Workshop on
contributions of smart city projects to climate resilience

Date: December 16-18 2020

Registration: Please register to receive zoom link prior to the event. https://bit.ly/2HsrTQz

Co-organizers: Hiroshima University (Network for Education and Research on Peace and Sustainability), Global Carbon Project-Tsukuba International Office, Future Earth, Asia-Pacific Network for Global Change Research (APN)

Background

Smart city initiatives enabled by Information and Communication Technologies (ICTs) are deemed essential for helping cities to develop transformative solutions to address the challenges of global change and to create just, sustainable, and resilient communities. While a vast body of knowledge exists on the contributions of smart city projects to sustainability and quality of life, relatively little is known about their contributions to climate resilience and climate action planning. Accordingly, this workshop aims to bring together scholars and practitioners from several countries around the world to share knowledge on the actual and/or potential contributions for smart city solutions to climate resilience. Climate resilience in this context contributes to achieving climate change adaptation as well as mitigation objectives.

Major activities

This 3-day workshop is consisted of sessions related to three main activities:

1. The first day is allocated to presentations by authors who have submitted their works to be considered for publication in a special issue of Environment and Planning B. Details about the special issue are available at: https://journals.sagepub.com/page/epb/collections/special-issues
2. On days 2 and 3 the participants will take part in interactive sessions focused on investigating the actual and potential contributions of smart cities to climate resilience. Scholars involved in a related project funded by The Asia-Pacific Network for Global Change Research (APN) (https://www.apn-gcr.org/resources/items/show/2114) will report their findings. In addition to presenting their case study research on contributions of smart city projects to resilience, participants will also collaborate on developing a smart city resilience assessment toolkit that can be used to examine actual and/or potential performance of selected cases across the world. Outputs will provide useful scientific and policy knowledge on how to integrate resilience thinking into smart city developments and will also include lessons that can be transferred to less developed countries in the region.
3. On day 3 a parallel session will be organized to discuss contributions of smart cities to urban climate change mitigation. The organizers are lead authors of the Six Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR6). They will discuss the results of their analysis of the state of knowledge and synthesize the findings to be communicated to IPCC.

Major objectives:

- To elaborate on the concept of data-driven urban planning and its implications for climate resilience in cities
- To gain a better knowledge on the actual and/or potential contributions of smart cities to urban climate change adaptation and mitigation
- To share and explore good practice examples of contributions of smart city solutions to climate change mitigation and adaptation
- To discuss co-benefits of smart solutions for sustainability, health, and equity
- To discuss knowledge gaps related to the contributions of smart solutions to climate resilience
- To discuss barriers to optimizing climate resilience through smart solutions
- To explore opportunities to enhance climate resilience by using ICT-based solutions and big-data analytics
- To develop an indicator toolkit for measuring effectiveness of smart city solutions for climate change mitigation and adaptation and associated co-benefits
- To develop a plan to examine cases in the participating countries using the toolkit
- And finally, to use the workshop as a platform to establish a network for transdisciplinary research on smart city resilience

Who can participate?

In addition to invited participants (i.e., the EPB special issue speakers and the APN collaborators) we invite interested students, researchers, and policy makers to participate in the workshop. Please register to receive zoom link prior to the event. https://bit.ly/2HsrTQz

December 16, 2020 **Smart Cities and Climate-Resilient Urban Planning (allocated to papers submitted to EPB special issue)**		
7:15-7:20	Opening remarks	Yoshiki Yamagata
7:20-7:30	Introduction and aims/objectives	Ayyoob Sharifi
7:30-8:00	Developing sustainable and health-promoting cities with nature-based solutions in a multi-stakeholder approach	Julita Skodra
8:00-8:30	A grammar-based optimization approach for walkable urban fabrics: addressing walkability and infrastructure cost trade-off	Fernando Lima
8:30-9:00	The Spatial Dimension of Assessing Energy Performance in Solar Community Microgrids	Mina Rahimian
9:00-9:30	Smart Water: emerging digital technologies for municipal water management	Allison Lassiter
9:30-13:00	Break	
13:00-13:30	Pursuing Data-Driven Urban Adaptability: The Current Status and Data Gaps of Tokyo, Taipei, and New York	Masahiko Haraguchi
13:30-14:00	Telework at the time of crisis: The neglected role of place	Abbas Shieh
14:00-14:30	Data science and citizen's adaptation to climate and environmental changes; Mining the adaptive capacity level of Tehran citizens using twitter posts	Mojtaba Khanian
14:30-15:00	Break	
15:00-15:30	Urban Commons in the Techno-Economic Paradigm Shift: An ICT-Enabled Sharing Paradigm Review	Herlin Chien
15:30-16:00	Mainstreaming Climate Resilience: A GIS-based Methodology to Cope Cloudbursts in Turin (Italy)	Ombretta Caldarice
16:00-17:00	Panel discussion	
End of the day		

December 16, 2020
Smart Cities and Climate-Resilient Urban Planning

7:15-7:20 **Opening remarks**

Yoshiki Yamagata

Head of GCP Tsukuba Office / Principal Researcher, National Institute for Environmental Studies (NIES)

7:20-7:30 **Introduction and aims/objectives**

Ayyoob Sharifi

Hiroshima University

7:30-8:00 **Developing sustainable and health-promoting cities with nature-based solutions in a multi-stakeholder approach**

Skodra, J., Alvanides, S., Herranz-Pascual, K., Garcia, I., Zorita, S., Moebus, S.

University of Duisburg-Essen, Germany

Dr. Julita Skodra is a postdoctoral researcher in the Institute for Urban Public Health (InUPH) at the University of Duisburg-Essen, Germany. She is a transdisciplinary researcher focused on healthy, resilient, equitable and sustainable urban development. She is interested in new modes of urban living and co-creation of future cities that challenge current approaches focused solely on aspects of infrastructure and technology, as the basis for healthier living. Julita has a background in architecture, urban planning and management. She has worked with the InUPH since 2014, where she has been involved in different interdisciplinary projects, including the European project CLEVER Cities.

Abstract: Information and Communications Technology (ICT) enables cities to collect vast amounts of data from different sources that can be used for integrated planning of sustainable, healthy and just cities. However, ICT and solely technological approaches alone are insufficient to support long-term sustainability. CLEVER Cities Project combines ICT solutions with nature-based solutions (NBS) in a multi-stakeholder approach in order to develop sustainable, climate resilient, just and healthy cities. Building on the digital platforms to collect, store and provide data, the CLEVER Monitor has established a robust, locally-adaptable framework for co-monitoring and impact assessment. The approach fully employs the co-monitoring principle, meaning that different sectors, stakeholders and CLEVER Cities partners are involved in the assessment of the performance of the NBS and the effectiveness of the implementation process. This paper reports on the lessons learned, and the procedures and methods used in co-monitoring to evaluate benefits and co-benefits and identify negative effects.

8:00-8:30 **A grammar-based optimization approach for walkable urban fabrics: addressing walkability and infrastructure cost trade-off**

Fernando Lima

Pennsylvania State University, USA

Dr. Fernando Lima is a visiting scholar at Stuckeman Center for Design Computing – Pennsylvania State University. He has a Ph.D. in Urbanism from the Federal University of Rio de Janeiro, having attended a doctoral exchange period at the Faculty of Architecture of the University of Lisbon. He was awarded the Brazilian CAPES Foundation Thesis 2018 Honorable Mention. He is currently the vice director of the Faculty of Architecture and Urbanism at the Federal University of Juiz de Fora, Brazil, where he is a professor in the Department of Design, representation, and technology and a permanent professor in the master's program of Built environment.

Abstract: Adopting generative, parametric, and data-driven design approaches increase designers' ability to explore wider sets of potential solutions. Thus, identifying designs with an optimized performance out of the vast possibilities that computational resources provide is crucial. The work described in this paper hypothesizes that coupling shape grammars with multi-criteria optimization can help address trade-offs in urban design. It focuses on the walkability and infrastructure cost trade-off to verify the suitability of a grammar-based optimization approach for more dynamic and efficient solution-finding in urban design. In summary, this paper aims to contribute to climate-resilient design approaches by exploiting the possibility of articulating shape grammars and multi-criteria optimization in the quest for urban fabrics that are more integrated and walkable while consuming less-resources and emitting less CO2.

8:30-9:00 **The Spatial Dimension of Assessing Energy Performance in Solar Community Microgrids**

Mina Rahimian

Pennsylvania State University, USA

Mina (Vina) Rahimian is a PhD candidate in architecture at the Pennsylvania State University where her research efforts lie in the intersection of computational design and sustainability. She's a design technologist interested in technological and data-driven responses for solving wider sustainability-related issues in the built environment. Mina holds a BArch from University of Tehran, a MS in Architecture and a graduate certification in Applied Statistics from the Pennsylvania State University. Mina previously served as a visiting researcher at University of Lisbon in Portugal, worked as a researcher at Autodesk in San Francisco, and is currently the Director of Generative Design at Deluxe Modular in New York City.

Abstract: This research discusses the multidimensional impact that the spatial structure of urban form has on the energy performance of solar community microgrids. Benefiting from artificial neural networks, this

study was able to uncover the complex relationship between San Diego's urban form and its impact on community scale energy consumption. Results of the training procedure proves the existence of a strong statistical relationship between urban form and energy performance in communities. This presentation takes the statistical analysis that was conducted on the model and architecturally interprets the results. Accordingly, a comprehensive set of design principles were extracted from this analysis that guides architects and urban planners in spatially designing high energy performance community microgrids in San Diego. Another deliverable discussed herein is an energy simulation software prototype that predicts the energy performance of any given solar community microgrid design scenario in real-time by the virtue of its urban spatial configuration. The real-time prediction feature of this software (triggered by the use of surrogate models) is a major contribution to the field and sets an example for future simulation software developments, since current existing urban scale energy simulation tools are extremely time and resource consuming.

9:00-9:30 **Smart Water: emerging digital technologies for municipal water management**

Allison Lassiter

University of Pennsylvania

Dr. Allison Lassiter examines opportunities to use nature-based solutions and emerging technologies to build resilience and increase adaptive capacity in cities. Her research focuses on urban water management. She is currently working on evidence-based green infrastructure policy; adapting municipal water to rising seas; and smart water. She teaches courses on sustainable cities, smart cities, and water policy. She received a BS in Computational Biology from Cornell, Masters in City Planning from MIT, and PhD in Environmental Planning from UC Berkeley.

Abstract: Municipal water providers around the globe are managing the combined challenges of outdated and inadequate infrastructure, insufficient revenue, and climate changed-induced shifts in water resources. These challenges exist in both developing and developed economies. One approach to creating more resilient and affordable water systems may be through employing emerging, digital technologies associated with smart cities. This study examines how smart water technologies are contributing to resilient municipal water systems. We review the literature, focusing on distributed, low-cost technologies. We thematically characterize the types of water management problems smart water may be able to solve.

9:30-13:00 ***Break***

13:00-13:30 **Pursuing Data-Driven Urban Adaptability: The Current Status and Data Gaps of Tokyo, Taipei, and New York**

Masahiko Haraguchi, Akira Kodaka, Liao Kuei-Hsien, Akihiko Nishino, Kota Tsubouchi, Chiang Yen-Sheng, Upmanu Lall, Naohiko Kohtake

Research Institute for Humanity and Nature, Japan

Dr. Masahiko Haraguchi is a Postdoctoral Researcher in the Research Institute for Humanity and Nature while collaborating with researchers at the Harvard T.H. Chan School of Public Health. His research interests include disaster risk management, water resource systems analysis, risk analysis, and sustainability. Before the current position, he was a postdoc at Harvard University for three years. Masa earned his Ph.D. in Earth and Environmental Engineering from Columbia University, where he worked on projects in the Columbia Water Center at the Earth Institute. Previously, Masa worked for the urban climate change and disaster risk divisions of the World Bank.

Abstract: By 2050, 70% of the world's population will live in urban areas. As cities continue to grow, disaster risk is expected to increase exponentially. Traditionally, disaster planning has relied on limited analysis regarding possible disaster scenarios. Notably, past planning efforts often do not distinguish between event time of day, workdays vs. weekends, seasons, or urban locations (e.g., indoor, outdoor, underground). As an international project funded by the Belmont Forum, we have started a project in 2020 to address dynamic disaster scenarios as well as the needs of vulnerable socio-economic groups in urban areas. In this presentation, first, we will introduce an overview of the project. Then, we analyze the current status of Tokyo, Taipei, and New York and identified data gaps while referring to possible methods, smart technologies, and data sources to propose dynamic, data-driven disaster planning in the megacities.

13:30-14:00 **Telework at the time of crisis: The neglected role of place**

Abbas Shieh

Azad University of Tehran, Science and Research Branch, Iran

Dr. Abbas Shieh is a City Strategist with over 15 years of professional experiences in planning and managing urban projects. He is currently an Assistant Professor of Planning and Design in the Azad University of Tehran, serving different national and international initiatives as a Smart City and Urban Resilience consultant. Through his academic and professional experiences, Dr. Shieh has intellectually developed an interest in elaborating planning and design discussions around the relationship between urban form and technology phenomena. In particular, the evolution of urban spatial structure in the information age is an overarching issue in his recent research. More specifically, he has studied smart working/telework as a technological

practice to contribute to the implications of the emergence of new working environments to the future shape of cities.

Abstract: For the past 50 years, telework has always been a solution to vulnerable, urgent, and critical human situations, including climate-related crises. No specific theorizing of the effect of place has been done in the literature over the past 50 years. This paper addresses this empirical gap by comprehensively assessing the impact of place-related factors on work motivation, based on a sample of 277 Australian home-based teleworkers. Empirical findings indicate that several key place-related factors have a significant effect on the work motivation of teleworkers. The paper begins with a brief review of the supporting role of telework in crisis management. It then reviews the literature regarding the place and non-place related requirements of teleworking. Next, the paper provides the results of predictive analyses and discusses how different place-factors can be related to a more urban resilient situation. The paper concludes by assessing how Australian planning policy needs to be improved to be responsive to highly frequent climate disasters in Australia.

14:00-14:30 Data science and citizen's adaptation to climate and environmental changes; Mining the adaptive capacity level of Tehran citizens using twitter posts

Mojtaba Khanian

Hamedan Housing Foundation, Iran

Mojtaba Khanian studied architecture with a focus on designing in the undergraduate level. After taking some courses related to the concept of sustainability, he became interested in sustainability in general and the social dimension of sustainability in particular. This encouraged him to pursue his postgraduate studies in urban planning and to explore social issues throughout the course. After that, being worked in Hamedan Housing Foundation, he realized that climate change impacts in Iranian urban and rural settlements are transforming the social, environmental and economic catechistic of them. Therefore, he designed and conducted some researches about settlements adaptation and resiliency facing with climate changes, resulting to publish them in peer reviewed journals.

Abstract: Climate and environmental changes are becoming the most important global issues of the present time and the future. Many studies and reports introduce "adaptation" as the most appropriate response that a community can make to events resulting from environmental and climate changes. Adaptability is often defined as the ability of a system to deal with external stresses resulting from emergence of a new situation. A review of the related literature shows that the adaptability of individuals, known as adaptive capacity, is determined by their social, cultural, and psychological characteristics. Therefore, as an empirical study, this study intends to develop a method to use the big data analysis to mine the tweets posted during the past three years by Tehran citizens as a case study about their environment and Tehran City at the time of facing the impacts of climate change and examine the adaptive capacity of these citizens.

14:30-15:00 ***Break***

15:00-15:30 **Urban Commons in the Techno-Economic Paradigm Shift: An ICT-Enabled Sharing Paradigm Review**

Herlin Chien , Keiko Hori and Osamu Saito

National Pingtung University of Science and Technology, Taiwan

Dr. Herlin Chien, originally trained as a political scientist, is an Associate Professor at National Pingtung University of Science and Technology in Taiwan while pursuing her second PhD degree at United Nations University, Institute for the Advanced Study of Sustainability, Japan. Her recent research interests include using socio-ecological system approach to analyze the social dilemma in urban river restoration. She also tries to use Coupled Infrastructure Framework to systematically decouple urban river governance and explores the potential of citizen engagement or urban commoning with aid of ICT innovation.

Abstract: Since the early 21st century, there has been a stream of derivative commons focusing on solving urban problems, especially in the context of rapid urbanization and climate change, and the need to craft a more sustainable and resilient city. This emergence of urban commons is also accompanied by the techno-economic paradigm shift featured by an ICT enabled sharing practice based on the epochal creation of new online social structure. Due to the newness of this field of study, different terminologies, and an array of nascent applications in the real world, this paper argues that there is a need to conduct a systematic literature review to enhance our understanding of 1) theoretical foundation of ICT to expand functions and scale of urban commons from sharing paradigm perspective, 2) opportunities of ICT-enabled urban commons to solve urban unsustainable problems, and 3) barriers of ICT-enabled urban commons.

15:30-16:00 **Mainstreaming Climate Resilience: A GIS-based Methodology to Cope Cloudbursts in Turin (Italy)**

Grazia Brunetta, Ombretta Caldarice, Stefano Salata

Politecnico di Torino, Italy

Dr. Ombretta Caldarice, is assistant professor in urban and regional planning at the Politecnico di Torino. She has ten years of international experience in research, capacity-building and education on the role (and limits) of planning in complex and adaptive systems assuming a comparative perspective. Her research activity includes the interplay between planning and urban resilience through the lens of planning rules and urban codes. She is a member of the Responsible Risk Resilience Centre - R3C of the Politecnico di Torino within she supports local stakeholders towards transformative resilience. She is junior

coordinator of the Risk Management and Adaptation group of the international programme RESURBE - Urban Resilience and Climate Change Adaptation. She is in the expert committee of the Summer School on Urban Resilience (Southern University of Denmark).

Abstract: The presentation will focus on how to map and to assess the vulnerability of the city of Turin (Italy) to cloudburst events in the frame of the on-going revision of the local land-use plan, that is based on the application of a mainstreamed approach especially to extreme rainfalls. The proposed methodology aims at identifying hydraulic vulnerability by mapping streams and flood-prone areas with GIS-based overlay. We employed an array of datasets and indices combined with modelling techniques of the "streams", elaborated with the Integrated Valuation of Ecosystem Services and Tradeoffs software program. Results of the methodology allow to understand what would happen if the urban canals fail to discharge during a phenomenon of intense rain (cloudburst event) and consequently, which areas of the city should undergo adaptation and transformation to reduce their flooding vulnerability while mainstreaming the resilience of the system.

16:00-17:00 **Panel discussion on urban system design for creating sustainable and resilient cities**

(Chairs: **TBD**)

• Urban system design

• Integrated approaches for achieving low-carbon, smart, resilient, and sustainable cities

December 17, 2020 **Contributions of smart cities to climate resilience (reporting on the APN activities)**		
9:00-9:10	Introduction and aims/objectives	Ayyoob Sharifi
9:10-9:30	The role of smart cities to increase resiliency: Lesson learnt from case studies	Hasan Masrur
9:30-9:50	IoT, Smart mobility, and Smart City: A Case Study of the YouBike in Taipei	Nae-Wen Kuo
9:50-10:10	Data-sharing approaches for a resilient and smart city to urban urgent disaster and hazard: a case of smart city R&D project in Daegu, South Korea	Yesuel Kim
10:10-10:30	Envisioning sustainable and resilient Petaling Jaya through a smart city framework: A case study	Melasutra Md Dali
10:30-10:50	Break	
10:50-11:10	Climate (un)smart? Case study of smart city projects in Surat, India	Shrutika Parihar
11:10-11:30	Digital Solutions for Resilient Cities: A Critical Assessment of Resilience in Australian Smart City Initiatives	Leila Irajifar
11:30-11:50	The Smart City Initiatives for Resilience: The Case of San Francisco, California, United States	Yekang Ko
11:50-13:00		
13:00-13:30	Smart cities and resilience: Insights from a Delphi survey	Chong-En Li
13:30-16:00	Interactive session on developing a toolkit for assessing resilience of smart cities	
End of the day		

December 17, 2020

Contributions of smart cities to climate resilience (reporting on the APN activities)

9:00-9:10 **Introduction and aims/objectives**

Ayyoob Sharifi

Hiroshima University

9:10-9:30

The role of smart cities to increase resiliency: Lesson learnt from case studies

Hasan Masrur, University of the Ryukyus, Okinawa, Japan, and **Ayyoob Sharifi**, Hiroshima University, Japan

Hasan Masrur earned a Master's Degree in Department of Energy, Environment, and Climate Change in 2017 from the Asian Institute of Technology, Thailand. He is currently undertaking his Ph.D. degree in the interdisciplinary Intelligent Systems Engineering, Graduate School of Engineering and Science of the University of the Ryukyus, Okinawa, Japan with the MEXT scholarship. Mr. Masrur is actively working with academia and industry on different research projects. Currently he is involved as a research assistant in the APN funded project- 'Assessment of the Actual and Potential Contributions of Smart City Projects to Climate Resilience in Selected Asia-Pacific Cities'.

Abstract: Smart cities are often characterized using ICT-enabled solutions in various socio-economic, institutional, and environmental fields to enhance quality of life, sustainability and resilience, and to preserve the competitive potential of cities in an increasingly interconnected network of cities. While the concept and adaptation of 'smart city' has been around for a while, recently there is a growing interest on smart cities as a resilience measure worldwide. It is vital to recognize the effect of smart cities on improving urban resilience, especially with regard to climate adaptation and mitigation. Our database of approximately 300 case studies tries to investigate the resilience steps and smart solutions taken by smart cities around the world under categorized Indicator sets. The evidence based quantitative analysis of global smart city projects allows to highlight the success factors, trends and future paths along with their resilience characteristics and stages.

9:30-9:50

IoT, Smart mobility, and Smart City: A Case Study of the YouBike in Taipei

Nae-Wen Kuo and **Yu Chang,** National Taiwan Normal University

Dr. Nae-Wen, Kuo is a Professor of the Department of Geography, National Taiwan Normal University. He

received his Ph.D. in Environmental Management from National Taiwan University in 2000. His research expertise is about environmental planning and management, Industrial Ecology, urban metabolism, climate change adaption, and resilience city. He has published several articles in journals and books and often reviews papers for the international journals. He also serves as a consultant of the government agencies to contribute to the collaboration between academia and government and develop partnerships and relationships between different stakeholders.

Abstract: Smart mobility is aimed to make transport more connected, more efficient, more flexible, and environmental-friendly. It is the backbone for growth in today's urban environments, and can encompass everything from mass transit and car and bike-sharing services to private cars and commercial vehicles. **The main goals of smart cities** are focused on **improving citizens' quality of life,** urban resilience**, sustainable development,** and **greater efficiency in the management of available resources.** Smart mobility based on The Internet of Things (IoT) technology is essential for **smart cities** and smart transportation will play a *key* role in modern urban life.

The Internet of Things (IoT) is a basis for collaboration, offering a convenient way to bring together players in the private and public sectors, so new business models can be emerged. Most of these IoT-driven initiatives focus on the end-user experience, and emphasize the importance of delivering transport services that are simple to use and provide easy access to valuable, real-time information such as the YouBike in Taipei.

YouBike is public bike-sharing services based on IoT technology and it is the smart transportation policy of Taipei City Government. YouBike is selected as the case study in this paper and the user's behavior and the environmental benefits are analyzed. Both of the big databases from Taipei City Government and Taiwan Emission Data System are used in this research. The results show that this public bike-sharing service can generate many positive benefits. For example, it can reduce gasoline consumption and CO_2 and air pollutants emission.

9:50-10:10

Data-sharing approaches for a resilient and smart city to urban urgent disaster and hazard: a case of smart city R&D project in Daegu, South Korea

Yesuel Kim, **Sunghee Lee, Ayyoob Sharifi**, and **Youngchul Kim**

Dr. Youngchul Kim is an Associate Professor of Urban Design in the Department of Civil and Environmental Engineering at KAIST in South Korea. He is a skilled urban designer, architect, educator and researcher with strong background in urban design and redevelopment. He has experienced in conducting research projects regarding data-driven urban design, urban analytics, urban spatial analysis and urban redevelopment for sustainable, resilient, smart cities. Prof. Kim received the B.S. and M.S. degrees from Seoul National University, Seoul, South Korea, in 1999 and 2001, respectively, and the Ph.D. degree from the University of Michigan at Ann Arbor, MI, USA, investigating urban redevelopment and its impact on residents, in 2011. From 2012 to 2015, he was an assistant professor in the Department of Architecture and Civil Engineering at City University of Hong Kong, and from 2013 to 2015, he was an Associate Programme Leader of the Master of Urban Design and Regional Planning degree with the City University of Hong Kong. In 2016, he joined the Department of Civil and Environmental Engineering at Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, and since 2017, he has been the Director of the Smart City Research Center, KAIST. His research interests include experimental, innovative urban design, and urban data-driven analysis for smart, resilient, sustainable cities. He leads the KAIST Urban Design Lab.

Abstract: This study explores recent nationwide projects, including those related to smart cities, climate change, urban regeneration and the K-New Deal, and in particular analyzes how the national smart city R&D project instills resilience in a smart city. This study analyzes a government-funded smart city R&D project in Daegu, South Korea with a focus on three main topics: the effects of the system, the main items that should be considered by planners and decision makers, and ways to ensure participation from diverse groups of citizens. Advanced smart city technologies and services are being adopted as part of the smart city R&D project, such as deep learning-based civil motion recognition, advanced technology for intelligent disaster prediction, and warning technologies for heatwaves, heavy rain, slope collapses, etc. Our analysis of the smart city R&D project according to the analytics framework shows that the Daegu smart city R&D project has sought to consider 15 indexes of resilience and include the three main topics mentioned above. The list of resilience indicators presented in this study can be used as an assessment toolkit that comprehensively considers various parts of the city, such as technology/services, planners/decision makers, and citizens, all of which make up a smart city. This checklist provides a means of evaluating various stages of smart city projects that aim to increase resilience.

10:10-10:30

Envisioning sustainable and resilient Petaling Jaya through a smart city framework: A case study

Melasutra Md Dali, University of Malaya

Dr. Melasutra Md Dali is a Registered Town Planner under the Town Planner Act (Act 538) and also a member of Malaysian Association of Social Impact Assessment. She has 22 years of experience in University Malaya as lecturer at Faculty of Arts and Social Sciences and Faculty of Built Environment. Her teaching subjects are related to urban land use planning, social planning, planning theory and recreational planning. While serving UM, she also involved in several researches and consultancy services on Social Impact Assessment, Urban Redevelopment, Development Plan studies. She has been appointed as Council Member for Petaling Jaya City Council in 2008-2012 and be part of the One Stop Center committee. During the tenure she was also appointed as Panel Member for Local Agenda 21 of the city. She is currently serving as a panel member for Kuala Lumpur City Hall Public Hearing Committee for the gazettement of Kuala Lumpur Structure Plan 2040.

Abstract: Malaysia Smart City Framework was launched in September 2019, to serves as a national reference and guideline especially for cities and their local governments, and other relevant agencies and stakeholders in developing and implementing smart city initiatives. This comprehensive framework comprises all three tiers of government, as well as private sector participation to streamline and coordinate smart cities development in Malaysia. With funding support from the Global Environment Facility (GEF), UNDP is working together with our partners the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) and the Sustainable Energy Development Authority (SEDA) to implement a low carbon cities project titled the Green Technology Application for the Development of Low Carbon Cities (GTALCC) (Lee, 2019). The transformative and innovative solutions is critical to strengthen urban infrastructure to meet rising expectations of citizens for better quality of life. This case study focuses on Petaling Jaya City Council Smart City initiaves through various form of projects in their effort to implement smart initiatives in their urban planning prospects and look at their attainment thus far. It hopes to highlight the city council changing concept and combine approach with the modern intelligent technology towards formulating a smart city that resilience to the climate change. It is hope that this discussion will be useful policy knowledge and lessons to be shared and transferred to other local authorities else where.

Keywords: Smart City Framework, Smart City Initiatives, Low carbon City Framework

10:30-10:50 ***Break***

10:50-11:10

Climate (un)smart? Case study of smart city projects in Surat, India

Minal Pathak, Shrutika Parihar, Ahmedabad University

Shrutika Parihar is Doctoral candidate at Ahmedabad University. She specializes in GIS based modelling. For the last 10 years, she has been contributing to research in the domain of planning and public policy in collaboration with many national and international agencies. She has co-authored the book titled "Land use change trends of Indian cities: a bird's eye view: Vulnerabilities of unplanned urban growth" published by Sage. She has published in international peer-reviewed journals and has Co-authored national reports for Ministry of Environment, Forests and Climate Change, Department of Science and Technology, and Ministry of Earth Sciences. She holds a master's degree in Geomatics from CEPT University and a masters in Geography from Gujarat University.

Abstract: The rapid growth in population and size of India's urban centres has been largely incompatible with the climate change adaptation and mitigation needs. Government of India's flagship Smart City Mission does not explicitly recognise climate change although the focus on compact and mixed-use planning, promoting non-motorised and public transport, housing and inclusiveness, infrastructure, and enhancing open spaces could enhance resilience and reduce greenhouse gas emissions. Emerging literature focuses on defining smart cities in the Indian context, but gaps remain in understanding the impact of smart city projects and interventions. Specifically, there are gaps in assessing the adaptation and mitigation benefits and trade-offs of these interventions. The assessment includes a study of selected smart city initiatives in Surat city in western India for their efficiency in reducing emissions and enhancing resilience to two key climate impacts- flooding and heat. These include the completed projects for renewable energy, water supply, sewerage, solid waste management and transport. This assessment, based on a set of indicators published in literature is done through detailed review of city's plans, primary and secondary information, and interviews with key stakeholders. The study finds that while a number of projects have been successfully implemented, these falls short of an integrated approach for a sustainable climate resilient city. Finally, the study proposes a set of recommendations for mainstreaming climate change responses in Indian smart city projects and better integration within the overall urban development process.

11:10-11:30

Digital Solutions for Resilient Cities: A Critical Assessment of Resilience in Australian Smart City Initiatives

Leila Irajifar, RMIT University

Dr. Leila Irajifar is an interdisciplinary academic working on the intersection of urban design/planning, disaster resilience, and complex systems modelling as a mean to better understand the interdependencies of physical, natural and socio-economic responses in the face of climate change and other social and environmental hazards. Leila is program director in the Master of Disaster, Design and Development (MoDDD) at RMIT University in Melbourne Australia. As a lecturer in MoDDD and Landscape Architecture, her teaching courses include "Building Urban Resilience", "Industry Project Implementation", "Shelter and Settlements", "Disaster, Design and Development" and "Information systems in disaster response and humanitarian relief". Previously, she has had several years of experience in professional practice in architecture and urban planning. She has been involved in UN-Habitat's City Resilience Profiling Program in Barcelona and worked on economic resilience in rust belt cities as a research fellow at the Institute for Great Lakes Research in Michigan.

Abstract: Urban resilience and smart cities have emerged as a critical agenda for urban development in 21st century. The growing emphasize on smart and resilience concepts is mostly due to increasing shocks and stresses related to the environmental, economic, social, and technological pressures which is also exacerbated by the uncertainty associated with rapid urbanisation, climate change and resource limitations. While digital smart solutions are becoming increasing critical in addressing these emerging challenges, in adopting and using digital technologies in urban systems, it is essential to consider its broadest possible impacts to ensure that new vulnerabilities are not created, and resilience compromised. Kupers and Foden (2017) note “no complexity, no resilience” but conversely, it is also important to recognise that “systems can fail, even if everything works as it is supposed to”. The aim of this project is to investigate if the complexity drawn by introducing smart digital technologies in urban systems enhance resilience or create vulnerabilities? For this purpose, a deep case study analysis will be conducted in Melbourne, Australia investigating the extent to which the current smart city initiatives contribute to the urban resilience attributes or have the potential to do so. Melbourne has dubbed as the most liveable city in the world in several years and leads the nation as the most innovative city in Australia. Yet, despite its many efforts and relative wealth overall, the city faces stresses that weaken the fabric of the society, further entrench disadvantage, and may trigger the shocks of the future. Melbourne is exposed to natural disasters such as extreme heat, bushfires and floods, and emerging shocks like disease pandemics and extremist acts. There is an increasing number of smart city initiatives taking place in City of Melbourne, however, the extent to which these initiates are aligned with the climate resilience objectives is a critical area which needs attention from all

involved stakeholders. The significance and innovation of this project lies in its systematic examination of the contradictory promises, perils, and tensions of smart city solutions. This will facilitate better understanding of how to incorporate resilience thinking in smart city projects and also how to assess and avoid the potential risks of these smart solutions on climate resiliency of cities.

11:30-11:50

The Smart City Initiatives for Resilience: The Case of San Francisco, California, United States

Yekang Ko, Alison Grover, and Carmela Sambo, University of Oregon

Dr. Yekang Ko is an Associate Professor of Landscape Architecture and the Undergraduate Studies (BLA) Director at the University of Oregon. She also serves as the Director of the Sustainable Cities and Landscapes Program of the Association of Pacific Rim Universities (APRU). Her research and teaching focus on sustainable energy landscapes, green infrastructure performance, and planning and design for climate change mitigation and adaptation. Her research was recognized by the 2020 Council of Educators in Landscape Architecture (CELA)'s Excellence in Research Award (Jr Level). She obtained her Ph.D. in Landscape Architecture and Environmental Planning at the University of California, Berkeley.

Abstract: This chapter evaluates the city of San Francisco, California to see if its smart solutions contribute to improving resilience. Increasingly, cities worldwide are revolutionizing their systems through smart technologies. The use of data and applications has accelerated the efforts of cities in reducing emissions, addressing social inequities, and building economic security. In the United States, San Francisco has been a pioneer of using smart technologies for improving urban resilience. We found that San Francisco's best practices on smart technologies are most frequently mentioned in the media and research. Major risks that immediately threaten San Francisco include earthquakes, fire, tsunamis, flooding, extreme heat, droughts, terrorism, cyber terrorism, and communicable diseases. As a result, San Francisco's private and public sectors are funding smart technology in transportation, waste management, social, government, and economic realms, improving their long-term resilience and sustainability. The Department of Transportation has funded the city to implement projects such as smart traffic signals to reduce congestion and improve safety; high-occupancy vehicle lanes for public transit and carpools. The city offers residents and businesses with free water-saving devices to reduce water consumption and has developed an online tool to provide residents with recycling, reuse, and disposal options. This chapter further examines San Francisco's contribution to climate resilience and climate action planning. This research will aid in a smart city resilience assessment toolkit used to investigate actual and potential contributions of smart city initiatives to resilience in the United States.

11:50-13:00 ***Break***

13:00-13:30

Smart cities and resilience: Insights from a Delphi survey

Chong-En Li and **Nae-Wen Kuo,** National Taiwan Normal University, and **Ayyoob Sharifi**, Hiroshima University

Chong-En Li is a Ph.D. student of Geography at National Taiwan Normal University. His research work focuses on Urban Metabolism, specifically on the food system, pollutant emission and relevant evaluation indicators establishment in metropolitan area. He also interested in the smart city and climate resilience and participated in the APN research program.

Abstract: Smart city initiatives enabled by Information and Communication Technologies (ICTs) are deemed essential for helping cities to develop transformative solutions to address the challenges of global change and to create just, sustainable, and resilient communities. While a vast body of knowledge exists on the contributions of such projects to sustainability and quality of life, little is known about their contributions to climate resilience and climate action planning. As many cities around the world are exposed to a broad array of climate-related disasters, enhancing resilience is expected to be at the center of smart city development efforts.

In this research, we conduct a Delphi survey involving a panel of experienced and knowledgeable people to develop a smart city resilience assessment toolkit. The toolkit will then be used to examine actual and/or potential performance of selected cases from around the world. Experts (20-30 participants) were invited to take part in Delphi and AHP processes for development of the assessment toolkit. A summary of the literature review will be shared with the participants during the first round to further familiarize them with the scope and structure of the work. Finally, 13 experts finished the initial questionnaire survey (Round 1). According to the results, the second round questionnaire was designed and sent to those experts to collect their opinions. The output of the Delphi survey will be a finalized list of indicators for assessing smart city resilience, and the weights of indicators will be assigned by the Analytic Hierarchy Process (AHP).

Keywords: Smart city, resilience, Delphi survey, Analytic Hierarchy Process (AHP).

13:30-16:00

Interactive session on developing a toolkit for assessing resilience of smart cities

End of the day

December 18, 2020

Contributions of smart cities to climate resilience (reporting on the APN activities)

9:00-10:30

Interactive session on developing a toolkit for assessing resilience of smart cities (closed session, APN collaborators only)

10:30-10:45 ***Break***

10:45-12:00

Interactive session on developing a toolkit for assessing resilience of smart cities (closed session, APN collaborators only)

12:00-13:00 ***Break***

Global perspectives

13:00-13:30

Smart city assessment frameworks and their utilities for climate planning

Ayyoob Sharifi, Associate Professor, Hiroshima University

In the era of digital revolution many cities around the world have invested significantly in the design and implementation of smart city projects and initiatives to provide solutions to the challenges of climate changes and urbanization. At the same time, various efforts have been made to evaluate performance and outcomes of those projects and initiatives. This presentation provides a critical analysis of 34 selected smart city assessment tools to highlight their strengths and weaknesses and to examine their potential contribution to the evolution of the smart city movement and to climate action planning in cities. The selected tools are evaluated against an analysis framework that covers criteria related to comprehensiveness, stakeholder engagement, context sensitivity, strategic alignment, uncertainty management, interlinkages and interoperability, temporal dynamism, flexibility, feasibility, presentation and communication of the results, and action plans. Results indicate that selected tools have achieved limited success in addressing these criteria. In particular, only few tools have addressed criteria related to stakeholder engagement, uncertainty management, interlinkages, and feasibility. The paper argues that assessment tools should capitalize on the advancements in smart solutions

and big data analytics to develop better strategies for addressing these criteria. In addition to highlighting weaknesses that need to be addressed in the future, results of this study can be used by interested target groups such as smart city developers, planners, and policy makers to choose tools that best fit their needs.

13:30-14:00

Using a participatory approach to support the implementation and planning of innovative mobility concept to enhance sustainability of urban transport system, a case study of carsharing in Bangkok city

Peraphan Jittrapirom, Senior Research Fellow, Nijmegen School of Management, Radboud University and Executive Director, GCP Tsukuba Office

Global greenhouse gas (GHG) emissions continue to rise rapidly despite the urgency and the high-level commitment to address climate change. The transition toward a low-carbon future has been slow particularly in the transport sector; more than 95% of the energy consumed by the sector is from fossil fuels. Innovative transport concepts, such as Mobility as a Service (MaaS) and carsharing, are seen as potential solutions to address these climate challenges of the sector. However, their wide implementation, particularly in developing countries, are still limited. In this presentation, we will report how a participatory approach in Group Model Building, can contribute toward the planning and implementation of urban carsharing in Bangkok city, Thailand. The process helped to construct a shared understanding of the carsharing concept and build a coalition among the stakeholders. It also created a qualitative causal model that can be a basis for a formal policy analysis model. The entire process was also innovatively designed to reduce in-person contact and the risk of coronavirus exposure. The methodology and lessons learned in this exercise would be useful to researchers and practitioners looking for a new-way to support implementation of novel transport concepts, such as MaaS.

14:00-14:30

Modeling contributions of smart solutions to climate change

Yoshiki Yamagata, Head of GCP Tsukuba Office / Principal Researcher, National Institute for Environmental Studies (NIES), **Takahiro Yoshida**, Research Associate, NIES

Climate change is actually increasing the occurrence of extreme weather events such as heat wave and flooding in the world. Adaptation measures against climate risks are increasingly becoming important. In particular, as large population are expected to concentrate in urban areas in the future, climate risk management tools development using latest information and communication technologies (ICT) in the urban setting is an urgent issue for urban policy makers. In fact, in order to manage urban climate risks (e.g., heat) scientifically appropriately, we need to assess the three risk components: hazard, exposure and vulnerability. However, even using latest world-wide monitoring systems

such as meteorological observation networks, it is not easy to estimate the spatially explicit patterns of hazard (e.g., intensity of heat), exposure (e.g., people under heat stress), and vulnerability (e.g., age). Assessments of exposure and vulnerability are especially difficult, as they are to do with people's spatial behaviour which changes according to situation such as weekday/holiday, seasons, events in the city, etc. So, human behaviour information based new modelling methodology development is vitally important for achieving the climate risk management. Fortunately, due to the latest ICT developments, big-data (e.g., smart phone's global positioning system (GPS) data) are becoming available to us to monitor people location, risk response behaviour, and even stress sentiment information with high-spatial and temporal resolution. The objective of this study is to test the new application of spatial big-data analysis which is combining GPS data and geo-tagged tweets information towards urban heat risk management by estimating the three heat risk components at the same time. We have assessed the heat risk by combining the three components and then also analyzed the people's heat stress level by extracting the geo-tagged tweet that include heat stress related keywords. Then, we have analyzed the spatial relationship between the evaluated heat risk and heat stress related geo-tagged tweets distributions. The results suggested that the heat stress related discomfort of people are mostly explained by temperature increase during the hot days. However, heat risk assessment combining the three components estimated using the big-data are also selected as a statistically significant variable to explain the spatial distribution of the heat stress. The results suggest us about the effectives of using big-data which integrate both GPS and Social networking services (SNS) data for developing real time applications for urban climate risks management tools such as heat risk mitigation navigation information system in the near future.

14:30-15:00 ***Coffee break***

15:00-17:00

Closing session

• Gaps and opportunities
• Joint research activities
• Action items and next steps

End of the workshop