



Conference report

**Challenges in flood risk management in urban areas
of river deltas in South and South East Asia**

Wednesday 6 – Thursday 7 November 2013 | WP1257

Held in Bangkok



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Executive summary

Aim of the conference

1. The conference on “Challenges in flood risk management in urban areas of river deltas in South and South East Asia (WP1257)” aimed to share challenges, knowledge, good practices and experiences on building the resilience of Delta regions to floods and other hydro-meteorological disaster events, particularly the urbanised areas. It provided a platform to discuss the current challenges associated with flood and other hydro-meteorological disaster risk management and find solutions and strategies for risk minimisation by looking at sound practices available in the region and beyond. This conference also explored the need for greater regional collaboration and how this might be achieved.
2. The geographic focus of the conference included a number of river delta regions in South and South East Asia including but not limited to: the Mekong; the Chao Phraya; the Irrawaddy; and the Ganges–Brahmaputra-Meghna (GBM).

Objectives

3. This conference was organised to engage a wide range of stakeholder groups working on urban development, physical and economic policy planning, agriculture, disaster risk reduction (DRR) and climate risk management at the sub-regional, national and sub-national level of delta regions in South and South East Asia. Experts from other delta regions outside Asia were also invited to discuss and share their good practices and identify strategies for risk minimisation.
4. The conference also allowed for participants to:
 - Understand the hydro-meteorological factors that have a social, economic and environmental impact in urban areas within river delta regions;
 - Identify vulnerabilities and risks to the urban built environment, infrastructure, food security and livelihoods due to future adverse disaster events; including the potential increase in external factors such as severe weather events as an expected result of changing variability and climate over the deltaic regions and identify appropriate measures for risk minimisation;
 - Discuss existing strategies, sound practices and new opportunities for disaster risk management practice in urban built up within river delta areas and how these can be applied, for instance through disaster risk reduction programs, climate change adaptation programmes, mainstreaming DRR programmes, urban risk financing mechanisms, socio-economic development and welfare initiatives etc;
 - Explore whether greater collaboration about river deltas at a regional level would be beneficial, and if so in what format that might work best;
 - Encourage networking among stakeholders so that the challenges are discussed

subsequently and sound practices, solutions and experiences are shared.

Key highlights:

5. Large-scale urban centres in delta regions in South and Southeast Asia have developed as economic hubs. Unfortunately they are also among the most vulnerable areas to hydro-meteorological disasters. Risks such as flooding, subsidence, and rising sea levels threaten socioeconomic development each year. They are worsened by unsustainable urban development that reduces drainage or delays flooding in the short term while exacerbating flood intensity in the long term.
6. Implementing strategies to deal with hydro-meteorological disasters needs a long-term approach and countries in South and Southeast Asia will need to build individually tailored solutions to suit their distinct water management challenges and reduce the risk of major impacts of flooding in their urban populations living in the delta regions.
7. Solutions to managing flood risk across the four major delta areas of the South and South East Asia region can be enhanced by sharing best practice, data, knowledge and expertise and by technical assistance. Greater informal cooperation across the four river delta areas is encouraged, building trust and increasing resilience to the risk of flooding.

River delta regions

8. Historically, river delta regions have been the cradles of civilisation providing rich ecosystems and an ideal place for agricultural development. This pattern is still reflected in where cities are placed today.
9. Rivers cannot be seen as “just waterways”. Cultures have historically been created around rivers. In modern times governments are increasingly losing site of this historical truth. Decision makers should resist the view of rivers as being just waterways and acknowledge their cultural significance.

Urban development in delta areas

10. River deltas are seen as “valuable but vulnerable”. Delta regions are often the “best and worst places” to place cities. Delta regions allow easy access to land and sea shipping routes and are often used as trade hubs for international commerce. Delta regions are often the most vulnerable to flooding and storm surges due to their coastal placement. For example New Orleans is an important shipping hub, but due to its bowl shape and proximity to the coast it is also very difficult to protect against hydro-meteorological disasters.
11. Downstream communities suffer from upstream urban development. For example South Vietnam suffers from the consequences of development upstream due to being the southernmost region on the Mekong River.
12. In order to meet the ideals set by the “blue green” city paradigm it is difficult to devise a single master plan. Instead planners could opt for “intelligent zoning” of urban areas. Intelligent zoning considers time, space and people. Furthermore actions will not proceed in a linear fashion, favouring informal development planning as awareness and education is built.
13. During flooding it is very important to protect critical infrastructure, for example hospitals. Protecting key infrastructure creates resiliency for cities allowing them to recover faster from a disaster situation.

Flood risks in river delta areas

14. Flooding in itself is not necessarily bad. Historically, without flooding civilisation would not be possible, and agricultural systems in delta areas remain dependent on annual flooding. However, the intensity of flooding in delta regions has increased over recent years in South and South East Asia, both from rivers and the sea, adversely affecting

growing urban centres. With particularly bad floods in all the major delta regions over recent years the risk of flooding now has to be taken much more seriously.

15. Risk can be calculated using the formula: risk = (hazard intensity X vulnerability X exposure) divided by adaptive capacity. Facts and figures for risk are often based on averages. However, development should not consider purely averages because average occurrences are not ones that pose the most risk. It is argued that decision makers should consider extreme occurrences and develop strategies to tackle these events not just the average. "There is no such thing as normal" it was suggested when it comes to managing flood risks.
16. Climate change is a major concern in delta regions and is believed to be contributing to rising sea levels, higher flood rates and longer droughts. Whilst societies often blame nature at times of disasters such as severe flooding, economic expansion and urbanisation can significantly contribute to many disaster situations.

General challenges in water management in delta regions – upstream and downstream

17. In general, solutions for tackling floods have been divided between those looking to constrict the river and those looking to expand the river. The former school of thought aims to construct structural measures to contain rivers and prevent them from flooding. The latter school of thought aims to give room for the river to "slow it, spread it and sink it", arguing that constricting rivers actually creates a build-up of water resulting in high intensity floods in the long run.
18. Over time, controlling water resources has become synonymous with establishing power in many situations, which has led to damming upstream. This process in turn has led to increasingly intense flooding in delta regions. Dams can also lead to operational failure, structural failure and sedimentation; in the long run dams themselves can lead to disaster. Over the years dams have contributed to turning frequent low intensity floods into infrequent high intensity floods.
19. In water management there are rarely 'win-win' situations. For example, in the case of Thailand, letting water build in dams upstream can cause severe flooding during the monsoon season if the dams reach capacity. However, if water in the dams is released prior to the monsoon season, there may not be the surplus of water available for agricultural use during the dry season.
20. Simply trying to minimise the effects of flood hazards through structural interventions which "stop" nature is not regarded as sufficient or sustainable, it is argued. New solutions should try to understand and work with nature. Non-structural measures should improve drainage along the whole river basin and encourage people not to aim to prevent flooding, but to embrace and live with low intensity flooding. Preventing good floods, it is suggested, can also mean that bad floods are worse.
21. Governments of countries which have major river systems leading to deltas are encouraged to build on the adaptive capacity of the rivers and their communities, with calls to "work with nature", "give room to the river" and "live with flooding" better.
22. The value of non-structural solutions is significant, because even if only a proportion of these work during severe flooding it would still reduce damage, whereas structural solutions could be wiped out.
23. Individualised solutions to flood risk management should be sought in delta regions, as there are specific limitations and factors for each community. For example the solutions appropriate for a world city may not be the same as those sought for a small township.

Subsidence

24. Among one of the most serious issues facing river delta regions is subsidence. Norwegian experts estimate that subsidence is occurring in the deltaic region of South

Vietnam, for example, at a rate of 0.7 meters per year. Subsidence is becoming even more of a serious concern than the rising of the sea level.

25. Water pollution causes a deficit of fresh water that in turn encourages the usage of ground water. The usage of ground water contributes to subsidence. In addition to water pollution, salt-water intrusion is also causing people to use fresh groundwater for fisheries.
26. The issue of subsidence has no easy solution. Legislation needs to enforce limits on the use of groundwater. In concert with creating legislation, governments need to secure other sources of cheap clean water for the use of the public so as not to create an unfair burden on the public. Documentation also needs to be completed regularly to monitor subsidence rates. Furthermore, in the worst-case scenarios the option of city relocation must be explored. There is more information now on where cities can be built safely, information that was not available during the inception of the delta cities.

Flood risk management in the river deltas of South and South East Asia: current approaches and future plans

27. The four deltas in the South and South East Asia region are taking a range of approaches to manage the flood risk in delta areas.

Bangladesh: the Ganges- Brahmaputra Delta

28. Bangladesh lies at the crossroads of three river basins making it especially vulnerable to hydro-meteorological disasters such as flooding, rising sea levels, salt-water intrusion and subsidence. Similar to Vietnam it is also affected by upstream river developments outside its jurisdiction. Its vulnerability is increased due to a very high population density. Urban areas are made predominantly of concrete and lack adequate drainage.
29. Bangladesh is building resilience through a 100-year plan. Measures that are already in place include improved flood drainage, early warning systems for flooding, building codes based on risk mapping, and building community awareness about flood risks.
30. The Flood Action Plan (FAP) undertaken in 1990 as an initiative to undertake the construction of 4.5 to 7 meter high embankments along the Ganges River an initiative that has come under much criticism by political economists and environmentalists. These criticisms include:
 - Embankments deprive flood plains from nurturing effects of inundation.
 - Dykes sometimes cause artificial flooding and create slow-on-set disaster.
 - Silt is now accumulated on riverbeds. Large scale and costly dredging operations are needed.
 - Landless fishermen who are dependent on fresh water fishing have been deprived of their livelihoods.
 - Diversity of agricultural resources has been reduced.
31. Summarily, embankments are not seen as a sustainable solution and are regarded as both an economic and environmental hazard.
32. The Local Government Engineering Department is also undertaking a number of innovative smaller-scale projects. These include submergible roads that provide a means of transport for people during the dry season, but also are constructed not to obstruct the natural flow of water in the Haor basin.
33. Bangladesh has also initiated an early warning Interactive Voice Response Service available by dialing 10941 from any mobile phone in Bangladesh. This has proved an effective use of modern technology to mitigate disasters. The service provides early warning to sea-going fisherman along with those living on river ports, while also

providing daily weather bulletins.

34. Bangladesh's forecasts on river levels can only predict floods 5 days in advance. However, to adequately prepare for a flood a lead-time of at least 10 days advance is required. A broader collaboration within the South Asia region is needed and is hoped that greater sharing of data between India and Bangladesh can be achieved after a recent South Asian Association for Regional Cooperation meeting.

Myanmar: the Irrawaddy Delta

35. In Myanmar the Irrawaddy delta area, like all deltas, faces the double challenge of high tide and salt water intrusion, plus heavy rainfall. Two million people are exposed to flood hazards by the Irrawaddy river, covering 404 km². The coastal and delta areas includes 26 townships.
36. The four government agencies in charge of flood mitigation are the Department of Meteorology and Hydrology, the Department of Irrigation, the Directorate of Water Resources and Improvement of River Systems, and the Department of Relief and Resettlement. They are in charge of early warning, strengthening of embankments, river training and evacuation, respectively.
37. Local challenges include:
- Lack of real time automatic observation stations;
 - Detailed data of the river systems are not available;
 - Protection of serious bank erosion of deltaic rivers and creeks are not sufficient;
 - Modeling of sedimentation rate and seawater intrusion not yet implemented;
 - Detailed data of the Mangrove deforestation are not available;
 - Capacity building and institutional capabilities of related institutions are weak for Disaster Management.
 - Technical and Financial input for climate change reduction are insufficient.
 - Human capacity and Human resources at National Level are limited.
38. Community-led flood risk mitigation efforts include: a reforestation programme, flood wall construction, community sandbagging, repairing of houses for flood resistance, and construction of multipurpose buildings.

Thailand: the Chao Phraya Delta

39. Thailand is spending USD 10 billion on a new flood management project as a direct result of the 2011 flooding. The 100-plan entails 10 modules to be completed in 5 years. The plan includes implementing upstream, midstream and downstream solutions.
40. Upstream solutions include reforestation and the construction of reservoirs. Midstream solutions include the construction of a retention area with a capacity of up to 3 billion m³, and the rehabilitation of old river channels for flood diversion. Downstream solutions include the construction of short bypass channels and two main flood diversion channels.
41. Other than structural measures, Thailand also aims to encourage a better understanding of the causes of floods and invite community participation in creating localised solutions. Unfortunately in order to implement this process using existing agencies would take too long. Thailand therefore aims to contract a number of international companies. Such a resolution, known as design-build, is deemed to be both faster and more effective.
42. Design-build is the same model used after Hurricane Katrina in the USA where a contract was awarded to an international company. The company is chosen based on

their past performance and a brief conceptual plan. This allows for competition in innovative design.

43. Financing for the Thai plan will be done through Guaranteed Maximum Price (GMP). GMP provides a ceiling price. The contractor is subject to overruns. Furthermore, any savings from underruns are to be returned to the Thai government. This would encourage contractors to aim as close to a USD 10 billion plan as possible.
44. While those with experience in the field realise that a 100-year plan is a relatively short term solution, many of Thailand's decision makers already believe this amount is too much to spend. The current plan is seen as a quick fix to build confidence in investors. The real challenge, it is argued by some, lies ahead in educating and changing the perception of decision makers so as to allow for continued adaptation.
45. Thailand is pursuing public participation through community based water management. This provides an opportunity to hear from the public and serves as a forum to address public needs. The Thai public is still relatively uneducated about flood risks. For example among the leading causes of death in 2011 was electrocution, which could have been easily avoided with increased education of the risks associated with flooding.

Vietnam and the Mekong

46. In Vietnam about 18 million people live in the Mekong delta region, 5 million of whom live in urban areas. The portion of the population living in delta cities is expected to rise to up to 50% by 2050. In these areas floods can cover up to 1.9 hectares and be up to 3m deep.
47. Coping with this large volume of water yearly is a challenge, nonetheless in 2011 Vietnam was able to demonstrate its ability to not only prevent serious losses as compared with Thailand, but also to utilise the surplus water to become the world's top exporter of rice. It was noticeable that the damage of the 2011 flooding was significantly less than in previous years. However, it was noted that the 2000 floods had drained away along the Mekong better than in 2011.
48. One reason for Vietnam's general success in flood water management is due to its "Living with Floods" policy of flood risk management. The strategy takes the approach that flooding neither can nor should be completely controlled in order to protect people and maintain normal lives during inundation.
49. Vietnam employs structural flood risk measures including: dams, dikes, sluices, and canals built to protect crops and properties; and residential clusters/dykes.
50. Emphasis, however, has been put on the implementation of non-structural measure including:
 - Strengthening flood and storm preparedness organisations;
 - Flood forecasting and warning on the flood situation in each area;
 - Emergency relief during and after flooding to stabilise people's livelihood as soon as possible and get prepared for the future floods;
 - Training courses and workshops on disaster preparedness and mitigation for disaster management officers;
 - Improvement of public awareness on disaster management and mitigation through leaflets; and
 - Research on disaster mitigation measures such as study on the shifting of cultivation timing to mitigate crop losses.
51. It is also worth noting Vietnam's collaboration with the Netherlands from 2009-2013. Together Vietnam and the Netherlands created a master plan to last till 2100, and

shared engineering resources. This plan was intended to cope with sea levels rising up to 100cm.

52. The Mekong River Commission (MRC) is providing flood risk mapping for the whole of the Mekong and benefits Vietnam. The mapping data is derived from 23 forecast points along the Mekong River and is made available on their website. The MRC also promotes data exchange, water usage monitoring and ensuring healthy water quality.

Flood risk management: some examples from outside the region

The Netherlands

53. As an example of best practice, the Netherlands is among the most prepared for hydro-meteorological disasters due to its long history with flooding. Preparations are made for up to 100,000 years in the future. The attitude taken is that, if there are resources available, there is no reason not to take advantage of them to build up defences against the risk of flooding. A strategy of adaptive management is employed. Implementing many options for flood risk management allows for flexibility in dealing with water hazards. Decision makers may choose between many options to ensure the best possible actions are taken. USD 1 billion will be set aside each year starting in 2020.
54. Adaptive management is employed in recognition of an uncertain future regarding water hazards. Better preparation limits future regret it is argued.

Kuala Lumpur

55. Malaysia is seeking structural and non-structural approaches to cope with flood risk management. Similar to the Netherlands, Malaysia has a dynamic approach to flood risk management with multiple options for decision makers to take.
56. Of particular interest is Malaysia's Stormwater Management and Road Tunnel (SMART) water drainage system in Kuala Lumpur. The system uses catchment basins and dual-use tunnels to alleviate flooding, particularly flash flooding, with the ability to move significant amounts of water under the city to reduce the risk of flooding above ground. Normally the SMART tunnels are used as a two level motorway to cope with Malaysia's heavy traffic. During a storm levels of the SMART tunnel can be sectioned off to allow for water drainage from catchment basins.
57. SMART has been running for 6 years and is largely effective, although there are still challenges for instance in the build-up of sediment in the tunnels when flooding occurs.

Flood risk management: assessments, awareness and preparedness

58. Where countries such as the Netherlands may have a large budget and a long time frame to implement water management solutions, countries in South and Southeast Asia do not have this luxury. Nonetheless there is still much these countries can do in terms to reduce flood risks effectively such as developing and using flood hazard mapping, improving urban planning, raising community awareness of risk and improving the preparedness and response mechanisms.

Flood hazard mapping

59. Through flood hazard mapping governments are able to quantify flood risk in terms of projected damage. Cities can be mapped in terms of low, medium and high flood risk. In turn development planning may be informed directly by flood hazard mapping. For example low risk locations can be used for the development of schools, which can then be used as evacuation sites during floods. Flood hazard mapping may also be used to inform insurance guidelines for flooding.
60. Although science and risk mapping in particular is a great resource, communities and governments need to have access to the information in order to use it effectively and increase their resilience to flooding. In the UK it has been demonstrated that by publishing the flood maps and distributing them to the public, communities are more

likely to educate themselves on flood risk. This fact was initially surprising, as it was perceived that the public would not be able to make sense of the scientific information disseminated, and there was also the potential for legal challenge.

Raising awareness through communication and the media

61. Even where information is readily available the numbers and scientific data can be difficult for people to relate to, and the messages from government agencies to its people are not clear. Attention needs to be paid to the human aspect of water risk management as well as the scientific aspect. A common challenge across delta regions is the education of people to flood risks. A better understanding of what to do and how to effectively cope with flood risks can curb losses in the long run.
62. The media can be used as a tool for public education on disaster risks and management. One possibility is to encourage the media to participate in educational programs for reporting on water management. News managers would recognise these courses and reporters with this background would be favoured for water management stories. Suggestions were also made of awarding certificates upon the graduating from such courses to further legitimise the courses.

Improving the preparedness and response to flooding

63. Being better prepared to respond to flooding is critical. In Mozambique, an example shared at the conference, each community has a local committee known as a Comitês locais de Gestão do Risco de Calamidades (CLGRC), comprised of up to 18 volunteers from the committee to strengthen community emergency preparedness and response. Each member of CLGRCs is trained to monitor river levels, to create risk mapping, and to predetermine localized evacuation routes. The CLGRCs meet regularly and carry out simulation exercises prior to the rainy season. The CLGRC approach also has the benefit of meeting the challenge of effective coordination and the understanding of different attitudes of communities towards early warning.
64. Increased technology and resources is not an adequate solution in itself. Often an increase in technology and resources is correlated to an increase in demands for emergency services. In this way, for example in Australia, communities which may have been largely resilient on their own have now become reliant on emergency services. For example, in the past people were inclined to leave their homes once threatened with flooding. Now some people refuse to heed warnings of local enforcement, knowing that someone will come to save them and their belongings. A possible but strong-arm solution to this problem may be to use fear against citizens; by the emergency services threatening not to return for those who choose to stay, people would be more inclined to evacuate areas at risk of flooding.

Insuring flood risk

65. It is important to find a balance between taking and transferring risks in flood insurance. Where risk taking is feasible and makes financial sense, risk can be transferred to the private sector and markets in the form of flood insurance.
66. Increasing intensity and exposure to floods due to climate change and urbanisation is leading to an increase in economic losses, especially in the insurance industry. The public and private sectors have to work together to address underlying risks together, to create value and reduce loss. Small and medium enterprises (SMEs) are especially vulnerable to losses. Through planning SMEs can lower their insurance premiums and losses by preparing for floods. Government partnerships in creating strategies to reduce flood risk will also reduce insurance premiums.
67. Flood insurance is covered under indemnity insurance and is generally part of property insurance. A challenge for flood insurance is that if a flood occurs annually and becomes “predictable” it is no longer an insurable risk. Furthermore, damages caused by floods are often less severe and more isolated when compared to other types of

indemnity insurance, such as earthquake insurance.

68. A number of options exist for the broader transference of risk:

- Disaster Insurance and Reinsurance – Risk Transfer
- CAT Bonds (Catastrophe bonds)
- Weather Derivatives
- Catastrophe Pools

69. Examples of regional catastrophe pools such as the Caribbean Catastrophe Risk Insurance Facility, have been shown to be particularly effective to insure against large-scale disasters that would not have otherwise been insurable. Another example of broader insurance risk is Flood Re which is being introduced in the UK in 2015.

70. Risk financing is only one part of a recommended comprehensive flood risk management. Other important parts of flood risk management include flood risk identification, flood risk reduction, flood preparedness and response, and disaster recovery.

Regional and international cooperation

71. There are many ways that governments across the region, which share the same challenges and vulnerabilities of delta flooding, could better cooperate. These include sharing data, early warning systems and forecasting, modelling, and resources for example trans-boundary river gauges or remote sensing tools.

72. Better sharing of data, knowledge and experience through round-table discussions and fora and informal networks and co-operation between academic and technical institutions can build trust and increase resilience on a region-wide scale.

73. In addition regional co-operation could include sharing food supplies and clean fresh water from upstream countries during emergencies as well as supporting rescue operations.

74. The Mekong River Commission is an example of an organisation currently facilitating collaboration in the region by working with six countries through which the Mekong flows. The MRC issues twice daily flood forecasts during the flooding season, but is also expanding this to cover water flows after the wet season to assist forecasting. The MRC is also being asked to assist other trans-boundary water management discussions, for instance between Thailand and Cambodia when flash flooding occurred in 2012.

75. Governments in South and Southeast Asia can also take advantage of foreign experts. Through international cooperation governments can learn from each other's best practices and new ideas.

Conclusion

76. Managing flood risk in urbanised delta areas in South and South East Asia is likely to need a range of solutions, both structural and non-structural including improved spatial planning, coordination between different stakeholders, and greater community awareness of flooding hazards.

77. Greater sharing of knowledge and expertise is encouraged across the region and more widely from the international community where other countries have had long experience with hydro-meteorological disasters and can share their approaches and assist South and Southeast Asian countries.

78. Experience from outside the region has shown that while hydro-meteorological hazards are unavoidable, an adaptive multi-faceted approach that aims to work with nature and to educate people about flood risks can be very effective.

79. Sharing ideas and examples about how each country is tackling the flood risk in river deltas with large urban populations across the four river deltas in the region is a first step. Building a network of experts and encouraging informal cooperation would enable greater sharing of solutions.

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