B
2005/July.26	India, Mumbai	Flood	1094	$690 M
2005/June23	China	Flood	567	$2.77 B
2005/Mar.28	Indonesia, Sumatra, Nias	Earthquake (Magnitude: 8.6 M_w) (Depth: 30 km)	1,346	N/A
2005/Feb.22	Iran, Kerman, Zarand	Earthquake (Magnitude: 6.4 M_w) (Depth: 14 km)	625	$80 M
2004/Dec.26	Indonesia; Sri Lanka; India; Thailand; Maldives	- Earthquake (Magnitude: 9.1 M_w) (Depth: 30 km) - Tsunami	275,950	>$15 B
2004/Sept.13-28	Haiti; United States, Florida; Dominican Rep.	Hurricane Jeane Category 3 (SSHS) (Wind Speed: 178-208 km/h)	3006; 291; 18	$7 B
2004/May18-25	Haiti	Flood	2,000	N/A
2004/Feb.24	Morocco	Earthquake (Magnitude: 6.4 M_w) (Depth: 10 km)	628	N/A
2003/Dec.26	Iran, Kerman, Bam	Earthquake (Magnitude: 6.6 M_w) (Depth: 69.2 km)	26,271	$1 B
2003/Oct.25	United States, California	Wildfires 1,134 km^2area burned	15	N/A
2003/Sept.25	Japan, Hokkaido	Earthquake (Magnitude: 8.3 M_w) (Depth: 27 km)	1	N/A

Date	Country	Disaster	Fatalities	Economic Costs
2003/Sept.6-20	United States	Hurricane Isabel Category 5 (SSHS) (Wind Speed: > 252 km/h)	51	$3.6 B
2003/June-Aug	Western Europe	Heat Wave	40,000	N/A
2003/May21	Algeria	Earthquake (Magnitude: 6.8 M_w) (Depth: 10 km)	2,266	$1.3 B
2003/Apr.30 Mar.2	United States, Missouri; Tennessee	Tornado, EF4 (Wind Speed: 267-322 km/h)	48	$952 M
2003/Apr.28	Argentina	Flood	24	$1 B
2002/Nov. 2003/July	Worldwide	Pandemic (SARS)	916	N/A
2002/Sept.20	Russia, North Ossetia	Avalanche and Mudflow	125	N/A
2002/Aug.22 Sept.1	South Korea	Typhoon Rusa Category 4 (SSHS) (Wind Speed: 209-251 km/h)	113	$6 B
2002/Aug.	Germany; Czech Republic; Austria; Italy	Flood	58	$15-20 B
2002/June22	Iran, Qazvin, Bou'in-Zahra	Earthquake (Magnitude: 6.5 M_w) (Depth: 10 km)	261	$225 M
2002/Mar.25	Afghanistan, Hindu Kush	Earthquake (Magnitude: 6.1 M_w) (Depth: 8 km)	1,000	N/A
2002/Mar.3	Afghanistan, Hindu Kush	Earthquake (Magnitude: 7.4 M_w) (Depth: 225 km)	150	N/A
2002/Jan.17	Congo, Goma	Mount Nyiragongo, Volcanic eruption	147	N/A
2001/Nov.10	Algeria, Algiers	Flood	800	$350 M

Date	Country	Disaster	Fatalities	Economic Costs
2001/Sept.11	United States, New York City	Aircraft hijacking, suicide attack; Collapse of World Trade Center, Partial collapse of Pentagon	2,996	$2 T
2001/June23	Peru	Earthquake (Magnitude: 8.4 M_w) (Depth: 33 km)	138	N/A
2001/May.24	Jerusalem, Talpoit	Collapse of Versailles wedding hall	23	N/A
2001/Mar.4	Portugal, Lisbon	Bridge Collapse	59	N/A
2001/Jan.26	India, Gujarat	Earthquake (Magnitude: 7.7 M_w) (Depth: 16 km)	20,005	$2.6 B
2001/Jan.13	El Salvador, San Miguel	Earthquake (Magnitude: 7.6 M_w) (Depth: 60 km)	944	$2.6 B
2000/Dec.16	United States, Alabama	Tornado, EF4 (Wind Speed: 267-322 km/h)	12	$35 M
2000/Dec.1	China, Guangdong	Mall collapse	11	N/A
2000/Sept.25 Oct.6	Central America, Belize; Mexico	Hurricane Keith Category 4 (SSHS) (Wind Speed: 209-251 km/h)	40	$319 M
2000/Sept.-Dec.	Europe	Flood	20	$2 B
2000/June4	Indonesia, Sumatra	Earthquake (Magnitude: 7.9 M_w) (Depth: 33 km)	103	N/A

Table A-1 Summary of the Twenty-first Century's Disasters (June 2000 – March 2012)

- Economic costs given in terms of USD of the consequent year
- SSHS – Saffir–Simpson Hurricane Scale
- EF – Enhanced Fujita Scale