

**SUSTAINABILITY SCIENCE JSXX6012**  
**Sem. 2 20192020**

**MODULE 1:**  
**SUSTAINABILITY, SUSTAINABLE DEVELOPMENT AND METHODOLOGY**

**Topic 1: Introduction to sustainable development: history, concept and knowledge dimension (4hrs)**

The conceptual history of sustainable development is introduced. It begins with the historical background on how this concept emerged which is closely linked to the environmental issues and problems. The evolution of the concepts and its progress will be explained and discussed. To aid understanding, a classification and mapping of the different trends of thought on sustainable development is also presented. The second part is about the knowledge dimension of sustainable development begins with the scientific thinking (epistemology) behind the concept of sustainable development. The response of the scientific community to environmental challenge and complexity is discussed into disciplinary, interdisciplinary and trans-disciplinary responses. Some reflection on pursuing sustainable development to the evolution of policy instrument, the transformation of the environmental scene and the evolution in environmental problems in the past two-decades is presented.

**References**

- Mitcham, C. (1995). The concept of sustainable development: Its origins and ambivalence. *Technology in Society*, 17:311-326.
- Elliot, J.A. (2006). *An Introduction to Sustainable Development*. Routledge Perspectives on Development. 283 p. Routledge, London and New York.
- Hadorn, G.H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffman-Riem, H., Joye, D., Pohl, C., Wiesmann, U., Zemp, E. (2008). The emergence of transdisciplinarity as a form of research. In, *Handbook of Transdisciplinary Research*, G. Hirsch Hadorn et al. (eds.). Springer.
- Sachs, J.D. (2012). From millennium development goals to sustainable development goals. *Lancet*, 379:2206-2211.
- Hezri, A.A. (2016). *The Sustainability Shift. Refashioning Malaysia's Future*. 222 p. Areca Books, Penang, Malaysia

**Topic 2: The structure and development of sustainability science as a discipline (4hrs)**

To understand the complexity of environmental issues and problems for sustainable development a science is needed. Sustainability Science is the science that attempt to seek creative solution to these complex challenges. The origins and development of sustainability science is traced in relation to the need to better understand the problems affecting the sustainability of development and their solutions. In this topic sustainability science will be explained and discussed as a discipline that point the way to a sustainable society and that provides the integrative framework from which inter-linkages between global ecosystems, social systems and economics are examined and rationalizes. This will be explained and discussed in three main points; the emergence of sustainability science, the evolution of sustainability science and the future of sustainability science.

## References

- Redman, C.L., Grove, J.M. and Kuby, L.H. (2004). Integrating social science into the Long-term Ecological Research (LTER) Network: Social dimensions of ecological change and ecological dimensions of social change. *Ecosystems*, 7:161-171
- Kajikawa, Y. (2008). Research core and framework of sustainability science. *Sustainability Science*, 3:215-239.
- Haberl, H., Fischer-Kowalski, M., Krausmann, F., Martinez-Alier, J. and Winiwarter, V. (2011). A socio-metabolic transition towards sustainability? Challenges for another great transformation. *Sustainable Development*, 19:1-14.
- Jerneck, A., Olsson, L., Ness, B., Anderberg, S., Baier, M., Clark, E., Hickler, T., Hornborg, A., Kronsell, A., Lovbrand, E. and Persson, J. (2011). Structuring sustainability science. *Sustainability Science*, 6:69-82.
- Miller, T.R., Wiek, A., Sarewitz, D., Robinson, J., Olsson, L., Kriebel, D. and Loorbach, D. (2014). The future of sustainability science: a solution-oriented research agenda. *Sustainability Science*, 9:239-246.

## **Topic 3 : Methodology and Research Design for Sustainability (4 hrs)**

Sustainability science has been described as “new paradigm of scientific research”. It emerges as a problem-driven approach to resolve real world sustainability issues and to understand the dynamic interactions between humans and natural systems. To build a science of sustainability, it requires integration of multiple forms of knowledge and management of inter-connected challenges. This lecture will explore the approaches available and also outline some, but not all, key areas of methodology and research design for sustainability science.

## References

- Sachs, J. The Age of Sustainable Development. New York: Columbia University Press (2015).
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., Thomas, C. J. Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science* 7 (Supplement 1) (2012) 25-43.
- Schoolman, E. D., Guest, J. S., Bush, K. F., Bell, A. R. How interdisciplinary is sustainability research? Analyzing the structure of an emerging scientific field. *Sustainability Science* 7 (2012) 67-80.
- Stock, P. and Burton, R. J. F. Defining terms for integrated (Multi-Inter-TransDisciplinary) Sustainability Research. *Sustainability* 3 (2011) 1090-1113.

## **MODULE 2 : SOCIO-ECOLOGICAL SYSTEM**

### **Topic 4 : Environmental Ethics and Value (4 hrs)**

#### **Environmental Values and Ethics for Sustainability**

Sustainability is essentially the relationship between the environment and society. This relationship is affected and controlled by elements such as technologies; understanding of the environment; understanding how exploitation affects society; understanding how exploitation affects the environment; and how we understand our ethical attitudes about ourselves and nature. It involves a physical aspect (exploitation) that should be guided by ethical values. Thus, to understand ethical values, researchers must understand dimensions which are connected and involved with sustainability. Technology is perceived as tools to meet human needs and it determines human ability or efficiency at exploitation. The dimension of sustainability involving technologies, usually is focussed on meeting human needs which affects the exploitation of ecosystem and human cultures. Thus, ethical values are much needed to determine how human can use technologies and at the same time do not condone to exploitation or effects nature and human cultures. Biocentrism, ecocentrism and anthropocentrism are the three ethical values which will be the main subject of discussion in this topic.

#### **References**

- Attfeld, R. 2003. *Environmental Ethics : An Overview For The Twenty-First Century*. Cambridge, UK : Polity Press.
- Light, A. & Rolston, H. 2003. *Environmental Ethics : An Anthology*. MA : Blackwell
- O'Neill, J., Turner, R.K., Batem, J. (eds). 2002. *Environmental Ethics And Philosophy*. Cheltenham, UK.
- Pojman, L. P. (Ed). 2001. *Environmental Ethics : Readings In Theory And Application*. Belmont, California : Wadsworth.
- VanDeVeer, D. & Pierce, C. 2003. *The Environmental Ethics And Policy Book : Philosophy, Ecology, Economics*. CA : Belmont, Thomson/Wadsworth.

### **Topic 5 : Society and Sustainability (4 hrs)**

The challenge of today's world according to Mahatma Gandhi is that the 'Earth provides enough to satisfy every human's need, but not every human's greed'. Due to the nature of human being, we are continuously struggling to find the balance in life between need and want, such as in the context of development, conservation and protection. This brings to the question of how could we ensure our actions today will not leave next generations empty-handed by the depletion of resources (tangible and intangible) and environmental degradation?

In this lecture, the first part will discussed on types of society defined by its technological, socio-economy and cultural settings. Issues pertaining to society will also be highlighted, putting the context of time and space into factor, to ensure understanding of society is relevant to all disciplines of study. The second part will elaborate on the relationship between society and sustainability and meaning of sustainable society, particularly to illustrate in relevance to SDG and bringing the idea into local perspective and some practical actions.

## References

- Chhetri, N., Stuhlmacher, M. & Ishtiaque, A. 2019. Nested pathways to adaptation. *Environ. Res. Commun.*, 1(2019)015001
- Clark, W.C. & Dickson, N.M. 2003. Sustainability science: The emerging research program. *PNAS*, 100(14): 8059-8061.
- Diamond, J. 2012. *The world until yesterday: What can we learn from traditional societies?* USA: Penguin Books.
- Griggs, D. 2013. Sustainable development goals for people and planet. *Nature*, 495:305-307.
- Ishak Shari. 2008. *Pembangunan Mengejar Impian atau Harapan*. Kuala Lumpur: Dewan Bahasa Pustaka.
- Peeters, W., Dirix, J. & Sterckx, S. 2015. The capabilities approach and environmental sustainability: The case for functioning constraints. *Environmental Values*, 24: 367-389.
- Reckien, D. et al. 2017. Climate change, equity and the Sustainable Development Goals: an urban perspective. *Environment and Urbanization*, Vol. 29(1): 159-182.
- Sen, A. 2013. The ends and means of sustainability. *Journal of Human Development and Capabilities*, 14(1): 6-20.
- Viederman, S. 1993. A sustainable society: What is it? How do we get there? *The George Wright Forum*, 10(4): 34-47.

## **Topic 6 : Economics, Development and Sustainability (4 hrs)**

Economy is an essential pillar in sustainable development concept. Economic system utilizes inputs from environmental and natural resource system to produce output and services for human welfare. Economist argued that economic growth as prerequisite for nation development. However, high economic growth generates an adverse effect to natural resources and environmental system. This lecture will introduce the important concepts in economics, development and sustainability from the economic point of view. Interdependency economic system and environmental system is discussed critically and empirical evidences from the past studies will be demonstrated in order to provide a better understanding of the topic. Debates on sustainability paradigm derived from two distinguished school of thoughts namely economist and ecologist groups are explored and discussed. In order to integrate natural resource and environmental parameters into the economic models, several valuation techniques will be introduced and highlighted.

## References

- Ayres R. U. 2008. Sustainability economics: Where do we stand? *Ecological Economics* 67: 281-310.
- Barbier E. 2001. Introduction to the Environmental Kuznets Curve (Special Issue). *Environment and Development Economics* 4: 357-367.
- Brekke K. A. *Economic Growth and the Environment: On the Measurement Income and Welfare*. Cheltenham: Edward Elgar.
- Ekins P., Sandrine S., Deutsch L., Folke C., and De Groot R. 2003. A Framework for the Practical Application of the Concepts of Critical Natural Capital and Strong Sustainability. *Ecological Economics* 44 (2-3): 165-185.
- Neumayer E. 1999. *Weak versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*. Cheltenham: Edward Elgar.
- Stern, D.I. 2003. *The Environmental Kuznets Curve*. International Society for Ecological Economics. (<http://www.ecoeco.org/pdf/stern.pdf>) Theodore P. *Economic Growth and the Environment*.

## **Topic 7 : Resources And Procees Sustainability : Sustainable Natural Resources (4 hrs)**

Natural resources are underpinning life on earth. It is due to lack of understanding of the nature of the natural resources, we have put most of it to the brink of extinction or some to the state of critical. Obviously, sustainability definition originates from the relationship between human and resource they use. The lecture includes the definition and concept in natural resources, introduction to common or main paradox, understand the connection and interrelation between human and nature, analysing current issue and problem in managing natural resources, understanding local initiative in sustainable natural resources and perspective and possible transition on how to accommodate, substitute and innovate. The discussion will be based on three important natural resources that support life directly will be known water, forest and earth (soil and mineral).

### **References**

- Brubaker S. 1972. To live on Earth: Man and His environment in perspective. The John Hopkins Press, Baltimore and London
- Ferguson, I. S.1996. Sustainable forest management. Melbourne, Australia
- Fisher, R.J.; Maginnis, St.; Jackson W.J.; Barrow E. and Jeanrenaud, S. 2005. Poverty and Conservation: Landscapes, People and Power. Gland, Switzerland and Cambridge, UK.: IUCN
- Inforesources trend 2005. Depletion of natural resources-implication for Development. Bern. Switzerland. [https://boris.unibe.ch/71777/1/trends\\_2005\\_e.pdf](https://boris.unibe.ch/71777/1/trends_2005_e.pdf)
- Saiful Arif. Abdullah, Abdul Malik Mohd Yusof & Mohammad Imam Hasan Reza. 2018. Changing Landscape and Sustainability of Wildlife Protected Areas in Peninsular Malaysia. Penerbit Universiti Kebangsaan Malaysia. Bangi. 104
- World Trade Report 2010. B Natural resources definition, trade pattern and globalization; **online** [https://www.wto.org/english/res\\_e/booksp\\_e/anrep\\_e/world\\_trade\\_report10\\_e.p df](https://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report10_e.p df)