

## Application Form of EASTS IRG

Date of Submission: 2019/06/04

<p>1. Name of IRG:</p> <p>Vulnerability Assessment of Transport Systems due to Flooding in Selected Asian Cities</p>
<p>2. List of research members</p> <p style="text-align: center;"><b>EASTS ID number should be provided for each member. (2019/9/8)</b></p> <p>1) a) Name: Dr. Alexis FILLONE  b) ID number of :EASTS Regular Member: ph-95-17-0012  c) Affiliation: Civil Engineering Department, De La Salle University, 2401 Taft Avenue, Manila  d) E-mail: alexis.fillone@dlsu.edu.ph  e) Tel: 632-5244611 local. 231  f) Country/Region &amp; Address: 2401 Taft Avenue, Manila 1004, Philippines</p> <p>2) a) Name: Dr. Sittha Jaensirisak  b) ID number of :EASTS Regular Member:  c) Affiliation: Ubon Ratchathani University  d) E-mail: sittha.j@ubu.ac.th  e) Tel: +66-80-2077771  f) Country/Region &amp; Address: Engineering Faculty, Ubon Ratchathani University, Warin Chamrap, Ubon Ratchathani, 34190</p> <p>3) a) Name: Dr. Varameth Vichiensan  b) ID number of :EASTS Regular Member:  c) Affiliation: Kasetsart University  d) E-mail: fengvmv@ku.ac.th  e) Tel: +66-2-7970999 Ext 1359  f) Country/Region &amp; Address: Department of Civil Engineering, Faculty of Engineering, Kasetsart University 50 Ngamwongwan Rd., Lardyao, Jatujak, Bangkok Thailand 10900</p> <p>4) a) Name of representative: Prof. Dr. Atsushi FUKUDA  b) ID number of :EASTS Regular Member: jp-95-17-0161  c) Affiliation: Nihon University, Chiba, JAPAN  d) E-mail: fukuda.atsushi@nihon-u.ac.jp  e) Tel: +81 47 469 5355  f) Country/Region &amp; Address: 7-24-1 739D, Narashinodai, Funabashi, Chiba 2748501, Japan</p> <p>5) a) Name: Dr. Shinichi Muto  b) ID number of :EASTS Regular Member:  c) Affiliation: Yamanashi University  d) E-mail: smutoh@yamanashi.ac.jp  e) Tel: +81 055-220-8599  f) Country/Region &amp; Address:</p> <p>6) a) Name: Dr. Anabel A. Abuzo  b) ID number of :EASTS Regular Member:  c) Affiliation: Civil Engineering Department, Xavier University-Ateneo de Cagayan, Cagayan de Oro City, Philippines</p>

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3. Name of contact person other than representative:  
Prof. Dr. Alexis M. FILLONE

#### 4. Keywords (Maximum: 5 words)

Vulnerability assessment, Adaptation policy, flood mitigation, flooding simulation, transport network modeling,

#### 5. Purpose and Mission of IRG:

The research aims to understand the impacts of flooding on transportation in cities in Asia and provides appropriate adaptation policies that are applicable to the transport sector. And, the appropriate adaptation policies are evaluated at an economic point of view. The study attempts to shed light on how cities' transport system is affected in the event of a disaster focusing on flooding, how these cities will be able to craft an adaptation policy, how much cost is needed for its implementation that would suit to their needs.

Study Areas: The following cities will be included in this research: (1) Metro Manila, Philippines, (2) Iloilo City, Philippines, (3) Cagayan de Oro City, Philippines, (4) Ubon Ratchathani City, Thailand, (5) Khon Kaen City, Thailand (6) Yamanashi, Japan

#### Background:

Flooding is experienced in many cities across the world and is intensified because of the effects of climate change (rising sea levels and recurrent extreme weather events). Because of the rapid

urban developments and population growth that occurs in urban areas, cities have become the most vulnerable human habitats because of climate change (Intergovernmental Panel on Climate Change (IPCC), 2007; Stern, 2006). Furthermore, the risk of flooding is often aggravated by poor solid waste management and rapid housing developments along river banks (Birhanu, Kim, Jang, et al., 2016) that typically occur in impoverished areas. Critically, the impacts of flooding affect not only the built environment but also activities and individuals who attempt to continue their daily routines by commuting using any available forms of transport.

In recent years, transportation networks face the threat of climate change and extreme weather events. Various studies have proven that floods cause damage to transport facilities and infrastructure (Balijepalli & Oppong, 2014; Oswald & Treat, 2013) and make certain portions of the road network impassable (Berdica, 2002). The disruptions resulting from disasters result to losses in travel time (Balijepalli & Oppong, 2014; Berdica, 2002; Scott, Novak, Aultman-hall, et al., 2006), affects other parts of the network (Oded Cats & Jenelius, 2016), burdens other important lifelines (Khademi, Balaei, Shahri, et al., 2015), and impairs the abilities of individuals to perform their daily activities like commuting, shopping, etc. (Oded Cats & Jenelius, 2014).

However, despite the importance and benefits of transportation services in the functioning of urban regions, most effects the disruptions to urban transportation networks are still unknown (Suarez, Anderson, Mahal, et al., 2005). Transport planners, therefore, should be aware of the susceptibility of transit networks to disruptions so that the corresponding services can absorb and withstand its impacts and continue to function. One way of determining the impact of disasters to the transport sector is performing vulnerability assessments. Typically, vulnerability assessments analyze the susceptibility of the overall transport network when a network component (i.e., link or node) fails due to an external event (e.g. flood, earthquake, terrorist attack). In recent years, vulnerability assessments were also performed on not only road network but public transportation networks (O. Cats, Yap, & van Oort, 2016; Oded Cats & Jenelius, 2014, 2016).

Especially, since the risk of damages by flooding has been increasing all over the world, various policies have been introduced to increase awareness and reduce the damages and losses in the urban area. For example, in Japan, the National Plan for Adaptation to the Impacts of Climate Change was established and provided the vision of actively working on the implementation of adaptation policies. Thailand also enacted the National Adaption Plan in 2015 where they defined development-oriented measures because there is no legal binding law on climate change issues (ONEP, 2015). In the Philippines, the Philippine Disaster Reduction and Management Act shifted how the country deals with disasters. However, it focuses attention on the coordination of agencies and government units and lacks policies regarding mitigating the impacts of disasters.

As mentioned above, while understanding the impacts of disasters to the overall transportation network may be beneficial to policymakers and transport planners alike, there is difficulty in formulating the appropriate adaptation policy that would be implemented. Likewise, in developing cities where adaptation policies are insufficient or are not properly validated, there is still a need to uncover how urban activities such as transport and land-use will be affected when adaptation policies are implemented. Finally, it is necessary to evaluate how effective the implemented adaptation policies at an economic point of view. Based on the above, we will tackle research by upholding four themes as below; 1) Change of accessibility by the road flooding, 2) Change of choice of the location under the urban flood, 3) Change of traffic behavior (Choice of departure time, choice of modal split, etc.), and 4) Estimation of economic effect by measures for floods (Elevated road, Move to a higher elevation, etc.). In concretely, a model included in transport, land-use, and the flood is constructed, firstly. And, the impacts of the implementation

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of adaptation policies in Asian cities are simulated by using the model. Moreover, the impacts on the vulnerability of the transport network when the adaptation policies are implemented are assessed. Especially, this is changed by inundation height of the flooding. Moreover, an economic model which is represented the relationship between policy implementation, and tax and subsidy is constructed. Finally, the implemented adaptation policies are evaluated at an economic point of view such as cost-benefit analysis by using the economic model.

6. Target year for completion (Research period is 2 years from October 2019 to September 2021):

September 2021

7. Research plan:

Research period: October 2019- September 2021

Preparation (September 2019)

- 1<sup>st</sup> group meeting for sharing research collaborator's activities at EASTS Conference

4th Quarter of 2019 (October 2019-December 2019)

- 2<sup>nd</sup> group meeting through skype regarding research orientation and direction setting
- Selection of research topics and literature review of them
- Selection of study areas to be included in the research

1<sup>st</sup> Quarter of 2020 (January 2020-March 2020)

- Development of Methodology < Each member will generally follow similar methodology by may use different statistical, transport and flood models
- 3<sup>rd</sup> group meeting through skype regarding selected research topics
- Request for funding support from ICRA<When there are already initial results and there is a need to consolidate and integrate the findings, funding will be needed for additional data gathering and travels

2<sup>nd</sup> Quarter of 2020 (April 2020 – June 2020)

- Gather secondary data regarding the study area
- Start to gather primary data if the secondary data is not enough

3<sup>rd</sup> Quarter of 2020 (July 2020- September 2020)

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- Continue to gather primary data
- Group meeting in one of the Asian countries
- Update and sharing on each country's research accomplishment

### 4<sup>th</sup> Quarter of 2020 (October 2020 – December 2020)

- Develop initial publication for conferences and journals
- Start to develop a book regarding the research

### 1<sup>st</sup> Quarter of 2021 (January 2021 – March 2021)

- Develop more publications for conferences and journals
- Submit research papers to EASTS
- Continue with the development of a book on the topic
- Group meeting through skype

### 2<sup>nd</sup> Quarter of 2021 (April 2021 – June 2021)

- Wrapping up of the research
- Draft submission of each member's City Case Study for the book publication
- Develop final draft of the book on the topic and circulate to members for comments
- Another Skype meeting of group members for issues and concerns
- Submission of conference and journal papers to EASTS for presentation in the EASTS 2021 Conference

### 3<sup>rd</sup> Quarter of 2021 (July 2021 – September 2021)

- Development of more journal publications if possible
- Group meeting in the EASTS 2021 and holding of Special Session on the topic
- Final editing of the book
- Publication of the book on Vulnerability Assessment of Transport Systems due to Flooding in Selected Asian Cities

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8. Research funds:	
Source of research funds(*)	Approximate amount (US\$)
ICRA	US\$10,000
University internal research funding (De La Salle University)	US\$2,000

\*: (ex.) ICRA (Research grant of EASTS), Grants-in-aid for Scientific Research of Ministry of Education, Culture, Sports, Science and Technology (Japan), and etc..

**All applications are to be delivered to:**  
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