

## Summary Report of 3E-Nexus Kick-off Meeting

IR3S (Integrated Research System for Sustainability Science) of University of Tokyo in association with ICSS-Asia (International Conference on Sustainability Science in Asia) organized an international conference on ‘ASIA-PACIFIC REGIONAL INITIATIVE ON ENERGY, ENVIRONMENT AND ECOSYSTEMS (3E) NEXUS FOR SUSTAINABLE DEVELOPMENT’ at Hulhule Island Hotel, Maldives from 24 - 25 FEBRUARY 2014. The purpose of the conference was to advance climate change mitigation action by facilitating the diffusion of advanced low- carbon technologies, products, systems, services and infrastructures in line with the Japanese Joint Credit Mechanism (JCM). The conference was started with the opening speech of Professor Kazuhiko Takeuchi, director of IR3S and Senior vice Rector of UNU. Prof. Takeuchi explained the significance of 3 E-Nexus Initiative in global change context with focus on Asia –Pacific Region. More than 40 members and guests shared the significance of the Energy, Environment and Ecosystems nexus under one roof. Prof. Akimasa Sumi of NIES, Japan presented the summary and implications of upcoming IPCC WG1-AR5 report; its relevance to the 3E-Nexus initiative. As a guest speaker, His Excellency Mr. Thoriq Ibrahim Minister of Environment and Energy, Government of Maldives expressed the conference objectives quite interesting with closer cooperation in future.

After a short Tea break and photo session, the conference was resumed with three key note speeches by Mr. Kotaro Kawamata, Director, International Cooperation Office, Ministry of the Environment, Japan (MoEJ); Prof. Mai Trong Nhuan, Former President, Vietnam National University (VNU), and Dr. Akio Takemoto, Director, Asia-Pacific Network (APN) for Global Change Research, Japan with focus on MOEJ, VNU and APN activities respectively in relevant to 3E Nexus project. These keynote speeches were followed by Dr. Alexandros Gasparatos, University of Tokyo with an overview on the 3E Nexus and its upcoming agenda.

After lunch break, Prof. Ijaj Hossain from BUET chaired the first presentation session on ‘**Environment and Economy**’. Prof. Minjun from China began the presentation on ‘China’s medium-and-long-term economic development and carbon emission under fossil energy supply constraint: A simulation analysis of Chinese Energy-Economy-Environmental policy model based on a dynamic CGE model’. Following are highlights of his presentation:

- Several scenarios were modeled (baseline, resource limitation and low-carbon scenario)
- The low-carbon scenario can be imagined as the 3E scenario
- The baseline scenario shows increasing GHG emissions
- The 'Resource Limitation' scenario shows a peak and then a dip but at the expense of economic growth
- The 3E scenario is able to maintain economic growth and follow the same GHG emission path as the resource limitation path

Prof. Minjun concluded that the low-carbon scenario (3E) will allow China to maintain growth with decreasing GHG emission.

Next, Prof. Narayanan from IIT Mumbai gave an overview on 'Economic Growth, Population and Resource use: Examining EKC Hypothesis for Fertilizer and Pesticide use in Post Liberalization India'. Following are the highlights of his presentation:

- Modelled chemical (fertilizer and pesticide) inputs into agriculture against income for India
- EKC – Environmental Kuznets Curve
- Surprising finding was that both fertilizer and pesticide inputs were increasing despite the increase in income thus violating the expected EKC
- Indian agriculture is moving away from sustainability, a challenge for sustainability for India

Next, Prof. Weerakoon from University of Peradenia, Sri Lanka began with an overview on energy supply Sri Lanka. Following are the highlights of his presentation:

- Discussed the difficulties of hydropower development
- Run of river potential need to be harnessed
- Emphasized the importance of Feed-in Tariff
- Government has plans for 20% renewable energy
- Flood inundation issues due to the Kelani River as a result of Climate Change and the adaptation strategies

Finally, Prof. Murty from TERI, India brought out the very important concept of the “Maintenance Cost”. His discussion points were:

- Maintenance Cost methods measures the cost of environmentally sustainable production to producers
- Modeled the impact of pollutants (Particulates, SO<sub>2</sub>, N<sub>2</sub>O) in a region
- Shadow prices of US\$ 100 per ton of SO<sub>2</sub> were estimated
- The concept of CARBON TAX can be derived from these kinds of studies

Final session of the day on **‘Environmental Technology’** consisted of 6 presentations in this session that spanned across

- Solid waste management
- Water and wastewater treatment, and
- Water quality

The session was started by Prof. C. Visvanathan with presentation on ‘An Overview of Municipal Solid Waste to Energy and Climate Co-benefit Potential in Asia- A Case of Thailand’. Following are the highlights of his presentation:

- Highlighted energy recovery from wastes (WTE) is one of the effective ways to deal with increasing waste generation while fulfilling growing energy demands, along with various climate co-benefits.
- Thailand is targeting to meet 25% of its total energy consumption from renewable energy sources by 2021.
- Key challenges: technical, financial and capacity issues.
- WTE facilities are operating at cost-inefficient conditions,
- Inappropriate choice of WTE technologies
- lack of wastes separation at source
- Lack of skilled manpower for operation and maintenance of the WTE facilities etc.
- WTE and 3R (reduce, recycle and reuse) have conflicting needs
- Which option has a higher overall benefit?
- Public education/awareness is an important attribute for WTE implementation (e.g., waste separation)

- How to promote effective public education/awareness

Next, Dr. Nguyen Phuoc Dan of Ho Chi Minh City University of Technology discussed on 'Monitoring trihalomethanes (THMs) in water supply facilities in Ho Chi Minh City, Vietnam and application of low cost methods for THMs removal at household scale'. Following are his discussion points:

- Water quality data obtained in Vietnam during 2006-2011 showed that ammonia and organic concentrations exceeded their allowable limits (N-ammonia > 5 mg/L, COD > 10 mg/L).
- The concentration of THMs in water distribution network could reach 1,662 µg/L
- A low cost household-scale air-stripping column could remove 64% of THMs.
- 83% OF THMs could be removed by boiling water for 15 minutes.
- The practicality of boiling water for 15 minutes.
- The merit of exploring basin wide water quality management strategy.
- The importance of political factors and how this attribute could be enhanced.
- Affordability and international cooperation are important. How to manage these issues?

Next presentation was on 'Innovating Water Treatment Technologies in Managing Water-Energy Demand' with highlights on:

- It is possible to produce high quality water from unconventional water sources and optimize energy consumption via technological innovation.
- Research on innovative water technologies will need to be continued along the direction of water-energy nexus.
- Public education is an important attribute towards success in implementing innovative solutions.

Next presentation was on 'Sustainable Waste Management in Palm Oil Mills' with following highlights:

- Sustainable palm oil mill effluent (POME) management has been successfully developed in Indonesia which helps to prevent environmental pollution and produce valuable materials, such as energy or organic fertilizer, simultaneously.

- How much the management pays attention to greenhouse gases emission reduction is an important issue.
- How to motivate management to pay attention to greenhouse gases emission reduction
- Possibility: tax incentive, etc.
- Political and social factors are important issues. How to manage these issues?

Next presentation was on ‘Sustainable arsenic removal system for affected communities in Cambodia using HAIX’ with following highlights:

- Arsenic removal is an important issue for people who live in the area contaminated by arsenic in Cambodia.
- This presentation highlighted the importance of promoting public awareness of negative health impact associated with arsenic (and for that matter other water quality issues)
- Social economic dimension is not less important than technological for water quality enhancement.
- People must have good awareness of the health impacts associated with water quality
- Political factors and international cooperation are important factors.

Final presentation was on ‘Monitoring Water Quality of Estero de Paco, manila’ with description on the effort to restore water quality of Estero de Paco and challenges encountered. Following are the highlights:

- Willingness to bear the cost incurred is essential for implementing water quality enhancement projects.
- There is a need to explore optimizing operating protocols for water quality enhancement systems to enhance acceptance by the beneficiaries.
- Affordability is an important parameter for successful implementation of water quality enhancement projects.

Day 2 was started with a session on ‘**Ecosystems**’. Dr.Tsogtbaatar Jamsran from Mongolian Academy of Sciences chaired this session.

First presentation introduced by Dr.Han Ji from East China Normal University. Title of presentation was on “Urbanization in the Shanghai-Yangtse River Delta Urban Agglomeration (SHYRDUA) region, China: Its trajectories, landscape impacts, and ecological issues. In the beginning of the presentation he introduced about socio-economic characteristic of study area of Shanghai region of China.

Mainly, methodology of analysis for trajectories of urban development and its impact on urban landscapes have been introduced by. Dr.Han Ji. For the analysis of past history of Shanghai area was used Integrated Urban Ecology Model (GREAT). Basically, carbon emission per capita and GDP per capita used as basic indicators for the analysis of urban development in China. For the comparative analysis, Dr.Han Ji used some relevant data from 226 countries for the testing of the GREAT model.

Regarding with output of analysis, some types or trajectories of urban development have been introduced. According to his analysis, three types of urban development have been classified. First trajectory is declining stage in the period of 1960-1978; second trajectory of stable development of urbanization- in the period of 1978-1988 and third trajectory of urbanization in China – acceleration stage for 1989-2011.

In addition, impact of urban development on urban landscape was discussed in the second part of presentation. The phenomenon of urbanization influencing to urban landscape was characterized by land use and land cover changes (LUCC) in the region. Specially, increasing trend of transfer of crop land into forestland by 1990-2000 and 2000-2010 highlighted in this part of presentation.

Finally, methodology of assessment for overall quality of ecosystems was introduced basing on carbon source and quantity of carbon sink in urban area. Initial output of the overall quality assessment of ecosystem was introduced by some provinces of China.

After introduction of presentation, the speaker made answer and clarification of the participants. Output of this presentation was quite interesting for the delegated of some countries of the region.

Second presentation on “Restoring greenery for Sustainable Ecosystem Services in Urban Sprawl of Kathmandu Valley of Nepal” was made by Prof. Krishna Kumar Shrestha from Tribhuvan University of Nepal.

In the beginning of presentation, Prof. Krishna Kumar Shrestha introduced about socio-economic condition of Nepal, subtropical zone, environmental issues, environmental index, life index, populous country ownership of forest resources. It gives clear picture of needs of greenery action in Kathmandu city due to promote carbon sink through greenery activity. Environmental issues in Kathmandu, including air pollution, water pollution, major governance issues; ecosystem services have been introduced to the participants. Hence, low carbon initiative will be new paradigm for the nation of Nepal in the future.

Third presentation on Study on suitability for Nang Xuan rice variety by combination of soil database and climate change scenario was introduced by Dr. Nguyen Xuan Hai from Vietnam National University. Introduction, objectives, data and methodology, land use issues related to suitability for Nang Xuan rice variety well illustrated and some initial results have been introduced for the discussion. According to results of climate modeling, adaptation of rice variety is crucial option of soil database and climate change scenario of for 2090.

Low temperature signal and prediction could be investigated more detail in the future regarding with climate change scenario for Nang Xuan rice variety in Vietnam.

Last presentation on ‘Ecological vulnerability issues in Mongolia: Towards Sustainability’ was delivered by Dr. Tsogtbaatar Jamsran from Mongolian Academy of Sciences. He made introduction about vulnerability issues and factors in Mongolia and highlighted about pastureland ecosystem is very vulnerable comparing to other ecosystems and life systems in Mongolia. In Mongolian land, ecological vulnerability is interlinked with climate change, drought, land degradation, desertification and recent mining activities. In this presentation, early warning of ecological vulnerability in Mongolia well justified and demonstrated through assessment of land degradation and desertification in the country.

Finally, he replied on question on how can co-exist energy harvesting and food and sustainability of rangeland ecosystem in Mongolia.

Next session was on **‘Greenhouse Gas Emission and Mitigation’**. Altogether three presentations were made in this session by distinguished speakers, namely Prof. Joni Hermana, Dr. Zuhair S Khan, and Dr. Retno Gumilang Dewi.

Prof. Joni Hermana from Sepuluh Nopember Institute of Technology, Indonesia presented paper on Alternative Methods for the estimation of carbon emission from Transportation Sector based on Data Availability. The paper was basically about un-availability of data for research in energy and climate change sector in most of the developing countries. Due to this, there is a problem to make plan and forecast the GHG emission and mitigation. Transportation sector contributes 23% of total GHG emission. To address this issue, the author proposed 3 alternative methods of calculation for GHG emission. Alternative methods proposed by author can be directly applied to calculate the GHG emission and the result received through this method is much closer to the result that produced through IPCC methods.

The second presentation was made by Dr. Zuhair S Khan, National University of Science and Technology (NUST), Pakistan. His presentation was about GHG emission mitigation by renewable and alternative energy technologies backed by sustainable innovations in advanced materials. He raised issue about the GHG emission in Pakistan due to use of fossil fuel based power plants. It can be mitigated by using renewable energy technologies. He proposed different kinds of renewable energy technology and their scopes and potential of GHG emission. He also presented the research activities that are going in his department in National University of Science and Technology.

The third presentation was by Retno Gumilang Dewi from Institute of Technology, Bandung, Indonesia. Her title of presentation was ‘Technology options for achieving the low carbon energy in Indonesia’. Energy sector is the second largest emitter of GHG in Indonesia. She also presented total energy potential of Indonesia. On her presentation, she gave brief information about status of GHG emission which calculated through LEAPFROG method. The government of Indonesia had targeted to achieve the application of renewable energy technology by 4.5% in year 2005 and 25% in year 2025. She also presented energy demand and GHG emission model that they developed in Institute.



After lunch break, ‘**Renewable Energy**’ session was started with chair by Prof. Joni Hermana from Indonesia. The first speaker Prof. Rinaldy Dalimi, UI, NEC, Indonesia on “A scenario toward renewable energy era for Indonesia energy demand” presented a scenario towards the renewable energy era in Indonesia that was divided into 3 different phases. The first phase is started from the year 2011 as the beginning era, following the Fukushima case that still relied on fossil fuels/nuclear as source of energy. The second phase is between 2011 – 2050 that is divided into two phase, Phase 2A (2011 – 2030) that requires a support policy for RE to be applied and Phase 2B (2030 – 2050) that requires no policy from government because the market will decide the usage of RE because by that time the fossil fuel is relatively more expensive than the RE. Finally, the phase 3 starting from 2050 onward where there is 100% of RE consumption. The rooftop solar cell and Space Solar Power Station (SSPS) will dominate the source of energy consumption. It was stated that the use of RE in each country not only depends on the capability of domestic industry in that country, but more influenced by the availability of the RE technology in the international market. Since the RE technology are available in the international market with a cheaper, compare to electricity from the grid, the consumers will buy the products. This is quite a challenge for the market.

The second speaker Prof. Tri Ratna Bajracharya, Tribhuvan Univ., Nepal on “Nexus between Renewable Energy Technology and Climate Change Mitigation in Nepal” shared his view about the major challenges in promoting the renewable energy technologies (RETs) that covered financial, technical, institutional, policy and legal issues. Although the energy consumption is still lower in Nepal as compared to other neighboring countries, but the unequal distribution due to the non-synchronized grids will result in unequal load shedding. On the other hand, it was also stated that the RETs provide socio-economic and environmental benefits to people that contribute for adopting and ensuring better adaptation to climate change based on the local context. It was shown that theoretically altogether 4.45 million tons of CO<sub>2</sub>e of the GHG emission can be mitigated per year if all the remaining technical potential of deploying seven major RETs consisting of biogas, improved water mills, stand-alone micro-hydro plants, mini-grid micro-hydro plants, solar PV home systems, mud-ICS and metal-ICS were installed. The challenge for achieving how to integrate the policy that supports the implementation of the CO<sub>2</sub> mitigation through the RETs (it is still under different ministries).

The third speaker Prof. Janaka B. Ekanayake, University of Peradeniya, Sri Lanka on “Smart Grid to accommodate more renewable” presented the potential and the application of RET in Sri Lanka, particularly PV, Wind, CoGen, Biomass, Small Hydros (Sri Lanka has large reservoirs where hydro energy can be used as a big battery, 1350 MW). Several barrier and challenges were also mentioned in relation to the implementation of RE, among others: its generation variability, how to store and making use of the RE’s potential, besides operational and stability issues. The power system and power grid should be evolved to a smart grid to overcome some of the anticipated issues because it more complex in the future: cost-effective and grid friendly will be the key words.

The fourth speaker Prof. Zuriati Zakaria, Head, Department of Environmental Engineering and Green Technology Malaysia Japan International Institute of Technology, UTM, Malaysia on “Implementation of Feed in Tariff in Malaysia- Case study: Public participation through the Solar Home Rooftop Programme” provided a good example of the government policy and role in the country level on how to implement the RE by the implementation of Feed-in Tariff (FiT). It provides the much needed thrust for RE industry. The four RE resources that are eligible for FiT are biogas, biomass, small hydropower and solar photovoltaic (PV). The Solar Home Rooftop Programme is initiated by SEDA (Sustainable Energy Development Authority) to encourage massive public involvement to install solar PV system. The challenges are not only financial issues through the introduction of incentives, but also the raising the RE awareness particularly for individuals/households.

General Remarks of this ‘renewable energy’ session can be summarized as:

- The RE is very potential to be implemented in country levels as the main energy resource, because it will alter the diminishing fossil fuel energy resources and in the same time, it mitigates carbon emissions for the climate change.
- To be successful, at the beginning the RETs implementation must be under the full and integrated supports from the central government until the market takes over the mechanisms because the fossil fuels cost will increase.
- The challenge of the RETs corresponds to the initial investment, seasonal resource variability, people awareness, besides technical, institutional, policy and legal issues.

- The 3R NEXUS network of experts between Asia-Pacific Countries will be potential to enhance the development of sustainable countries through academic campaign.

Final presentation session was on '**Energy Conservation**' with chair by Prof. J B Ekanayake from University of Peradeniya, Sri Lanka.

The first presentation started with discussion on the current situation in the Laos and how demand will increase by fivefold towards 2020. It was pointed out that as the existing generators are already committed to supply power to neighboring countries, they are expecting a deficit of generation until 2020. In order to combat this situation, the energy conservation was proposed. However no firm plans for energy conservation was presented.

Next, energy efficiency and GHG mitigation in Bangladesh was discussed. The presentation started by outlining the current status of power generation and demand in Bangladesh. It was pointed out that as most of the power plants are natural gas based Open Cycle Gas Turbines, in which the efficiency is around 30%, much resource is wasted while producing more GHG emissions per MWh of power generation. There are also about 14 MW of captive generation and pointed out the possibility of operating them as co-generation plants. The main message of the paper was inefficient operation of their power systems and methods to overcome that.

Next presentation was about sea transport in pacific region. As the cost of fuel is escalating and GHG emissions due to sea transport are increasing, the possibility of using wind powered and solar powered ships were described with a number of examples. Four strategies for energy efficiency in sea transport are: operation, technology, alternative fuels and renewable generation. It was pointed out that the potential of renewables for enhancing the efficiency of sea transport. Also discussed how well-being of local community could be enhancing by community based transportation solutions.

In final presentation a real implementation of an energy conservation measure in Cambodia was described. The Programme addressed the topics such as: raising awareness, building the capitol for energy efficiency measures, developing energy labels, installing CFC lamps and solar heaters and supporting carbon offset projects. Achievements of this project were satisfactory and pointed out that this can be implemented in other cities.

As general comments Chair said that two presentations on different options for energy conservation and energy efficiency were presented in this session. Another presentation discussed about an actual implementation. Even though the level of intervention was very much basic to the options presented in the previous two papers, this study demonstrated that if proper incentives are in place, it is easy to implement energy conservation and energy efficiency measures. Finally the Chair said that in order to achieve the Nexus agenda energy conservation and energy efficiency measures should be introduced into both energy and transport sector and Dr. Nutall's presentation provided some evidence for the later.

At the end, an interactive '**Panel Discussion**' session was started with the summary of each session by the respective chairs; followed by Prof. Kensuke Fukushi of IR3S of University of Tokyo, Japan on CAPACITY DEVELOPMENT, TRAINING & EDUCATION under 3E Nexus Initiative. Prof. Fukushi also clarified the different concerns of the participants on the 3E Nexus Initiative.