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# ENVIRONMENTAL DEVELOPMENT & SUSTAINABILITY: TECHNOLOGY & MANAGEMENT

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***Abstract:*** *Most of the people all over the world today have an immediate and intuitive sense of the urgent need to build a sustainable future. Environmental engineering is the branch of bioengineering and sustainable engineering that is concerned with protecting people from the effects of adverse environmental effects, such as pollution, and improving and safe environmental quality. Environmental bioengineers work to improve recycling, waste disposal, public health, and water and air pollution control. Environmental health bioengineering can be considered as sanitary bioengineering brought to meet the needs of the future of the World. Sanitary bioengineering is essentially disease-oriented: it may be defined as the use of bioengineering principles and bioengineering devices for public health purposes. Environmental health bioengineering is the application of bioengineering fundaments to the control, modification or adaptation of the physical, chemical or biological characteristics of the environment in the interest of the health, comfort and social activities of people. It requires the control (quantity and quality) of the basic necessities and waste by-products, whether solid, liquidor gaseous. These by-products, if uncontrolled and allowed to accumulate, lead to widespread disease and physical damage, and could literally make human existence impossible. The fundamental concept of sustainable development is depending on the social, the economic and the environmental dimensions. For development to be sustainable, all the 3 dimensions need to be addressed in a balanced and integrated way, to reach present and future needs. Education for sustainable development is an emerging but dynamic concepts that encompass a newvision of education that seeks to empower people of all ages to assume responsibility for creating a sustainable future. Today, the prospects for future health depend to an increasing extent on the processes of globalisation and on the emergence of global environmental changes occurring in response to the great weight of humankind'seconomic activity. The globalization of trade, travel and culture is likely to have both positive and negative impacts on health. Increased trade in services and products harmful to health and the environment, travel and mass migration of people constitute additional global threats to health. A healthy population is essential for economic development. The modern engineering education should be reformed to include the spheres of economy, science and education. Finally, we have to accelerate progress towards universal health coverage and the sustainable development goals by ensuring equitable access to a skilled and motivated health worker within a performing health system.*

***Keywords:***. *bioengineering, education, environment, health, management, sustainable development, technology*

## INTRODUCTION

We have only one planet, and we are using its resources 50% faster than it can take. So, what about the future of the new and next generations! Future of humanity and the planet depends on successful resolution of the interconnected challenges of economic, social, cultural, and environmental sustainability."
Sustainability is the capacity to endure. In ecology the word describes how biological systems remain diverse and productive over time. For humans it is the potential for long-term maintenance of well-being, which in turn depends on the maintenance of the natural world and natural resources.

Sustainability has become a wide-ranging term that can be applied to almost every facet of life on Earth, from local to a global scale and over various time periods. Long-lived and healthy wetlands and forests are examples of sustainable biological systems. Invisible chemical cycles redistribute water, oxygen, nitrogen and carbon through the world's living and non-living systems, and have sustained lifesince the beginning of time. As the earth's human population has increased, natural ecosystems have declined and changes in the balance of natural cycles has had a negative impact on both humans and other living systems

Sustainable development has gained momentum as a more significant movement over the years. The sustainable development notion is supposed to assemble humankind's development while contemporarily sustaining the natural environment's competence to preserve ecosystems and resources upon which the human economies be contingent. The Sustainable Development Goals (SDGs), as presented in the 2030 Agenda for Sustainable Development, represent a global plan required for all of us to live and grow in a sustainable and prosperous world. The goals are comprehensive, covering development opportunities and challenges relating from water, energy to climate, ecosystems, food, jobs, innovation, health, and poverty (Figure 1).


Figure 1. The main goals of sustainable development

National, regional, and local efforts across all social sectors are required to achieve these 17 goals and 169 targets (United Nations, 2017). Khan and Khan (2012) writes that the "Sustainable Development" modeldescribed in Agenda 21 rests on Social Sustainability, Economic Sustainability, and EnvironmentalSustainability, the three conceptual pillars (Khan and Khan, 2012). The idea of environmental sustainability is all about how the environment tends to be fruitful and resilient for human life. Environmental sustainability is tied to the ecosystem's stability and the natural environment's carrying potential (Brodhag and Talière, 2006). This suggests that it is essential to extract natural resources no faster than it is possible to recover them. Simultaneously, waste should not be generated faster than its absorption in the atmosphere (Haller, 2018). Thatis because, the processes of the earth have borders and constraints. However, the race of uncontrolled growthputs higher demands on the physical system and increasingly burdens these constraints as technological advances may not support exponential growth. There is mounting evidence of concerns about environmental sustainability and poverty (Zhao et al., 2021; Imaz and Sheinbaum, 2017).

**Environmental Sustainability and Development**

- Environmental sustainability is defined as responsible interaction with the environment to avoid depletion or Environment degradation of natural resources and allow for long-term environmental quality.

- The practice of environmental sustainability helps to ensure that the needs of today's population are met without jeopardizing the ability of future generations to meet their needs.
- The three pillars of sustainability are (Figure 2.):

1. Economic development,
2. Social development and
3. Environmental protection.

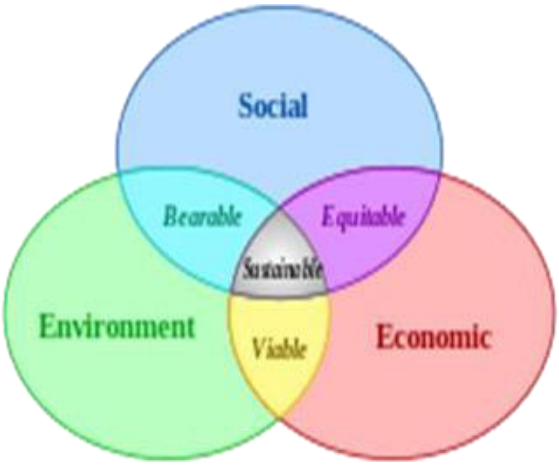


Figure 2. Definitions of sustainability often refer to the "three pillars" of social, environmental and economic sustainability

- The world is facing a serious environmental, social and economic challenge:
  - climate change,
  - environmental pollution,
  - public health as well as the world population increases,
  - pressure on soi,l and
  - increases and the natural capital of soil faces continuing reduces.

- **Environmental Sustainability decided to restructure itself around 7 foci:**
  1. Environmental change issues;
  2. Environmental change assessments;
  3. Environmental Change & Global Sustainability
  4. System dynamics & sustainability;
  5. Sustainability governance & transformation;
  6. Sustainability challenges; and
  7. Sustainability science.

**CONSUMPTION — POPULATION, TECHNOLOGY, RESOURCES**

The overall driver of human impact on Earth systems is the destruction of biophysical resources, and especially, the Earth's ecosystems. The total environmental impact of a community or of humankind as a whole depends both on population and impact per person, which in turn depends in complex ways on what resources are being used, whether or not those resources are renewable, and the scale of the human activity relative to the carrying capacity of the ecosystems involved.
Careful resource management can be applied at many scales, from economic sectors like agriculture, manufacturing and industry, to work organizations, the consumption patterns of households and individuals and to the resource demands of individual goods and services.

One of the initial attempts to express human impact mathematically was developed in the '70s and is called the I PAT formula. This formulation attempts to explain human consumption in terms of three components: population numbers, levels of consumption (which it terms "affluence", although the usage is different), and impact per unit of resource use (which is termed "technology", because this impact depends on the technology used).
The equation is expressed:

$$I = P \times A \times T$$

Where:
I = Environmental impact,
P = Population,
A = Affluence,
T = Technology

- Soil is the basis of the landscape and ecosystem that provides biophysical, economic, cultural and spiritual services to the humanity and to all global biotic factors.

- Food and water securities, climate change limit, ecosystem development, biodiversity protection, energy sustainability, etc. are the main basic elements of global societal challenges and the concept of soil security can be used to provide a useful links between soil and important basic elements in sustainable development.

- A fully functioning soil lies at the centre of solving the issues of food and water securities, biodiversity, climate change and fresh-water regulation and other global environmental problems.
- . So, functioning soil is need for improvement of the ecological and human sustainable developmental ecosystems.
- The most significant threats to soil function at the global scale are soil erosion, loss of soil organic carbon and nutrient imbalance.
- Increasing human demands on soil-derived ecosystem services requires reliable data on global soil resources for sustainable development.
- Finally, it is true that the world that secures its soil will sustain itself.
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***Integrating sustainable development is fully into higher education and research strategies.***

- Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

***Environmental protection and green development is of great importance***

Therefore, this outline lecture attempts to propose an environmentally friendly and sustainable development model that depends on Environmental Socio-economics and Technology.

***KEEPING AN EYE ON HIGHER EDUCATION DEVELOPMENTS WORLDWIDE***

In this regard, we strongly think that a political message that is supposed to enlighten the future should be: Education and, above all, University Education for All (UE4A). And by this we mean Higher Education that is: broadly and proactively **inclusive**; of **good quality; geographically distributed; respectful of difference** (gender, age, culture, religion and civil beliefs). In order to achieve such an ambitious goal, it is of utmost importance that the academic world tackles it soon and as effectively as it can.

**How do higher education institutions contribute to the Sustainable Development Goals (SDGs)?**

- Higher education (HE) plays a key role in achieving the 2030 Development Agenda and related Sustainable Development Goals (SDGs).
- Leaders of universities and other higher education institutions, academic and administrative staff, students and other HE stakeholders are driving the processes towards a more sustainable present and future.
- Environmental sustainability practices in universities can play an important role in helping society form a sustainable future.
- In this study, the roles that universities play in terms of sustainability practices on their campuses.
- The existing research on sustainability practices is to put the environmental sustainability practices in the higher education institutions of the world.
- The term '*sustainability science*' has been employed to refer to a scientific trend, movement or program aimed at studying problems related to human–nature interactions.
- However, since it does not have its own set of principles for knowledge building and lack of a definition of a study object, sustainability science is not a science, at least in the usual sense of the word.
- A study object is the conceptual delimitation of the problems tackled by a science, and therefore, its search in the context of a science of sustainability requires exploring different notions of sustainability.

***The concept of sustainable community is emerging faster than ever.***

Developments of sustainable cities require new action and policies, very often compared with essential benchmarks as sustainability, resilience and smartness.
The formation of a sustainable community in order to preserve the environment promotesthe aspiration to create as much value as possible with as few resources as possible while providing measures and systems for waste management and disposal and recycling, which reduces the consumption of natural resources as a basic postulate of the circular economy.
The availability of energy is directly related to the economic and political stability of each country, while resources such as water and food directly affect human health and quality of life, as well as the realization of basic human rights.
Having in mind the importance that these two areas have, the basic task is to harmonize the human interest to live today (energy) and survive tomorrow (ecology).

- There are some concepts that deal with health and relation between the environment and human life-style:
    1. environmental determinants of health (medical and health geography),
    2. Political ecology of health, and
    3. Social studies of biomedicine.
- For medical and health geography, environmental epigenetics shows the need to treat place and space as more than a setting, and bodies as more than receptors.
- Populations are impacted by environmental physical or chemical factors e.g., toxins, stress, temperature, radiation, etc. with varying degrees, and potential to cause changes in gene expression.
- Many ecological external mechanisms and their effects on human bodies are known through epigenetics.
- It was demonstrated that in addition to classical gene mutations, there is a mechanism, called "epigenetics," refers to a change in the gene expression.
- There is constant interaction between the external and internal environments that is required for normal development and health maintenance as well as for influencing disease load and resistance.

- For example, exposure to pharmaceutical and toxic chemicals, diet, stress, exercise, and other environmental factors are capable of eliciting positive or negative epigenetic modifications with lasting effects on development, metabolism and health.
- These can impact the human body so profoundly as to permanently alter the epigenetic profile of an individual.
- Most of the people all over the world today have an immediate and intuitive sense of the urgent need to build a sustainable future.
- Environmental engineering is the branch of bioengineering that is concerned with protecting people from the effects of adverse environmental effects, such as pollution, and improving environmental quality.
- Environmental bioengineers work to improve recycling, waste disposal, public health, and water and air pollution control.
- Environmental health bioengineering can be considered as sanitary bioengineering brought to meet the needs of the future of the World.
- Sanitary bioengineering is essentially disease-oriented: it may be defined as the use of bioengineering principles and bioengineering devices for public health purposes.
- Environmental health bioengineering is the application of bioengineering fundaments to the control, modification or adaptation of the physical, chemical or biological characteristics of the environment in the interest of the health, comfort and social activities of people.
- It requires the control (quantity and quality) of the basic necessities and waste by-products, whether solid, liquid or gaseous.
- These by-products, if uncontrolled and allowed to accumulate, lead to widespread disease and physical damage, and could literally make human existence impossible.
- The fundamental concept of sustainable development is depending on the social, the economic and the environmental dimensions.
- For development to be sustainable, all the 3 dimensions need to be addressed in a balanced and integrated way, to reach present and future needs.
- Many health problems will continue to be exacerbated by pollution, noise, crowding, inadequate water and sanitation, improper waste disposal, chemical contamination, poisonings and physical hazards associated with the growth of densely populated cities.
- Education for sustainable development is an emerging but dynamic concepts that encompass a new vision of education that seeks to empower people of all ages to assume responsibility for creating a sustainable future.
- Today, the prospects for future health depend to an increasing extent on the processes of globalisation and on the emergence of global environmental changes occurring in response to the great weight of humankind's economic activity.
- The globalization of trade, travel and culture is likely to have both positive and negative impacts on health.
- Increased trade in services and products harmful to health and the environment, travel and mass migration of people constitute additional global threats to health.
- A healthy population is essential for economic development.
- The modern engineering education should be reformed to include the spheres of economy, science and education.
- Sustainable development holds the key not to resolve the problems every nation is facing these days but also for long-lasting effects (Chen, 2021).

**SDG7: Affordable and Clean Energy**

- The recent sixth assessment report of the IPCC warned again of the dangers of climate change.
- We may be able to limit global warming to a maximum of 1.5°C but only if we take big steps now to cut down on greenhouse gas emissions.
- At the same time a third of humanity uses dangerous and unsafe cooking systems and 759 million people have no access to electrical power.
- The UN Sustainable Development Goal 7 (SDG7) 'Affordable and Clean Energy' exists to engage with grand global challenges and facilitate the rapid expansion of modern renewable

energy systems, particularly in heating and transport, and an acceleration of energy efficient technology.

- If we can do both we can help prevent an environmental catastrophe while improving the health and standards of living of hundreds of millions.

## HIGHER EDUCATION AND SOCIAL ECONOMIC DEVELOPMENT

Despite the fact that more equal access to higher education has been an objective public policy for several decades, little is known about the effectiveness of alternative means for achieving such goal. Indeed, nowadays high level of graduate population can be observed both in countries with high and low level of fees, or high and low level of public expenditure in higher education.

### Sustainable Development Research

This is multidisciplinary topic objectives:

- to creating a unified foundation for the Sustainable Development: research, practice and education
- to provide the exchange of ideas around best practice sustainability research in the all global Region.
- to draw links between research, practice, education for sustainability and the needs of industry, and address the sustainable development goals (SDGs).
- Future Universities and Graduate: Quality Education Beyond the Horizon
- Close linkages between the Rectors and the Students is assured through a synergic exchange
- Contribute to the policy dialogue on higher education
- Strengthen the linkages between universities, governments, business and industry, and local communities

Eight keys are important:

- Environmental Sustainability
- Sustainability Education
- Education for Sustainability
- Sustainability in Economic, Social, and Cultural Context
- Sustainable Cities
- Sustainable Buildings
- Sustainable Infrastructure
- Sustainability Policy and Practice

Highlight how institutions explore the local and the global, designing experiences where students apply new learning in diverse contexts—including through nuanced deliberation about the complexity of the real-world issues of our time.

The dialogue will provide models, practices, and resources for

- developing courses, programs, and curricula that put student engagement with real-world issues at the center of the educational experience;
- project-based and signature assignments that advance ethical integrative thinking, teamwork, and community-based research and service;
- assessing global learning, engagement, and social responsibility to ensure that all students leave college prepared to address the issues of our time with knowledge, sensitivity, and commitment to the well-being of others;
- using requirements of the accreditation review process (such as the Quality Enhancement Plan) as opportunities to develop institutional commitment to and strategic planning for global learning;
- preparing faculty for their multiple roles—including teacher, facilitator of difficult dialogues, and mentor—with special attention to issues affecting student well-being, and investing in institutional resources to ensure that students, faculty, and staff receive the support they need.

**Environmental dimension**

Healthy ecosystems provide vital goods and services to humans and other organisms. There are two major ways of reducing negative human impact and enhancing ecosystem services:
1) ***Environmental management***.
This direct approach is based largely on information gained from earth science, environmental science and conservation biology. However, this is management at the end of a long series of indirect causal factors that are initiated by human consumption, so a second approach is through demand management of human resource use.
2 ***Management of human consumption of resources***, an indirect approach based largely on information gained from economics. Herman Daly has suggested three broad criteria for ecological sustainability: renewable resources should provide a sustainable yield (the rate of harvest should not exceed the rate of regeneration); for non-renewable resources there should be equivalent development of renewable substitutes; waste generation should not exceed the assimilative capacity of the environment

## SUSTAINABLE ENERGY, RENEWABLE ENERGY, AND EFFICIENT ENERGY USE

The Sun's energy, stored by plants (primary producers) during photosynthesis, passes through the food chain to other organisms to ultimately power all living processes. Since the industrial revolution the concentrated energy of the Sun stored in fossilized plants as fossil fuels has been a major driver of technology which, in turn, has been the source of both economic and political power.

In 2007 climate scientists of the IPCC concluded that there was at least a 90% probability that atmospheric increase in $CO_2$ was human-induced, mostly as a result of fossil fuel emissions but, to a lesser extent from changes in land use. Stabilizing the world's climate will require high income countries to reduce their emissions by 60-90% over 2006 levels by 2050 which should hold CO levels at 450-650 ppm from current levels of about 380 ppm. Above this level and temperatures could rise by more than 2°C to produce "catastrophic" climate change. Reduction of current $CO_2$ levels must be achieved against a background of global population increase and developing countries aspiring to energy-intensive high consumption Western lifestyles.

Reducing greenhouse emissions, referred to as decarbonization, is being tackled at all scales, ranging from tracking the passage of carbon through the carbon cycle to the commercialization of renewable energy, developing less carbon-hungry technology and transport systems and attempts by individuals to lead carbon neutral lifestyles by monitoring the fossil fuel use embodied in all the goods and services they use.

In the current era of digital age, each nation wants to achieve sustainable development for their future generations. In addition, environmental sustainability is an imperative module to achieve sustainable development.

## CONCLUSION

- Finally, we have to accelerate progress towards universal health coverage and the sustainable development goals by ensuring equitable access to a skilled and motivated health worker within a performing health system.
- There's no way around it. Sustainability is an extremely urgent and universal concern

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