4th International Workshop on Clean Energy Development in Asian Cities

26 October 2018

Venue:

Interdisciplinary Graduate School of
Engineering Sciences, Kyushu University,
Chikushi Campus, Chikushi Hall

Organized by:

Kyushu University Platform of Inter / Transdisciplinary Energy Science

KYUSHU UNIVERSITY

APN ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE 日本学術振興会

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Kyoto University, Japan

Assoc. Prof. Benjamin McLellan
Kyoto University, Japan

Assoc. Prof. Robert Lindner
Kyushu University, Japan

Background:

Cities throughout Asia have experienced an unprecedented economic development over the past decades. In many cases, this has contributed to their rapid and uncontrolled growth, and has resulted in multiple problems, which include a rapid population increase, enhanced environmental pollution, collapsing traffic systems, dysfunctional waste management, as well as a rapid increase in the consumption of energy, water, and other resources. The twin challenges of global climate change and energy insecurity in Asian cities can only be solved with rapid devising of clean energy strategies, both for energy supply and energy efficiency. Many Asian cities were not able to provide social and economic opportunities to many, as well as put tremendous pressure on the local and global environment. Consequently, urban areas in Asia contribute increasingly to climate change, and as well as suffering many of its impacts. Thus, in an attempt to provide some viable solutions for clean energy strategy development in urban Asia, we aim to organize this annual expert workshop at Kyushu University.

Past workshops:

The First International workshop on clean energy development in Asian cities (Technological and political perspectives) was held on 28-29 March 2016 at the Institute of Advanced Energy, Kyoto University. The workshop was intended to be a forum to share the experiences about clean energy development and its applications in Asian cities. The main achievement of the first workshop was to create a knowledge sharing environment for further cooperation and dialogue between different scholars in order to identify challenges and possibilities. The workshop was attended by over 15 delegates from India, Japan, Europe, and the USA.

In continuation of the 1st workshop, the 2nd workshop (Learning from real cases) was organized on 22 Feb 2017 and held at the Institute of Advanced Energy, Kyoto University to enable a sufficient amount of dialogue between scientists and policy-makers for the specific case studies which may lead to the definition of new collaboration projects on clean energy development in Asian cities. The main objective of the 2nd workshop was set to address the case studies of successful clean energy solutions in Asian cities (India, China, and Japan).

The third workshop (Experiences from Asia and Latin America) took place from 1-3 Feb 2018 at the Institute of Advanced Energy, Kyoto University which, was financially supported by the Japan Society for the Promotion of Science (JSPS) and the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP). This comprehensive three-day workshop was built around a number of lectures from the Japanese and Brazilian experts in order to further explore best practices for sustainable urban energy system development. In addition, a hands-on exercise session was conducted in order to provide training for the Urban “Co-benefits Evaluation Tool”. Both Brazilian and Japanese scholars shared the outcomes and the used methodologies in their studies each other, including clean technology and new assessing methodology used in both countries.

Workshop Program

	Introductory:	
9:00 – 9:30	Registration	
9:30-9:45	Welcome Address	Prof. Akira Harata, Kyushu University, Japan
9:45-10:00	Workshop program overview	Assoc. Prof. Hooman Farzaneh, Kyushu University, Japan Prof. Hideaki Ohgaki, Kyoto University, Japan
	Session I Moderators: Prof. Keiichi N. Ishihara, Kyoto university, Japan Prof. Aya Hagishima, Kyushu University, Japan	
10:00 – 10:30	Carbon Balance Analysis and low carbon development in the context of climate change the case study of Chongming Island in Shanghai, China	Assoc. Prof. GUO Ru, Environmental Planning and Management Institute, Tongji University, China
10:30 – 11:00	Solar power and Japanese cities: "duck back" electricity demand and the role of batteries	Prof. Miguel Esteban, Global Center for Science and Engineering Waseda University, Japan
11:00 – 11:30	**Break**	
	Session II Moderators: Prof. Takahiko Miyazaki, Kyushu University, Japan Assoc. Prof. Benjamin McLellan, Kyoto university, Japan	
11:30-12:00	Regional revitalization through collaboration among industry, government and academia: Focus on energy infrastructure in Japan	Assoc. Prof. Muhammad Aziz, Institute of Innovative Research, Tokyo Institute of Technology, Japan
12:00-12:30	Governance for integrated solutions to climate change and sustainable development: From linking issues to aligning interests	Nobue Amanuma, Institute for Global Environmental Strategies, Japan
12:30-14:00	**Lunch**	
	Session III Moderators: Prof. Hideaki Ohgaki, Kyoto University, Japan Assoc. Prof. Robert Lindner, Kyushu University, Japan	
14:00 – 14:30	Designing for renewable energy and resource cycles: Opportunities in a circular economy	Prof. Damien Giurco, University of Technology Sydney, Australia
14:30- 15:00	Model framework of innovative transition pathways of energy in mega cities: Case of Tehran	Prof. Yadollah Saboohi, Sharif University of Technology, Iran
15:00 – 15:30	**Break**	
	Session IV Moderators: Prof. Jun Tanimoto, Kyushu University, Japan Prof. Antonio José Junqueira BOTELHO, Sophia University, Japan	
15:30- 16:00	Ideas from Baseline Study for Low Carbon Langkawi, Malaysia	Prof. Nasrudin Abd Rahim, UM Power Energy Dedicated Advanced Centre, University of Malaya, Malaysia
16:00-16:30	Future Design of Sustainable Energy Visions Using a Backcasting Approach	Dr. Yusuke Kishita, The University of Tokyo, Japan
16:30 – 17:00	**Break**	
17:00-17:15	Launch of the workshop book : Devising a Clean Energy Strategy for Asian Cities	Assoc. Prof. Hooman Farzaneh, Kyushu University, Japan Dr. Mei Hann Lee, Springer Nature
17:15-17:40	Workshop wrap-up	Prof. Keiichi N. Ishihara, Kyoto University, Japan
17:40-18:00	Closing remarks	Prof. Jun Tanimoto, Kyushu University, Japan
18:00-20:30	**Dinner**	

GUO Ru

Dr. GUO Ru, Associate Professor, deputy director of environmental planning and management institute, college of environmental science and engineering, Tongji University. Dr. GUO has been closely involved in regional sustainability and climate change science. Dr. GUO received many grants, including the National Natural Science Foundation Research Grant of China and Shanghai Science and Technology Committee Research Grant. She published three books and more than thirty academic articles in the field of climate change mitigation and sustainability assessment. Dr. GUO holds a Ph.D. in Environmental Science and Engineering from Tsinghua University in China.

Carbon Balance Analysis and low carbon development in the context of climate change the case study of Chongming Island in Shanghai, China

Assoc. Prof. GUO Ru, Environmental Planning and Management Institute, Tongji University, China

Increasing urbanization raises both opportunities and challenges for global sustainability and low carbon development. With the increasing carbon constraints in the context of climate change, the capacity of carbon sequestration becomes an important resource to address regional sustainable development. However, there is still a lack of an integrated methodology to evaluate urban sustainability within a local urbanization process from a carbon cycle perspective. The concept of carbon neutral coefficient (CNC) is proposed based on the estimation of carbon emissions and sinks, which emphasizes the fundamental role of carbon sinks in achieving low carbon development and improving local sustainability. Taking Chongming Island of Shanghai (China), the largest alluvial island in the world, as a case study, carbon emissions and sinks are calculated respectively according to an integrated carbon inventory and local coefficients. The results showed a temporal-spatial variation of CNC in the study area, owing to the different growth rate of carbon emissions and sinks. Furthermore, a spatial variation of change of CNC was detected, caused by the imbalanced spatial distribution of carbon emissions and sinks. Remote Sensing based analysis shows that the change of land use and cover which was induced by human activities can greatly influence local carbon balance and sustainable development. Consequently, sustainability requires balance between emissions and sinks at different levels according to local situations, which needs integrated assessment of mitigation and adaptation actions.

Yusuke Kishita

Yusuke Kishita is a lecturer at the University of Tokyo. Prior to the current position, he worked at National Institute of Advanced Industrial Science and Technology (AIST) and Osaka University. His research field is scenario design for sustainable futures. He is currently involved in research on sustainable consumption and production, sustainable energy visions, and road mapping for Sustainable Development Goals (SDGs). He holds MSc and Ph.D. in mechanical engineering from Osaka University.

Future Design of Sustainable Energy Visions Using a Backcasting Approach

Dr. Yusuke Kishita, The University of Tokyo, Japan

A summary of my presentation (250 words) The adoption of Sustainable Development Goals (SDGs) by the United Nations brings a good opportunity to design energy visions for sustainable futures. In particular, Japanese local governments are strongly encouraged to plan long-term energy policies in a way that is consistent with SDGs. This presentation aims to propose a method for designing sustainable energy visions on municipal scale by integrating a backcasting approach and Future Design. Future Design refers to a concept to exploit the voices of imaginary future generations, aiming to reflect them in the decision-making process. With discontinuous change in mind, we propose a six-step procedure to design energy visions where we integrate brainstorming sessions by holding participatory workshops and a computer-aided scenario design methodology using Sustainable Society Scenario (3S) Simulator developed by the author's laboratory. Drawing on four participatory workshops, we carried out a case study to describe sustainable energy visions and associated pathways for Suita City to 2050. Four different energy visions were eventually created, all of which achieved a 75% CO2 reduction target for 2050 set by the city. The results showed that the four visions differ in goals to be achieved, such as CO2 reduction, energy self-sufficiency, and compact city. It was also revealed that there is difference in the needs between future generations and the present generation.

Muhammad Aziz

Dr. Aziz is currently an Associate Professor at Institute of Innovative Research, Tokyo Institute of Technology, Tokyo, Japan. He received B. Eng., M. Eng., and D. Eng. degrees from Kyushu University, Japan, in 2004, 2006 and 2008, respectively, in the field of mechanical engineering. He was working previously as lecturer at Ritsumeikan Asia Pacific University, mechanical designer at Seiko Epson Corp., and also researcher at Institute of Industrial Science, The University of Tokyo, Japan until 2011. In 2011, he moved to Tokyo Institute of Technology as an assistant professor before receiving the current position in 2015. His general research area is energy systems. His research interest includes power generation, renewable energy utilization, process modeling, smart grid, electric vehicle, battery, and hydrogen production and utilization. He has published more than 90 peer-reviewed journals, and 16 books and book chapters.

Regional revitalization through collaboration among industry, government and academia: Focus on energy infrastructure in Japan

Assoc. Prof. Muhammad Aziz, Institute of Innovative Research, Tokyo Institute of Technology, Japan

The effort of regional revitalization in Japan has been initiated in 2014 and strongly emphasized as the effort from the local regions to improve and boost their economic performance. Therefore, this revitalization covers all the living sectors, including energy, economy, social, and environment. As a research organization under Tokyo Institute of Technology focusing on the development of energy systems, AES (Advanced Energy Systems for Sustainability) Center has also involved in several activities related to the regional revitalization in Japan. It creates and promotes research project in order to identify the optimum solutions to such issues through open innovation, in which the industries, governments, and academia are able to equally participate. Several regional revitalization projects have been established in collaboration with the industries, local governments and academia. In this opportunity, two representative projects are presented: Smart City Hamamatsu and Tsuhima Environment and Energy Consortium. The concept and characters of each project, as well as the challenges faced during the development, are discussed.

Damien Giurco

Damien is Professor of Resource Futures at the Institute for Sustainable Futures, University of Technology Sydney. He is team leader for resources and energy at the Institute and his collaborative research with government and industry is focused on responsible prosperity and resource stewardship in the waste, water, energy and minerals sectors. Damien has spoken and published widely on sustainability and is Editor-in-chief for the journal Resources. He led the Wealth from Waste Cluster [2013-2017] on pathways for metals in a circular economy and is currently Chair of the Energy Storage Working group for the Australian Battery Recycling Initiative.

Designing for renewable energy and resource cycles: Opportunities in a circular economy

Prof. Damien Giurco, University of Technology Sydney

Access to clean energy is pivotal for supporting sustainable development goals. The majority of humanity now lives in cities which creates a pervasive demand for resources, including to underpin the clean energy transition. Ensuring the responsible stewardship of resources and energy for all remains an important under-addressed challenge. This paper focuses on the role of the city and the citizen (using examples from Sydney and Australia) to explore the intersection of the resource-energy nexus at different scales, from households and organizations, to the impacts of cities on regions and nations. The paper proposes strengthening critical perspectives and governance regarding the resource-energy nexus by being explicit about who benefits in future demand and efficiency scenarios. It examines how resource and energy business models are changing – including opportunities as the circular economy develops – and the new policy challenges arising from the clean energy transition, for example, managing end-of-life photovoltaics and energy storage batteries. Finally, it questions the captivating influence which the rise of the smart cities agenda has on progressing renewable energy and resource cycles and sustainable development more generally – where does connected data help? where does it hinder? and how might we ensure that technology and policy are thoughtfully deployed to benefit future societies.

Nasrudin Bin Abd Rahim

Professor Nasrudin Bin Abd Rahim is an established researcher in the area of power and energy; founder and director of UMPEDAC, the first engineering-based Higher Institution Centre of Excellence (HiCoE) in Malaysia. Active in research and policy makings in power and energy related topics. Research interests include power electronics, solar and wind technologies, real-time control systems, and electrical drives, with over 300 technical papers in journal and international conference proceedings. Chartered Engineer and a Fellow of IET (UK), Senior Member of IEEE (USA) and a Fellow of the Academy of Sciences Malaysia.

Ideas from Baseline study for low carbon Langkawi, Malaysia

Prof. Nasrudin Abd Rahim,University of Malaya

In 2007, Langkawi was declared by UNESCO as one of the global Geoparks and the first Geopark Island in South East Asia. Naturally, this prestigious international recognition has inspired Government to embark on the Low Carbon Langkawi (LCL) program to transform the island into a Low Carbon Island by 2030. Subsequently, this work was initiated to establish a baseline study on the energy consumption, CO_2 emission and avoided in Langkawi, which will facilitate a comprehensive Low Carbon Langkawi study in the future. This report presents the data collected and the analysis, covering the social-economic, energy and environmental aspects of Langkawi, which are subdivided into nine (9) sectors, namely, Transportation, Industry, Commercial, Residential, Agriculture, Power Generation, Waste, Water and Forest. Two types of data mining activities were conducted throughout the project; preliminary data mining using a top-down approach, and detailed data mining using a bottom-up approach. The data presented in this report includes data which are obtained directly from the relevant agencies or published documents, as well as primary data extracted through surveys, measurements and stakeholder engagements done by the project team.

Miguel Esteban

Miguel Esteban is currently a Professor at the Research Institute of Sustainable Future Society, Faculty of Civil and Environmental Engineering of Waseda University, in Tokyo, Japan. He received his PhD in Coastal engineering from Yokohama National University in Japan in 2007, and then he continued his work with Post-Doctoral Fellowships and the United Nations University Institute of Advanced Studies (UNU-IAS) and at Kyoto University. Subsequently he also worked as an Associate Professor at Waseda University and The University of Tokyo.

Solar power and Japanese cities: "duck back" electricity demand and the role of batteries

Prof. Miguel Esteban, Global Center for Science and Engineering Waseda University, Japan

As the uptake of solar power continues in cities and urban areas throughout the world, concern about the intermittency of renewable energy is being replaced by the appearance of "duck back" electricity demand profiles. Such problems already exist in California, which have required the development of new classes of fast-reacting resources to help meet the very steep ramp in demand that can take place in the late afternoon, when solar power fades yet electricity demand stays steady (or even increases). This problem is yet to impact Japan, but given the large increases in installed solar PV capacity it the country, it will likely manifest itself in the near future. To compensate for such issues there will clearly be a need to integrate a wide range of types of renewable energy that are geographically distributed throughout the country. The use of a variety of electrical storage mechanisms can also play a role in balancing such a system. The author will present work that outlines the magnitude of the problem and potential solutions to it, through the analysis of a realistic model of the Japanese grid that uses renewable energy sources and electrical batteries. The simulation uses hourly meteorological data to simulate the amount of electricity that could be produced, and this was compared with the hourly electricity demands imposed on the system. The conclusions will highlight how it will be necessary for the Japanese government to incentivise private individuals to not only install PV panels on their rooftops, but to also start acquiring the batteries or electric cars that will be necessary to smoothen the overall electricity demand curve.

Nobue Amanuma

She joined IGES as the senior policy researcher in 2017. Previously, she worked at the United Nations Economic and Social Commission for Asia and the Pacific and supported the regional process of sustainable development for Asia and the Pacific. She has produced analytical works on integration of economic, social and environmental dimensions of sustainable development and governance for the region's policymakers. One of her most recent works include a policy report titled "Governance for Integrated Solutions to Sustainable Development and Climate Change: from linking issues to aligning interests". She holds a Master of International Development from the University of Pittsburgh and has research and operational experience in international development.

Governance for integrated solutions to climate change and sustainable development: From linking issues to aligning interests

Nobue Amanuma, Institute for Global Environmental Strategies, Japan

Energy is one of the key issues included in the Sustainable Development Goals (SDGs). Energy is also closely interlinked with other goals of the SDGs, making it important to tackle energy issues in an integrated manner. In fact, many policymakers are responding to the SDGs by integrating multiple concerns, including energy issues, into their development plans. However, much of the recent research to support policymakers on SDGs implementation has focused on developing models and analytical frameworks to identify linkages across a wide range of issues. Fewer studies have examined the governance arrangements needed to align agency and other stakeholder interests behind integrated solutions. The recent IGES policy report titled "Governance for integrated solutions to sustainable development and climate change: from linking issues to aligning interests" aimed to fill this gap by determining whether and to what extent three different dimensions of governance—horizontal coordination, vertical coordination, and multi stakeholder engagement—affected integrated approaches concerning climate and other sustainable development issues. Based on this publication, this presentation will briefly discuss linkages between energy and other sustainable development issues and introduce some integrated approaches addressing linkages between energy and other goals such as 1) co-benefits, 2) sustainable transport, and 3) the water-energy-food nexus. Then, the presentation will discuss, based on case studies, whether and to what extent three different dimensions of governance were important to align agency and other stakeholder interests behind integrated solutions.

Yadollah Saboohi

Yadollah Saboohi is a Professor at the Energy Engineering Department of the Sharif University of Technology, Tehran, Iran. He is also the founder and director of the Sharif Energy Research Institute, Tehran, Iran. He has supervised dozens of Ph.D. these, has led a variety of national and international projects and has many publications to his credit. Dr. Saboohi's work focuses on interdisciplinary research combining science, technology, economics and policy to enhance the understanding of, and policy responses to, the challenges of accelerating the transition to sustainable low-carbon energy systems. His main areas of expertise include energy systems modeling, technology assessment and technology policy analysis.

Model framework of innovative transition pathways of energy in mega cities:

Case of Tehran

Prof. Yadollah Saboohi, Sharif University of Technology, Iran

Rapid growth of large cities in Iran has been due to social and economic development, concentration of administration and services in large cities and migration of population from other parts of the country, specially from rural areas, to metropolitans. But development of infrastructures has not been compatible with rapid growth of population and urban planning has rarely supported changes that have been taken place in last 3 decades. As a result, cities with large number of populations in general and mega cities in particular have been confronted with multidimensional and complex problems. Persistence of multi facet issues in mega cities has led to increased consumption of energy, considerable accumulation of pollutants in air, waste of time due to intense traffic system, extensive production of waste materials, unreliable supply of water, social disparity and inefficient uses of resources. Present state of affairs in mega cities has caused extensive external costs and it has reduced quality of life. The consequence of externalities has undermined stability and sustainability of life and society. A central element of lack of sustainability has been observed to be the growing fossil energy demand. Increased energy demand is involved with high emission of air pollutants and formation and concentration of low size particles. Such a phenomenon has also caused inversion in certain times of the year and it has contributed to low economic productivity and reduced life time and chaotic social behavior. Improvement of energy efficiency, substitution of fossil fuel consumption with renewable energies, changes in the structure of mobility and optimal maintenance of utilities in household and service sectors are understood as important undertakings. Therefore, identification of reliable solution to complex problems requires innovative measures and transition pathways. Identification,

formulation and implementation of innovative transition pathways have investigated in various case studies in Tehran as a mega city in Iran and an integrated model for analysis of different development paths towards a clean and resilient city are being developed. The integrated model includes different modules that are being used as analytical tools for better understanding of different dimension of problems in mega cities. The general framework of the integrated model shall be presented that could support investigation of transition pathways towards identifying optimal options which could help developing roadmap for energy transition in mega cities. The presentation shall be concluded by introduction of a policy framework that has been formulated based on the result of model application.

Venue:

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