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Education for Sustainable Development as Strategy for Climate Change Adaptation and Mitigation: A Literature Review

DONNA LOU E. NERI
donnaevasco@yahoo.com
University College Sedaya International
Kuala Lumpur, Malaysia

Abstract - The World Health Organization (2003) stated that there is growing evidence that changes in the global climate will have profound effects on the well-being of citizens in countries throughout the world. The "business as usual" frame of mind in dealing with this phenomenon is no longer feasible. Rather, there is a great need for a "sense of urgency" to empower and actively involve every individual to adapt and to mitigate the worsening of climate change. A great number of studies show that the leadership of the educational system in developed countries for more than 2 decades has been successful in promoting environmental sustainability. Some of these studies are reviewed and documented in this paper so that vulnerable countries may learn and benchmark from their experiences.

Keywords - Education, sustainable development, climate change

INTRODUCTION

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change might result from natural factors and processes or from human activities. The term "climate change" is often used interchangeably with the term global warming. Global warming refers to an average increase in the temperature of the atmosphere near the Earth's surface, which can contribute to changes in global climate patterns. However, rising temperatures are just one aspect of climate change (US EPA, 2010).

Climate change is real. One can easily see and feel its impact all around the globe. For instance, flooding is becoming a more common occurrence. Birds are nesting earlier, animals are moving territories, the duration and range of seasons is changing. Every day, the reporting on climate change highlights the risks and alerts people to measures they can take to both mitigate and adapt. Some countries have a choice of media, a choice of funding and a choice of strategies to cope with climate change. However, other countries are less fortunate. For the vast majority of people, the impact of climate change means an increased risk of losing their homes and livelihoods, more disease, less security and sometimes death. Children in the world's poorest communities are the most vulnerable. They are already seeing the impacts of climate change through malnutrition, disease, poverty, inequality and increasing risk of conflict – and ultimately an increase in child mortality rates. According to the World Health Organization (WHO, 2008), it will be the young and the poor in developing countries that will suffer the earliest and the hardest.

Another fact is that climate change is a global issue. Hence, addressing it is a shared responsibility. CARE International (2009) reported that the world's poorest countries and the most vulnerable people will bear the brunt of climate change. Failure to act will render the environments of millions of children and their families even more hazardous. Many poor people already live in fragile climates, where food and clean water are scarce and shelter inadequate – climate change will exacerbate this fragility. The children – particularly those in Africa and Asia – are already facing a future in which it appears likely that

disasters will increase in number and become more intense, where economic growth will falter and incomes fall, where disease outbreaks will be more frequent, clean water and good sanitation harder to secure, and habitats and communities less stable (Confalonieri, et al., 2007).

Moreover, many developing countries have poor infrastructure and lack the technologies that could help them cope with a changing climate, such as flood defences and early warning systems. Thus, they are more vulnerable to the impact of climate change and their children are the most vulnerable of all. The potential impact on children has been a critical missing element from the debate about climate change. While there is a growing body of literature on the links between climate change and vulnerability, particularly in relation to the impact of natural disasters, research and advocacy activity on climate change and children specifically is less developed (UNICEF for UK Committee, 2008).

The examples of the currently unfolding environmental and human impacts of climate change outlined above are striking enough. However, projections of future climate change suggest that the worse is yet to come. The Intergovernmental Panel for Climate Change (IPCC, 2008) scenarios indicate that a warming of 2–3 degrees across the globe is likely within the next 50 years – largely the result of greenhouse gases already in the Earth's atmosphere. Thereafter, levels of potential warming are likely to be significantly influenced by the levels of greenhouse gas over the coming years. Such scenarios predict rising sea levels to threaten large cities in Africa and the densely populated river deltas of the Ganges and Mekong. More so, the glacier melting is likely to disrupt water supplies in Asia and Latin America.

In the 2006 United States Climate Action Report, it was stated that health impacts will be disproportionately greater in vulnerable populations. Globally, people at greatest risk include the very young, the elderly, and the medically infirm. Low-income countries and areas where undernutrition is widespread, education is poor, and infrastructures are weak will have the most difficulty adapting to climate change and related health hazards.

FRAMEWORK

In answer to this pressing need to adapt, the United Nations Framework Convention on Climate Change (UNFCCC, 2007) proposed that more can be done to limit human contributions to further climate change. More can also be done to support the poorest and most vulnerable to cope with the likely increase in global temperature and its effects. The likely impacts of climate change compel each individual to act, both to minimize the projected increase in global temperature and to build the resilience of nations and communities to withstand its effects.

One very significant strategy is to mainstream climate change-related lessons in education from pre-school to tertiary level of education (Selby, 2008 and Namsouk, 2008). A concrete example of this is the United States' "Climate Change Education Program" headed by the National Science Foundation (NSF). The vision of the Climate Change Education (CCE) program is a society that can effectively weigh the scientific evidence as it confronts the challenges ahead, while developing an innovative scientific and technical workforce that can advance the knowledge of human-climate interactions and develop solutions for a sustainable, prosperous future. To achieve this vision, the NSF supports activities to develop more effective models and resources for formal and informal climate change education and training that integrate interdisciplinary climate research and current understanding of how people learn. NSF also supports efforts to establish or enhance mechanisms that help to disseminate, scale-up, or increase utilization of effective practices for climate change education.

Protecting human health is the "bottom line" of climate change strategies. Climate change can no longer be considered simply an environmental or developmental issue. More importantly, it puts at risk the protection and improvement of human health and well-being. A greater appreciation of the human health dimensions of climate change is necessary for both the development of effective policy and the mobilization of public engagement.

Strengthening of public health services needs to be a central component of adaptation to climate change. The international health

community already has a wealth of experience in protecting people from climate-sensitive hazards, and proven, cost-effective health interventions are already available to counter the most urgent of these. Broadening the coverage of available interventions would greatly improve health now. Coupled with forward planning, it would also reduce vulnerability to climate changes as they unfold in the future (WHO, 2008).

Some degree of future climate change will occur regardless of future greenhouse gas emissions. Adapting to or coping with climate change will therefore become necessary in certain regions and for certain socioeconomic and environmental systems. The need for adaptation may be increased by growing populations in areas vulnerable to extreme events. However, according to the IPCC, "adaptation alone is not expected to cope with all the projected effects of climate change, and especially not over the long term as most impacts increase in magnitude"(UNDP, 2008).

Hence, education is now considered a vital means of reducing vulnerability and increasing adaptive capacity to climate change. A vast majority of studies and literature already talked about strategies to combat climate change health impacts through legislative and technical programmes. However, there is a dearth of data venturing on utilizing education as an effective strategy for empowering every individual to cope with and prevent potential health effects of climate change (Selby, 2008; Namsuk, 2008).

It is in this light that this study is conducted. This research will try to look into the possibility of tapping the educational system, from the pre-school to the basic education, to the secondary and tertiary levels, as well as post-graduate and graduate studies, in the capacity-building to combat the ill-effects of climate change.

OBJECTIVES OF THE STUDY

This paper explored the various educational strategies on climate change adaptation and mitigation from the pre-school up to the graduate school. In particular, this described the experiences, as well as, the best practices on environmental education and education for sustainable development among educational institutions in developed countries.

MATERIALS AND METHODS

This study utilized the descriptive-analytic research design aided by content analysis of the reviewed literature. Educational strategies related to combating climate change, whether adaptation or mitigation strategies, are documented in this paper. Both online and printed literatures were explored and organized. Data gathered were then analyzed according to the different themes identified.

RESULTS AND DISCUSSION

Environmental Education (EE) versus Education Sustainable Development (ESD)

The world movement for environmental education (EE) first started in the early 1960's after several experiences of environmental problems. Ten years later (1972), during the United Nations Conference on the Human Environment in Stockholm, governments of member countries issued a declaration. The declaration highlighted that education in environmental matters, for the younger generation as well as adults, is essential for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension (as cited by Venkataraman, 2008).

In 1975, 3 years after the declaration, the United Nations held an International Workshop on Environmental Education in Belgrade. Its culminating document, called the Belgrade Charter, contained the global framework for EE, asserting that it is an *active process which will ultimately lead to a society that has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.*

For 20 years after the Stockholm Conference, EE programs developed slowly due to the lack of teachers and professors trained in ecology and multidisciplinary teaching styles. Fortunately, at present, there is already an explosion in EE programs. While EE programs initially focused on environmental cleanup and good waste management practices, schools, colleges and universities are beginning to embrace elements of EE with increasing numbers, emphasizing environmentalism as a core principle of their education.

In United Kingdom, for example, the national curriculum for primary and secondary levels includes education for sustainable development. In India, organizations such as the Indian Environmental Society are actively involved in establishing public and school EE programs and a National Green Corps. In the United States, the Environmental Protection Agency's Office of Environmental Education and organizations like the National Environmental Education Foundation have accelerated curriculum development and professional development for teachers. As a result, primary, secondary, and higher education have been increasing efforts to integrate environmental topics across curricula and as real-world applications of scientific principles.

However, in 2002, the United Nations promoted another framework called Education for Sustainable Development (ESD). It further declared 2005-2014 as the Decade for Education for Sustainable Development (ESD) and highlighted the difference between EE and ESD. As defined, **EE** is a well-established discipline focusing on *humankind's relationship with the natural environment and on ways to conserved and preserve it and properly steward its resources*. **ESD,** on the other hand, *encompasses EE but sets it in a broader context of socio-cultural factors and the socio-political issues of equity, poverty, democracy, and quality of life*.

According to the United Nations, ESD equally addresses all three pillars of sustainable development- society, environment, and economy- with culture as an essential additional and underlying dimension. By embracing these elements in a holistic and integrated manner, ESD enables individuals to fully develop the knowledge, perspectives, values, and skills necessary to take part in decisions to improve the quality of life. The question now facing the educational community is how can ESD be translated into practice so that it can be effective in transforming society to a more sustainable future?

The UNESCO (United Nations Educational, Scientific and Cultural Organization) in 2006 pointed out that the traditional educational structure acts as an obstacle to ESD. They argued that sustainability is not just another issue to be added to an over-crowded curriculum. Instead, sustainability must be viewed as a gateway to a different view of curriculum, of pedagogy, of organizational change, of policy and particularly of ethos. At the same time, the effect of patterns of un-

sustainability on the current and future prospects is so pressing that the response of higher education should not be predicated only on the integration of sustainability into higher education because this invites a limited, adaptive response. According to Venkataraman (2009), people needed to see the relationship the other way around- that is, the necessary transformation of higher education towards the integrative and more whole state implied by a systemic view of sustainability in education and society.

The problem on nature-deficit disorder and videophilia among children

Author and child psychologist, Richard Louv (2005) was the first to coin the term and to diagnose America's children as having "nature-deficit disorder". The term refers to a child's alienation from the natural environment. Louv was not alone in this assessment. In 2006, Pergams and Zaradic added the concept of "videophilia", which is defined as the human tendency to focus on sedentary activities involving electronic media (entertainment options such as television, video games and the internet). This was concurred by many educators who have witnessed firsthand the difference between children nowadays and children 30 years ago (Bartels, 2008; Stevenson 2010; Lougheed, 2008; and Blum, 2008).

According to these authors, not long ago, kids commonly spent after-school hours and summer vacations playing carefree in the woods, fields, hills and water. Today, however, most children are busy with electronic games and demanding schedules of structured activities. Per observation, this circumstance is not only happening in the Americas and Europe, but all around the globe. Even in developing and poor countries, this is a common everyday scenario, for as long as people can afford to have televisions, video games and the internet. Thus, there is a pervasive and fundamental shift away from nature-based recreation. Nature Conservancy chief scientist, Peter Kareiva (as cited in Lougheed, 2008), suggested that this shift could well be the most serious environmental threat facing the world today. If a substantial proportion of the population has little or no direct interaction with pristine natural environments as children, how will that affect their lifelong attitude toward such places? How will they come to regard the value of environmental science or policy?

Kareiva wrote further that the fate of biodiversity and ecosystems depends on political and individual choices. If people never experience nature and have negligible understanding of the services that nature provides, it is unlikely that people will choose a sustainable future. Cornell University psychologists, Wells and Lekies (2006) found out that when children become truly engaged with the natural world at a young age, the experience is likely to stay with them in a powerful way-shaping their subsequent environmental path. Moreover, they noted that the lifelong impact was more profound when the engagement with nature was spontaneous and unstructured, as characterized by the general unpredictability of pursuits such as huntings, fishing, or simply wandering around a forest. Wallace (2008) added that by helping children experience the natural world, they are also moulded as future stewards of the Earth.

Starting young: the children and the environment

There are a number of ways to teach children about nature conservation and to increase their environmental awareness as it relates to home and school. Integrating nature appreciation in the daily school and home activities is a good start (Cline and Leuvan, 2009). Pre-school teachers may simply take the kids outside for a walk in the park, let them play in the stream or appreciate animals in a farm. These kids may also be involved in tree planting and gardening. Any activity done "outside with nature" may do as long as these children appreciated and enjoyed communing with nature (Clarke, 2010; Stevenson, 2010).

Elementary teachers, on the other hand, can show the older children how others have assumed responsibility to claim a role as an environmental advocate. There are many true stories of young heroes who made serious commitments to saving the environment (Lange, 2009; Cole 2009; Slater 2007; Blum 2008; Henderson, 2007). Driven by internal passions, these "earth angels" (children guardians of the earth), "enviropreneurs" (children who raise money for environmental causes), and "green kids" (children who think of new ways to save resources, promote environmental education and innovative applications) are unstoppable in their determination to make a difference in their communities, regions, and in some cases, globally.

Behind many of the "green kids" are teachers who have inspired grades 4-12 students to turn anxiousness about an uncertain future into understanding and finally to transfer knowledge into positive actions than can have small or large scale results. These stories provide actual examples that can be read in class, which demonstrates that environmental stewardship is not just something an adult should be concerned about. In fact, an 11-year old child was quoted saying, "you don't have to be an adult to make a difference!"

From the true stories shared, the kids were able to figure out the need to save the environment, brain-stormed ideas for solutions to the problem, found creative ways to raise money and to increase public awareness on climate change. Environmental issues also offer a good opportunity to begin discussions in science, current events, economics, politics, geography, and research. Freitag (as cited by Blum, 2008), another conservationist, aptly stated that there may be some direct, short term benefit in the money raised or some land saved because children learned to love the environment, but the real payoff may come 50 years later. Investing in kids- introducing them to the beauty of nature- is investing in the people who will be making the decisions about how the environment will look in the future.

A model Middle School

In September 2006, Sidwell's middle school in Washington DC, where the 2 daughters of President Obama are enrolled, received a Platinum rating from the US Green Building Council (USGBC). It is the first K-12 school in the United States to have a LEED Platinum rating and the first LEED Platinum building in the District of Columbia (Goffman, 2009).

Primarily, the building was constructed following the LEED standards. The LEED (Leadership in Energy & Environmental Design) Rating System is a voluntary standards & certification program created in 1993 by the US Green Building Council. It is the industry standard for rating high-performance green buildings. LEED awards credits for green building attributes including strategies for sustainable site development, water savings, energy efficiency, materials selection, & indoor environmental quality. There are four levels of certification; the certified, silver, gold, & platinum.

According to the school head, Sidwell wanted to integrate environmental stewardship into teaching and life, keeping with its Quaker philosophy. The construction of the LEED Platinum Middle School Building has sparked a renewed interest in integrating environmental stewardship into their curriculum. Below are some examples of how the building has impacted what goes on in and out of the classroom.

SIDWELL FRIENDS SCHOOL
Environmental Sustainability Student Activities

1. Middle School Student Advisory Projects - During the 2007-2008 academic year, several advisories explored how Sidwell Friends treats its stormwater run-off, how drinking water is treated, and where the trash goes.
2. DC Environmental Inventory - For the past several years, 8th graders have worked to find out how healthy Washington, DC's environment is. Students interviewed scientists, regulators, and enforcers, visited city facilities, took photographs, and wrote up their research.
3. AP Environmental Science - Students conduct labs including comparing water quality in the on-campus biology pond to water in a nearby tributary, studying the invertebrate biodiversity in the soil on the green roof, and comparing stormwater runoff from the green roof with runoff from the conventional roof.
4. 8th Grade Environmental Science - Students participate in labs in which they measure and compare nitrogen and phosphorus levels in various levels of the wetland and in the basement holding tank, and learn the valuable role that wetlands play in purifying water.
5. 8th Grade English - Students engage in reading, writing and thinking about a variety of environmental texts which have sparked communal social action and make connections between the building's systems and the world outside the building.
6. Middle School Environmental Challenges invite students to reduce their carbon footprint. Several challenges are posted

each trimester and students of all ages are encouraged to participate. At the end of the year, the pounds of carbon saved are calculated.

7. Green Housekeeping - The goal of the housekeeping program is to maintain a healthy learning environment. The focus is on cleaning for health, not just appearance. All contracted cleaning staff receive training on green cleaning prior to and during their employment. They use energy-efficient equipment with less environmental impact—low moisture processes, quieter operation, higher filtration, and lower emissions. Their cleaning service provider uses Green Seal Certified cleaning products, 100% recycled paper towels and tissues.
8. Recycling allows them to reduce the burdens on the environment as a result of both solid waste disposal and the extraction of the natural raw materials. They recycle mixed paper, cardboard, cans, glass, and type 1 (PETE) and 2 (HDPE) plastics.
9. Additionally, they use a solar-powered trash compactor on their Wisconsin Avenue campus that operates on 100% solar energy. While its footprint is the same as an ordinary trash receptacle, its capacity is five times greater. This increased capacity reduces collection trips and can cut fuel use and greenhouse gas emissions.
10. Green Food Service - Sidwell Friends' commitment to environmental stewardship extends to their cafeterias. The food service provider is dedicated to reducing food waste and selecting regional vendors as much as possible to reduce the impact of long distance deliveries on natural resources and promote food safety and integrity.

Figure 1. Examples of school-related environmental sustainability activities.

Sidwell Friends School has become a model institution which schools around the world can emulate. It just illustrated how an academic institution may teach and involve children in sustaining the environment, at the same time ensuring their future. Even at young

ages, the way children and young people view the environment, and themselves in relation to it, will play a vital role in fighting climate change.

Towards "cool" colleges and universities

All across North America, colleges and universities are taking steps to green their campuses (Chiras, 2010). Green is not a new color in college campuses. For the past 2 decades, many colleges and universities have started environmental sustainability initiatives such as recycling waste and other measures to reduce their impact on the environment.

Today's green movement is much deeper and greener, aimed at creating a sustainable future. Over 600 colleges in the United States have joined the Campus Climate Challenge which was started to reduce their contribution to global warming. They are buying renewable energy and implementing energy-efficiency measures that lower their carbon emissions as part of their university policy. They are also building new classrooms and other facilities to much higher, more energy-efficient standards using green building materials-often thanks to student insistence (Hattam, 2007; Underwood, 2007; Whittelsey, 2009).

So, although the United States government did not ratify the Kyoto Protocol, most of its citizens, through colleges and universities have taken big steps toward saving the environment. Noteworthy to mention is its annual search for top 10 "Cool Schools" which started in 2007 (Hartog, 2008). The top schools earned points in ten categories, namely; policies for building, energy, food, investment, procurement, and transportation, curriculum, environmental activism, waste management, and overall commitment to sustainability. A perfect score in every area would give a school 100 points.

The Eco League schools prided themselves on integrating experiential learning into the curriculum - from backpacking trips to analyses of "leave no trace" ethics and how education can affect avalanche safety. They are also actively pursuing environmental studies, of which a great number of scholarships are offered. College of the Atlantic has started paying to offset all its greenhouse-gas emissions. Green Mountain College now gets more than half its

electricity from generators powered by methane from dairy cow waste. The Northland College students voted to tax themselves $20 per semester to fund clean-energy projects (ecoleague.org).

Also in a league of their own are the 10 University of California campuses. With 220,000 students and 170,000 faculty and staff, the UC system has the ecological footprint of a large city. Efforts to reduce that footprint one campus at a time mean the system now leads the higher education pack in making big green changes. At UC Berkeley, for example, campus dining options are 65 percent vegetarian, reducing the use of resource-intensive meat-based meals. (Pound for pound, more energy, water, and land go into producing meat than vegetables.) Harvests from UC Davis' olive trees that once left oil slicks on bike paths have been put to better use in a line of award-winning olive oils. Meanwhile, UC Santa Cruz has offset 100 percent of its carbon dioxide emissions since, and four of UCLA's high-rise dorms now have solar-powered water heaters. Farther south, UC San Diego generates 7.4 megawatts of its electricity (10 to 15 percent of its total energy) using renewable sources including methane-powered fuel cells, solar, and wind (universityofcalifornia.edu).

Another environmental-friendly action is the development of "ECO-DORMS". Schools around the globe have taken to greening campus housing with innovations such as renewable energy, recycled building materials, and composting facilities. In 2008, 318 students at California's Pitter College moved into a new residence hall that has rooftop gardens, solar panels, and low-flow showers and toilets. Most building materials, including lumber and metal, came from within 200 miles of the campus. At Kentucky's Berea College, 50 to 100 students live in the Ecovillage, a group of apartments and learning facilities built around a perm culture food forest (where food grows among trees instead of on a cleared swath of land), vegetable gardens, and a wastewater-recycling system.

UNIVERSITY OF COLORADO- BOULDER
Environmental Policy

Purpose:

In keeping with its mission, CU-Boulder is committed to providing an educational model for fiscally sound, environmentally responsible stewardship of the campus and its resources. The institution intends to maintain its reputation as a proactive leader in the environmental sciences and campus sustainability. The campus values choices and decisions that reduce the environmental impacts of its actions. Compliance with the law is required. Environmental education and participation in campus environmental programs are encouraged.

Policy Statement:

CU-Boulder strives to proactively manage how it impacts the environment, while responsibly managing the resources provided to the campus. As a leader in environmental issues, UCB's policy is to be responsible in protecting the environment and natural resources. We are committed to:

- Complying with sound environmental practices, including the commitment to meet or exceed applicable legal and other requirements.
- Properly managing wastes and pollution.
- Managing our processes, our materials and our people in a way that considers the environmental impacts associated with our actions.
- Striving for continual improvement in our environmental management system.

Date: August 18, 2004
Approved by: Richard L. Byyny, Chancellor
Author: Director of Environmental Health & Safety

Figure 2. Sample of a university environmental sustainability policy.

In 2000, the University of Colorado (CU) became the first U.S. university to buy renewable energy credits. Today the mile-high school supports local offset projects. CU does more than buy its way out of carbon guilt, however. The Buffaloes have also made strides in reducing emissions produced in the first place. Eighty percent of students commuted car free since 2007. Another highlight is on transportation wherein the tuition covers city bus passes and loaner bikes. Most campus shuttles, or Buff Buses, run on biodiesel.

Implications to Education

The United Nations recognizes education as a tool for addressing human development, health care, environmental sustainability, human values and human rights issues. Anghay and Japos (2009) concluded in their study on Worldwide Patterns of Education across Human Development Indicators that education is a major component of well-being and is used to measure economic development and quality of life. Given this vital role in global development, it is very important to explore the implications of education in reducing vulnerability to climate change impacts.

Based on the literature, management of the impacts of climate change should be two-pronged: adaptation and mitigation. However, many scientists recommended that adaptation should be prioritized first, but must go hand in hand with mitigation measures (Bo, 2010). Both require political will and technological know-how. Therefore, whatever actions will be planned in the educational system for the management of impacts of climate change, they should be enforced from top management up to the bottom. If there is no political support by the educational leaders, these plans may be bound to fail.

Prior to planning, a review of existing adaptive mechanisms is necessary. The adaptation plan is intended to increase the resilience or the capacity to cope with current and future climate change. Adaptation may be anticipatory or reactive, the former being preventive and the latter spontaneous. Hence, for a comprehensive plan, it may be important to develop both anticipatory and reactive adaptation plans.

According to Lacanilao (2009), there is hardly anything the people can do to prevent climate change, but people can increase chances of survival through a paradigm shift in education and research. It

means, a "transition from a crisis/symptom mode to a prevention/cure mode" of problem solving. Moreover, Lucido (2009) emphasized that education must now take a radical turn. Education must no longer be confined to teaching the basic and specialized disciplines, but it has to integrate values and lifestyle changes among all its stakeholders. It must not relate only to personal and professional development, but it has to relate as to how people should live to make their present and future sustainable. This is what encompasses Education for Sustainable Development (ESD).

ESD was already endorsed at the highest political levels during the World Summit in 2002. The landmark declaration at Johannesburg states that sustainable development is built on 3 interdependent and mutually reinforcing pillars. These are economic development, social development and environmental protection, which must be established at the local, national, regional and global levels.

Given the established relationship among socio-economic, health and environment in this study, it may be imperative to shift from the traditional education framework and adopt the ESD framework. As aptly expressed by Lucido (2009), only a visionary approach to education, like ESD, can reorient mankind to better understand their present roles in addressing the complex and interdependent problems that threatened the future.

ESD seeks to empower people to assume responsibility for creating a sustainable future. The goal of UNESCO, being the lead agency for ESD, is to integrate the principles, values, and practices of sustainable development into all aspects of education and training.

As a catalytic process for social change, ESD seeks to foster- through education, training, and public awareness- the values, behaviour and lifestyles required for a sustainable future. This means that ESD involves learning how to make decisions that balance and integrate the long term future of the economy/ natural environment/ peoples' wellbeing now and in the future. As a visionary approach, ESD seeks to help people to better understand the world in which they live, and to face the future with hope and confidence.

In particular, ESD established linkages across poverty alleviation, human rights, peace and security, cultural diversity, biodiversity, food security, clean water and sanitation, renewable energy, preservation of

the environment and sustainable use of natural resources. Foremost, t view seeks a better quality of life for everyone now and for the generations to come (ESD Primer).

Given this framework for "meaningful learning", educational systems around the world may opt to start necessary transformations towards achieving environmental sustainability. Only after this shift of pedagogy, of curriculum, of organizational structure, of policy and of ethos, will "meaningful learning" may occur.

This important shift must happen immediately, no matter how difficult it will be. Cruz (as cited by Bo, 2010), emphasized the need to act and be decisive as "inaction now will be costlier and indecision now will mean harder decisions in the future".

CONCLUSIONS

Data revealed that many educational institutions (low, middle, and tertiary schools) in highly developed countries such as the USA and European countries have started their "GO GREEN" campaigns for a decade or more. Their environmental sustainability initiatives are reflected in the institutions' policies, programs and student activities in and out of the classroom. Led by the school administrators, faculty, personnel and students have been actively involved in these environmental initiatives. Clearly, they have been successful in arousing the interests of the stakeholders in loving and caring for the environment.

From the experiences of these educational institutions in developed countries, it can be deduced that the educational sector at any level (international, regional, national, and local) is an excellent avenue for the promotion of environmental sustainability among its stakeholders and even to others. The Education for Sustainability Development (ESD) framework promoted by UNESCO may be an appropriate means to the urgent need of paradigm shift and the integration of environmental sustainability in the educational system.

RECOMMENDATIONS

Based on the conclusions, the following are recommended:

1. Heads/managers of the educational sector must lead in the fight against climate change. A "pro-active" stance must be initiated more than a "reactive" stance. The ESD model of the UNESCO may be the guiding framework of the educational institutions in initiating steps towards a sustainable future. The educational institutions' plan (short-term or long-term) for environmental sustainability must be reflected in the school or university policies and may even be integrated in the vision, mission, goals, and objectives (VMGOs) for better grounding. These policies will then be the basis for the integration of ecology lessons/ activities in and out of the classroom. Aside from curriculum and instruction integration, related activities on exposure and risk reduction as well as development of coping capacity may also be integrated in student services and curriculum extension. Integration of environmental education may start from the earliest time a child enters school (preschool) up to graduate school. The earlier a child understands the relationship between man and environment, the better.
2. Both teaching and non-teaching personnel must undergo seminars and trainings related to environmental sustainability and climate change issues to better understand the problem and to facilitate change. The transformation process may not be as easy as it seems, therefore, advocacy and capability building are very essential. These education personnel have vital roles to influence both the students and community members.
3. School facilities (canteens, dorms, farms, gardens, etc.) and teaching laboratories may be renovated following the standards of energy and environment conservation, that is, if the school can afford. However, these standards for energy and environment conservation may be utilized for building of future teaching facilities.
4. Research is another significant area for the implementation of the environmental sustainability plan. First, the research unit of the school or university must adopt an ecology-friendly agenda

or must prioritized climate change issues in the research agenda. Secondly, research findings related to the environment should then be disseminated to the community and to the concern groups to facilitate utilization of research findings.

5. The academic institutions must partner, work hand in hand and collaborate with the local and national government in the fight for climate change. It is also essential to build partnership across sectors (civil society, media, business and industry, tourism, etc.). The educational sector has the potential to influence political leaders through lobbying in policy-making and decision-making regarding environmental issues.

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