International Workshop on Urban Planning and Environmental Research Cooperation

18th March 2022

Yokohama, Japan

International Workshop on Urban Planning and Environmental Research Cooperation

Objective

While the vulnerability of climate change will be felt globally, Asia will be one of the regions that will recognize the most visible impacts in terms of changing rainfall patterns, availability of water resources, increasing flood risks, etc. In addition, rapid urbanization increases the threat of inland flooding and causes various problems related to urban natural resources. The purpose of this workshop is to report the state of the art on the initiatives and activities relevant to climate change, natural resources and urban planning in international, national and local level in Asia. In addition, we will discuss the possible collaboration between IACSC member universities and other research institutes in order to strengthen the current research activities in Asia.

Time & Date
18th March, 2022 10:00 a.m.-16:00 p.m. (Japan Standard Time)
Venue
Online Zoom Meeting
Contact
Dr. Peii Tsai, Assistant Professor Global Cooperation Institute for Sustainable Cities (GCI), Yokohama City University 22-2 Seto, Kanazawa-ku, Yokohama, 236-0027, Japan Office Tel:+81-45-787-2121 E-mail: tsai@yokohama-cu.ac.jp

List of Participants

Speakers

Yokohama City University, Japan

Prof. Hidefumi Imura, Professor, Global Cooperation Institute for Sustainable Cities (GCI)

Prof. Akio Onishi, Professor, School of Data Science

Dr. Peii Tsai, Assistant Professor, Global Cooperation Institute for Sustainable Cities (GCI)

Environmental Science Research Institute, Environmental Planning Bureau, City of Yokohama, Japan

Mr. Koji Minoshima, Manager

University of Tsukuba, Japan

Prof. Akinobu Murakami, Professor, Faculty of Engineering, Information and Systems

National Institute for Environmental Studies (NIES), Japan

Prof. Toshiaki Ichinose, Executive Senior Research Scientist

Institute for Global Environmental Strategies (IGES), Japan

Dr. Brian A, Johnson., Researcher

Universiti Sains Malaysia (USM), Malaysia

Prof. Ngai Weng Chan, Professor, School of Humanities

University of the Philippines Los Baños (UPLB), Philippines

Prof. Damasa Magcale Macandog, Professor, Institute of Biological Sciences, College of Arts and Sciences

National Cheng Kung University (NCKU)

Prof. Yen-Lien Kuo, Associate Professor, Department of Economics

Moderator

Vietnam National University (VNU-USSH), Vietnam

Ms. Dang Nguyen Thien Huong, Lecturer, Vietnam National University, University of Social Sciences and Humanities

Committee members

Yokohama City University, Japan

Prof. Rui Ota, Professor, Department of Economics, Faculty of Economics and Business Administration, Director of Global Cooperation Institute for Sustainable Cities (GCI)

Prof. Takashi Yoshinaga, Associate Professor, School of Economics and Business Administration

Prof. Masahiko Nakanishi, Professor, School of International Liberal Arts

Dr. Fumihiko Omori, Assistant Professor, Global Cooperation Institute for Sustainable Cities (GCI)

Program

09:40 – 10:00 **Registration**

10:00 – 10:10 Opening Session *Moderated by Ms. Dang Nguyen Thien Huong*

10:00 - 10:10 **Welcome by** Prof. Hidefumi Imura, GCI, Yokohama City University

Background and Objective of the Workshop

Prof. Akio Onishi, School of Data Science, Yokohama City University

10:10 – 12:10 Urban Planning and Environmental Session Ⅰ

Moderated by Ms. Dang Nguyen Thien Huong

10:10 - 10:20 **Mapping of Multi-Dimensional Urban Planning-Climate Change Studies**

Prof. Hidefumi Imura, GCI, Yokohama City University, Japan

10:20 - 10:40 **Sponge cities as a comprehensive adaptation to climate change in terms of flood, drought and temperature**

Prof. Ngai Weng Chan, Professor, School of Humanities, Universiti Sains Malaysia (USM), Malaysia

10:40 - 11:00 **Participatory Watershed Land-Use Management (PWLM) Approach for Integrating Climate Change Adaptation and Mitigationin Sta. Rosa-Silang sub-watershed, Philippines**

Prof. Damasa Magcale Macandog, Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños (UPLB), Philippines

11:00 – 11:10 Coffee/Tea Break

11:10 - 11:30 **Nature-based solutions for climate change adaptation: A systematic review of systematic reviews**

Dr. Brian A, Johnson, Institute for Global Environmental Strategies, Japan

11:30 - 11:50 **Are the Rich less Prone to Flooding? A Case Study on Flooding in the Southern Taiwan during Typhoon Morakot and Typhoon Fanapi**

Prof. Yen-Lien Kuo, Department of Economics, National Cheng Kung University (NCKU), Taiwan

11:50 - 12:10 **Urban Households' Willingness to Pay for Improvements in Rainwater Harvesting and Rainwater Infiltration System: Case Study in Japan**

Dr. Peii Tsai, GCI, Yokohama City University, Japan

12:10 – 13:20 Lunch Break

13:20 – 14:40 Urban Planning and Environmental Session Ⅱ

Moderated by Ms. Dang Nguyen Thien Huong

13:20 - 13:40 **Temperature observation in Yokohama city**

Mr. Koji Minoshima, Environmental Science Research Institute, Environmental Planning Bureau, City of Yokohama, Japan

13:40 - 14:00 **How to bridge environmental evaluation to actual urban planning- case study of countermeasure against urban heat island**

Prof. Akinobu Murakami, University of Tsukuba, Faculty of Engineering, Information and Systems, Japan

14:00 - 14:20 **Thermal physiological analysis with remote sensing and big data for urban design**

Prof. Toshiaki Ichinose, National Institute for Environmental Studies, Japan

14:20 - 14:40 **Extraction of hot spots and cold spots of land surface temperature from time-series data in summer and understanding of their spatial characteristics-A case of August 2020-**

Prof. Akio Onishi, School of Data Science, Yokohama City University, Japan

14:40 – 14:50 Coffee/Tea Break

14:50 – 16:00 Discussion: Next Steps for Collaborative Research

Moderated by Ms. Dang Nguyen Thien Huong

14:50 - 15:50 **Discussion: Next Steps for Collaborative Research**

Panelists: Prof. Hidefumi Imura and All participants

15:50 – 16:00 Closing Session

15:50 - 16:00 **Closing Remarks**

Prof. Hidefumi Imura, Global Cooperation Institution for Sustainable Cities, Yokohama City University, Japan

Prof. Ngai Weng Chan, Professor, School of Humanities, Universiti Sains Malaysia (USM), Malaysia

Abstract

Mapping of Multi-dimensional Climate Change-Urban Planning Studies

By Prof. Hidefumi Imura

Senior Advisor, GCI, Yokohama City University

Global climate change is affecting our activities in many ways at the national, regional, urban, and community levels. In relation to our daily lives, the challenge is how to reduce or mitigate the unavoidable impacts on cities, where many people live their daily lives. To cope with these impacts, a new or improved approach for urban planning is essential, and this requires the incorporation of new factors brought about by climate change within the traditional urban planning framework. We, as researchers, must provide policy makers with analytical methods and the information obtained from such analyses to carry out this task in a scientific and rational manner. In this report, we will discuss the interface between climate change and urban planning, based on mapping of various studies that try to integrate climate change factors such as urban temperature rise, rainfall pattern changes, and flood hazards with information on the layout of housing and public facilities, land use regulations, zoning, and the distribution of natural ecosystems within the city. The significance of various studies will be discussed from this viewpoint.

Sponge cities as a comprehensive adaptation to climate change in terms of flood, drought and temperature

By Professor Dr Ngai Weng Chan
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Climate change is a highly pervasive phenomenon that has brought about devastating environmental disasters on cities, including extreme heat waves, floods and droughts which cause significant loss of life, injury and property damage. To comprehensively mitigate them, cities need better coping mechanisms, adaptation strategies and enhanced resilience. This research proposal examines how the concept of sponge cities can be employed to address the heat, flood and drought hazards in cities. Sponge cities employ a combination of green lungs, sustainable urban drainage, urban farming, and water storage capabilities to reduce floods, heat waves and droughts. Addressing these climate change effects will lead to achievement of Sustainable Development Goals 6, 11 and 13. The research methodology involves obtaining primary data in the form of remotes sensing images, measured temperatures from infrared thermometer, and questionnaire survey of city managers and inhabitants. Secondary data from past research, historical events, literature review, and case studies is also used. This research is expected to produce deeper understanding on the role of sponge cities in adapting to climate change, including absorbing and retaining rainwater and stormwater, purifying and storing the water, and transferring excessive city heat out of the city. The research plans to develop a workable theoretical framework combining technical application of sponge cities and non-technical human coping and resilience as the key towards effective climate change adaptation.

Participatory Watershed Land-Use Management (PWLM) Approach for Integrating Climate Change Adaptation and Mitigation in Sta. Rosa-Silang sub-watershed, Philippines

Damasa B. Magcale-Macandog*, Isao Endo, Brian Johnson, Akio Onishi, Milben A. Bragais, Masayuki Kawai and Paula Beatrice M. Macandog

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The Sta.Rosa-Silang sub-watershed has undergone massive land use changes since the early 1990's brought about by urbanization and industrialization. The sub-watershed is composed of uplands and lowlands and is principally drained by the Silang-Sta. Rosa river. During heavy rainfall events and typhoons, the lowland areas of the sub-watershed experience flooding due to surface run-off from the uplands, river overflow and lake water level rise. Participatory watershed land use management (PWLM) approach was conducted in the sub-watershed to support decision-making. PWLM approach involves participatory land use mapping, risk analysis based on plausible future scenarios, climate change measure development, and climate-sensitive land use planning.

Nature-based solutions for climate change adaptation: A systematic review of systematic reviews

By Dr. Brian A, Johnson

Institute for Global Environmental Strategies (IGES)

2108-11 Kamiyamaguchi, Hayama, Kanagawa, Japan

Nature-based solutions for climate change adaptation (NBS-CCA; also commonly referred to as "ecosystem-based adaptation") can provide a variety of co-benefits, including biodiversity conservation/enhancement, disaster risk reduction, and climate change mitigation. As evidence of their growing popularity, thousands of primary studies have been published on NBS-CCA over the last decade, and a number of review papers have been written to summarize these primary studies. The prior reviews, however, are scattered across many different journals and gray literature sources, making it difficult for academics and practitioners to grasp the progress and remaining research gaps. In this study, we conducted a systematic review of 82 systematic reviews on the topic of nature-based solutions for climate change adaptation (NBS-CCA), with the aim of summarizing the main characteristics of the prior reviews.

Are the Rich less Prone to Flooding? A Case Study on Flooding in the Southern Taiwan during Typhoon Morakot and Typhoon Fanapi

Yen-Lien Kuo[1], Ya-Ming Liu[1], Hone-Jay Chu[2], Hung-Ching Lee[1]

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The study uses Taiwan as an example to explore whether the budget allocation of risk reduction depends on income related political power. Specifically, we empirically examine the effect of household income on the probability of flooding. Beginning in 2006, the government implemented an 8-year project referred to as the "Regulation Project for Flood-Prone 10 Areas" with a budget of NT$115.9 billion (US$3.86 billion). Over half of the budget was allocated to local authorities in southern Taiwan to help them carry out flood risk mitigation projects. As it was not clear how the local authorities set their priorities in allocating their budgets, this study investigates whether high-income individuals may have used their political influence to influence the budget allocation to improve the flood risk reduction facilities in their communities. Villages, whose average household income was within the top 10% in the county or city, were selected as high-income villages and assigned 15 to the treatment group, whereas other villages were included in the control group. The results using propensity score matching (PSM) show that the flood probability of the high-income group (13% and 16.9%, respectively) was lower than that of low income group (22% and 28%) during Typhoon Morakot and Typhoon Fanapi, suggesting that high-income areas are less prone to flooding, which might stem from their political power

Urban Households' Willingness to Pay for Improvements in Rainwater Harvesting and Rainwater Infiltration System: A Case Study in Yokohama, Japan

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[2] School of Data Science, Yokohama City University, 22-2 Seto, Kanazawa-ku, Yokohama, Kanagawa, Japan

There is an urgent need to develop an urban rainwater drainage system in cities that have been facing flooding due to heavy rainfall events. In Japan, several municipalities have provided financial support to encourage residents to use household-level rainwater infiltration and harvesting facilities. However, the use of domestic installations is still limited. This study used the contingent valuation method (CVM) to investigate household preferences for rainwater tanks and a rainwater infiltration inlet (RII) in Yokohama, Japan, and examine the factors influencing respondents' willingness to pay (WTP) for using these systems. We found that public perceptions of these systems and municipal subsidy programs have remained low. Improving information dissemination is required to enhance public acceptance of rainwater tanks and RII. The mean WTP was JYP 29,181 (US$ 265) and JYP 30,117 (US$ 274) per unit for RII and a rainwater tank, respectively. When compared to the actual market price, the households' WTP levels indicate high interest in these systems. Moreover, "income", "evaluation for the equipment effectiveness", "environmentally conscious behavior", "duration of residence", "the experience of flooding", "attitudes to flooding disaster", and "the evaluation of installation effectiveness" had a positive influence on the respondents' WTP for both equipment.

Temperature observation in Yokohama city

By Mr. Koji Minoshima

Environmental Science Research Institute, Environmental Planning Bureau, City of Yokohama, Japan

The long-term increasing trend of temperature in Yokohama city is especially large among Japanese cities. This is due to the heat island effect as well as global warming. In recent years, the global effects of climate change have become severer. Therefore, the local governments should promote adaptation as well as mitigation measures in order to suppress the effects. Among the adaptation measures, measures to cope with heat are especially essential for people to live healthy. Promoting those is effective for countermeasures against heat stroke and sleep disruption during hot and humid nights.

Variations in temperatures are complex due to a variety of influences, including wind and other weather conditions, land use and topography. In Yokohama city, it has been confirmed that the sea-breeze from Tokyo Bay and Sagami Bay and the cold air from large green areas cause regional differences in temperature within the city. Therefore, for implementing adaptation measures, it is necessary to understand regional characteristics and to obtain the perspective in keeping with the characteristics.

We conduct an annual temperature observation during summer (July-August) in order to understand the heat conditions in Yokohama city. The observation method is that we record hourly temperature using thermometers with built-in data storage at instrument shelters in several elementary schools (approximately 40 locations) in the city. The survey results confirmed that there are regional differences in temperature distribution within the city, with areas prone to high temperatures differing between the daytime and nighttime.

Since the survey has been ongoing for over 10 years, year-to-year comparisons can be made. The result of comparisons showed that one of the effects is related to the end of the rainy season (Baiu). The Baiu is a cloudy and rainy period of early summer in Japan. The rainy season ended much earlier than usual in 2018, the year which was represented “disastrous heatwave” by Japan Meteorological Agency. In terms of distribution of the whole Yokohama area, averaged temperatures in a year of intense heatwave, such as 2018 was higher than those in a year of usual heatwave.

How to bridge environmental evaluation to actual urban planning

-Case study of countermeasure against urban heat island

By Prof. Akinobu Murakami

University of Tsukuba, Faculty of Engineering,

Information and Systems, Japan

Changes in land cover conditions and the increasing amount of anthropogenic heat released into the outdoor spaces aggravates the outdoor thermal environment in urban areas and increases energy consumption. And, in turn, the increased energy consumption further aggravates the outdoor thermal environment. Therefore, a countermeasure against the heat environment problems must be implemented to break this vicious cycle. In the past, the cooling effect of greenery was the focus of not only the studies but policies. However, it is not clear whether urban greenery is effective in a variety of urban spaces, while the indices related urban green such as green cover ratio, are used in city planning procedures to obtain development permissions. In this presentation, the analysis of the outdoor thermal environment and the cooling effect of urban greenery is introduced. There, the urban element information for a substantial urban area was collected precisely and broadly, and was used to generate a three-dimensional CAD model, to which material data and physical properties were added. Then, a numerical simulation is conducted to determine the cooling effect of urban greenery. Based on the result of the study, how to bridge environmental evaluation to actual city planning would be discussed.

Thermal physiological analysis with remote sensing and big data for urban design

By Prof. Toshiaki Ichinose

National Institute for Environmental Studies, Japan

Our current plan is a multi-scale abstraction of the spatio-temporal information of the urban thermal environment with fusion of a remote sensing and big data analysis. Its purpose is to build a monitoring system of urban heat stress. This system is applicable to an urban environmental administration, and improvement of the environmental monitoring technology and the environmental evaluation ability. In detail, it gives some contribution to urban environmental planning (urban design), and management of human living environment. The valuable opportunity that the effect of urban design is confirmed, not in the numerical simulation but in an actual field, is expected.

Extraction of hot spots and cold spots of land surface temperature from time-series data in summer and understanding of their spatial characteristics -A case of August 2020-

Akio Onishi[1], Toshiaki Ichinose[2]

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It is widely known that the cause of the heat island phenomenon is exacerbated by the artificialization of land use / land cover inside the city. It is already known that the promotion of natural land use / land cover is effective in mitigating the temperature rise.

There are many existing studies targeting the heat island phenomenon in the Kanto region or the Tokyo metropolitan area. In the analysis of the heat island phenomenon, satellite images are often used to acquire information on the land surface temperature (LST), land use, and land cover. Recently, research to analyse the daily LSTs based on the hourly observation results using the information of the geostationary meteorological satellite Himawari-8 launched on October 7, 2014. However, most of the existing research deals with information for a certain period (ex. 1 shot image or daily images). Therefore, there are a few studies that analyse the relationship between the characteristics of the LST and land use / land cover over a certain long period of time, such as summer season or other season.

Since MODIS (Moderate Resolution Imaging Spectroradiometer) installed in Terra is a polar orbit satellite, it can be observed only once or twice day and night. However, the MODIS can grasp the characteristics of continuous LSTs by using multiple satellite images, for example during summer season. Using this MODIS information, hot spots with chronically high LSTs and cold spots with chronically low LSTs can be extracted and can analyse the relationship with the LSTs and land use / land cover. Based on this result, we can examine, for example, countermeasures for improving land use / land cover to effectively mitigate the LSTs in hot spots.

In this study, we used spatial statistical methods to extract chronic hot spots and cold spots of LSTs using time-series data in the summer in the Tokyo metropolitan area. Then, the spatial characteristics of these hot spots and cold spots were grasped from the relationship with land use.