



	<h2>Delta Alliance Newsletter – Taiwan Special, August 2015</h2>
	<p>This newsletter is focussed on one of our newest Wings: Taiwan. The Taiwan Wing presents it's partners and the four major delta regions. We invite you to share your thoughts, ideas and solutions with the Delta Alliance Taiwan Wing members.</p> <p>Before opening the floor to Taiwan, we briefly touch upon Delta Alliance news and some activities that will take place coming months.</p> <p style="text-align: right;">For more news and updates see our website</p>
	<h2>New Wing: Ebro Delta</h2>
	<p>We welcome the Ebro Wing in Spain to our family of Delta Alliance Wings. Learn more on the Ebro delta issues and see the current overview of our 16 wings on our website.</p> <p style="text-align: right;">Read more...</p>
	<h2>New Publications</h2>
	<p>Recently two new publications of the Delta Alliance were published:</p> <ul style="list-style-type: none"> - Vulnerability assessment of deltas in transboundary river basins - Vulnerability and Resilience Assessment of the Ayeyarwady Delta in Myanmar <p>Also, the results of the Delta Alliance Argentina Wing workshop on 'Urban-Environmental Scenarios for Lower Parana Delta' are presented on our website.</p> <p style="text-align: right;">See our total list of publications ...</p>
	<h2>World Water Week Stockholm</h2>
	<p>24th of August</p> <p>Join us at the Climate Adaptation and Disaster Risk Reduction session during the Stockholm Water Week on Monday 24th of August, 14.00 – 15.30 h, Room FH202. The session is organised by The Hague Institute for Global Justice, Deltares in collaboration with the Delta Alliance. More information and background for the discussion can be found in the booklet: 'Governance of Climate Adaptation and Disaster Risk Reduction in Vulnerable Low-Lying Countries'.</p> <p style="text-align: right;">Read more ...</p>

	<h2>Delta Alliance's International Governing Board Meeting</h2>
	<p>25th of August</p> <p>At 25th of August the International Governing Board of the Delta Alliance will convene for it's annual meeting.</p> <p>At this meeting we will welcome two new board members:</p> <ul style="list-style-type: none"> - Richard Damania, the Global Lead Economist in the World Bank's Water Practice and - Henk Ovink, Special Envoy on International Water Affairs for the Kingdom of the Netherlands.
	<h2>Research uptake of the Urbanising Deltas of the World research programme</h2>
	<p>Delta Alliance will cooperate with the Urbanising Deltas of the World Programme of NWO (The Netherlands Organisation for Scientific Research) to organise the knowledge exchange and research uptake for this programme. First activity is the UDW conference to be held in Bangladesh end of November 2015. Details will be worked out in the months ahead.</p> <p style="text-align: right;">Read more ...</p>
	<h2>Introduction Taiwan Wing Members</h2>
	<p>On behalf of Taiwan, the Academia Sinica signed a collaboration agreement with the Delta Alliance International on Sep. 23, 2014 and officially became a member of the Delta Alliance.</p> <p>The Academy has collaborated in with National Taiwan University, National Cheng Kung University, National Ilan University, National Pingtung University of Science and Technology and Tunghai University to work on the effects of climate change on natural disaster mitigation, adaptation and rehabilitation, food security and the health of aging people and other related issues, in the four major delta regions in Taiwan, including the Taipei(Tamsui River), Chuoshui River, Pingtung(Gaoping River), and Langyang deltas.</p>
	<h2>Four cases in Taiwan</h2>
	<p>Actions and local practices in promoting resilience to cope with flood risk</p> <p>Ching-Cheng, Chang, Academia Sinica, Taipei; Peiwen Lu, National Central University, Taoyuan; Yi-Chang, Chiang, Chinese Culture University, Taipei; Wenko Hsu, National Central University, Taoyuan; Mei-Chun, Lin, Academia Sinica, Taipei.</p> <p>The issue of rapid rainfall and flood risks has gained increasing consideration in decision-making of urban development due to the experiences of flooding disasters in the past and the estimated threats of flooding in the future. In southern Taiwan, typhoon Morakot in 2009 brought over three metres of heavy rainfall within four days. Hundreds of people died as a result of mudslides and other flooding consequences. The economic losses amounted to more than five hundred million euros (National Science and Technology Center for Disaster Reduction, 2010). Typhoon Fanapi in 2010 brought over 0.6 metres of rapid rainfall within half a day. These extreme rainfalls crushed the drainage system and led to a serious flood in the Kaohsiung city centre.</p> <p>Storms with such extreme rainfall may occur more frequently and will likely result in more disasters in the coming decades. The situation will get worse if the sea level rise is considered – it is expected to rise 0.18 metres by 2030 and 0.59 metres by 2090 (Water Resource Agency and Sinotech Engineering Consultants, 2010). The notion of resilience has grown popular in this context as a concept which can help in planning to address the increasing number of uncertain disturbances, such as flood risks and the impact of climate change. Urban resilience is often considered as the ability to respond to a contemporary sense of complexity, uncertainty and insecurity, and to set up new approaches or priorities for adaptation and survival (Christopherson et al., 2010).</p> <p>Resilience, in this respect, is about the capacity of a city to respond, recover and reform from unforeseen disturbances that may eventually become the opportunities for spatial development (Lu</p>

	<p>and Stead, 2013). Based on the existing knowledge of urban resilience, this report focuses on the way in which local actions are transformed to promote resilience in the metropolitan areas of Taiwan constantly challenged by flood risks. We will present four cases in Taiwan in relation to actions and local practices for building more resilient cities. It follows the approaches of case study and comparative analysis. Sources of data collection in the case studies are multiple, including GIS spatial analysis, interviews, and participating observations where communication with local contacts continues in knowledge exchange and research outcomes evaluation.</p>
	<p>Case 1: Keelung-Tamsui River Delta - Shezi Island in Taipei City</p>
	<div data-bbox="381 463 1422 1207" data-label="Image"> </div> <p style="text-align: right;">Figure 1: Shezi Island, Taipei City</p> <p>Under the threat of extreme precipitation caused by climate change and the rising sea level induced by global warming, response measures for estuary region should be taken immediately. Shezi Island, a bar lying at the confluence of Keelung and Tamsui River (Figure 1), has been delimited as a construction-forbidden retention area for Taipei city since 1970. Due to this restriction, Shezi Island becomes a low developed estuarine community in the flourishing city. Today, with the confliction between threat of flood and demand of development from residents, Shezi Island is challenging Taipei City's adaptation strategy for climate change. As a result, we choose Shezi Island as a model to study and portray a design prototype for estuarine communities in Taiwan to cope with climate change.</p> <p>To build a resilient city living with flood and to boost up local development, communities are drawn as basic units for adaptation prototype in our case study. The main purpose is to integrate the local strategies to build a spatially and socially resilient community that can lead Shezi Island into a water-resilient community in the foreseeable future. By analyzing the interaction between human and environment with causal relationship, issues and problems in every phase are easier to be comprehended.</p> <p>In the first phase, the Driver-Pressure-State-Impact-Response (DPSIR) approach was used as a cause-effect framework. We estimated the impact of flood on community with the emphasis on local economy and historical fabrics. Next, from social resilience's viewpoint and through field survey and literature review, the study on climate change adaptation design was launched. We found that the design prototype is conducive to reinforcing local adaptation technology and knowledge while motivating residents to develop a critical understanding of the menace of climate change on their daily life.</p>
	<p>Case 2: Keelung-Tamsui River Delta – Shijr-Woodu Township in New Taipei City</p>
	<p>Due to the rising damages caused by recent typhoons and flooding events, regional flood</p>

control projects and risk assessment has become the basis for a comprehensive risk management framework. In 1998 and 2000 Typhoons Zeb, Babs and Xangsane flooded the Shijr and Wu-doo Area in New Taipei City. The enormous damages have brought into public attention the flood mitigation effort along the Keelung River. Both structural (e.g., dike, levees) and non-structural (e.g., early warning system) measures were adopted in this effort. This case study combines an integrated flood risk engineering model with the economic cost-benefits analysis to evaluate the efficiency of a flood diversion tunnel, Yuanshanzih (Figure 2), which is located at upstream of Keelung River in New Taipei City.(Chang et al., 2007)



Figure 2. Yuanshanzih diversion tunnel and flood warning system in Taipei
Source: Water Resource Agency, Ministry of Economic Affairs, <http://www.wra.gov.tw/ct.asp?xItem=25864&ctNode=25864>

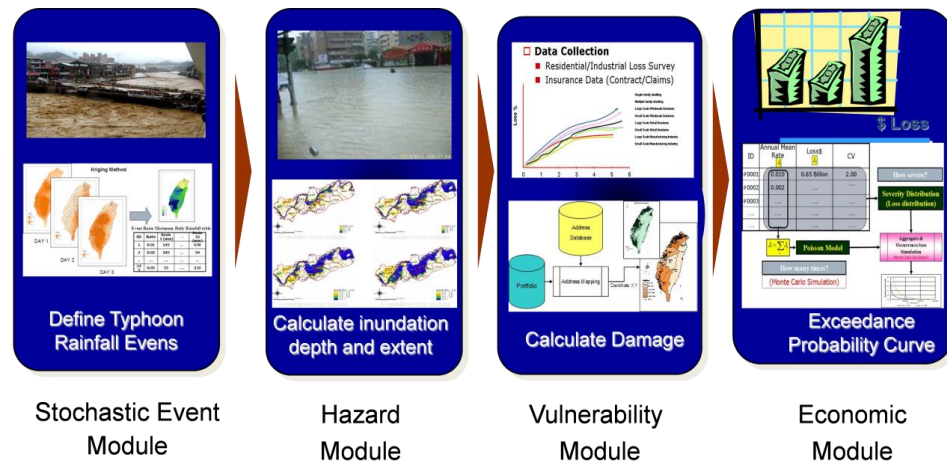


Figure 3. Overview of a GIS-based Flood Loss Assessment in Keelung River Basin

Figure 3 provides an overview of our integrated assessment which contains four modules (Hsu et al., 2011). The stochastic event module provides historical rainfall occurrence, distribution and hazard data. The hazard module uses the flood potential maps from hydrology routing modelers to determine the possible inundation depths and spatial dispersions. The vulnerability module integrates the flood potential maps with socio-economic survey data and flood-depth-loss curves using the grid-based GIS mapping technique for the flood loss assessment. The economic module combines the loss assessment results with the stochastic event database to construct the exceedance probability of flood damage. The results show that the average annual benefit is 0.97 billion NT dollars per year, which exceeded the amortized construction and maintenance cost of Yuanshanzih diversion tunnel 0.72 billion NT dollars.

Case 3: Kaoping River Delta – Meinong Township in Kaohsiung City

Meinong Township is an agricultural settlement located in the peripheral area of Kaohsiung City. The geographical features cause Meinong to have a critical position in managing both the issues of flooding and water scarcity. The township is located at the top of the alluvial fan area of the Kaoping River Delta where the water speed rapidly decreases and the slope of the river suddenly levels out. This makes the township vulnerable to flooding.



Figure 4. International workshop in Kaohsiung City, 2012

The discussion of water scarcity is a highly political issue for decades due to a national development strategy that aims to ensure that the downstream Kaohsiung City has sufficient water supply for industrial development, which is influenced by the development of petrochemical, steel, and metal manufacturing industries near the Port of Kaohsiung. These heavy industries have been the main drivers of the economic growth, but also brought negative environmental pressures on the city, such as air pollution and poor quality of the drinking water. Policy makers are keen to transform the industries from heavy-industry-oriented to service-oriented types.

A Meinong Reservoir was proposed in the early 1990s. However, it was criticised by academics and local communities from the perspective of ecological protection. The reservoir proposal was abandoned in the early 2000s and replaced by two engineering-related strategies. The first one is to construct channels through the mountains to transport fresh water from another source, the Zengwen Reservoir. The second one is to dig artificial lakes in the farmlands for water storage. Both strategies are currently in different phases of implementations.

An International Workshop (Figure 4), *the strategy of Kaohsiung waterfront redevelopment for climate change*, was held in 2012 to form a collaborative network with the Dutch research team and

	<p>the municipality in integrating adaptive strategies for urban development along the riverfront (Research Development and Evaluation Commission and Hydraulic Engineering Bureau, 2012). Five Dutch experts and the research team from Delft University of Technology in the Netherlands were invited to work together with municipal officials and private consulting firms. Field work included Meinong Township (both flood and drought) as well as Kaohsiung City Centre (flood and storm surge). The outcomes of the workshop included analysis and recommendations of smart technologies for spatial development. Some structural proposals, such as water retention ponds, were also given higher priority for local implementation.</p>
	<p>Case 4: Zengwun River Delta – Tainan City</p>
	<div data-bbox="331 488 494 981" data-label="Text"> <p>The city of Tainan has a long history of urban development. It was the capital city of Taiwan for centuries until the national administration was moved to Taipei in the early 20th century. The city of Tainan is unique in its richness of</p> </div> <div data-bbox="512 470 1401 851" data-label="Image"> </div> <div data-bbox="533 902 1007 931" data-label="Caption"> <p>Figure 5. The Open Forum in Tainan City, 2014</p> </div> <div data-bbox="331 981 1295 1037" data-label="Text"> <p>cultural resources. Large numbers of historic heritages make the city attractive for tourists. Development strategies are mainly focused on cultural economy and tourism industry.</p> </div> <div data-bbox="331 1052 1404 1245" data-label="Text"> <p>An open forum (Figure 5), Tainan climate change adaptation forum, was hosted in 2014 by the Taiwan Integrated Programme on Climate Change Adaptation Technology (TaiCCAT) and the municipality of Tainan. The forum focused on examining the gap between scientific studies and local perspectives in relation to the vulnerability of the area. The discussion showed a mismatch between scientific outcomes and local awareness in relation to the vulnerability of the environment. Representatives of residents did not consider themselves vulnerable in places where are marked as hazardous.</p> </div> <div data-bbox="331 1261 1388 1480" data-label="Text"> <p>This can be interpreted in two aspects: First, residents perceive climate risks as issues of government's responsibility. This causes an insufficient awareness of climate risks, and of their responsibilities for mitigating these risks. Second, the communities have been well prepared with capacity to cope with the disturbances. Exposure to climate risk is taken for granted, so the communities have learned to adapt based on previous experiences and therefore remain fully functional during the occurrences of the disturbances. However, they may miss the opportunities to influence the exposure to future risks, and the opportunities to effective adaptations will be missed as well.</p> </div>
	<h2 style="color: green;">Research finding and future work</h2>
	<p>Under a general framework of discussion in flood risk and climate change, each case presents its unique characteristics in relation to the environmental conditions, the interests in decision-making and the way in framing collaboration. This indicates a fact that local actions can vary among cases which share similar spatial development objectives and national institutional framework, A more local-based, area-specific framework in decision-making is therefore critical to promote resilience in coping with complex issues as flood risk and climate change.</p> <p>Future work can focus on the context as well as the content of local actions in promoting resilience to cope with flood risk and climate change. The context is about the characteristics owned in specific areas (e.g., culture preferences, planning traditions, finance and environmental conditions). This identifies the important factors that lead to new discussions in decision-making and therefore cause changes in local practices. These can include the appearance of new considerations, external disturbances, shifts in the interests of actors or changes in participation. The content of local actions indicates the importance of developing a research framework that can</p>

	help to unearth the implicit ideas addressed in local actions. Research design for a framework of comparative analysis is valuable for our future work.
	<h2>References</h2>
	<p>Chang, C.C., M. D. Su, J.L. Kang, W.K. Hsu, W.H. Teng, and L. Chou, 2007. "The Cost-Benefit Analysis and Risk Assessment of Public Projects: A Case Study of the Keelung River Basin Integrated Flood Control Plan." <u>Taiwan Economic Forecast and Policy</u>, 37, 2, 111-137. (in Chinese)</p> <p>Christopherson, S., Michie, J. & Tyler, P. 2010. "Regional resilience: theoretical and empirical perspectives." <u>Cambridge Journal of Regions, Economy and Society</u>, 3, 3-10.</p> <p>Hsu, W.K., P.C. Huang, C.C. Chang, D.-M. Hung, W.L. Chiang, 2011. "An Integrated Flood Risk Assessment Model for Property Insurance Industry in Taiwan", <u>Natural Hazards</u>, 58, 1295-1309.</p> <p>Lu, P. & Stead, D. 2013. "Understanding the Notion of Resilience in Spatial Planning: A Case Study of Rotterdam, The Netherlands." <u>Cities</u>, 35, 200-212.</p> <p>National Science and Technology Center for Disaster Reduction, 2010. <u>Disaster Survey and Analysis of Morakot Typhoon</u>. Taipei: National Science and Technology Center for Disaster Reduction, NCDR. (in Chinese)</p> <p>Water Resource Agency, M. O. E. A. & Sinotech Engineering Consultants, 2010. <u>White Book on Water Infrastructure Strategies to Climate Change</u>. (in Chinese)</p>

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