

Report on the TWIN-SEA
First International Workshop

on

*“Climate and Societal Change in Coastal Areas
in Indonesia and South East Asia”*

February 19-22, 2014, Grad Sahid Jaya Hotel, Jakarta, Indonesia



Organized by:



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Project webpage: <http://www.ehs.unu.edu/article/read/twin-sea-1>

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1. Background

TWIN-SEA Project and overarching joint research structure

The TWIN-SEA Project: “Expert network and twinning institute on climate and societal change for Southeast Asia” is funded by German Ministry of Education and Research (BMBF) in scope of the program for the establishment of joint research structures of German universities with partners in Asian Pasific Research Area (APRA)¹. It deals with the systematization of climate change-related hazards (e.g. sea-level rise), vulnerabilities and risks in coastal urban and peri-urban areas. It also focuses on the analysis and evaluation of measures to strengthen the resilience of coastal communities and to identify best practice examples and low regret measures in the context of risk reduction and climate change adaptation. Knowledge gaps in the understanding of processes as well as application and implementation obstacles of low regret adaptation measures will be addressed.

An expert network in Southeast Asia, with an institutional node in Indonesia, will be established in cooperation with additional German and international research institutes and universities in order to systematically improve the German-Indonesian research and development cooperation in this field. The expert network as well as institutional partnership deals with improvement of Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) strategies.

Important framework conditions for the creation of the expert network are already in place, serving as a basis for the ongoing efforts within TWIN-SEA project. United Nations University, Institute for Environment and Human Security (UNU-EHS) and the main project partner Franzius Institute Hanover (FI) were heavily involved in research activities in Indonesia, particularly in the scope of GITEWS² and Last-Mile – Evacuation³ projects on risk and vulnerability in context of tsunami early warning system. FI has already signed partnering contract with the Indonesian Ministry of Research and Technology (RISTEK) in 2007 in this scope. Further activity in Indonesia was manifested in a joint UNU-EHS/DAAD International PhD Workshop on “Disaster Risk Reduction and Climate Change Adaptation in Context of South and Southeast Asia”, in close cooperation with the partners in Gadjah Mada University⁴. Furthermore, a UNU-EHS Expert Working Group on Measuring Vulnerability was conducted on July 12-16, 2012, focusing on the topic of “Development Pathways for Urban and Rural Coastal Zones” in Bogor, Indonesia. It involved national and local experts from Indonesia (Indonesian Institute of Sciences/LIPI, National Statistical Office/BPS, and Gadjah Mada University/UGM)⁵. UNU-EHS and LIPI have signed a Memorandum of Understanding for further cooperation that underscores the mutual interest to develop joint activities in the field of human security to natural hazards and environmental change, including climate change. A senior researcher, Dr. Fabrice Renaud from UNU-EHS, has been sent to Jakarta where he took office August 2013, for a 2 year period to catalyze the institutional cooperation with Indonesian Institute of Sciences, International Center for Interdisciplinary and Advanced Research (LIPI-ICIAR). Starting from February 2014, Mrs. Gusti Ayu Ketut Surtiari, a research associate of LIPI, will be based in UNU-EHS (Bonn) to conduct PhD research within the project.

¹ <http://www.ehs.unu.edu/article/read/twin-sea-1>

² <http://www.ehs.unu.edu/article/read/gitews> and <http://www.gitews.de/index.php?id=6>

³ <http://www.ehs.unu.edu/article/read/last-mile> and <http://www.last-mile-evacuation.de/last-mile-fruehwarn-und-evakuierungsinformations-system/>

⁴ <https://www.ehs.unu.edu/article/read/860> and <http://www.ehs.unu.edu/article/read/source-no-142010-investigates-disaster-risk-reduction>

⁵ <http://www.ehs.unu.edu/article/read/9th-meeting-of-expert-working-group-on-measuring-vulnerability>

About the workshop

This event was the first workshop of the international workshop series in the scope of the TWIN-SEA Project, held on February 19-22, 2014, in Grand Sahid Jaya Hotel, Jakarta.



This event was jointly organized by the Franzius Institute for Hydraulic, Waterways, and Coastal Engineering University of Hannover (FI), United Nations University Institute for Environment and Human Security (UNU-EHS), and the Indonesian Institute of Sciences, International Center for Interdisciplinary and Advance Research (LIPI-ICIAR). The overall **objective** of the first workshop was to outline the state-of-the-art and

future research needs on the assessment of current and future coastal hazards and vulnerability as well as adaptation measures in Indonesia. The workshop brought together some 45 international and national experts coming from LIPI and TWIN-SEA expert network, as well as relevant experts from UN-agencies (e.g. UNIDO), international organizations (e.g. GIZ, Mercy Corps), universities (e.g. University Gadjah Mada, ITB) and representatives from Indonesian government organizations (e.g. BPPT, KLH, LAPAN, DKP, BMKG, DNPI, BAPPENAS).

The workshop was structured in two main parts: thematic presentations to collect existing findings and challenges, and thematic working group discussions on the following themes: i) ecosystem services and low-regret adaptation in coastal management; ii) socio-economic vulnerability and development pathways ; iii) role of education (e.g. e-learning). On the last workshop day, a field excursion to potential case study sites in North Jakarta was organised. During the workshop, actual problems/research questions, as well as an initial work plan for the working groups were formulated.

2. Strategic Orientation of the First TWIN-SEA Workshop

The workshop was officially opened by the Head of LIPI, **Prof. Lukman Hakim**, Director of UNU-EHS, **Prof. Jakob Rhyner**, and UN Resident Coordinator, **Mr. Douglas Broderick**. All three of them emphasized the importance of the topic of disaster risk reduction and adaptation towards climate-change related hazards and societal changes in the coastal areas in Indonesia and Southeast Asia, where joint activities and expert networking between Indonesia and international partners is a crucial part of.

The strategic direction of the workshop and overall collaborative activities was further described within the introductory part of the workshop. Firstly, the director of UNU-EHS **Prof. Jakob Rhyner** explained the rationale of focusing on Indonesia considering the existing cooperation with the Indonesian partners, also as a country with emerging economies in light of the UN Post-15 agenda where there is a conducive research perspective on solving the actual problems of high risks related to climate changes in the coastal areas of the country. In this regard, TWIN-SEA contributes through

building expert network between Indonesia and Germany, but also other international partners in Europe and Australia.

The Director of LIPI-ICIAR, **Dr. Diaz Santika**, also introduced the scope of LIPI-ICIAR with the core components of interdisciplinary and advanced research with training and education component, particularly on the research programs of coastal community resilience and climate change and disaster risk management, that fit very well to the objective and content of the collaborative activities. Especially he emphasized on the intention of LIPI-ICIAR and UNU-EHS to pursue development of a research school to facilitate capacity building of LIPI's young researchers (PhD and Master's program). This activity would be linked with the current "Riset Pro" funding scheme of RISTEK which aims to send Indonesian researchers overseas as well as exchange programs with experts from overseas. He expected to have more concrete collaboration through the workshop.

UNU-EHS Head of Section of Enhancing Graduate Educational Capacities for Human Security Section, **Dr. Jörg Szarzynski**, presented the scope of education and capacity building activities of UNU-EHS and the potential cooperation within this scope. There is a wide spectrum of activities conducted with different target groups in various countries from the classical form (face-to-face) and using online-environment technology such as social network portal, web conference system, and learning management system. UNU-EHS conducts regularly PhD block courses and has recently developed a joint Master Program with the University of Bonn. To date, there is a wide alumni network in 79 countries, with 795 members. Within the workshop, joint activities will be identified addressing the questions of what do we teach, to whom are we teaching, and how do we teach?

Dr. Matthias Garschagen, a UNU-EHS Assistant Academic Officer also presented some orientations from the TWIN-SEA project expected outcomes and addressed triggering questions to open the thematic sections. The project currently is in its first phase of knowledge generation, development of e-learning materials, and development of adaptation options (creation of business opportunities). The first phase will serve as the basis for the second phase of involving more business opportunities and activities towards implementation. The first workshop plays an important role in the first phase of the project through strengthening the expert network to exchange the state-of-the-art knowledge and develop tangible joint work programme.

3. Workshop Program

Wednesday, 19 February 2014 Room: Puri Putri, 2nd Fl.	
08:45 – 09:45	Registration
09:45	<p>Welcoming speeches <i>Prof. Lukman Hakim / Chairman of LIPI</i> <i>Prof. Jakob Rhyner / Director of UNU-EHS</i> <i>Mr. Douglas Broderick / UN Resident Coordinator</i></p> <p>Master of Ceremony: <i>Nirma Yossa</i></p>
<p>I – Introduction to TWIN-SEA Project, Linking the Workshop to The Broader Ongoing Strategic Planning</p> <p>Moderation: <i>Prof. Yekti Maunati</i>, Rapporteur: <i>Gusti Ayu Ketut Surtiari</i></p>	
10:15	<p>UNU-EHS strategic researches, TWIN-SEA and other relevant research activities in natural hazards and risk in SEA-region <i>Prof. Jakob Rhyner / UNU-EHS</i></p>
10:35	<p>LIPI-ICIAR medium-term strategies, core research topics, and contribution to expert network building in South East Asia <i>Dr. Diaz D. Santika / LIPI-ICIAR</i></p>
10:55	<p>Statements and overarching questions for the workshop <i>Dr. Matthias Garschagen / UNU-EHS</i></p>
11:15	<p>Role of education and capacity development (and e-learning), expected contributions and joint activities <i>Dr. Jörg Szarzynski / UNU-EHS</i></p>
11:35	Q&A for the session
<p>II – Coastal hazards, vulnerability and risk profile in Indonesia</p> <p>Moderation: <i>Dr. Neysa Setiadi</i>, Rapporteur: <i>Gusti Ayu Ketut Surtiari</i></p>	
11:40	<p>Observed and expected CC impacts on various sectors in the coastal areas <i>Drs. Budi Suhardi, DEA / BMKG</i></p>
12:00	<p>Selected case study & main findings on vulnerability and risk assessment in urban coastal context <i>Dr. Deny Hidayati / LIPI</i></p>
12:20 – 13:15	Lunch Break
13:15	<p>Coastal Risks, Vulnerability and Resilience in the Phang-Nga Province, Thailand <i>Prof. Javier Revilla Diez / University of Hanover</i></p>
13:35	<p>Selected case study & main findings on vulnerability and risk assessment in rural coastal context <i>Dr. Herry Yogaswara / LIPI</i></p>
13:55	Q&A for the session
<p>III – Coastal hazards and climate change impacts on coastal ecosystem services</p> <p>Moderation: <i>Dr. Zita Sebesvari</i>, Rapporteur: <i>Nannina Horstmann</i></p>	

14:20	Ecosystems for Disaster Risk Reduction and Climate Change Adaptation in the Context of South East Asia <i>Dr. Fabrice Renaud / UNU-EHS</i>
14:40	The Impact Chain of Climate Change on Coastal Region in Indonesia, Sustainable Wetlands Adaptation and Mitigation Program / ecosystem-based adaptation options <i>Mr. Giacomo Fedele / CIFOR</i>
15:00	The importance of higher education research networks to investigate aggravating effects of climate change on species invasion into Indonesian marine ecosystems <i>Dr. Carsten Thoms / DAAD</i>
15:20	Vulnerability, Adaptation and Security of Low Lying Coastal Areas and Small Islands to the Extreme Events: Different Ecosystems in Indonesia <i>Prof. Wahjoe Soeprihantoro / LIPI</i>
15:40	Q&A for the session
16:00 – 16:15	Coffee/Tea Break
IV – ‘Virtual’Expert Panel Discussion – some research elements and reflection on Indonesia context Moderation: <i>Dr. Matthias Garschagen</i> , Rapporteur: <i>Dr. Neysa Setiadi</i>	
16:15 – 17:30	Virtual short statements of TWIN-SEA expert <i>Prof. Dirk Vallée / RWTH Aachen</i> <i>Prof. Stefan Greiving / TU Dortmund</i> <i>Prof. Mark Pelling / Kings College</i> <i>Dr. Nishara Fernando / University of Colombo</i> Moderated discussion on (to be reflected on actual flood management challenges in Jakarta) <ul style="list-style-type: none"> ▪ Challenges of urban community infrastructure planning ▪ Challenges of urban spatial planning and institutions ▪ Challenges of formal and informal adaptations of the urban community ▪ Potentials and challenges of relocation

Thursday, 20 February 2014 Room: Puri Putri, 2nd Fl.	
Reflection on the first day	
09:15	Summary of discussions in day 1: Identified hotspots, key issues, gaps and needs <i>Dr. Matthias Garschagen & Dr. Neysa Setiadi</i>
V – Session on Coastal Management and Low-Regret Adaptation Measures Moderation: <i>Dr. Fabrice Renaud</i> , Rapporteur: <i>Gabriel David</i>	
09:40	Climate Change Adaptation in Indonesia <i>Dr. Arif Wibowo / KLH</i>
10:00	Current efforts on climate change adaptation at various levels <i>Dr. Ari Mochamad /DNPI</i>

10:20	National multiyear-long coastal management strategy <i>Dr. Widjo Kongko / BPPT</i>
10:40	Low-regret adaptation measures, state-of-the-art of hard- and soft-coastal protection measures, potentials and challenges <i>Prof. Torsten Schlurmann / FI Hanover</i>
11:00	Case study on coastal adaptation measures: good and bad practices <i>Dr. Zainal Arifin / LIPI</i>
11:20	Q&A for the session
11:30 – 11:35	Coffee/Tea Break
VI – Session on Assessing Current and Future Vulnerability, and Challenges for Adaptation Moderation: <i>Prof. Tommy Firman, Rapporteur: Dr. Neysa Setiadi</i>	
11:35	Development issues in the coastal areas and impacts of climate change <i>Dr. Tommy Hermawan / BAPPENAS</i>
11:55	Vulnerability and risk research in climate change context, potential and limitation of various methods (e.g. scenario) <i>PD. Dr. Joern Birkmann / UNU-EHS</i>
12:15	Urbanization and adaptive capacity of megacities: The Greater Jakarta <i>Prof. Robert Delinom / LIPI</i>
12:35	Coastal vulnerabilities, risks and adaptation strategies – experiences from Australia and Oceania <i>Prof. John Handmer / RMIT</i>
12:55	Dynamic vulnerability assessment and adaptation options for Indonesia CCA (KRAPI) <i>Mr. Anindito Raphael / GIZ</i>
13:15 - 14:00	Lunch Break
VII – DISCUSSION IN WORKING GROUP Moderation: <i>Moderators & co-moderators of each WG, Rapporteur: assigned by the WGs</i>	
14:00 - 15:30	<p>Goal: This session will focus on identifying research elements - unknown factors where science/further research may contribute - for assessing current and future vulnerability, development pathways and adaptation to coastal hazards in the context of climate change in Indonesia</p> <p>Thematic areas:</p> <p>GROUP 1: Coastal hazards, vulnerability and risk assessment, focus on ecosystem services</p> <p>GROUP 2: Socio-economic vulnerability and risk (including scenarios), development pathways, and societal change</p> <p>GROUP 3: Coastal management and low-regret adaptation measures</p> <p>GROUP 4: Role of educational activities (e.g. e-learning) in promoting DRR & CCA</p> <p>NOTE: GROUP 1 and 3 merged due to intersecting themes and interests</p>

15:30 - 16:00	Coffee Break
16:00 - 17:30	Continue working group discussion Presentation of the working group outcomes in the larger group

Friday, 21 February 2014 Room: President Suite, 21st Fl.	
VIII – Collaboration and Cooperation	
08:00 – 10:00	Continue working group discussion Goal: Continue working groups discussion, especially focused on mapping of existing projects / case studies / data where further joint research in scope of TWIN-SEA are suitable, as well as explore potential educational activities in the related activities. Presentation of the working group outcomes in the larger group
10:00 – 11:00	Discussion on educational activities (including e-learning) in the larger group Moderation: <i>Dr. Jörg Szarzynski / UNU-EHS</i>
11.00	Closing Speeches <i>Prof. Jakob Rhyner / UNU-EHS</i> <i>Dr. Diaz D. Santika / LIPI-ICIAR</i>
IX – Internal Meeting TWIN-SEA (LIPI-UNU-EHS)	
14:00 onwards	Further planning & next steps Follow-up workshop outcomes, formulation of research agenda and recommendations, planning of joint pilot activities

Saturday, 22 February 2014	
FIELD EXCURSION	
<ul style="list-style-type: none"> • Comparative observation of adaptation measures in different social groups: Kamal Muara and Pantai Indah Kapuk • Informal settlement and relocation measures: Waduk Pluit (reservoir) and Rusunawa (low-cost housing) in Muara Angke 	
Organized by LIPI-ICIAR	

4. Existing Knowledge of Coastal Hazards, Vulnerability, and Adaptation in Indonesian and Southeast Asian Context

Overall Summary

In the session of “**coastal hazards, vulnerability and risk profile**”, perspectives on both sides of risk were presented: hazard and vulnerability components. The existing and ongoing projects were presented. Representative of Meteorological, Meteorological, Climatological, and Geophysics Agency (BMKG), **Mr. Budi Suhardi**, provided a national view on the climate change issue and information basis. As a core data provider of climate data, BMKG has an overview of various relevant data services, related to climatic trend and projection, modeling scenarios, pattern and extreme changes, as well as vulnerability, in cooperation with various international agencies. Furthermore, various assessments in urban (Jakarta), and rural areas (Demak, Bali) in Indonesia and Thailand (Phang Nga) were presented by senior LIPI researchers, **Dr. Deny Hidayati**, **Dr. Herry Yogaswara**, and by **Prof. Javier Revilla Diez**, University of Hannover, covering a range of qualitative and quantitative methodologies as well as different dimensions of vulnerability (social, cultural, economic). Moreover, a particular attention to small islands was emphasized by **Dr. Wahjoe S. Hantoro**, where the pressures from extreme natural events and anthropogenic stress in the context of dispersed and remote low-lying areas meet.



In the session of “**coastal hazard and climate change impacts on ecosystem services**”, the review of existing knowledge related to coastal ecosystems was presented by international experts, **Dr. Fabrice Renaud** and **Mr. Giacomo Fedele**. It encompassed among others the importance and potential of ecosystem-based adaptation approaches compared to coastal “hard structures”, as well as assessment on the current and potential impacts and related feedback loops from climate variability, extreme, and change in mangrove and coral socio-ecological systems. Finally, **Dr. Carsten Thoms** from DAAD/Bogor Agricultural University emphasized on existing higher education networks with Indonesian students and universities in conducting research and capacity building on marine ecosystems.



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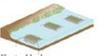
“Low-Regret” Adaptation Measures –
Hard- and soft-coastal protection systems (Review)

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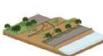
Perspectives on “low-regret” adaptation strategies (5)

- Novel engineering-type **soft-coastal protection systems** encompass innovative approaches to protect coastal areas from coastal hazards, e.g.
 - In coastal waters (shallow water environments)

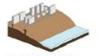




 - On the shoreline


 - Upland


Prof. T. Schlurmann, 20-Feb-2014 – Session IV: Coastal Management and Low-Regret Adaptation Measures Source: UWAS, 2013
Slide 17

In the session of “**coastal management and low-regret adaptation**”, the government representatives from Ministry of Environment (KLH), **Mr. Arif Wibowo** and **Mr. Ari Mochamad** from National Board of Climate Change (DNPI), presented the national framework and programs of climate change adaptation implementation in Indonesia. On the other hand, **Dr. Widjo Kongko** from Agency for Assessment and Application of Technology (BPPT) presented the importance of technological advancement to support national economic plan, especially for infrastructure in coastal areas, with example of Java-Sumatra bridge project. **Prof. Torsten Schlurmann** from Franzius Institute for Hydraulics, Estuarine and Coastal Engineering (FI)

also provided an overview of state-of-the-art hard and soft coastal protection measures, from the traditional structures like seawalls to novel engineering measures like constructed wetlands. A case study in Probolinggo on both hard and soft approaches was presented by a senior LIPI researcher **Dr. Zainal Arifin**.

In the session of “**assessing current and future vulnerability, challenges for adaptation**” a representative of National Agency for Development Planning (BAPPENAS) **Mr. Tommy Hermawan** presented the link of Indonesian development plans with climate change adaptation as cross-sectoral issues. **PD Dr. Joern Birkmann** provided scientific research direction of climate change adaptation, especially related to adaptive urban governance and scenario of development pathways. Case studies and review on climate change adaptation challenges were presented by **Prof. Robert Delinom** from LIPI on Jakarta and **Prof. John Handmer** from Royal Melbourne Institute of Technology (RMIT) on Australia and Oceania. In both studies, climate change impacts were evident and strongly linked with development issues. A methodological approach to measure dynamic vulnerability and climate change adaptation options using meso level multi sector analysis was presented by **Mr. Anindito Raphael** from Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).



An extra session using virtual connection with several TWIN-SEA experts was also conducted involving **Prof. Dirk Vallée** from RWTH Aachen University on climate change impacts and various options of urban adaptation in spatial planning, **Prof. Stefan Greiving** from Technical University of Dortmund focusing spatial and urban planning instruments for flood risk management, **Dr. Nishara Fernando** on challenges and considerations of involuntary relocation to as a vulnerability reduction measure, and **Prof. Mark Pelling** on limits of formal and informal adaptation as well as consideration of transformative adaptation of urban community.

In the following , a summary of the major outcomes of the presentations are outlined particularly related to ongoing processes of disaster risk reduction and climate change adaptation in Indonesian context as well as identified actual gaps and research needs. The main points from the presentations serve as a starting point for further working group discussions.

All complete presentations were documented and developed as e-learning teaching materials⁶.

⁶ For further interest in accessing the e-learning materials please contact Joerg Szarzynski (szarzynski@ehs.unu.edu)

Ongoing processes on DRR & CCA in Indonesian and Southeast Asian context



Several processes at the national level in Indonesia, and to limited extent in the wider Asian region, have been identified and may be relevant for the joint research activities:

- Master Plan 2015-2045 of BMKG placed strengthening the foundation for DRR and CCA efforts as one main priority. BMKG provides online information services for climate change information

and offers to conduct an assessment to develop future climate trends and appropriate adaptation strategies in the coastal environment.

- Ecosystem management approaches has been increasingly recognized e.g. in Regional Roadmap on DRR through CCA in Asia and the Pacific (October 2010) and BAPPENAS National Action Plan for DRR 2010-2012, and thus should be a central part of CCA-DRR strategies
- In the Law of Environmental Protection and Management UU 32/2009, climate change mitigation and adaptation is explicitly mentioned as part of environmental protection and management plan, as well as vulnerability and adaptive capacity assessment as part of strategic environmental assessment
- KLH has various ongoing programs on climate change adaptation, including vulnerability and adaptation assessment, such as KRAPI in cooperation with GIZ, online information system on climate change vulnerability and risk mapping at the village level for the whole Indonesia ("SIDIK")
- The Indonesian government is preparing of national action plan on climate adaptation (RAN-API), a basis for regional government in formulation a climate change adaptation strategy as direction formulation of regional development planning document that is resilient to climate change
- In light of Masterplan for Acceleration and Expansion of Indonesia Economic Development (MP3EI) as an integral part of the existing national development planning system (RPJPN-RPJMN-RKP/RAPBN, the assessment and application of technology for coastal zone management is emphasized and required

Identified gaps and research needs

The following points were identified and suggested as potential areas, where further research are needed:

Vulnerability assessment and challenges of adaptation:

- There is a need to shift from a one-dimensional-linear approach in risk management (hazard focus), towards the consideration of different dimensions of vulnerability (social, economic, ecological, institutional) and risk dynamics. In this regard, current scenario methods as important tools need to be further developed and tested (quantitative versus qualitative).
- Further economic dimension of vulnerability should be incorporated (across scale from national to local-urban- to household level), including direct and indirect impacts when discussing the relation between damages and recovery

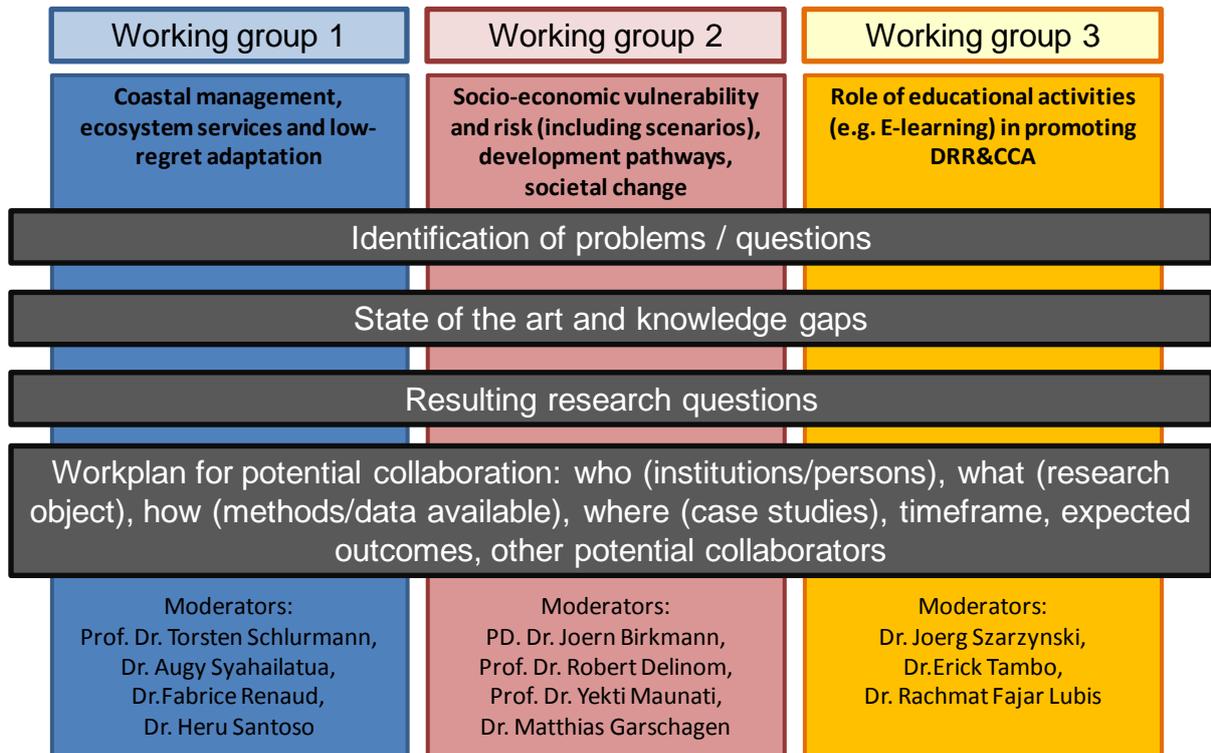
- There is need for a better understanding specific role of local knowledge/ wisdom, how to treat and integrate this in policy development, also under uncertainty of climate change impacts, and how
- Knowledge gaps on human system in socio-ecological systems still exist, need to understand better the combined effects between systems
- There is still a gap in the stakeholder's access to information about climate change and relevant capacity development, and how it influences on decision-making
- There is a need to explore further what the barriers of transferring various adaptation options applicable in the more developed countries like Germany to developing countries with different planning systems in Southeast Asia
- The limit of the current formal and informal adaptations also need to be assessed, to what extent both reduce or even generate other vulnerabilities, also in case of relocations. Considering new decision making systems and transformative adaptation.

"Low-regret" adaptation options

- In spite of its increasing recognition, the role of ecosystem –based adaptation is still underexplored, research on understanding the benefits and value of ecosystem services for climate change adaptation and disaster risk reduction is still needed
- How do we effectively link ecosystems, DRR, CCA and sustainable development in Indonesia and the region?
- There is a need to assess complementarities and compatibilities among various "low-regret" adaptation strategies, also including cause-effect relationships between processes/cascading effects
- Debate about and need for research on the role of the state on the effectiveness and implementation, on the economics of disasters and adaptation, as well as on insurance.

5. Working Group Results

The participants were divided in three thematic working groups based on their interest and field of expertise. For each working group, there were several moderators who provided background materials and triggered the discussion. The discussion line was following the same basic points as shown in the figure below: identification of problems or questions with inputs from previous presentations, identification of knowledge gaps and research questions, and finally a draft of collaborative work plan of joint activities on selected topics and case studies.



The working group outcomes are described more in detail in the following section.

Working Group 1: Coastal Management, Ecosystem Services and Low-Regret Adaptation Measures



Group moderators

Prof. Dr. Torsten Schlurmann (FI), Dr. Fabrice Renaud (UNU-EHS), Dr. Heru Santoso (LIPI), Dr. Augy Syahailatua (LIPI)

Members

Dr. Zita Sebesvari (UNU-EHS), Nannina Horstmann (FI), Rachmi Yuliantri (DNPI), Barnard (KKP), Zainal Arifin (LIPI), Intan Adhi (LIPI), Aniessa Delima (Mercy corps), Ari Soemodinoto (TNC Indonesia), Hendra Yusran Siry (KKP), Djati Mardiatno (University Gadjah Mada, Yogyakarta), Johan Risandi (R+D Center for marine and fisheries technology), Semeidi Husrin (LPSDKP, KKP), Widjo Kongko (CDRC BPPT), Wahyu S Hantoro (LIPI), Wahyu Widiyono (LIPI), Rahman Hidayat (BPPT)

State-of-the-art and motivation

Coasts and estuaries are increasingly exposed to varying extreme weather and climate events. Likely impacts vary from gradual processes, i.e. sea-level rise, coastal erosion, etc., and likewise from extreme single events, i.e. storms and storm surges. With 250 million inhabitants, 17,500 Islands and 35,000 km coastline, Republic of Indonesia is particularly vulnerable due to its exposed situation regarding high probability of earthquakes and tsunamis.

But, cause-effect relationships between processes or likeliness of cascading effects are yet not effectively considered in coastal adaptation frameworks. Recently, increased attention has been paid to managing the risks of extreme events (SREX, 2011) by means of combining methods and tools from disaster risk reduction (DRR) with climate change adaptation (CCA). This effort promotes to establish a diverse portfolio of options, e.g. “low regret” adaptation measures to prepare for adverse environment impacts from future climates. Moreover, coastal ecosystems such as tidal marshes, mangroves, dunes, coral reefs and shellfish reefs generate almost 40% of the services of all ecosystems on our planet, the latter being about twice the GDP of the world population. Therefore,

these ecosystems have to be preserved, maintained and improved in order to guarantee sufficient benefit regarding wave energy dissipation and with this obtaining the opportunity to reduce flood levels.

In addition to the present conventional coastal engineering approaches, a more resourceful, sustainable and effective integration of expertise from the socio-economic and marine ecosystem disciplines is required in order to preserve and improve existing ecosystems and to establish an approach for “Ecosystem-based and Low Regret Adaption Management” (ELRAM) for sustainable coastal protection systems. This paradigm shift covers a transitional process from building in nature towards building with nature in order to ensure a sustainable future as well as to protect the functioning of ecosystems.

Problems and research questions

It is outlined that engineered coastal adaptation strategies are gradually supplemented by soft-protection measures, e.g. beach or foreshore nourishments, revised land management as well as flood insurance programmes. Ecosystem protection and restoration are increasingly recognized as legitimate novel coastal protection schemes to provide or enhance function and structure of ecosystems services. Even non-classic policy solutions such as coastal setback lines, rolling easements, building codes and coastal zoning have emerged as possible forces to combat coastal hazards linked with climate change.

Working group 1 discussed the application and benefit of ecosystems as well as “low regret” measurements regarding main problems linked to risk reduction and adaption measures and tried to identify key issues for the future. The outcomes of the working group discussion have been shown that mostly the data availability for evaluating the effectiveness of ecosystems and “low regret” measurements is still incomplete. Furthermore, knowledge gaps about environmental processes and consequences of coastal protection measures are present, yet. Thus, the acceptance of “soft” protection measures is still complicated.

Therefore, research questions have been formulated in order to adjust the project contents of TWIN-SEA to the main necessary issues of the Indonesian government and population as given in the following:

1. *What are the status, performances and limitations of ecosystem services (ESS) in terms of disaster risk reduction (DRR) and “low regret” adaptation?*

Research question 1 comprises the characterization and assessment of current and future conditions of ecosystem services (ESS). Furthermore, indicators of ESS will be identified and investigated so that the performance of ESS can be evaluated and the limitations of the systems can be estimated.

2. *How to improve local acceptability and sense of ownership?*

In research question 2, the focus is on the enhancement of knowledge on ESS and Ecosystem Disaster Risk Reduction (EcoDRR) as well as on the development of a “low regret” management strategy, whereby local wisdom and knowledge will be integrated. Socio-economic co-benefit of ESS and EcoDRR will be worked out and the results will be joined in a platform in order to obtain an instrument for developing collaborative design and decision making tools among stakeholders.

In the project, the expertise of scientists from coastal and civil engineering, vulnerability and risk management, environmental physics and communications, socio-economy and geo-ecology are brought together in very close collaboration in association with local coastal and marine authorities to conduct a transdisciplinary research project. The primary objective of working group 1 is to shape a conceptual ELRAM framework and to develop the required transdisciplinary methodologies, techniques and modelling tools for practical guidelines and adequate implementation of ELRAM-based sustainable coastal protection systems for coastal zones in South East Asia and Indonesia.

This will also include the assessment of structure and function of coastal ecosystems and their capacities or possible reinforcement (e.g. mangrove forest, sea grass, vegetated dunes) or tackle other innovative low-regret measures (e.g. the sand-engine, bamboo breakwaters, artificial reefs) for protection against flooding and erosion as well as approaches in order to protect specific habitats which are likely to further deteriorate due to coastal erosion processes, especially in the context of climate change.

Such “soft” and “low-regret” solutions are not only more resilient and adaptive, but will also significantly contribute to prevent losses and degradation of ecosystems which will otherwise results from the impact of conventional hard engineering protection measures. Therefore, preventive and reactive responses spanning broader scales and dimensions, i.e. transdisciplinary competences and knowledge, related to coastal erosion processes and their links to ecosystem and society, are needed.

This will require a much broader framework of the underlying methodologies, techniques and models for their evaluation and integration with further intangible and tangible aspects into a complete vulnerability and risk assessment.

Working Group 2: Socio-Economic Vulnerability and Risk (incl. Scenarios), Development Pathways and Societal Change



Group moderators

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Background

The recent IPCC Special Report on Extreme Events (IPCC 2012) describes the notion of vulnerability as a social construction of disaster risk by “transforming physical events into hazards of different intensities or magnitudes through social processes that increase the exposure and vulnerability of population groups, their livelihoods, production, support infrastructure, and services”. It emphasizes the **linkage between disaster risk reduction, climate change adaptation and development**, which also implies considerations of **dynamics in the vulnerability** over time and space. However, most current scientific assessment for climate change adaptation and risk reduction are based on climate change scenarios but still lacking of considerations of socio-economic scenarios. Particular attention needs to be paid to socio-economic dimensions of vulnerability and risk. Birkmann et al (2013) demonstrates the necessity and potentials of **socio-economic scenarios for vulnerability, risk and adaptation** researches. Especially it demonstrates variation in exposure, susceptibility, adaptive capacity of countries with different income levels under different SSP scenarios at the global level, as

well as specific aspects at the local level that need to be taken into account in developing scenarios, e.g. local political orientation, migration pattern etc.. Also, various processes and stakeholders in the rapidly-transforming developing countries, such as Vietnam within its economic reformation, play a significant role in vulnerability dynamics of various social groups, and thus, **socio-economic as well as institutional criteria for climate change adaptation** are crucial (Garschagen 2013).

Vulnerability assessment is very crucial to ensure that risk reduction and adaptation measures incorporate the vulnerability of various social groups, such as in case of relocation for dyke construction and buffer zone regulation (Birkman et al. 2012; Fernando 2010) as well as early warning system and evacuation planning (Setiadi 2014a). Moreover, adaptation to climate change should not only focus on physical adjustment, but also institutional aspects (e.g. improvement of planning systems and governance processes) and integration of the wider socio-economic, demographic, political and administrative transformation processes (Birkmann et al. 2010). This is particularly relevant in climate change context that implies longer term planning and high uncertainty. Thus, the need to **systematically integrate vulnerability assessment in the existing planning scheme** (Nadim et al submitted) as well as to **rethink the existing planning instruments and tools** is obvious (Birkmann et al. 2014).

Equally important are the **issues of perception or cognitive factors, people's behavior** that may directly or indirectly influence the effectiveness of various risk reduction and adaptation measures, especially at decision-making processes (Schwab forthcoming) and implementation at the local level (e.g. Setiadi 2014b). In the context of climate change adaptation, assessment of cognitive factors with regard to climate change risk perception and perceived adaptive capacity is important for adaptation assessment (Grothmann and Patt 2005; IPCC-Field et al. 2012).

Moreover, in the context of Indonesia, the existing knowledge of socio-economic vulnerability in the coastal areas and the hardly explored issues of policy enforcement under considerable of cultural values, existing conflicts related with adaptation measures are important issues to be addressed in this group. Based on a preliminary review of case studies of LIPI (especially Jakarta, Semarang, and Bone Bay Sulawesi), there are certain issues that have been discussed further, including the **social conflict, institutional aspects (law enforcement, policy, politics etc), social system and cultural values, and social change**. The development of megacities has indeed attracted people to migrate to mega cities like Jakarta. For example, in 2010, almost 10 million people resided in Jakarta, not including the commuters. This has been followed by the gap between the rich and the poor that has extended rapidly turning into conflict or social jealousy. Additionally, weak of law enforcement on spatial planning has been observed. To support the marginalized and vulnerable groups, government or stakeholders need to understand their cultural values as well as the social systems within the multicultural society. Some ethnic groups prefer to live near the sea as they have difficulty to live in a vertical housing. The social system, like local social organization and kinship, to mention a few, could be utilized as capacity to reduce vulnerability in local level.

Along with the development of megacity, society has experience social changes. Social relation has transformed toward a different model, which is more individualistic, instead of communal way. Henny Warsilah (forthcoming) suggests that the combination of modernity and tradition shall be promoted to deal with the modern housing complex in the city. She points out the need of space for informal forum where people could meet and discuss freely about various things. To understand the above issues, one needs to apply qualitative method, while the existing data have mostly been based

on quantitative data. Consequently, the following issues for the future research or collaborations need to be addressed: how to enrich the understanding of vulnerability assessment from **interdisciplinary approaches and perspectives**; how is the **interplay between political power and economic power that has impacted to the marginalization of certain community** (especially poor community); to understand the various types of vulnerability indicators, case studies at the local levels is a must.

State-of-the-art vulnerability assessment in Indonesia

There have been various studies identified on vulnerability and risk assessment

- National: KRAPI / GIZ-KLH, Climate risk assessment/KLH
- Local: provincial and district level in 7 cities / GIZ, CCA studies in Batu, Indramayu, Semarang, Pekalongan, Yogyakarta, Situbondo), community level adaptation assessment, assessment of local NGOs (their roles in adaptation process), CSIRO : study about agriculture sector in Lombok,, CCA in urban water sector provision (CCA) in Makasar, as well as micro (qualitative) studies in various areas

Additionally, potential existing data are available at the national level, namely statistical data from BPS (general indicators, nevertheless, recently also included some additional disaster-related indicators). The environmental ministry has also published baseline information online on climate change vulnerability and risk assessment. At the local level, through existing network in the working group, access to local data e.g. Kendari and Makasar local governments exist, on hard structure, land-use and spatial plans available at Public Work Body, as well as qualitative data from micro studies.

Existing vulnerability assessments in Indonesia are mostly still at regional levels, focusing on physical aspects of climate change. In this case social and economic vulnerability assessments are still lacking; if any, only in micro studies. Clearly, there is a gap that we need to fill in the future collaboration

Actual problems

Several questions were addressed by the working group members, focusing on the factors that influence the societal vulnerability in the context of Indonesia, especially related with socio-economic characteristics in the coastal areas and the hardly explored issues of policy enforcement related with adaptation measures. The discussion focused on people's perception of existing risks versus opportunities in the highly exposed areas or other livelihoods options that people have, which relates to the political and economic development at national, regional, and local levels. Some specific questions are as follows:

- Why do people still want to live in the dangerous areas (e.g. Jakarta)??? – law enforcement, social changes (traditional to modernity)
- What alternatives do the people have - livelihoods strategies, economic development, companies, structural change
- How to organize structural change and capacitate the people?
- How can poverty reduction promotes adaptation and vice versa? – opportunity for adaptation

- Under which political circumstances is a particular adaptation implementable?
- How can we involve local community (participation)?
- What is the role of leadership (Jakarta case study, Jokowi)?
- How do people assess their benefits out of adaptation, esp. low-income people? Risk as opportunity vs threat, risk perception
- What is the role of media in changing the perception towards risk and leadership?
- The issues of negotiation, trust and humanity, underlying factors
- Relocation issues: formal and informal roles.

It was agreed that studies with more comprehensive vulnerability assessment, including dynamics of social, economics, scale etc., such as regional economic development and political development, is needed.

Potential case study selection

Some potential case studies were selected considering its comparability in scientific view, based on the following criteria: i) scale or size of the city; ii) ongoing interventions, iii) climate change impacts or exposure, iv) urban dynamics and context

Case study	1 Scale/Size	2 Interventions	3 CC impacts/exposure	4 urban dynamics, context
Jakarta	Big / global hub	A lot	Actual problem (flood, subsidence)	Political change, relocation
Semarang	Medium/ regional hub	Initiative of local gov., they need cost/benefit	Actual problem (flood, SLR, subsidence) Fishery, industry	Immigration decreasing, Kensemak, integrated north java coast
Makasar	Medium/ reg hub	Recommended adapt. Strategies exist (CSIRO)	Flood, SLR, water supply (salinization) small island disappears Manufacture, fish&rice prod.	Corridor of east Indonesian MP3EI, greater Maminasata
Bandar Lampung	Small		floods	Agricultural buffer zone for Jakarta, bridge construction plan 2020

In the following, the context and arguments for the potential case studies are described in more detailed.

Case study Jakarta

Jakarta, the capital and largest city of Indonesia, is located in the northern coast of West Java. The Special Capital Region of Jakarta (DKI Jakarta; Daerah Khusus Ibukota) covers an area of ca. 662 km,

and over the last half century, the city's population rose rapidly from 2.7 million in 1960 to more than 10 million in 2011 (BPS, 2013). Population pressures and economic developments have caused extensive land use change in Jakarta (Firman 2009). Meanwhile, in the urban centre, many former residential areas have been converted into offices and business spaces, whilst open green space in Jakarta has greatly decreased from 28.8% of total area in 1984 to an estimated 6.2% in 2007 (Firman 2009). Jakarta is dealing with the problems of informal settlements, where many inhabitants are squatting illegally along riverbanks, empty lots and floodplains (UN Habitat, 2003 cited in Simamarta et al. 2013). Therefore, the dualism global and local process of urbanization has shaped the institutions of Jakarta in dealing with numerous urbanization challenges.

Jakarta is exposed to various hazards especially floods and has been assessed as one of the most cities at risks in Southeast Asia due to climate change (Yusuf and Fransisco, 2009). The Center for Development of Coastal and Marine Areas, PPKPL-ITB (2007) projected that the sea level on the waterfront of Jakarta will increase to 0.57 centimeters/year and within this scenario and most of North Jakarta area will be submerged by 2050 (Firman et al., 2009)

In terms of physical geography, Jakarta is a lowland area with a relatively flat topography, with slopes ranging from 0 to 2% in the northern and central parts and 0–5% in the southern part (Abidin et al. 2001). The area suffers from land-subsidence (Abidin et al. 2001, 2010, cited in Ward et al. 2011). Recent estimates of Abidin et al. (2010) suggest an average subsidence rate of 4 cm/year in northern Jakarta. In general, land subsidence in northern Jakarta is more rapid than in the south of the city. Ward et al. (2011) has assessed the potential damage for various sea level scenarios under consideration of land subsidence and highlighted the severity of land subsidence problems of Jakarta that exacerbated potential inundation in the future.

The Metropolitan area of Jakarta (including surrounding regencies of Bekasi and Bogor in West Java and Tangerang in Banten province, including the cities of Bogor, Depok, Tangerang, and Bekasi, is crossed by 13 rivers and many more intersecting canals. Among the most important rivers within the Metro Jakarta Watershed is the Ciliwung River, which runs south to north, starting in the Puncak Mountains, going through Bogor District and City, Depok City, Jakarta Province and ending at Marina Beach in Jakarta Bay and is inhabited by over 5 million people. The problem of floods in Jakarta is related to the complexity multi dimension causes and issues of multi administrative river basin (Ciliwung) management. Flood problem got worse due to the densely occupation of the areas at the upstream (water basin e.g. in Puncak, Bogor) and also informal settlement at the reservoirs and along the canals.

Existing research program and network in the area:

LIPI has been pointed by Research Institute for Humanity and Nature as the coordinator for their project called Human-Environmental Security in the Asia Pacific Ring of Fire: Water, Energy, Food Nexus. The project will include the study of CCA and DRR in Jakarta Bay. Beside LIPI scientists, some others scientists from another institute such as ITB, IPB, and National Electric Company are involved in this project. The project will end on the year of 2019.

It is also foreseen to strongly link the work of TWIN-SEA PhD scholar (Gusti Ayu Ketut Surtiari) into this case study.

Case study Semarang

Semarang, one of the big cities in Indonesia, is a coastal city that is located in the north part of Java Island and is a capital city of Central Java Province with an area of 373,7 km². Since the colonial era, Semarang city has been known as a city that has an International seaport and currently still becomes a center of export-import ship beside the seaport in Jakarta. It is a city with a large variety of activities in industry, trade, housing, education, finance and also tourism. Due to the central functions, the number of population in Semarang City reaches a population of 1.527.433 in 2010 which was an increase from 1.419.478 in 2005 (BPS Semarang, 2011), and it is projected to reach 2 millions in 2025 (Sutanta, 2002 in Marfai and King, 2008). In-migrants become one of the causes of the fast growth of population. They enter Semarang for finding a job and also for education purpose.

Marfai and King (2008) stated that Semarang City consists of three types of geological characteristics which are volcanic rock in the hill, sedimentary rock and alluvial deposits that are found in the coastal area. Overall, Semarang city can be divided into two areas, coastal and hill areas in the southern part of city. However, the coastal area becomes a center of all types of activities that arouse a risk of land subsidence that is also triggered by the over-exploitation of ground water, soil consolidation and overloaded number of building. Furthermore, Marfai and King (2008) revealed that the land subsidence in Semarang during the period 1997-2000 was about 16 cm per year that was found in some areas on the coast and had an elevation below the sea level and it was predicted to increase in the future.

The land subsidence and climate change impact on sea level rise caused the flooding and high tide to be more frequent in some areas (Marfai and King, 2007). They also mentioned that the flooding in subsidized area would be worse.

Meanwhile, on the coastal area of Semarang city some slum areas with low economic condition are found. The number of people who live in poverty line in 2010 was about 25.6 percent of the total population number in Semarang city and mostly was found in the northern part of Semarang city (Bappeda, 2011). The poor people get more severe impact of flooding and tidal wave since they have limited asset to recover their loss when the flooding hit their housing. One of the impacts of flooding and inundation is the pollution of their water in well since it mixes with water from flooding and inundation.

In 2009, Semarang City joined Asian Climate Change Cities Network (ACCCRN) that was assisted by Mercy Corps as a local partner. From the vulnerability assessment, Semarang is also vulnerable to the impact of climate change such as drought, increasing rainfall intensity, and sea level rise (see ISET, 2010).

Existing research program and network in the area:

Research Center for Population has been doing research in Semarang city due to Climate Change impact to population. The research is focusing on impact water resources, quality of air and also health condition especially on dengue fever distribution. The researches examine the vulnerability based on their exposure, adaptive capacity and also adaptation strategies in households and community level. The research has been funded by LIPI routine budget that is called DIPA in 2010-2014 years planning. However, Mercy corps already mapped the vulnerability in collaboration with CCROM and URDI. This entire research project tried to complement with the existing program under supervision of Mercy corps. The assessment became a basic adaptation program in Semarang City.

In the first year of this LIPI project, in 2010, the research focused on people perception mapping on climate change and type of climate change impact that they experienced. In the second year, in 2011 and 2012 the research focused on adaptation to the change of water resources availability due to the climate change impact and the decrease of air quality. In 2013, the research explored the process of government adaptation regarding the intervention from Mercy corps in term of ACCCRN project.

At the end of the LIPI's five-year research program, the research team tries to develop a progressive adaptation strategy that will be added to the existing type of adaptation and its process. The result is expected to answer the challenges to implement the adaptation program.

Related to the research, LIPI already collaborated with the local government and local institutions such as City planning office (Bappeda) of Semarang city, environmental agencies, and public work agencies, University of Diponegoro, State University of Semarang and University of Soegijopranoto. Mercy corps also becomes an important partner in this research just as it assisted Semarang City in Adaptation programs.

Beside the adaptation to climate change program supported by Mercy Corps, mitigation program is also promoted in Semarang City that is supported by GIZ. One of their programs is protect the coastal areas from abrasion and sea level rise through mangrove plantation.

Especially for ground water issue, researchers from Research Center for Geotechnology conducted research on subsurface impact assessment due to urban groundwater loading at Semarang city. This research compared the subsurface impact due to ground water overexploitation at Jakarta and Semarang.

Case study Makasar

Makasar is the capital city of South Sulawesi Province and the biggest city in the eastern Indonesia that is located on the coast of Makasar Bay with an area of 175,77 km² and it is coupled with 11 small islands in Makasar Bay with an area of 100 km². The city consists of 14 sub districts with a population of 1.272.439 in 2009 and it increased to 1.352.1366 in 2012 (Bappeda, 2012). The population density varies from 33.390 people per one square kilometer in Makasar sub district to 8.009 per one square kilometer in Panakkukang sub district.

Due to its strategic location, Makasar has an important position socially, economically and politically that causes fast growing of the city. In 1997, Provincial Government of South Sulawesi figured out an idea to establish a greater Mamminasata, agglomeration cities, consisting of Makasar city, Maros regency, Goa Regency and Takalar regency to become a progressive integrated city in South Sulawesi. In 2008 Mamminasata metropolitan area was appointed as one of the national strategic areas that had privilege regarding its spatial planning (Public work, 2009). All of the cities showed a good progress in economic growth.

For Makasar itself, the strategic position of Makasar influences the positive economic growth. Since 2002 the economy has significantly grown from 4,8 percent in 2002 to 9,8 percent in 2013 and become a highest contributor to economic growth in the province level. The growth is contributed by three sectors such as trading at 78, 87 percent, processing industry at 29, 30 percent and service at 16, 31 percent (Bappeda, 2012). However the number of people who live in poverty line are still plentiful and even it tended to decrease from 62.192 in 2011 to 43.696 poor people in 2013 (www.makasarkota.go.id).

Geographically, the altitude of Makasar city varies from 1 meter to 25 meters from sea level and the coast has 0 – 5 meter of its slope and is crossed by two rivers (www.makasarkota.go.id). The areas surrounding those rivers regularly experience flooding especially wet season (UNHAS, 2011 in Tjandraatmaja et al, 2012). Tjandraatmaja et al (2012) stated that Makasar city has low environmental quality due to the occupation of water catchment areas for housing. That caused various problems such as water, air and soil pollution.

Existing research program and network in the area:

The research on climate change has been done by CSIRO, in which Australia collaborated with Research Centre for Climate Change Impact in Eastern Indonesia in 2012. This research investigated potential climate change impacts on urban water services in Makasar and identified some potential adaptation strategies. The objective was to support Makasar as a coastal city to anticipate impacts of climate change. The report document that was produced to provide background information of the water and its resources in urban context in terms of Mamminasata areas and component for analysis water management strategy also explored the issues and challenges the water and waste water provision in the city (Tjandraatmaja et al, 2012).

Additionally, a working group member Dr. Riyanti Djalante has a good network with the local University of Hasanuddin and the local government there, so that data collection and stakeholder meeting may be supported further.

Case study Bandar Lampung

Bandar Lampung is a coastal city that is located on Lampung bay in the southern part of Sumatera Island and bordered by Sunda Strait. It is a capital city of Lampung Province with an area of 192, 18 km². As the province capital city, Bandar Lampung consists of 13 districts and 98 sub districts and its number of population increases significantly from year to year. In 2005 there were only 793.746 people inhabiting the land, which increased up to 879.651 based on National Population Sensus in 2010 and it is predicted to become 1,8 million people in 2030 (http://bandarlampungkota.go.id/?page_id=13).

The dynamic population is related to central position of Bandar Lampung because of the concentration of such activities such as government, trading, finance, education, social and cultural. More than 12 percent of population in Lampung province is settled in Bandar Lampung city. As a geographically strategic location, Bandar Lampung has a vital role in connecting Java and Sumatera Island for transportation, logistics distribution, and ore distribution besides becoming an export-import seaport. Moreover, the function of the seaport will increase regarding the plan to extend the seaport as a gateway for regional strategic economic activities which is called Sijori (Singapura-Johor-Riau). The new issue in Bandar Lampung regarding its more vital function in regional economic activities, Indonesian Government has a plan to build a bridge that directly connects Java and Sumatera islands that is known as Sunda Strait Bridge. This mega-project is perceived to bring more benefit to Bandar Lampung economic growth (http://bandarlampungkota.go.id/?page_id=13).

Based on topography data, Bandar Lampung consists of hilly mountainous areas with an altitude of about 300 meters from sea level, undulating areas of 300 – 500 meters from sea level, alluvial plains that are found near the coast at central Bandar Lampung, tidal marshes plain with an altitude of 0,5 to 1 meter from sea level and watershed areas at some parts of the coastal areas. Bandar Lampung is

crossed by 2 big rivers that are Way Kuripan and Way Kuala, and 23 small rivers that all meet at the Lampung Bay (Bappeda, 2012).

Due to the progressive activity growth on the coast and also a high concentration of people in that area, some housing are built on reclamation areas. The reclamation area is mostly inhabited by marginal people who live in poor condition and the occupied lands do not have certificates yet. This also becomes a challenge of local government to realize Bandar Lampung as a Water front City (ISET, 2010).

The number of people who still live in the poverty line in 2010 is 260.574 people or 204.018 households or around 30 percents of total population (BPS, 2011). Those people especially already get regularly aids from government to fulfill their basic needs such as food intake. Some of them are settled on coastal areas. Based on their low economic condition, they also get more exposure to climate hazards.

During 1990-2013, there were several extreme events that impacted people in Bandar Lampung such as flooding, landslides, high wave/ abrasion, typhoon, and drought. Flooding is the most intensive that becomes an extreme event in Bandar Lampung. The National Board of Disaster Management (BNPB) noted that during 1990 – 2013, there were 1,152 houses damaged, of which 82 were severely damaged and 429 were evacuated due to the flooding and the landslide events. There were 700 people evacuated and 18 houses severely damaged. The number of victims also were noted high due to typhoon which forced 278 people to evacuate during the period and 23 houses got severely damaged (http://dibi.bnpb.go.id/DesInventar/simple_results.jsp). However, CCROM (in ISET, 2010) mentioned that the flooding was more caused by tidal wave (rob) and abrasion.

Yusuf and Fransisco (2009) mentioned that Bandar Lampung is one of the cities that has a high number of climate hazards such as flooding, drought and landslide which means that Bandar Lampung has more exposure to that events. BNPB also mapped social economic vulnerability index and revealed that Bandar Lampung also became a city that has a high vulnerability score index.

In 2009, Bandar Lampung was selected as one of cities beside Semarang representing Indonesian cities to become a part of Asian Cities Climate Change Network that was founded by Rockefeller Foundation due to its vulnerability to climate change. It aims to build resilience cities through climate change adaptation in vulnerable cities. In Indonesia, there is Mercy corps as a local partner. For assessing the vulnerability and also adaptive capacity, mercy corps collaborated with Center for Climate Risk and Opportunity Management in South East Asia and Pasific, Bogor Agriculture Institute (CCROM, IPB), DPK and The Urban and Regional Development Institute (URDI). CCROM was using historical climate data to identify current and future exposure at the kelurahan level such as floods, drought and landslides (ISET, 2010). The result of that assessment is then to be discussed with related stakeholder to make it more suitable in the local context and to be put in the vulnerability analysis.

Existing research program and network in the area:

Research center for Geotechnology has a program in five year on ward (2015-2019) in the LIPI routine budget scheme that called as DIPA. The objective of the research overall is examine the resilience city due to the water resources.

Expected outcomes

Interest of the working group members particularly on joint publication and possibility of exchange and research activities between Indonesian and German scientists were expressed. The expected outcomes identified were as follows:

- Collection of existing studies from group members including grey literature – write shop possible
- Joint publication as working paper series and peer-reviewed journal (the first one could be state-of-the-art e.g. Studies on Jakarta)
- PhD work (Ayu-LIPI), and more students from LIPI
- Post-docs (possibility to link with DAAD, DFG)
- Research visits Indonesian and German/Int'l experts
- Joint workshop at national level
- Science-policy platform, e.g. Training of local government, policy brief (can make use of e-learning platform and local universities may facilitate)
- Joint research proposal for further activities (currently LIPI has funding for some relevant studies)

It should be examined further in the course of the first project year, which activity is possible to achieve considering the project capacity and time frame.

Working Group 3: Role of Educational Activities (e.g. E-learning) in Promoting DRR & CCA



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Background

In order to better promote climate change adaptation and disaster risk reduction, education is one important instrument. The goal of this working group was to develop an adequate educational framework in order to:

1. Increase the awareness of global warming & climate change to targeted community with various digital media for further dissemination
2. Increase the capacity of the public and specific communities in adapting and mitigating to climate change processes and to introduce practical and appropriate actions in everyday life.
3. To propose Global warming & Climate change as part of national education curriculum

Some examples of educational activities and networking platforms already conducted in Indonesia are as following:

- Community preparedness programs as conducted by LIPI (Compress LIPI) to enhance the risk perception among Indonesia people especially those resident within disaster prone areas.
- Empowerment of a disaster preparedness school (*sekolah siaga bencana*) program.

- Establishment/improvement of an Indonesia vulnerability index for disaster risk reduction (DRR) and climate change adaptation (CCA).
- Community Radio.
- TV Radio.
- Free education materials and open online information.

Existing problems

A number of persisting problems or gaps were identified by the working group:

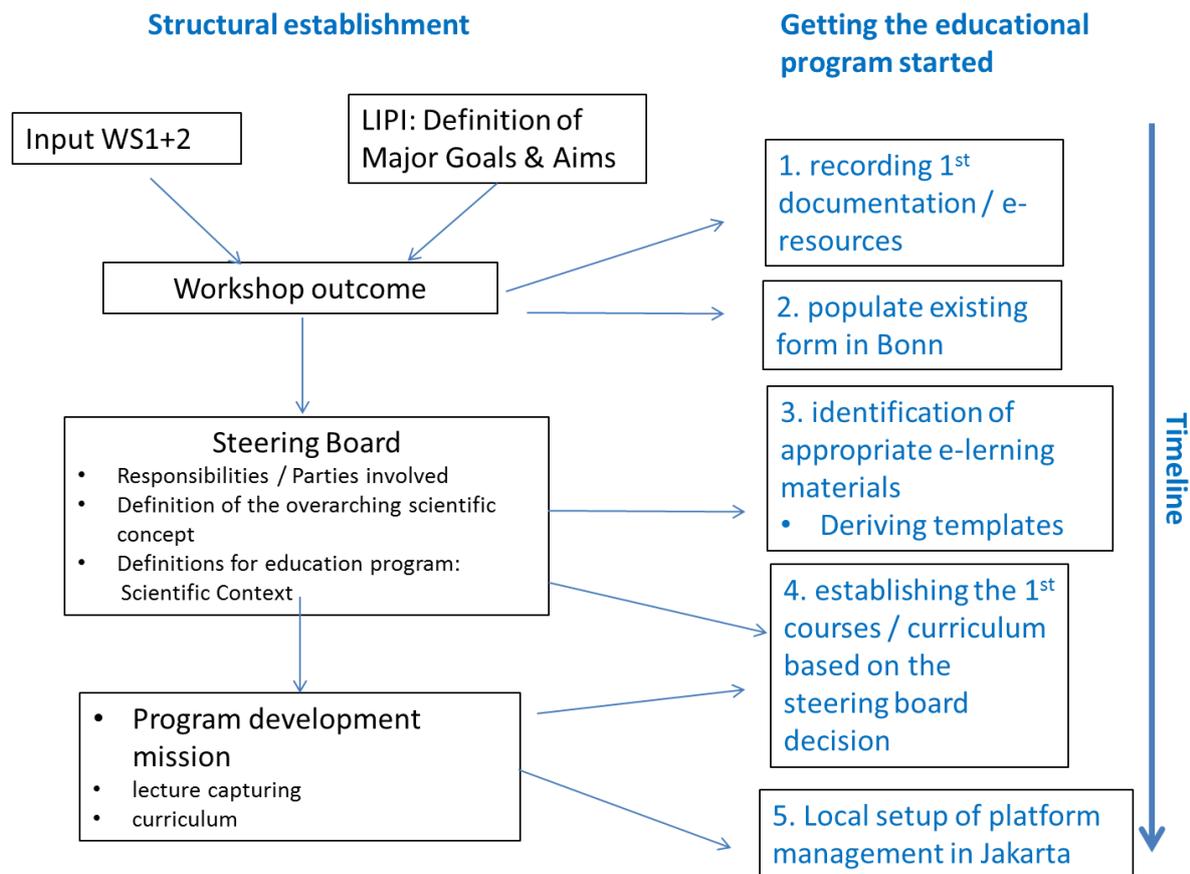
1. Clear definition of target groups. In Indonesia there are approximately 3 main target groups: academia, policy maker and the public. Thus, the role of education must consider the differences in education level, socio-cultural background and the specific perception of every individual group. Academia and policy makers were identified as the more crucial groups.
2. An appropriate knowledge transfer scheme is necessary for each group individually, especially on how to effectively communicate with the respective group. The scheme should be established based on an improved understanding of the needs of every main group.
3. Identification of competent educators/trainers.

The different expertise of the group members would be serving to contribute to the development of the following elements:

1. Research School
2. Short courses/summer school
3. Exchange programs
4. International internship
5. Joint degree program
6. Action based learning such as field lab experience and
7. E-learning/ technology enhanced learning.

Technology enhanced learning, especially e-learning, is nowadays widely used and recognized as an appropriate educational tool that has a broad outreach within both the academic as well as the practitioner's community. Respective e-learning materials in support of educational activities have to be tailored to the specific requirements within the context of disaster risk reduction and climate change adaptation. Current challenges in developing such educational activities are related to various perceptions and different levels of knowledge within the related communities. E-learning modules can be developed for specific application in Indonesia taking into account available resources, available platforms, internet connectivity, technical equipment, human and financial resources, training capacities and the envisioned formats (e-lectures, webinars, off line database, podcasts, community radio etc.) or mobile learning. Quality assurance of developed modules and materials was identified as a final requirement within the described workflow.

Within the program following steps are envisioned:



- Defining the time frame (2-4 years)
- Thematic content will be collected from working group 1+2 plus further extensions
- A clear definition of LIPI as the host institution regarding major goals and milestones
- Establishment of a “Joint Board” to administer research and educational questions within the TWIN SEA project
- Resource allocation and funding options
- Curriculum development/program description
- Definition of structural elements such as E-learning (E-lectures, webinars, m-learning etc.)
- Conceptual development of Short course and research school.

6. Field Excursion in North Jakarta – Some insights

Jakarta with its population of around 10 million is a highly dynamic megacity in Asia. Jakarta consists of five cities and one regency that are Jakarta Selatan, Jakarta Timur, Jakarta Barat, Jakarta Selatan, and Jakarta Utara Cities and Kepulauan Seribu Regency (Seribu Islands). Jakarta's rapid development has influenced the development of its surrounding areas such as Bekasi, Tangerang, Bogor and Depok, as the so-called Greater Jakarta or JABODETABEK. These areas provide affordable formal housing/settlements and industries areas for the spill-over of Jakarta. People living in outer Jakarta become commuters and contribute to the big number of population in Jakarta during the working hours reaching about 12 million.

The city of Jakarta Utara is very dynamic due to the location of the existing international airport as well as seaport and has developed as an dense industrial area. As a central of trading and industrial activities, there is a big number of in-migrants coming to this area pulled by the labor market opportunities. However they are hardly absorbed in the formal sectors, hence various informal sectors as well as informal settlement areas were growing without official permission and land certificates. Jakarta Utara also has an unstable land structures due to its geological characteristics and been suffering from land subsidence related with overextraction of ground water and dense load of building construction. Moreover, due to its location in the estuary, it is crossed by 13 rivers coming from upstream areas and experienced many floodings as Jakarta in general. Land subsidence recently is blamed as one caused of the intensively inundation in almost all areas near to coast.

Jakarta Utara is inhabited by various types of community in terms of income. Low income community lives in slum area and the high income community in exclusive areas known as gated community. However, both of them live in highly exposed areas affected by climate change. However, they have differentiated adaptive capacity to climate change. The low income community experienced regularly floods and inundation due to the limited drainage system capacity. On the other hand, the high income community possess a high technology to protect their area from floods and inundation.



A field excursion to some of these areas in Jakarta Utara was conducted to observed the conditions described above. To get a comprehensive description, four locations were visited: fishermen community in Kelurahan (village) Kamal Muara, Pantai Indah Kapuk (exclusive settlement area), low cost appartments in Muara angke, and Waduk Pluit area (pluit reservoir).

1. Fishermen Community in Kamal Muara (RW 1- 4)

Fishermen community in the Kamal Muara was established around 1940s and 1960s. Most of them are migrants from South Sulawesi, Indramayu, and other parts of Indonesia. Their number increases significantly due to the kinship networking which helps potential migrants in their origin place to

come to Jakarta in getting a house and also a job. Some of the people from Sulawesi are known as “Bugis” ethnic who have good experience as fishermen. Due to their nature of living in coastal areas, they built traditional houses from wood with minimal –own-initiative- infrastructure near to the coast in Jakarta Utara. Living near sea water brings specific comfort for them. The community has been growing significantly causing higher population density in that area.

Most of the housings have no land certificate because the land was previously a swamp area. Some people in RW 4 (part of the slum area in Kamal Muara), settle the area because they were relocated in 1997/1998 due to construction of a sport center. All the people from the construction site who lived there since 1960s had to move with insufficient financial compensations. The relocation caused a social conflict between government and people since the land occupation was illegal but the people did not want to move. At that time, an informal local community leader initiate occupation of a swamp area of about 3 km from their previous housing and close to the coast. It created a new informal settlement. During 1997-2013 the number of household in the new informal settlement had grown from 400 to 600 households. New migrants keep coming into this area and get access to housing and job through the kinship networking.



The main occupation of the people is fishery and working in informal sectors such as as street vendors, small traders and factories laborers. As fishermen, the average daily income varies between 20.000 Rupiahs up to more than 100.000 Rupiahs (about 1.7 – 8.5 USD) depending on the weather conditions. The women also support fishery works like peeling shells and paid daily around 21.000 rupiahs until almost 100.000 rupiahs depending on their productivity.

The community has experienced some hydro-meteorological extreme events such as flooding, high tide/tidal wave, typhoon and abrasion. Recently, they perceived that some extreme events occurred more frequently and affected their livelihoods. For example, fishermen cannot go fishing as regularly as before due to uncertain weather. In addition, marine degradation also reduced fish production. Also, flooding occurred more intensively and inundated more areas recently and the tidal wave events cannot be predicted anymore as about ten years ago.



The community has been adapting to the impacts of the uncertain climatic events or climate change. Some of their adaptation options are among others putting sacks of shells in front of their house to prevent floods and elevating their house. However, such adaptation measure were limited due to lack of financial resources.

The government established an early warning system to flooding at the Kelurahan level involving mosques to announce evacuation guidance. At the provincial level, there was a vulnerability reduction program for the coastal community, involving construction of a small dyke close to

the fishermen settlement, which was completed in 2013. However, some people reported that the water still entered their houses through the holes along the bottom of the dyke. Once the sea water entered the houses, it could not return back to the sea and cause even more inundation. Nevertheless, the small dyke was able to minimize the coming waste from the sea.

2. Pantai Indah Kapuk “exclusive housing community”

Pantai Indah Kapuk (PIK) is an exclusive settlement area developed by private developer for high income community. Previously, Pantai Indah Kapuk was a swamp area but then it was made to solid by the developer. This settlement is located in the vicinity of fishermen community in Kamal Muara, but has never suffered from regular floods as in Kamal Muara. The settlement is equipped with a high technology pump system to protect the area from floods with 6 pumping machines (three are operated regularly) and a reservoir to retain water which will be pumped back to the sea when it reaches the maximum level.



Moreover, the settlement also uses high technology to process tap water from local water resources to minimize the utilization of ground water. Considering the high technology facilities provided, the settlement becomes one of the most expensive ones in Jakarta. Yet, there was high demand to this settlement area, so that new developer is conducting land reclamation for three islands in Jakarta Bay to be part of PIK area connected by a bridge.

On the other hand, some informants in Kamal Muara mentioned that the high technology has worsened the flooding and inundation in their slum area. Also, the reclamation caused the stream flow to move to the other direction which in this case was to settlement in Kamal Muara. Other negative impact due to development of the new islands is the chemical content of compacted sands that caused sea water pollution that killed many fish around the area.

3. Low Cost Housing, at Muara Angke (Provided by Buddhist Foundation)

In many cases, low-cost apartments provided by the government in some areas in Jakarta, people in slum areas, were not occupied as hoped. This is due to the distance to workplaces or difficulties to adjust to living in vertical housing and limited social activities (as a characteristic of traditional community). Moreover, private institutions are also allowed to provide such low-cost apartments.

One of the sites visited in Muara Angke belongs to the Buddhist Foundation, which was previously provided to people who relocated from other development projects in Kali Adem area in Jakarta. People living in



that apartment are coming from slum areas and previously work as fishermen. After living there, they do not allow re-rent to others (which was the case in several other areas). Every one room costs 90.000 Rupiahs (about 7.7 USD) monthly, which is much cheaper than the apartments provided by government around 200.000 Rupiahs (about 17 USD) monthly.

Residents living there also get education and capacity building by volunteers from the foundation. For example, the volunteers brief them to respect the environment through proper cleaning of the apartment, and education for children for achieving better future.

4. Waduk Pluit (Pluit Reservoir)

Waduk Pluit is one of the reservoirs in Jakarta for flood protection. Initially the size of this reservoir is about 80 hectares but decreasing to only 60 hectares due to occupation of the surrounding reservoir areas. Actually the land is owned by the government but since 1990 the area has been growing rapidly as a dense built areas. Not only slum but also industrial and formal housing areas have been



developed around the reservoir. The dense population caused an increase of sedimentation in the reservoir and reduced its depth from 10 meters to around 2-5 meters. Every high rainfall, in the area generates flooding since this reservoir cannot function properly to retain the water.

On 2013, the new Jakarta Governor relocated people living in slum area around the reservoir. They were relocated to some low cost housing such as in Muara Baru, Muara Angke (as described above), Marunda and Muara Karang. The process of relocation was not an easy task, but the new governor managed to persuade the people to relocate using a personal approach.

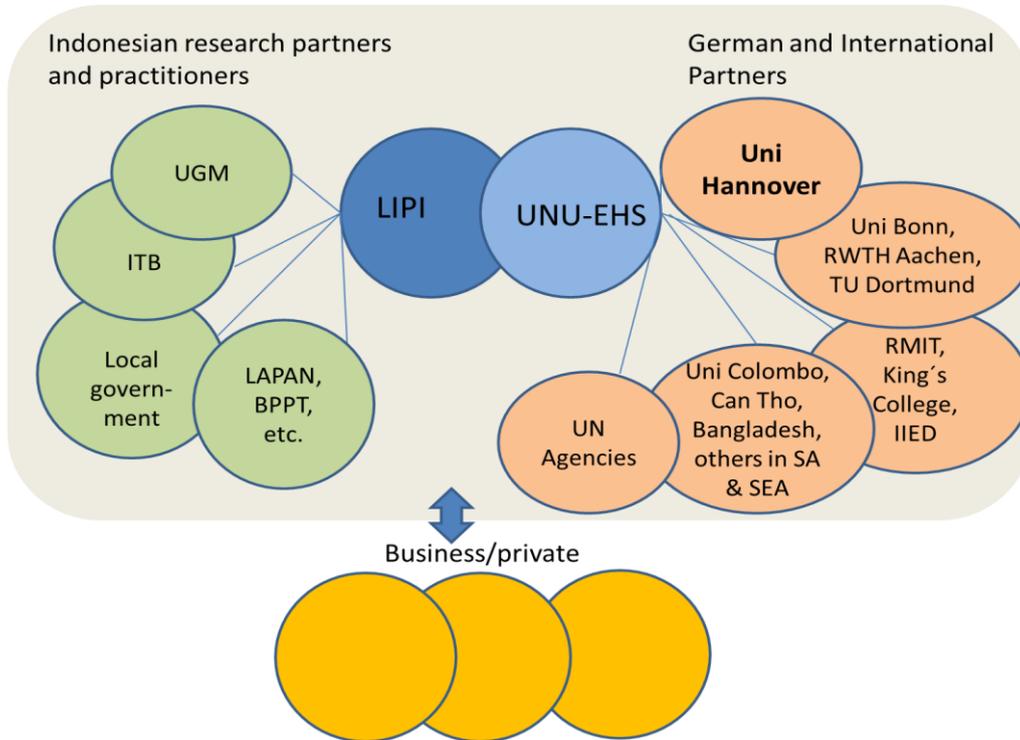
Some Insights

The observation in the field provides a better understanding on the complexity of the problem due to various aspects, including socio-economic and also political aspects. On the one hand, government allows private developers to build housing area in the flood retention areas and on the other hand, it attempts to relocate marginalized people from the same areas. Justified and transparent rules for spatial planning and land use management are still required to solve the problem.

Furthermore, political dimension is important and needs to be incorporated in the vulnerability assessment in order to have holistic and comprehensive analysis and recommendations for solving the problem.

7. Recommendations and Next Steps

At the end of the workshop, LIPI-ICIAR Head Dr. Diaz Santika has expressed LIPI-ICIAR's interest to follow-up this cooperation by integrating the results of the workshop in LIPI-ICIAR mid-term strategy, both in terms of joint research and educational activities. Research pro (RISTEK funding program) was also mentioned as one potential funding sources to send more PhD scholars to research institutions in Germany and partnering countries.



Future steps as identified during the TWIN-SEA workshop and follow-up meetings are:

- A concept note of joint educational activities (like research school or integrated master/PhD program) will be developed by LIPI and UNU-EHS and will be finalized by June/July of 2014. Exchange program of scientist is underway with two guest researchers from Indonesia who will be invited to Germany.
- A working paper will be prepared based on the results of the workshop, including summary of the workshop content and working group discussions, as well as state-of-the-art profile of the potential case studies where the joint pilot activities will be conducted in the next phase.
- An e-learning platform containing the existing educational materials is soon to be launched, where the working group members will get access and will be able to contribute material. This will also be used as platform for sharing documents and data and enhance cooperation structure as stated in working package 1 of the TWIN-SEA project.
- Specific activities will be carried out within thematic working groups linked to TWIN-SEA Project working packages and deliverables.

Specific activities of Working Group 1

WG 1 aims at shaping a conceptual Ecosystem-based and Low Regret Adaptation Management (ELRAM) framework and to develop the required transdisciplinary methodologies, techniques and modelling tools for practical guidelines and adequate implementation of ELRAM-based sustainable

coastal protection systems for coastal zones in South East Asia and in particular Indonesia. Assessment of functions and effectiveness of coastal ecosystems will be carried out in a qualitative analysis for general application of ecosystems and “low regret” measures for explicit case studies and numerical scenario-based flooding simulation including feasibility study for application of these ecosystems and “low regret” measures considering sea level rise due to climate change. The results will be a contribution to working packages 2, 3, 6 and 9 in the project. Furthermore, the outcomes can be used as an input for e-learning working package 7 as a knowledge transfer to increase acceptability in applying “low regret” protection measures.

➤ First steps for ELRAM:

Assessment of structure and function of coastal ecosystems and their capacities

Qualitative analysis for application of ecosystems and “low regret” measures for explicit case studies

➤ Further steps for ELRAM:

Numerical scenario-based flooding simulation including feasibility study for application of various ecosystems and “low regret” measures considering sea level rise due to climate change

Specific activities of Working Group 2

WG 2 will initiate the studies firstly in Jakarta and Semarang by collecting and reviewing existing data and studies, also strongly linked with the PhD work of Mrs. Gusti Ayu Ketut Surtiari. Working papers will be developed but targeted for journal scientific papers based on the review and data analysis. Another workshop in the case study sites is planned for beginning of 2015 involving the local stakeholders to present the first findings and develop local socio-economic development pathways scenario jointly. The results will contribute to working packages 3, 4, 5, and 6 to some extent, while taking into account the input from working package 2.

- Vulnerability assessment including dynamics of social, economics, scale, and development pathways scenario based on existing data/studies and further research in selected case studies.
 - Initial data collection and review of existing studies will be done for Jakarta and Semarang (linked with the PhD work). Additionally, existing network and expertise of the working group members will be mobilized.
 - A workshop on development of local scenario development with the local stakeholders is planned for end of 2014/beginning of 2015.

Specific activities of Working Group 3

WG 3 will develop a more solid structure of the educational activities with the input from the first two thematic groups. In this case, LIPI will be the host institution. Resource and funding options will be identified further for the activities. Moreover, curriculum development/program description, and structural element such as E-learning (E-lectures, webinars etc.), short course and research school will be defined jointly with UNU-EHS. This will serve mostly the goals of working packages 1 and 7.

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