# Sustainable Development and Role of Civil Engineers: Bangladesh & Global Perspectives

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## List of Abbreviations

ABET	 Accreditation Board of Engineering and Technology		
ASCE	 The American Society of Civil Engineers		
BUET	 Bangladesh University of Engineering Technology		
CUET	 Chittagong University of Engineering Technology		
EC	 Engineering Council		
EIA's	 Environmental Impact Assessments		
ESD	 Education for Sustainable Development		
IEE's	 Initial Environmental Examinations		
IPCC	 Intergovernmental Panel on Climate Change		
KUET	 Khulna University of Engineering Technology		
LCA	 Life Cycle Assessment		
NSDS	 The National Sustainable Development Strategy		
RUET	 Rajshahi University of Engineering Technology		
SD	 Sustainable Development		
SDG	 Sustainable Development Goal		
SEA	 Strategic Environmental Assessment		
SUST	 Shahjalal University of Science & Technology		
UN	 United Nations		
UNCSD	 United Nations Conference on Sustainable Development		
UNDP	 United Nations Development Program		
WCED	 World Commission on Environment and Development		

### Abstract

Sustainable development refers to economic and social development without causing any adverse effect on environment, both now and in future and this is increasingly a key operator at a range of organizational and spatial scales. Civil engineers have a role in directing greatest natural resources to offer best living standard for mankind, comprising economic specifications relative to technological change perspectives which implies to eco-industrial development. But yet engineers are struggling with ethical

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dilemmas posed by conflicts of economic requirements with environmental sustainability. Engineering students need to be equipped with wider horizon of concepts in terms of social, economic and ecological attributes for decision making of sensitive sustainability issues; hence necessity of Education for Sustainable Development (ESD) arises. Though Engineering Universities in Bangladesh like BUET, CUET, KUET, RUET, and SUST etc are arranging seminars and workshops on sustainable development regularly and also providing academic courses, still there are many limitations and challenges in this field. As this is a global issue, more studies and research on this subject are necessary. This secondary research paper has tried to make a clear understanding of sustainable development and roles of civil engineers to ensure it. Besides, challenges and opportunities of higher education in this field are also discussed in the context of Bangladesh and global perspectives.

Key Terms: Sustainable development; technological change; education for sustainable development.

# Objectives

The objective of the study is to improve the understanding of Sustainable Development and the various related concepts. The study also highlights the emergence of Education for Sustainable Development (ESD) with national and global perspective.

# **Research Methodology**

This study has been conducted based on secondary data. Necessary data has been collected from a large number of Books, Journals, Online Lectures and database of various Government and Nongovernment Institutions along with International Organizations. The collected data has been compared and analyzed qualitatively and also discussed with experts of relevant field.

# **Introduction & Definitions**

'Sustainability' is a very open discussed topic at present, especially, when we talk about development. Development refers to improvement in standards of life and sustainability refers to long time stability of development without any negative effect. As Sustainable Development (SD) has very wide range of coverage area along with various different aspects and dimensions it has been defined in different ways. The most commonly used and very famous definition is given by United Nation "Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987).

The American Society of Civil Engineers (ASCE) defines SD as "the process of applying natural, human, and economic resources to enhance the safety, welfare, and quality of life for all of society while maintaining the availability of the remaining natural resources" (ASCE, 2012).

A deep understanding of the definition given by ASCE indicates that a multi-dimensional approach from engineering, economic and social perspectives is required to achieve sustainable development, which is challenging to achieve (Davis and Cornwell, 2013).

Sustainable development refers to long time existence of development. It is a continuous process. It requires proper guidelines of social, environmental and economic changes to promote improvement of living condition at present as well as at future. For these changes to be ensured, it requires an intelligent and efficient economic system which does not ignore limitation of environmental resources while set a plan for development. It is a globally discussed and adopted policy by various institutions working for future development of the world.

The development strategies of societies has been changed time to time, but the basic targets of development are always same or very little different. Environmental declination in recent decades and severe resource limitation pose an urgent necessity to give extra care to environmental aspects in planning and designing of infrastructural development and other development activities which can cause threat to environment.

The modern world of 21<sup>st</sup> century can be characterized by lives highly enriched with technological advancement, but still it is not free from various problems like poverty, social discrimination, economic instability etc. So, none of economy or social development can be underestimated while giving priority to environmental resilience. The global challenge of sustainable development lies in complex interdependencies of environment, social and economic development. (Elliott, 2015)

# **Objectives of Sustainable Development**

The basic objective of sustainable development is to ensure continuous improvement of life standards of human being without causing any bad effect on environment and to ensure a healthy and livable world for the future generations. This basic objective is subdivided into some critical objectives by World Commission on Environment and Development (WCED) as given in the following table.

**Table 1:** Critical objectives and necessary conditions for sustainable

#### development (WCED, 1987) **Critical objectives of sustainable developments:**

- Revive and change the quality of growth
- Meet essential needs for jobs, food, energy, water and sanitation
- > Ensure a sustainable level of population
- Conserve and enhance the resource base
- Reorient technology and manage risk

Merge environment and economics in decision-making

The World Conservation Union defined SD as "to improve the quality of life while living within the carrying capacity of ecosystems".

In the extensive discussion and use of the sustainability concepts there has generally been recognition of three aspects of sustainable development: economic, environmental and social aspects (Holmberg, 1992).

**Economic**: Economic aspects of sustainable developments are – ability of continuous production of materials and services to maintain smooth economic growth. Sectoral imbalance should be avoided and agricultural and industrial productions should be increased to meet increasing demand of rapidly growing population.

**Environmental**: Main environmental aspect is to preserve natural resources and biodiversity. Extreme use of non renewable resources should be discouraged and investment in alternative energy sources should be encouraged to maintain a standard resource level for future. Besides, steps should be taken for preservation of biodiversity and ecological balance.

**Social**: Equity in every level of social life with provision of social services including health, education, gender equity, political participation and other social facilities should be accessible for people living in the society.

# **Dimensions of Sustainable Development**

The achievement of objectives of sustainable development is multidimensional. Many studies have shown different dimensions to direct institutions and organizations concerned to social and economic development. Four basic dimensions of sustainable development are set by a global framework of sustainability studies. These four dimensions are-

 Table 2: Basic Dimensions of Sustainable Development (UN, 2013)

# **Dimensions of Sustainable Development:**

- Development for every country.
- Social Inclusion and Human Rights.
- Convergence of global living standards.
- Shared responsibilities and opportunities.

For effective implementation the dimensions of SD should be more self explanatory and globally adopted. The leadership council of Sustainable Development Solution Network (SDSN) of United Nation has identified ten specific dimensions of SD. Each of these dimensions is strongly interconnected and has intense relation with the four basic dimensions mentioned previously (UN, 2013).

**End extreme poverty:** Poverty is the most concerning challenge in the path of sustainability. A collapsed economy tends to reduce quality of management of resources as well as social life facilities. Poverty induces

severe problems like hunger, child labor, and malnutrition and food scarcity, ending of which are necessary on urgent basis.

**Development within planetary boundaries**: a sustainable production and consumption patterns along with stabilization of global population are necessary to ensure development without resource degradation.

**Ensure education for all**: As education is a basic need of human being, access of quality education must be provided to every child both male and female to prepare them to take challenges of modern lifestyle and livelihoods.

**Gender equity and inclusive society**: Ending gender discrimination, racism, social conflicts, and political instability are vital necessity for a sustainable society. Besides it demands rules of law, human rights, equal access to public services, elimination of violence and explosions etc.

**Ensure health care for all:** Every citizen should get primary health services including reproductive health care and proper medical support without suffering any financial hardship. Health care should be provided at every stage of life while extra care should be provided to children, mothers and olds.

**Upgrade agriculture and improve rural life:** Increase food production exponentially to cope with rapidly growing population. Upgrade traditional agricultural practices with modern technological tools to improve quality of agricultural production, livestock, fisheries and small business related to farming. Develop rural infrastructures, reduce environmental impacts, and ensure resilience of climate change.

**Empower productive, inclusive and resilient cities**: Planning of cities and communities should be concerned with social inclusiveness, economic productivity and environmental sustainability. No development in cities should be conflictive with climate change. Participation of citizens in development activities and advanced supportive systems by city authorities to help systematic urbanization can be useful.

**Minimize human-induced climate change:** By a systematic control over emission of green house gases from industrial processes, energy combustions and other productive systems. The world leaders have signed many agreements in recent years to reduce  $CO_2$  emission by 2020.

Secure ecosystem services and biodiversity: For sustainable development to ensure resilient and adaptive biodiversity, marine and terrestrial ecosystems of local and global interest are very important. Water and other natural resources are managed and distributed in effective and sustainable ways.

**Transparent governance**: A transparent, accountable and participatory governance system to provide access of information to citizens, encouraging public business and other sectors to participate in social improvement and an administrative system without corruption.

The universal rules and regulations governing international trade and finance, corporate investments, technological changes and intellectual properties are consistent with achievement of Sustainable Development Goals (SDG).

 Table 3: Requirements for Pursuit of Sustainable Development (WCED,

## 1987)

According to WCED pursuit of sustainable development requires:

# Pursuit of Sustainable Development:

- A political system that ensure effective participation of citizens in decision making
- An economic system that provide solutions to minimize disharmony in development.
- A production system that meet demands of economy without degrading ecology.
- A technological system that strengthen sustainable trade and finance structure.
- An administrative system that is flexible and self corrective.
- An international system to globalize sustainability approaches.

A well structured framework including global rights and responsibilities are required to set a global financing system to reduce poverty and strengthen climate base not to degrade under changed situations raised due to changes in technological approaches of development activities.

Addressing these sustainability challenges at local, regional, national and global scales is mandatory to ensure the privileges of sustainability in every country and every region along with every human being. Civil societies, governments, business sectors and other organizations can pursue a plausible basis for framing SDGs to find practical solutions to the conflicts arise.

# Sustainable Development and Civil Engineering Contribution of Civil Engineers

From the very beginning of engineering history, civil engineers played important role to develop the society. They contributed devotedly to exponential improvement of living standards from ancient societies to ultra modern lives of 21<sup>st</sup> century. Ancient Roman viaducts represent engineering of that age while tallest and intelligent buildings of these century represent the most comfortable and high quality living. Digging small canal to structures like Hoover Dam indicates technological changes in engineering.

Civil engineers have undeniable contributions and impacts on society and nation as well as to the world. However, development processes created some severe problems to be concerned of. Excessive use of land for rapid urbanization, extensive energy use for industrial processes, pollution and damage of natural waterways for dams are degrading biodiversity and ecosystem which is a threat to the availability of resources for future generations.

Civil engineers need to find out alternate solutions to do more developments with less resource use, less energy consumption and minimum waste generation.

As civil engineers have dealt with challenges of society and overcome every hurdles in past, sustainable development is another challenge that they have opportunity to address.

The engineers' role is to be the manager of sustainability to see that technological applications incorporate sustainable development concepts (Wright, 1996).

The Engineering Council has defined the role of professional engineers in sustainability using the following six principles.

**Table 4:** Roles of Civil Engineers in Sustainability (Engineering Council,

#### 2009)

# **Roles of Civil Engineers in Sustainability:**

- > Build a sustainable society for present and future.
- > Do more than just comply with legislation and codes.
- ➤ Use resources efficiently and effectively.
- Seek multiple options to solve sustainability challenges.
- Manage risk to minimize adverse impact on people or environment
- Apply professional and responsible judgment and take a leadership role.

Summit of ASCE steering committee on "Future of The Civil Engineering" mentioned that civil engineers will be mostly responsible for the future global development and preservation of environment and biodiversity. They will have to play key role to SD not only as technological experts, but also as legislative supports and as prime motivators of policy making both at national and international level. The summit also produced a series of visions for civil engineers in a discussion of what will be their role in the world of 2025.

**Table 5**: Master role Civil Engineers for the world of 2025 (ASCE, 2006)

# Master role Civil Engineers for the world of 2025

- Planning, designing, construction and maintenance of social economy.
- > Keeping balance of environment and natural resources.
- > Innovation and integration of ideas technologies.
- > Management of risk and uncertainty caused by natural incidents.
- > Decision making of environmental and infrastructural policy.

As the world is changing rapidly Civil Engineers need to develop new skills, collaborate with other professionals and promote multidisciplinary approaches in their work. They need to conduct research on developing new tools and technologies to reduce the distance between various development aspects. They will have to provide the tools and advice to governments and policymakers at national, regional and global levels on the required skills and infrastructure for a sustainable future.

# Sustainability Challenges Concerned to Civil Engineers

Sustainability is not attainable very easily. There are many challenges to face. As key player of sustainable development, civil engineers have to overcome many critical situations posed from natural events and increasing demands of human being which are interactive in nature and are affecting as well as threatening the existence of our planet Earth.

Most important challenges to be faced by civil engineers in the path of sustainability are-

**Population growth**: The world population in 2007 was estimated at 6.7 billion with an annual growth rate of about 1.2 percent. To put the recent growth in perspective, the world population in the year 1900 was only 1.6 billion and in 1960 it was 3.0 billion. UN projected the world population in 2050 to be more than 9 billion (UN, 2011). A recent study shows that, every year population is being increased by about 1.6 million in developed countries while the number is about 80 million in developing countries. Thus an alarming truth is that population increment rate is higher at the places where rapid growth cannot be afforded. Excessive population is increasing consumption of natural resources very rapidly and creating an overloaded situation to the self refill system of natural resources.

**Urbanization:** Population growth coupled with urbanization results in significant impacts on the environment and other problems. Following table shows how rapid urbanization causes environmental declination and creates threats to sustainability of development.

Negative impacts of Rapid Urbanization:					
$\mathbf{\Lambda}$	Increased ambient temperature	$\boldsymbol{\lambda}$	Altered weather patterns		
$\triangleright$	Decreased air quality	$\triangleright$	Loss of natural beauty		
$\triangleright$	Increased water run-off	$\triangleright$	Farmland reduction and food		
$\triangleright$	Decreased quality of runoff		shortage		
	water	$\triangleright$	Deforestation		

**Table 6**: Negative impacts of Rapid Urbanization (Subramanian, 2007)

In addition, population growth and urbanization pose significant challenges for water resources management throughout the world. Consumption of food, energy and goods by urban population are much more compared to rural populations.

*Energy use and global warming:* Greenhouse effect is increasing due to human activity causing global warming. Over one-third of human induced greenhouse gases come from the burning of fossil fuel for generation of electricity. All fossil fuels are made up of hydrocarbons and they release carbon dioxide when burned. Intergovernmental Panel on Climate Change (IPCC) of the United Nations predicts some severe natural declination by the end of 21<sup>st</sup> century due to climate change:

- Rise in temperature probably from 1.8°C to 4°C and a possibly from 1.1°C to 6.4°C.
- ▶ Rise in sea level probably from 28 43 cm.
- Extinction of summer sea ice.
- Increase in heat waves.
- Increase in tropical storm intensity.

*Water scarcity*: The worlds both the ground and surface water is being used at a faster rate than it is being replenished. Water demand is doubling in every 21 years. Water tables are falling (caused by excessive pumping and leading to permanent damage to aquifers). Water scarcity leads to limits on irrigation which leads to limits on food production. If annual per capita supply of renewable freshwater of a country become less than 1,000  $m^3$  than that country is considered to be water scarce. So, proper and systematic management of water is a grave challenge for sustainability.

*Waste management*: Waste management refers to a series of activities -collection, transportation, processing and recycling or disposal of waste materials to earth. With increase in population waste generation is also increasing rapidly. Unprotected waste degradation causes serious natural pollution, nuisance and health hazards. In the future, every country will have to give importance to energy and waste management in order to have sustainability.

The awareness of the importance of sustainable development is growing in the world. Engineers will still be called upon to design, construct and manage complexity of demands through simple or complex systems. To achieve sustainable development, professional practice in engineering needs to have a wider scope than the development of elegant solutions to narrowly specified technical problems.

While working for SD, several challenges arises which demands more involvement and contributions by Civil Engineers.

 Table 7: Challenges to Civil engineers while working for SD (Ratnayake, 2008)

2008)

# Challenges to Civil Engineers while working for SD

- Reduce adverse impacts of development on environmental and society.
- > Improve environmental performance of development.
- > Improve contribution to improvement of life standard.
- Motivate and establish a sustainable lifestyle in society
- Ensure quality products and services to be competitive in the market place.

To overcome these challenges ability to work with the many other disciplines involved are necessary along with innovation, creativity and other traditional engineering skills.

It also requires change in the view of the world, and willingness to adopt new ways of working and revised lifestyle. Thinking about the negative and positive impacts of their activities in future is also required. Before implementation of a project it needs much more planning. Every material used and every process employed, has to be considered in the approach-conservation of resource, energy and water, enhancement of the environment and living standard of the community, reduction of pollution , waste generation and transportation etc.

# **Tools of Civil Engineers for Sustainable Development**

As users of large amounts of natural resources, water and energy in their work, Civil Engineers can make a significant difference to the way things are happening with conscious effort. Several Tools have been developed to assess and mitigate the impacts of human actions on the environment.

*Environmental impact assessment*: Initial Environmental Examinations (IEE's) for proposed projects are used to ensure that projects are planned, designed, and implemented in such a way that they will not exert any adverse impacts on environment. Conducting these environmental assessments at an early stage in the project cycle known as feasibility study stage, provides an opportunity for the engineers to look at alternative ways of doing things to avoid or minimize the probable negative environmental and social impacts, thus making it sustainable.

*Strategic environmental assessment*: Strategic Environmental Assessment (SEA) is another tool that is being used by Environmental Regulatory Authorities to help in informed decision making to guide development activities towards sustainability. SEA is carried out for policies, programs and plans before individual projects are identified or implemented. This assessment is done at an early stage when it is flexible to assess the projects sensitivity to environment, need for protection, availability and

constraints of resource, infrastructure, investment, external influences and threats etc. Proper investigation at every stage and analysis of investigation reports along with implementation of necessary actions are very urgent to make the project sustainable.

# Technological Change and Green Building Approach

New building materials and technologies are being developed but their life cycle impact on the environment is often unclear. Some manufacturers are providing life cycle assessments for their products, to provide choices for builders and consumers. The sustainability of buildings, therefore, requires more than a simple focus on energy consumption over the lifespan of the building.

- Defining suitable areas for development including inner cities and marginal lands.
- Defining urban population strategies to manage density and overall city population.
- > Providing effective infrastructure of long life span.
- Defining requirements for developers to meet urban and architectural design standards take cultural and social concerns into account.
- Facilitating the use, reuse and recycling of local materials rather than imported materials.
- Working with local building material.
- Building maintenance organizations should see environmental consciousness as a factor of competitiveness.
- > Adapted tools to help in decision-making should be developed.
- > The building process itself should be improved.

Many tools needed to assist planners; builders and consumers in achieving sustainable buildings are now being developed. Geographical Information Systems are proving to be valuable planning tools to define, map and manage local regions, including sensitive ecosystems, land uses, soil types, urban densities, watersheds and infrastructure. They can also be used to map potential future scenarios, derived from modeling changes to factors such as ecosystems, land use and water consumption, thus providing planners with an understanding of the local limitations to growth and, therefore, to planning. Life Cycle Assessment (LCA) is being used to further identify the life cycle impacts of buildings.

Green building is an outcome of a design philosophy which focuses on increasing the efficiency of resource use — energy, water and materials, while reducing building impacts on human health and the environment during the entire lifecycle of the building. It can be achieved through advanced planning, design, construction, operation, maintenance, and waste removal. Effective green building can lead to-

- Reduction of operating costs and resource usage.
- > Enhancement of productivity and livability.
- > Improvement of public and resident health.

Designers using the green building concept often seek to achieve not only ecological but aesthetic harmony between a structure and its surrounding natural and built environment, although the appearance and style of sustainable buildings is not necessarily distinguishable from their less sustainable counterparts.

# Sustainability and Bangladesh

# Background

Bangladesh is a rapidly developing country but still one of the world's least developed countries. The living condition of the country can be characterized by increased population density, illiteracy, unemployment, child mortality, socio-communal unrest and many more problems. Feeding the rapidly increasing population and support their livelihood in a sustainable manner is a massive challenge. The continuing pressure of urbanization is reducing cultivable lands and creating pressures on the government and the entire economic set up. The traditional agricultural systems have failed to provide sufficient support to national economy. Although, for more than half of the country's entire population agriculture is the main source of livelihood, this sector has arguably failed to create ground for sustainable development. Besides, agriculture has been constantly facing pressures due to its dependence on weather and typical vulnerability to natural hazards in Bangladesh. Another challenge to national economy is increasing numbers of landless populations caused by river erosions. (Hassan and Forhad, 2013)

# **Economic Growth**

For more than a decade Bangladesh has maintained an average of about 6 percent annual economic growth rate. This is a great achievement even after facing natural disasters, globally increasing food price, and global economic recession. This growth indicates the resilience of the economy, good economic management and existence of favorable external factors. Sustained economic growth has helped fast reduction of poverty. 48.9 percent of total population was below poverty line in 2000 which is reduced to 31.5 percent in 2010. It implies an average annual poverty reduction rate of 4.3 percent. Along with economic growth improvement in social indicators has also been achieved such as education for all, health and nutrition, and improved housing and sanitation. However, the process of continuous progress are facing fundamental challenges like- attain macroeconomic stability, increase energy supply, uplifting investment rate, removing financial stagnancy, increasing competitiveness of the economy and achieving sustainability of development.

# The National Sustainable Development Strategy

The National Sustainable Development Strategy (NSDS) has developed strategies to squarely meet the challenges of economic, social and environmental sustainability of the economy. The vision of the NSDS has been set consulting extensively with the experts and stakeholders as "achieving a happy, prosperous and ethically enlightened Bangladesh free from poverty, hunger, gender discrimination, social inequality, illiteracy and corruption which completely belongs to its citizens and also maintains a healthy environment". 2010-2021 has been set as the implementation period of the NSDS with the hope that by 2021, the country will be introduced as sustainably developed (NSDS, 2013). Key objectives and identified strategic priority areas to facilitate through the NSDS for sustainable development of Bangladesh by 2021 are given below:

Accelerated economic growth: To ensure higher quality of life which is a key development strategy of NSDS has accelerated growth of economy. It will also contribute to reduce poverty, unemployment and will assist to build a middle economy, transform the economy and also will be able to take care of environmental sustainability.

*Identification and implementation of priority sectors*: Agricultural improvement, industrial prosperity, energy use reduction, development of transportation system and human resource, population planning, quality education and training, health and sanitation services, improved nutrition and food safety will be considered as priority areas to implement NSDS.

**Urban sustainability**: Along with the economic development of the country rapid urbanization is inevitable, SD of the country depends in many ways on sustainability of urban development. Key issues for sustainability of urban development are-urban housing, management of urban slums, water supply and sanitation, pollution reduction, transport facilities and urban risk reduction.

*Social safety and rights*: Social security is a basic right of human being. For ensuring SD all citizens should be provided minimum shelters, access to services and utilities, social safety, women's and children's advancement and rights, special cares and facilities for aged and disables, extended employment opportunities and smooth access to information and communication technology.

*Managing natural resources and disaster*: Providing protection from natural disasters for humans, ecosystems and natural resources is a primary objective of NSDS along with management of water resources, biodiversity, forestry, land and soil resources, coastal and marine resource etc. *Good governance*: A good governance system refers to an effective parliamentary system, people's involvement in decision making, efficient public service delivery, sound law and order, independent and transparent legal and judicial system, effective local governance, and a corruption-free society with social justice and peaceful living.

**Institutional framework:** A well structured institutional framework will be developed to implement the strategies of national sustainable development. Current programs will be adjusted and new projects or programs will be initiated by concerned ministries or the authorized organizations and their agencies.

Bangladesh has shown commitment to pursue sustainable development in recent years and still committed to establish and maintain sustained economic growth, social equality and inclusiveness, human rights and dignity, a healthy environment and a sound base of natural resource. However, the country needs financial vibrancy, technology transfer, capacity enhancement support and consistency in defined activities to overcome its resource limitations and to move fast towards the goal of sustainable development.

# **Education for Sustainable Development**

# Introduction and Necessity

Sustainable development is a process by which today's environmental resources need to be used and managed with care, so that they remain available to future generations. Consistent with this trend, education for sustainable development (ESD) can be defined as an educational process characterized by approaches and methods aimed at fostering awareness about the issues pertaining sustainable development.

Educating future engineers can have the greatest positive impact on sustainability and green design. The introduction of green design concepts into civil engineering programs is very necessary to help a civil engineer understand and practice sustainable and green design is also crucial for enabling civil engineers to educate the public on these issues. Engineering curricula can incorporate specific courses and supplement or modify traditional engineering courses with sustainable practices and the courses can be both quantitative and qualitative in nature. (Bilec, Ries and Matthews, 2007)

The key to self-reliant and sustainable development is the education that all members of society can reach and new technologies and approaches are integrated to provide genuine and lifelong learning for all.

Sustainable development should be widely discussed in academic curriculum to-

> Assist the learners to understand why sustainability is in their interest.

- Use appropriate pedagogies for active engagement with issues
- Help learners gain plural perspectives
- > Encourage learners to think beyond formal education.

# Higher Education in SD: Opportunity and Challenges

The higher education sector has not been indifferent to the many international developments seen in the field of sustainable development over past two decades. Rather, it has engaged to a considerable extent. Many universities and colleges across the world have critically analyzed and substantially reduced the environmental impact of their operations.

Many have engaged on new learning paradigms, using systems thinking (Habron, Goralnik and Thorp, 2012).

Many universities of all over the world are providing higher education in sustainable development among which many are offering scholarships for meritorious students. A learner can achieve a higher degree in sustainable development or any degree relevant to it and can get the opportunity to build an excellent career as a leader of sustainable development.

ASCE and universities play a key role in educating new civil engineers. If ASCE emphasizes sustainable and green design principles through its role in ABET, then accredited programs will need to follow its lead. Independent of ASCE and ABET, universities have their own opportunities to shape civil engineers, who can help educate the public on sustainability and green design.

Advancement in a career as a sustainable planning leader will require a Bachelor or higher degree in a related field including Environmental Science, Natural Resource Management, Toxicology, or Environmental Policy. Most coordinators obtain a higher degree in Conservation, Sustainable Development, or Environment and Resources all with an emphasis or an additional certification on Energy Analysis and Policy. Sustainability consultants should become familiar and well rounded in business, planning, development, and environmental work while obtaining these degrees.

Engineering Universities in Bangladesh like BUET, CUET, KUET, RUET and SUST etc. are arranging seminars and workshops on sustainable development regularly and also providing academic courses on sustainable development. But still there are many limitations and challenges in this field. As this is a global issue, more studies and research on this subject should be conducted.

There are numerous careers closely related to sustainable development including a Pollution Prevention and Control Officer, Environmental Consultant, Environmental Health and Safety Officer, Environmental Policy Analyst, Environmental Compliance Officer, and Environmental Risk Management Specialist. Besides every engineer holding any position is directly or indirectly responsible for national and global perspectives of sustainable development.

# Conclusion

Sustainable development has been shown to be consistent with adopting a systems approach to resolving real-world problems and capable of being addressed with wide-scale engineering difficulties. Engineering education is so momentous and should be spiritedly pursued, to fully exploit the available possibilities for promoting sustainable development. It is one thing to have an enabling environment and it is another to maximize the opportunities.

The current emphasis to sustainable development as a whole and education for sustainable development at universities in particular, cannot be regarded as sufficient. Therefore, further action is needed. Young engineers should be equipped with knowledge of sustainable development and take responsibilities to the long lasting betterment of the world. As being the engineer of people, civil engineers have to play the leadership role to build a sustainable nation as well as a world sustainably developed.

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