

Perspectives on Global Issues Workshop: Report

A) What I learned by participating in this workshop?

The workshop on Perspective on Global Issues Workshop – Sustainability was a life-changing experience for me as it covered various aspect of this complex and high-impact global issues. The subject or the word “sustainability” itself has no boundary, and it touches every corner of modern human life such as the economy, ecology, and socio-cultural life. When I joined the KSU’s group of faculty in this workshop, I had a very narrow vision of sustainability and was limited to the words “science and practices”. My thought was science is the only solution to this global problem without realizing that it is much more complicated than that. This truly requires a transdisciplinary effort even though the science and technology would contribute the most in my opinion. Here are the take-home messages for me from this workshop:

1) Population and Food Supply. This complicated issue is related to global population growth and the future food supply. The current world's population is 7.5 billion. By the year 2050, and 2100 it is estimated to be 9.7 billion (23% increase), and 11.2 billion (33% increase). Given these efforts are underway to increase the food production so that hunger can be reduced or eliminated. In the year 2000 the world hunger index was 30, and by the year 2014, it was reduced to 21.3 (29% achieved). Similarly, in 1964 the planet had 3.2 billion people, and cereal production was 0.9 billion ton. By the year 2016, the global population increased to 7.2 billion (56% increased), and cereal production increased to 2.5 billion ton. (64% increase). However, the per capita increase of cereal production is only 20%. Under the sustainability umbrella, the question is, can the ecological farming feed the world in the future? Yes, ecological farming has the potential to global food security. By the year 2050, the food production will have to be double of the current day production to feed the entire population. To support the food production, ecological farming, etc. our society has to change certain practices like “food wastage”. If we can save even one-fourth of the food waste, we can feed 870 million hungry people. Data shows that ecological farming and the conventional farming yield similar are earning per worker between the year 1995-2014. However, there is a 20 % reduction of harvest via ecological farming. This loss of production can be compensated by switching to more vegetables and less meat, limitation of the population, efficiency increase, and reduction of food waste.

2) Sustainable Development. Among the believers of the sustainable development, the human activity uses up natural assets 1.5 times faster than nature can generate them. Human activities are the primary driving force behind changes, such as agriculture, food production, industry, energy supply, urbanization transportation, tourism and international trade. Sustainable development is not only environmental protection, and it is rather a combined effort of creating a balance between ecology, economy and socio-cultural activities. The strategic keywords that we need to realize for sustainable development are sufficiency, efficiency, consistency, preserving and maintaining the resilience of the ecosystem, etc.

3) The EU Energy and Climate Policy. Towards global sustainability and climate policy, the EU’s focus is not only on global warming. In EU’s view government play a primary role in steering the economy, market play secondary role. For EU decarbonization of society is of particular importance. For EU decarbonization is not just a single phenomenon. Decarobization is related to the reduction of costs, reducing air pollution, reducing supplier dependencies and energy security. For energy security, EU depends on onshore wind, offshore wind and solar photovoltaic. Developed countries are the primary contributors to the global warming and among those, the cumulative emission between the year 1850 to 2011 USA contributed more than 25%, Europe contributed more than 20%, China, and Russia contributed 10% each. For the energy needs EU

imports crude oil, uranium and natural gas. To meet the energy needs EU has adopted smart grid which involves the integration of renewable energy, energy efficient distribution, EV charging, and energy storage, grid and smart meter security and smart metering.

4) Multinational Enterprises. A question was raised regarding the benefits and/or drawbacks of multinational organizations. A multinational corporation should not be expected to have a conscience, as it does not have a soul to be damned, and body to be kicked. A multinational could be a The Good – The Bad – The Ugly. Whenever there is privatization – there is always a chronic water shortage problem. For example - gold mine establishment can cause excessive high freshwater consumption, arsenic deposition in rivers, heavy metal deposition in the sedimentation pools, high land consumption in surface mining. The author also presented a classic case study of “Nestle”, the world’s largest packaged food producer. The study claimed that Nestle drained water from the natural deep wells and forced the villagers to purchase bottled water they manufactured.

4) Education for Sustainable Development (SD). Education should be new global perspective towards sustainable development. The current environmental changes are certainly related to human activity. In a way, people are victims of environmental changes, but at the same time, people are also responsible for the environmental changes. Humankind should adopt the problem-solving approaches like energy efficient technologies, renewable energies, a mix of energy sources, tradition CO₂ emissions, and new infrastructure. The latest insights towards SD are attitude changes, lifestyle change and education and learning. Five action areas of world action plans are: to create enabling an environment for both education and SD; integrating sustainability principles into the curriculum of universities, colleges, and even high schools; building capacities of educators or trainers; empowering and mobilizing youths; accelerating sustainability solutions at local levels.

A) How am I using what I learned in this workshop?

The primary applications of the learning from this Perspective on Global Issues Workshop are applied in my research and scholarship and teaching. (1) I am implementing sustainability in my current research such as water purification and environmental remediation. (2) Secondly, I am working on developing a course on “Chemistry of Sustainability”. I am expanding my research area into more and more sustainability oriented topics. I am particularly interested in topics promoted by American Chemical Society (ACS) to find sustainable solutions to the challenges namely, renewable energy, environmental remediation, and food and water safety. My first research article “environmental remediation” and a proposal on this topic is under preparation to be submitted to National Science Foundation in Fall 2017.

I am also working on developing a graduate level course (cross-listed) entitled “Chemistry of Sustainability”. The **tentative topics to include** in this course are: Chemistry of Sustainability-Green Chemistry; Introduction to chemical principles and the properties of matter; Classification of matter- Composition and atomic structure; Sustainability: How and Where to find starting materials?; Introduction to molecular structure- Bonding and intermolecular forces; Molecular design: How much material do we need and how much is wasted?; Green chemistry as a set of molecular design principles; Modern Materials: An organic chemistry primer; Polymers and plastics; An Introduction to Energy; Fossil fuels, biofuels and the Greenhouse Effect; The potential of renewable energy; Use microbes and enzymes to achieve sustainability; Water: Properties and contamination problems; Towards sustainable clean drinking water: Purification strategies and Pollution, Prevention; Introduction to nanotechnology; Pollution prevention through nanotechnology and green nanomaterials science.