



**HANDOUT #1**

**CE315 ENVIRONMENTAL ENGINEERING**

**Engr. Reynaldo P Ramos, PhD**

**Friday, 1:00-4:00**

**CET07**

**INTRODUCTION**

**Environment:** In general term, it refers to the surrounding conditions that affect living organisms; or it refers to everything that affects an organism during its life time.

In operational term, it refers to the surroundings which relate to day-to-day activities associated with the following aspects: water quality, air quality, waste management, urban development and other issues with global and local impacts. It encapsulates all the 4 dimensions: biophysical, social, economic and political) which define our surroundings.

It also refers to our natural surroundings which have traditionally being described in bio-physical terms. In broader definition, it encompasses the following:

- Ecosystems and their interactive parts
- Natural and physical resources
- Characteristics and qualities of communities, areas and locations which influence the balance, well-being and amenity of society
- The social, economic and cultural dimensions which define and influence the health of all communities, including human settlement.

**Science:** It is an approach to studying the natural world that involves formulating hypotheses and then testing them to see if the hypotheses are supported or refuted.

**Engineering:** Application of science Examples: civil engineering – design of buildings and use machines). According

**Difference between science and engineering**

Traditionally, science and engineering have been seen as resting on fundamentally different philosophies and goals with science underpinning (foundation, support) engineering and providing the basic knowledge and understanding for engineering decisions.

The focus of science is on understanding the nature of things and the causes of their behaviour – its basic question is “Why”. The basic question for engineering is “How”, thus the profession (civil engineers) focuses on providing practical solutions to serve human needs.

Science: discovery (mainly by controlled experimentation); drawing correct conclusion based on good theories and accurate data.

Engineering: Invention, design and production; reaching good decision based on incomplete data and approximate models.

**Ecology:** The study of the relationships between living organisms (biota) and their physical environment (abiota). In its broadest sense, it is the study of organisms as they exist in their natural environment.

**Ecosystem:** It is a region in which the organisms and the physical environment form interacting unit. Within an ecosystem, there is a complex network of interrelationships. For example, weather affects plants; and plants evaporate water which also affects weather.

**Environmental Science:** It is a branch of science that deals with the environment (ecological system/ecosystem). It involves an understanding of scientific principles, economic influences, and political action. It is a mixture of the traditional science, individual and social values, economic factors, and political awareness that are important to solving environmental problems.

**Environmental Engineering:** It deals on the environmental problems, together with its solutions, including effect of technological advances on the environment. This is derived from civil engineering. It is the integration of science and engineering principles to improve the natural environment, to provide healthy water, air, and land for human beings and for other organisms, and remediate pollution sites. Further, it is concerned with findings plausible (reasonable) and realistic solutions in the field of public health, implementing laws which promote adequate sanitation in urban and rural areas. It is also involves of wastewater management, and air pollution control, waste management, industrial hygiene, environmental sustainability, environmental impacts of projects, health issues as well as a knowledge of environmental laws.

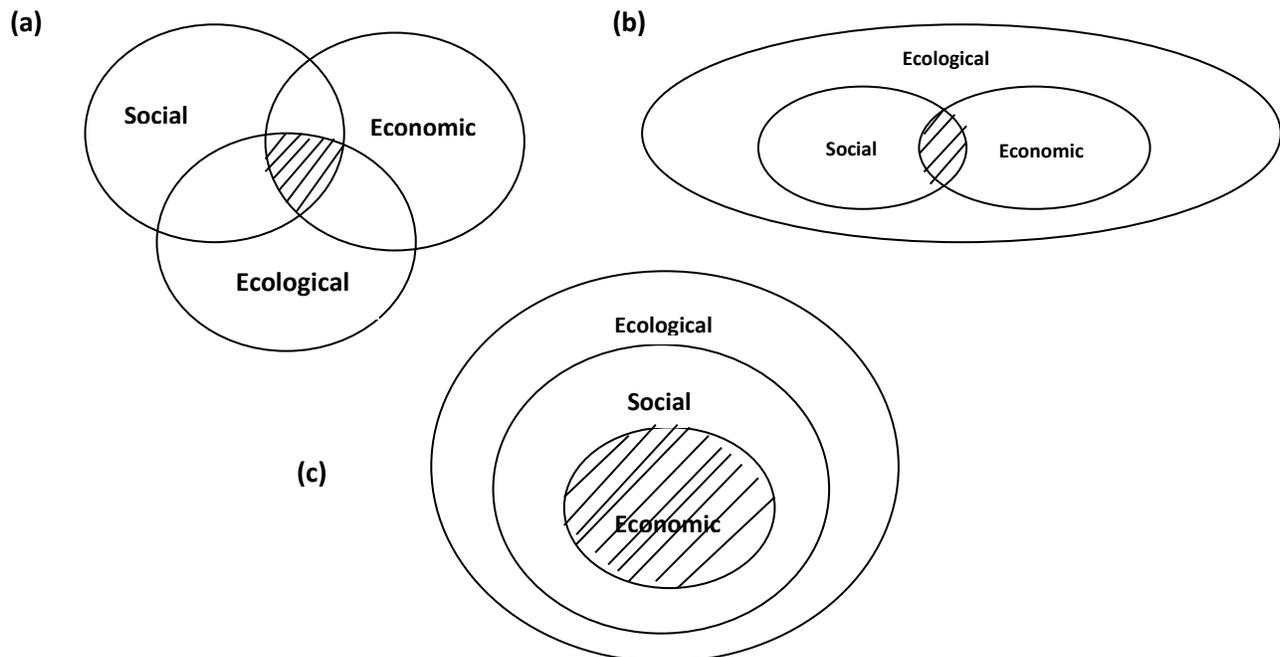
**Environmental Management:** It is the management of activities within tolerable constraints imposed by the environment itself, and full consideration of ecological factors. It covers issues on environmental impact, sustainability, resource and waste management, and control of emissions and pollution.

### **SUSTAINABILITY and SUSTAINABLE DEVELOPMENT**

Engineers and scientists play crucial roles in improving living standards throughout the world. As a result, engineers and scientists can have a significant impact on progress towards sustainable development.

**Sustainability:** It refers to the state at which something (ie economy or human way of life) is able to continue and be sustained undiminished over time (environmentally, socially, etc). It is the ultimate goal or destination.

The domain of sustainability – is the key aspect of the concept is the integration of economic, environmental and social (cultural) factors.



Sustainability is the capacity of the earth's natural systems and human cultural systems to survive, flourish, and adapt to changing environmental conditions into the very long-term future.

The three principles of sustainability: (a) reliance on solar energy (photosynthesis) (b) biodiversity (biological diversity) = variety of organisms, the natural systems in which they exist and interact, and the natural services that these organisms and living systems provide free of charge (renewal of topsoil, air/water purification) (c) chemical cycling (nutrient cycling) such as water cycle, carbon cycle, nitrogen cycle, phosphorous cycle, and sulphur cycle.

**Sustainable development:** It is the path or framework to achieve sustainability.

(From Brundtland Commission Report, 1987 UN World Commission on Environment and Development, *Our Common Future, 1987*; 1992 UN Conference on Environment and Development Earth Summit), Sustainable development is defined as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The concept of sustainable development has been expanded to cover seven key aspects:

- a. Futurity
- b. Inter-generation equality
- c. Participation
- d. The balancing of economic and environmental factors
- e. Environmental capacities
- f. Emphasis on quality as well as quantity
- g. Compatibility with local ecosystems

### **Existing and Emerging Environmental Issues (UN Environment Programme, 2002)**

- a. Globalisation, trade and development
- b. Coping with climate change and variability
- c. Growth of megacities
- d. Human vulnerability to climate change
- e. Freshwater depletion and degradation
- f. Marine and coastal degradation
- g. Population growth
- h. Rising consumption in developing countries
- i. Biodiversity depletion
- j. Biosecurity

### **SUGGESTED READING MATERIALS**

- 1 Davis, M. L. And Masten, S.J. (2004). *Principles of Environmental Engineering and Science*, International Edition, New York: McGraw-Hill Education.
- 2 Enger, E D., and Smith, B F. (2009). *Environmental Science, A Study of Interrelationships*, 11<sup>th</sup> Edition, Philippines: McGraw Hill International Edition (Asia).
- 3 Gagalac-Regis, Emelina, Labra-Espina, and Yacat, Ma Yvaine (2001). *The Pasig River: Caring for a Dying Ecosystem*, Manila: Pasig River Rehabilitation Commission.

- 4 Harding, R (1998). *Environmental Decision-Making*, Australia: The Federation Press.
- 5 Henry, J.G. and Heinke, G.W. (2000). *Environmental Science and Engineering*, Singapore: Pearson Education Asia Pte., Ltd.
- 6 Lee, S J, and Anes, M L. (2010). *Environmental Science – The Economy of Nature and Ecology of Man*, 2<sup>nd</sup> Edition, Philippines: C & E Publishing, Inc.
- 7 Mihelcic, J.R. and Zimmerman, J.B. (2010). *Environmental Engineering Fundamentals, Sustainability, Design*, Singapore: John Wiley & Sons Singapore Pte, Ltd.
- 8 Miller, G.T, Jr and Spoolman, S. (2013). *Principles of Environmental Science*, Singapore: Cengage Learning Asia Pte, Ltd.
- 9 Montgomery, Carla (2000). *Environmental Geology*, 5<sup>th</sup> Edition Update, USA: McGraw-Hill Higher Education.
- 10 Speight, J.G. and Lee S. (2000). *Environmental Technology Handbook*, 2<sup>nd</sup> Edition, USA: Taylor & Francis,
- 11 Vesilind P.A, Morgan, S.M., and Heine, L.G. (2013). *Introduction to Environmental Engineering*, 1<sup>st</sup> Philippine reprint, Singapore: Cengage Learning Asia Pte Ltd.

**INDIVIDUAL ASSIGNMENT #1: Identification of environmental issues and problems faced by your community (barangay – permanent place of residence).**

**DUE ON 22 June 2018 (Friday)**

1. Identify at least three (3) environmental problems/issues currently faced by your community (barangay).
2. Explain the major causes or sources of each problem/issue.
3. Identify the solutions or remedies to solve for each problem/issue.
4. Write your answers in your notebook dedicated for Environmental Engineering subject.

Example Summary Table

Issue/Problem	Cause/Source of the Problem	Solution/Remedy
1.	Explain the main reason why each problem is present in the community	Brief and clear answers to solve each problem. Identify doable and realistic strategies
2.		
3.		