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Disaster Risk Reduction and Land Management in Flood-prone Areas

Case studies: EU/Germany (River Rhine), NAFTA/USA (Mississippi), ASEAN/Thailand (Mekong, Chao Phraya)

Submitted by:

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Human Development Forum Foundation

Contract number: RDG5540026

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Executive Summary

The research study was scheduled for 8 months starting at 15 September 2555 (2012). During the indicated time frame of 8 months the research was generally finished, and this is the final report on the current findings of the study as well as recommendations drawn from the analyses.

Background of the problem: Disaster Risk Reduction and Land Management

In 2011 the Thai people witnessed one of the worst floods in the modern history of the Kingdom of Thailand. As in most cases, the floods were a natural as well as a manmade disaster, with unsuccessful mitigation measures, a problematic decentralized command and political enmities playing a role as well as dam and river management. These technical and natural deficiencies in combination with a heavy rain season thus left its toll on the people and businesses in Thailand. **Current research suggests that weather extremes will occur with a higher probability and be more severe in the future due to the effects of climate change.** Although climate change has gained a fast recognition in the policy and economic world, a politicizing of the topic hindered many useful political implementations or caused misunderstandings in the areas of affected peoples. Concurrently, economic liberalization contributed to deteriorating social cohesion and environmental conditions as well as deforestation, i.e. the disappearance of nature – natural water absorbent - for the sake of “economic progress”. It will therefore be essential to put in place coherent land rights and land management provisions stating nature’s importance in combating floods and natural hazards.

Against this backdrop, technical and natural mitigation measures have to be re-evaluated and adapted to the modern conditions to be able to handle weather extremes of the 21st century. In this instance it is essential that legal regulations are implemented and the affected population participates in the process. The consequences of the effects of climate change as well as

countermeasures (or mitigation efforts) in relation to flood prone land - be it insurance, compensation, land management or land usage – are indispensable elements of an all-encompassing response to the challenges posed by weather extremes.

The most commonly cited definition of **Disaster Risk Reduction (DRR)** from UN agencies states: "The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development." Disaster risk reduction is therefore a concept that focuses on the pre-disaster stages prevention, mitigation and preparedness. These on the other hand are all placed under the broader concept of **Disaster Risk Management (DRM)** which adds the management perspective to DRR. DRR/DRM are relatively new concepts, clearly visible through the fact that the Food and Agricultural Organization of the United Nations (FAO) only recently, 2008, published a guidebook for DRM systems analysis. While providing herewith a framework for an institutional assessment of DRM systems across administrative levels and sectors, it does not cover the topic on which research is still widely lacking: Why some governments are more successful than others in disaster management and what implications for land rights follow thereof? This study is designed to contribute towards filling this gap for Thailand. It does so through compiling an **international comparison of flood protection master plans from Rhine/Germany's Preventive Flood Control Act and its measures, from the Mississippi/USA and the U.S. Flood Control Act and Thailand/Chao Phraya and Mekong,** with a special focus on social impacts in order to provide a wide-ranging perspective on flood protection measures incl. land rights issues which could be used to contribute to the plan recently drawn up in Thailand by the Strategic Committee for Water Resources Management (SCWRM) under Prime Minister Yingluck Shinawatra. This comparison will delve into **different aspects of flood protection plans from effective awareness raising and public information to incorporation of federal, state and local measures and authorities** (as along the Mississippi river). Both the Rhine and the Mississippi feature heavy floodwall protection as well as floodplains management plans and their respective land rights / land use implications, which will serve as comparison to the Thai plan. Furthermore the Rhine analysis will serve as positive example to involve all stakeholders into the mitigation planning where former opposition farmers to the plan have become one of its strongest supporters. Finally, a short overview of forest and ecosystem rehabilitation plans as well as land reservoirs will be given.

It is the Asia-Pacific region that is hardest hit by natural hazards, which makes this study all the more important. Asia and the Pacific not only account for 42% of global economic losses and 85% of deaths as a result of natural hazard impacts but development gains are additionally eroded as $15 billion are required each year to restore infrastructure and economic momentum in Asian countries. While the

poor are generally the ones are suffering most from natural hazard impacts, communities also become vulnerable due to insufficient building codes and poor enforcement of codes and land use planning. Concurrently, the **Asia-Pacific region has one of the lowest penetration rates for catastrophe insurance in the world,** thus access to insurance and other forms of disaster risk financing are inadequate – another topic the study will cover through international hazard insurance comparison. Finally, only 4% of the estimated $10 billion in annual humanitarian assistance is devoted to prevention and yet every dollar spent on risk reduction saves between $5 and $10 in economic losses from disasters. Financing disaster risk reduction is thus a sound financial investment from the governments' perspective.

Disaster risk reduction is usually seen as a correlated issue to climate change mitigation and adaptation as they share common goals - to reduce the vulnerability of communities and achieve sustainable development. Government ministers and local authorities are therefore increasingly urged to mainstream their climate change mitigation actions with land use planning and management as well as with DRR measures (spatial planning on the local government level for example can try already to incorporate DRR measures).

Hypothesis and Objectives

Against this backdrop, the research study is designed to deliver a contribution to the management of the land-related Disaster Risk Management (DRM) issues. Effective DRM measures will have an influence on land usage in ASEAN and will cause some significant social impacts. ***The key hypothesis is that there are certain legal and implementation arrangements under which the mitigation measures of Disaster Risk Reduction plans can balance the (sometimes negative) –individual or social impacts and the securing of the welfare of the greater community***.

The key research questions referring to this are how land use (both industrial and individual) is regulated in the framework of DRM in EU/USA/ASEAN countries or states in order to protect vulnerable people and their development; which concrete actions were taken at the River Rhine and Mississippi to decrease the risk of severe flooding and why; what effect did this have on land use, land management and the affected population; how building plans near a flood prone river are regulated and are there any special regulations - such as taxes for industrial estates near a river – put in place; how cooperation and coordination among nation states (EU) and states (USA) is regulated to protect citizens from flooding and which roles do the national governments play; and which international regulatory scheme regarding compensation and insurance is deemed to be the most efficient and fair and why?

To answer these key research questions, the study focused on two objectives:

1. To analyze the existing situation with the help from case studies in EU (Rhine River), NAFTA/USA (Mississippi) and ASEAN (Chao Phraya, Mekong), referring to Disaster Risk Reduction and Land Management in Flood Prone Areas, social impacts and respective social, economic and legal mitigation measures.

2. Issue policy recommendations for coping with Disaster Risk Reduction and Land Management in Flood Prone Areas, under consideration of social provisions.

In order to achieve these objectives, the study analyzed potential flood impacts, vulnerabilities as well as existing frameworks and policies of the named regions and countries. The analysis was designed to identify strengths and weaknesses of the different approaches related to the institutional setting as well as the concrete policies. Therefore, the study analyzed the situation in three different regions and selected single river systems located in these areas. Land use issues related to Disaster Risk Management and vulnerabilities of the regions and countries were identified, the institutional and legal framework was analyzed, and concrete policies examined.

Findings from the case study analyses

Rhine River and Germany / European Union (EU)

The analysis of the Rhine River and Germany's/ EU's legal framework and Disaster Risk Management measures (Chapter 2 of the study) has shown that **increasing numbers of flooding incidents (Rhine in 1983, 1988, 1993, 1995, the Danube in 1988, 1999 and the Oder in summer 1997 and 2002) are strongly connected to the reduction of natural flood storage areas**. These are ramifications of past human interventions such as urbanization, industrialization and further development of infrastructure in and around the flood plains. These developments caused the aggravation of the maximum level of floods in addition with an increase of the river's pace. The clearing of forest in upper catchment areas, suppression of natural flood plains, extensive building activities in flood prone areas and most importantly, the straightening of the Rhine are further reasons for the rise of flood damage in the Rhine basin. The changes carried out in the last two centuries caused a high loss of the river's native alluvial areas, and had immense influence on the flood patterns. In this context is remarkable how **vulnerable –despite huge technical and financial means – the river basin populations in Germany/EU are due to the high population density and high industrialization level** of the river banks. Realizing these interconnections the affected countries and the EU as regional body established new policies and organizations in order to mitigate future flood events. **Core**

measures were the strengthening of the International Commission for the Protection of the Rhine (ICPR) and the Disaster Risk Management related units of the European Union on the basis of the Directive 2007/60/EC.

In case of the ICPR, the environmental ministers of Germany, France, Luxembourg, the Netherlands and Switzerland decided after the massive flood in 1995 to mandate the ICPR to prepare an Action Plan for Flood Defense (Action Plan 2020) in order to be able to cope with future flooding in the Rhine catchment. The ICPR acts as an advising agency for the riparian states in case of implementation of flood prevention measures, since the organization is the linkage between the member states to coordinate their flood related programs and projects. **The Action Plan 2020 was designed to be implemented over a span of 20 years and based on four objectives.**

1. ***Reduce damage risk*** *(damage risk as a linking of damage probability and extent of damage done)* – no increase of damage risks until the year 2000, reduction up to 10 % by 2005 and up to 25 % by 2020
2. ***Reduce flood levels*** – reduce extreme flood stages downstream of the impounded part of the river up to 30 cm until the year 2005 and up to 70 cm until the year 2020.
3. ***Increase flood awareness*** – increase the awareness of flooding by drafting risk maps for 50 % of the floodplains and the areas at flood risk by the year 2000 and for 100 % of these areas by the year 2005.
4. ***Improve the flood announcement system*** – short-term improvement of flood forecasting systems and international cooperation. Prolong the forecasting period by 50% by the year 2000 and by 100 % by the year 2005.

In 2005 a first detailed review of the achievements of these objectives revealed that referring to **objective 1 the damage risk was overall reduced** but efforts in reducing the damage risks along the Rhine have been larger along undiked stretches of the river than next to diked stretches. The **objectives 2, 3 and 4 were achieved with 80%, 100% and 100% respectively** thus rising the prevention part of Disaster Risk Management to a satisfactory level. This proves that on the institutional level the **implementation capacity is very high.**

As the EU is very bureaucratic it took until 2007 before the EU established a legal framework on the **regional level** to strengthen the ability of member states to deal with flood events: the Directive 2007/60/EC, which came into effect in November 2007. Main aim is to manage and minimize the impact of flood related damage to cultural heritage, economic activity, environment and human health in the member states.

The directive oblige members

- **to review all coastlines and watercourses** in their territory to which level they are exposed to the risk of flooding
- **to map the possible extent of floods** and the amount of people and assets that could be exposed to it
- **to strengthen the rights of the public** to access the information during the planning process of projects regarding flood prevention.

The Directive 2007/60/EC is carried out in coordination with the Water Framework EU-Directive 2000/60/EC of the European Parliament by mainstreaming the flood risk and land use management practices in the shared river basins and by making sure that no actions increase the flood risk in neighboring countries. In this context it is important to point out that legislation set by the EU is binding for national legislatures, and the bodies of the EU have the institutional power to enforce the rules and provisions that member states agreed on. **The legal framework defining land ownership, land rights, Disaster Risk Management etc. is well established and also enforced**. Supporting the implementation and the respective control by EU bodies is the factor that all related bodies have a broad and very detailed knowledge of flood patterns, land use and land conditions. Another important fact is that the EU tries to increase the effectiveness as well as acceptance of disaster risk management by an **early participation of relevant stakeholders in the planning and implementation process.**

On the **national level** the four most affected countries **France, Germany, the Netherlands and Switzerland** established additionally national policies and guidelines to implement efficient long-term flood management measures. Germany having the longest catchment with the Rhine River aims to achieve sustainable solutions through mechanisms of land use management. In this context there was a shift from solely structural approaches to non-structural flood defense methods including multiple flood risk mitigation approaches such as flood forecasting and warning systems, flood plain management as well as preventive risk reduction by spatial planning. **Spatial planning aims to reduce damage and risk potential in river catchments through the reduction of constructional development in flood plains (land-use control).** Spatial planning is based on three objectives:

- Give the rivers more room
- Restrain floods decentralized
- Control housing development – reduce damage potential

The underlying philosophy of this concept is to leave more room for rivers, especially in natural flood plains and re-naturalized river expansion areas in combination with initiatives to move dikes further away from the river banks and the restoration of flood plains. To link spatial planning methods such

as alternate use of flood-prone land and the use structural measures of flood prevention in areas were development is irreversible is an effective way to reduce flood damages. Thus, in 2002 this concept was introduced into a five point flood prevention program of the German Federal Government.

Nevertheless can devastating flood events cause high losses in greatly industrialized and densely populated areas when the waters excess flood prevention measures. Therefore adaptive flood strategies need to be implemented in order to lower the economical impact of natural disasters for vulnerable population as well as businesses. Examples are the complex flood insurance systems in place in the Rhine River vicinities helping to scale down economical losses for private and commercial properties. Different flood insurance schemes are available in European states, which can basically be divided into state intervention vs. private market based as well as bundle vs. optional systems, which vary from country to country. In France, for example, the flood insurance system is supported by a state-intervened scheme while the system applied in Germany is based on the private market. As both approaches have positive and negative "side-effects" it appears reasonable to combine positive elements of both approaches, into a new scheme. In this context it is important to mention that a **comprehensive insurance system (with a limited state-intervened scheme) is extremely useful for helping vulnerable and social weak people** to compensate essential losses. This is why all riparian states along the Rhine River introduce these kinds of mitigation measures in their Disaster Risk Management systems.

Mississippi / United States of America (USA)

The analysis of the Mississippi and USA's legal framework and Disaster Risk Management measures (Chapter 3 of the study) concentrated on local and US-states' policies along the Mississippi as one of the most important water ways and vulnerable to permanent occurring floods. NAFTA, as a regional organization with a rather loose structure, **lacks clear regional policies and subsequently institutional structures,** which is also fostered due to the different causes of flooding between the distinct nations (USA, Canada, and Mexico). However, every country developed own strategies to cope with flood hazards. The USA's regulations and directives are mainly released by the Federal Emergency Management Agency (FEMA), while the Presidential Policy Directive 8 (PPD-8/ 2011) marked the most recent advancement in a line of disaster preparedness guidelines. **All official FEMA documents relating to Disaster Risk Reduction (DRR) follow a comprehensive approach, seeking to include all members of the society to use their resources efficiently to mitigate flood risks in the best possible way.** Canada also seeks an all-level and entire community approach, outlined in the National Disaster Mitigation Strategy. The Emergency Management Framework for Canada provides

information for responsibilities and action plans in all phases (Preparedness, Mitigation, Response, and Recovery). In Mexico, like in the USA, modern and effective Disaster Risk Management started after a severe natural disaster, in this case the Mexico City earthquakes of 1985, which killed approximately 6,000 people. After this event, the National Commission for Reconstruction emerged as the main federal agency for Disaster Risk Management, developing the *Sistema Nacional de Protección Civil (SINAPROC)* as a disaster prevention framework covering all societal elements. However, besides the national structures with a limited information and knowledge exchange with their NAFTA neighbors, there are **no specific regional activities regarding prevention and mitigation measures related to natural disasters** except humanitarian aid and disaster relief (HADR) operations.

The economically favorable position of the Mississippi River and its tributaries entailed an increased settlement along the river's banks. This in turn led to an increased impact due to the frequent flooding of the river. The flood catastrophe of 1927 is –until today- the worst flood disaster which ever hit the lower Mississippi basin. A total of 145 crevasses along the river's levee system caused an inundation of 25,783 square miles, 246 fatalities and over 600,000 destroyed homes. Federal disaster response and recovery, which was quasi non-existent at that time, was set up *ad hoc* by then-Secretary of Commerce Herbert Hoover and organized in a streamlined decision-making process. This paved the way for the modern flood mitigation programs headed by FEMA and the US Army Corps of Engineers (USACE). **In 1928 Congress passed with the Flood Control Act a legal document which marked the starting point of modern flood mitigation.** Though several major flood disasters struck the river and its tributaries after the Great Flood of 1927 – most notable the 1937, 1973 and 2011 floods – the impact never reached the 1927 incident. To a main extent, this is the achievement of **smart mitigation programs along the Mississippi launched after the disastrous experience that are estimated to have saved approximately 99% of the otherwise caused damages** along the Mississippi and its tributaries. This efficient flood mitigation system does not solely comprise of levees, but also of floodways and backwater areas. Floodways are artificial channels that detract water from the main river if the crest reaches a critical point. This provides relieve to the levees at certain key points, mostly densely populated cities, while releasing the water into otherwise dry areas. The floodways are either operated through the blast of the designated levee sections or the opening of spillway constructions. As the levee-protection of land surrounding the confluences of the Mississippi proved to be difficult, the backwater areas which capture a significant amount of water in flat lands in case of a river flood were maintained and improved (enforced with levees, construction of floodgates to release the water into the main stem of the river after a flood). However, their operation has always been **highly controversial**: The areas designated to serve as water-detracting floodways in severe flood disasters were formerly dry and populated – though less densely than the to-be-rescued major

cities. However, residents, which were mostly farmers, feared that their crops were in danger of being entirely destroyed by the released water masses, which would have destroyed their entire income basis. According to the 1928 Flood Act, the federal government had to **purchase flowage rights from people with property in the floodway** in order to afford the floodway operation. Despite several lawsuits by landowners brought temporary success, eventually the acquisition of the necessary land – by condemnation in the last resort – was declared lawful by the Federal District Court. This dispute, whether the sacrifice densely populated rural areas to save major towns also arose in the 2011 flood, when the Birds Point-New Madrid Floodway opening was debated – and eventually conducted – for the first time since 1937.

On the structural side the two main agencies responsible for Disaster Risk Management at the Mississippi are the US Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA). **Through the operation of the National Flood Insurance Program (NFIP), FEMA has an important role in pre-disaster planning, e.g. through home mitigation or floodplain management requirements.** Through the website "ready.gov", FEMA furthermore provides disaster preparedness information. In the immediate disaster response phase FEMA plays an important role since the FEMA Administrator is the principal emergency advisor to the President and recommends or advises against the declaration of a federal disaster area, which in turn influences whether a state is eligible to receive federal disaster assistance or not. FEMA furthermore coordinates and activates the Emergency Support Functions, a system developed to streamline and efficiently bundle resources from distinct agencies for emergency response.

On the social impact side, it is apparent that a community's exposure to flood disasters is highly dependent on geographical factors such as height or proximity to the river. However, communities itself are not homogenous, as the distinct social groups' ability to resist flood disasters also differs enormously within a community. To reflect this fact, the **concept of Social Vulnerability Index (SoVI)** was developed, which gives certain predefined social groups different vulnerabilities according to their characteristics:

(1) ***socioeconomic status influences the social vulnerability of an individual***, as poor people normally lack the necessary financial abilities to prepare their property with necessary flood mitigation measures and therefore suffer higher losses

(2) ***dependent children, elders, disabled people or the respective caretakers are acknowledged a higher social vulnerability***, as dependency means limited self-aid capabilities in a disaster case.

(3) ***limited language proficiency contributes to a higher social vulnerability***. In cases of emergency when time is spare lack in English proficiency can delay and hinder the communication, e.g. between authorities and residents, significantly.

(4) ***quality of housing plays a role in the categorization of social vulnerability***: Poorly constructed homes or mobile homes are less or even entirely unable to resist floods.

(5) ***living in either urban or rural areas contributes to social vulnerability***, though it is yet unclear which location holds the higher one. On the one hand, the overall lower income in rural areas results in the social vulnerability consequences of a low socioeconomic status. However, the higher density in urban areas makes them more exposed to natural disasters, as the impact per square-kilometer is far higher.

Authorities will identify the level of vulnerability of the respective social groups and citizens on the basis of these criteria and subsequently determine measures to improve their resilience to flood disasters as well as define post-disaster help and reconstruction support.

One way to help flood-affected citizens to cope with losses is the Federal Disaster Assistance, which is available in zones declared as federal disaster areas by the President of the United States. The assistance is distributed via distinct channels. The **Federal Emergency Management Administration mainly provides grants to meet essential housing needs in the immediate aftermath of a disaster**, including psychological assistance, seeking for alternative shelter, etc. **The Small Business Administration (SBA) provides low-interest loans for private households or businesses to recover from flood losses**. Besides FEMA and SBA, the US Department for Agriculture is an important provider of federal disaster assistance.

Issuance of **flood insurance policies** was not possible until the 1960s as insurance companies saw the risks as being too unpredictable and therefore did not provide respective premiums. In 1968 the Congress however passed the **National Flood Insurance Act, in turn starting the National Flood Insurance Program (NFIP),** which remains in place up to date. After Hurricane Betsy caused tremendous damages on the Louisianan coast, which entailed extremely high costs due to federal disaster assistance, the idea was raised that a widespread coverage of flood insurance might mitigate the federal disaster assistance costs for future events because first, the victims would pay a share of the sum through insurance premiums, and second, the policy conditions could be shaped in a way that encourages participants to better prepare homes with flood mitigation measures for future events. Over time, the **issuance of flood insurances in high-risk areas became mandatory or a requirement for federal disaster assistance in flood cases**. The NFIP is conducted mainly through cooperation between the federal state and private-sector companies; a federal backed insurance program which relieves private insurance companies from the otherwise unbearable risks and – in

turn – benefits from their marketing channels and widespread distribution. Though the NFIP underwent numerous changes over the decades, **several deficits** were only discovered recently:

(1) ***outdated flood maps***, as flood maps were designed to accurately represent risk levels of a certain area and correctly indicate the necessary insurance premium for residents. However, due to floodplain developments, levee building, etc. the maps lost their substantiation, which in turn results in a shortfall of revenues for the program and endangers its financial stability.

(2) ***distribution across the nation is very unequal*** and shows an alarming shortfall in high-risk areas though overall coverage has increased compared to the beginning of the program

(3) ***poor enforcement by local authorities***, though the idea to encourage or even force residents in high-risk areas under the NFIP to improve homes and make them flood-proof is legally existent

(4) ***overall financial stability of the program is highly doubtable***. Though the premium-reimbursement ratio was positive for most of the program's history, the catastrophic impact of Hurricane Katrina led to a budget collapse. Even without this unpredictably strong disaster event, the program was already running on deficit for most of its time due to high operating costs and subventions for old structures that were actually not insurable.

Besides federal disaster assistance and the National Flood Insurance Program, citizens can also be proactive in Disaster Risk Reduction, which is strongly encouraged by the FEMA through the website "ready.gov". Preparations for the disaster case exceed flood protection measures like home elevation and include the development of family communication plans or the set-up of supply kits. Furthermore, voluntary enrollment in emergency management agencies or NGOs contributes to an improved emergency preparedness and response capacity.

Chao Phraya - Mekong / Thailand / ASEAN

The Chao Phraya River is very important to Thailand, affecting not only the livelihood of the people residing along the river banks and on the plains and basin areas, but the river also contributes greatly to the country's agriculture. As agriculture is the largest industry of Thailand, the river is significant to the country's economy. Floods that have occurred relating to the water level of the Chao Phraya River have a long history, mostly due to the river overflow as a result of heavy rain or tropical storms that start as early as the beginning of monsoon season. While it is impossible to avoid natural

hazards, prevention systems to avert floods, as a consequence of heavy precipitation and storms, can be put in place to minimize the effects should natural hazards become natural disasters.

The following issues regarding flood prevention and management in Thailand received special attention in this case study:

- ***Urbanization*:** Bangkok and its vicinity currently have 9.3 million inhabitants and the city is still expanding. Buildings, housing projects, and infrastructures have been continuously developed. However, these constructions proved to be an obstacle to flood prevention and mitigation. **The increasing number of buildings and infrastructure are causing the decrease of retention areas, which intensifies flooding in the city.** Moreover, increasing demand for water resources in the crowded city has lead to the common practice of overpumping of groundwater among households, which in turn causes land subsidence. In addition, when a flood occurs, small roads and streets between buildings and constructions proved to be difficult and inconvenient for flood relief or an emergency response team to access.
- ***Illegal land encroachment in riverbank areas*:** Over 23,000 households have encroached Chao Phraya River as well as its tributaries. These households have formed informal resettlements in riverbank areas. They are inhabited by the poor and regularly affected by floods. The Department of Provincial Administration has issued temporary address registrations to these homes without suggesting the time limit of habitation. As a result, these informal settlements have become a long-term community. **This type of informal resettlement growing indicates ineffective land use planning and insufficient land-use laws in Thailand**.
- ***Complex structure, responsibility overlaps, and inconsistency of organization in disaster prevention and management*:** Thailand has a large organizational structure of disaster management. Experts point out that the coordination between government agencies on the national level was in many cases with conflict and resulted in a delayed disaster response thus causing more severe social and economic damages that could have been averted. **Incompliant coordination in implementing national plans and systems between national and provincial levels has also been an issue.** For example, the Ministry of Health has developed an emergency plan and systems in 40 provinces across the country, but during the flood of 2011, each province implemented their own procedures neglecting the standard plan.

Whereas natural disasters cannot be avoided completely, losses and damages that may be caused by the disasters can be prevented and mitigated. In order to effectively minimize the negative consequences, the three aforementioned issues persisting in the Thai disaster management have to be addressed. **Additionally, in order to sustain the growth of the urban areas while ensuring the safety of the people, better knowledge in this topic need to be thoroughly established.** Civilian emergency response practice also has to be carried out to ensure the preparedness of people living in the city.

In addition, although Thailand has macro-scale emergency response plans that encourage cooperation between national, regional, and provincial level as well as micro-scale collaboration between sectors of government and the civil society, experts hint that the plans are somewhat uncoordinated. Therefore, an **analysis of challenges and opportunities in enhancing the effectiveness and efficiency of the plans should be conducted** to invent methods and strategies that strengthen the promptness of related organizations, preparedness of the people in the society, as well as the implementation of laws and regulations related.

Lessons can be learned from other countries and regions that are also prone and frequently experience floods and other natural disasters. The other components of this study compliment this learning. Successful policy and implementations from the Rhine River, Mississippi and Mekong regions can be further analyzed and adapted to transfer the knowledge applicable to Thailand.

On the **regional level** Thailand has the possibility to influence policy in the **ASEAN** framework, which is especially important since Southeast Asia is among the most disaster prone regions in the world. Flooding is the most common type of disaster in the region and it affects thousands of communities each year. In the region, flooding can be a result of storms as well as annual monsoon season, earthquakes and sea level rise due to climate change. Disaster management is an essential topic in Southeast Asia and the regional organization ASEAN today has an extensive network of entities to deal with disaster risk reduction, management and relief. After the Indian Ocean tsunami in 2004 it became clear that a regional approach to disaster management was necessary and the **first legally binding agreement based on the Hyogo Framework for Action was drafted. The ASEAN Agreement on Disaster Management and Emergency Response (AADMER)** clearly stated that all member nations should prioritize prevention and mitigation of disasters and its work program (2010-2015) includes the integration of disaster risk reduction in national development policies. **Direct risk reduction measures are still the nation's own responsibility but ASEAN has enabled significant information sharing and capacity building in the region**, notably through the **ASEAN Coordination Center for Humanitarian Assistance on Disaster management (AHA Centre)** in Indonesia.

The AADMER also supports the development of National Action Plans (NAPs), currently active in seven of ten ASEAN member countries. These plans are to establish the place of disaster risk reduction inside the nations and develop strategies adapted to the national context. The different **NAPs consider land rights and land use aspects to a varying degree, but all involve risk zone mapping and state that disaster risk zones should be considered in the establishment and management of human settlements.** Some plans (Myanmar, Cambodia, Philippines and Viet Nam) directly mention the need for changes in land use, such as changes to the cropping calendar or the development of alternative livelihoods in order to prevent disaster losses. Viet Nam furthermore proposes the relocation of all communities in high risk zones. Land management is regularly referred to as a question related rather to environmental concerns and climate change than disaster risk reduction, both in national policies and in ASEAN documents. The impact that disaster risk reduction and management policies have on land use and management is not yet properly explored in the policy material covered by this case study.

The most important river in the ASEAN region is the **Mekong** thus being chosen as case study for international regional river management. The Mekong is the tenth largest river in the world and the Mekong basin extends into six different countries: China, Myanmar, Thailand, Lao PDR, Cambodia and Viet Nam. Flood and river management is therefore a trans-boundary issue in the region and the Mekong River Commission (MRC) is the main regional actor on this topic. The MRC includes the countries of the Lower Mekong Basin (Thailand, Cambodia, Viet Nam and Lao PDR) as their members while China and Myanmar are dialogue partners. **Over the past years, it has become clear that the flood patterns in the region are changing. Floods have caused larger destruction; they had a longer duration, higher velocity and increased depths.** Notably in 2000 and 2011, large floods including mainstream flooding and flash flooding in some regions caused important loss of life and property. In the region, some flooding is absolutely essential for the renewal of soil quality and for fish migration. Although the flooding pattern has changed, floods have always been part of the region's ecosystem. **The problem is therefore not per se flooding, but that people are living in unsuitable areas or are not sufficiently prepared to be able to cope with flooding. In some cases, the population's use of the land around the river and livelihoods also worsen flood impacts**.

The **main challenges** regarding flood management in the region are:

(1) Vulnerability of the populations and increasing population pressure
(2) Unsustainable land use and land management
(3) Development projects
(4) Resettlement issues

The first challenge to flood management regards the current level of development and living standards of the communities living in and around the Mekong. In the riparian countries, the region around the Mekong is generally densely populated because livelihood opportunities for agriculture as well as fishery and other subsidence activities are abundant around the river. The development status of the riparian countries is low to medium, and the populations of especially Cambodia and Lao PDR are to a great extent poor, engaged in subsidence agriculture and lacking access to electricity and clean water. Poor populations generally have small means to prepare themselves for disasters and are vulnerable to flood losses and the disruptions to their livelihoods that floods can bring. At the same time, the population in the Mekong river basin is steadily increasing**. The combination of a large number of people living in high flood-risk areas with low development status and small financial margins leads to a situation where even small changes to the traditional flood pattern can have a great impact on people's lives**. An earlier onset of floods or longer duration can demand alterations of the agricultural calendar while a slow recession of flood waters can necessitate generating alternative livelihood solutions to ensure that households have sufficient yearly income.

Secondly, land use traditions and policies in the regions have to some extent worsened the flood situation. **Deforestation has led to soil erosion and increased water turbidity, while measures to protect agriculture from flooding by building dykes and controlling the water flows around agricultural lands have led to increased water flow velocity and depth** in the flooding season. Higher flow velocity leads to increased soil erosion downstream while limiting the flooding of soils decreases their quality as nutrient rich sediments are not deposed on the soil and pesticides are not flushed away. The nations around the Mekong and the MRC have mentioned this issue in policy documents. Viet Nam and Thailand have taken specific measures against deforestation and in the Mekong Delta the Vietnamese government has worked to control the number of dykes and small-scale flood control systems that were being constructed.

All nations around the Mekong have outspoken development agendas and the MRC mission clearly states that the organization should work for poverty alleviation and development in the region that benefits all riparian countries. However, **some development projects have direct effects on disaster risk and flooding, the switch from food crops to commercial crops (rubber) and energy crops for example render populations more vulnerable as lands that were previously used for gathering food products or small-scale cultivation is no longer available**. Large infrastructure projects and the development of the important hydropower potential on the river also pose important challenges as they often lead to deforestation, resettlement of populations and require extensive sand and gravel mining in the river - interfering with the natural deposition of sediments along the river stretch.

As there are no signs that the changes to the flood patterns are temporary, and as populations are great and increasing in high-risk zones, it is likely that **nations around the Mekong will be forced to find solutions to resettle populations or implement extensive solutions for adapting communities to floods and reduce losses.** Development projects such as mines, highways and planned hydropower plants in the region have also led to resettlement of communities and it is therefore of crucial importance that a thorough policy framework is in place in order to ensure that resettlement is done in the least harmful way possible to resettled households. Among the resettlement projects that have already been carried out, an important issue has been sustaining communities livelihoods after the resettlement. When resettled households are restricted in their livelihood options after resettlement, for example because they were given insufficient land in compensation for the land they lost or because the new land was not of equal quality.

The riparian countries have committed themselves to cooperate on issues that may have trans-boundary impacts, with the goal of profiting from the Mekong's resources in an equitable way. The MRC works extensively with disaster risk reduction through flood forecasting, information and technology sharing across the nations and capacity building in the region. MRC's documents and resolutions on flooding include environmental, livelihood and land management aspects and work is under way to integrate these question into the different entities of the organization. There are therefore positive signs regarding the river management and its relation to disaster and land management in the region. However, considerable strain has been placed on the organization since Lao PDR announced its plans for developing mainstream hydropower inside their country. According to the MRC procedures developed jointly across the four lower Mekong basin countries, the plans for hydropower development were to be thoroughly studied and considered by all parties. Despite the resolution by the MRC that further studies were necessary to evaluate the impact that the hydropower plant would have on communities downstream and the ecosystem, Lao PDR has reportedly continued with the construction process. This casts doubt on the influence of the MRC on controversial or sensitive issues. Furthermore, there is a **need for further improvement of the national policy frameworks with regards to integrating land issues in their development plans, while considering disaster risk reduction**. The protection of land rights also needs to be improved in current disaster risk reduction and management schemes, as for example for resettlement solutions.

General Conclusions

The overall objectives of the cases studies aimed to contribute to the understanding of the link between Disaster Risk Management and land management on the one side and protections / support

for vulnerable population on the other hand. In conclusion, it can be stated that all examined case studies have to deal with the following major issues (varying in their intensity):

- **Structural and non-structural prevention measures**
- **Mitigating impacts of natural disasters (e.g. flooding) for vulnerable populations**
- **Increase local ownership (= motivation) of populations settling in or near flood prone areas for disaster prevention and mitigation measures**

In Europe most of these issues are addressed and covered by exiting legal and insurance frameworks. However, due to the rapid industrial and infrastructural developments, **actual data/maps are lacking in several regions.** In USA especially **local ownership is lacking** in areas where protection of "hotspots" like big cities either incur enormous costs or comes with flooding of "less valued areas" – sometimes farmland. Additionally, the **NFIP program must be brought back on a financial sound basis** as natural disasters are in their frequency increasing. In Thailand and the ASEAN region however, **resettlements might be inevitable in the future**. Beyond this dimension the **establishment of a Social Vulnerability Index (SoVI)** could contribute to the recognition and improvement of the situation of the urban poor. Living in wild settlements and slum areas, often they also have no legal status or rights, including their land rights. The SoVI could be the start for a comprehensive approach to tackle economic, social, and environmental problems of these marginalized groups and to develop mechanisms to empower them to adapt to and cope with particular disaster impacts.

As last minute addition to the study findings the following lessons learned came from the European flood June 2013 where at the Rhine the flood was 100% percent controlled via structural and non-structural measures and passed without any damage to private housing or loss of lives of persons or live stocks. The flood at the river Elbe was contained for places which followed the key success factors developed from previous lessons learned:

1. **Awareness:**
   - The wording of "century flood" (i.e. happens only once in 100 years) is wrong as the mind set of people will say "I just survived the previous flood, son in my life time it will never happen again". So, this wording is wrong as it reduces public awareness and willingness to invest in flood prevention and protection, but this word is best selling in media and politics. So, people should avoid this word and being prepared for flooding at any time as Climate Change will bring more and intensive floods in the future. In this context Mr. Reinhard "Riku" Vogt from the Flood Protection Competence Center Cologne/ Germany (http://www.steb-koeln.de/hochwasser.html?L=1) also advocates intensified awareness campaigns by local authorities.

- People's participation in all stages of flood prevention/ protection planning in order to raise awareness and develop local ownership of the flood prevention measures (e.g. farmers at the river Rhine were massive opponents to retention room development as they would see their land flooded to protect the city of Cologne. Only after local authorities engaged them and asked what are the problems and tried to solve them in mutual beneficial ways the farmers joined into the citizen's flood prevention network and actively support the mitigation measures – however it has to be pointed out, that nowadays the Rhine is chemically not so polluted anymore, so the farmers can use their land after the flooding again).

2. **Prevention:** In terms of prevention national and local authorities should focus on
   - Detailed flood risk mapping (incl. Social Vulnerability Factors)
   - Flood risk zoning (with comprehensive law enforcement for the highest level to make sure that in these areas construction is restricted/ forbidden as well as establishment and enforcement of resettlement plans for not insurable properties)
   - Spatial planning earmarking areas for water retention and controlled flooding (in cases where there is local resistance: either the state buys the land rights or local citizen networks are established to ensure people's participation in ALL stages of (political) decision making)
   - Flood related construction codex (e.g. no buildings in highest risk areas, flood resistant buildings in lower risk areas considering e.g. no carpets but tiles in Ground Floor and 1st Floor, stilt houses; preparation for controlled flooding of properties/houses)
   - Professional excellent forecasting – and subsequently effective early warning of the population- and the authority of information dissemination to the public should remain with professionals (e.g., in 2013 some politicians gave exceeded numbers and caused kind of panic among local populations, even though the professional forecast was 100% correct with lower numbers)

3. **Protection:** in general flood protection/ mitigation measures should be centralized with kind of shared local responsibility as up-stream communities' measures will affect negatively downstream populations. Therefore professional Flood Protection Centers should be established for every major river under the supervision of national (or in case of several countries being involved: international) designated authorities. For structural flood protection measures the following proved to be the most effective:
   - Retention areas (German: Polder) which allowed to cut off the peak of the respective flood by 30-60 cm. However, a pure controlled flooding of land needs to take the discharge

capacity into consideration (e.g. under earth garages, metro tunnels etc. are not suitable as after filling up it is very complicated to get the water out and most of the electrical installations need to be repaired/ replaced)

- Retention areas II: in case of volunteer or "forced" controlled flooding of land, land owners must be compensated and national guidelines/ laws for compensation of affected land owners need to be implemented and executed.
- "De-straighten" the river, i.e., undo previous straightening of the river bed by building side arms, ponds, etc. which also can be used as green recreation areas and tourist destinations in normal times
- 3-dam-cascade system which allows the building of three lower dams zoning areas which can be controlled flooded thus spreading the water volume and the controlled damages.
- Obligatory insurance introduction provided either with or without state support should be strongly considered by Federal State governments.

4. **Joint training** of relief and rescue providers (incl. Red Cross, Civil Defence, local neighborhood helping groups as well as armed forces units, etc.) country wide, e.g. Civil Defence Units from Northern Germany trained with local people in the villages at the river Rhine to improve mutual understanding and communication. Special attention must be given for evacuation drills of children, elderly and disadvantaged people.

5. **Audit:** the (inter)national and local authorities should conduct regularly flood protection audits and reviews of their planning and implementation. With these measures land encroachments, illegal building activities, outdated flood risk maps and damages of dams can be discovered and dealt with in non-flooding times.

Overview table of the findings of the case studies

Natural Disaster (Flooding)	Rhine River/ Germany EU	Mississippi / USA	Chao Phraya-Mekong/ Thailand- ASEAN
Vulnerability	Medium	Medium	High
Main impacts	Economical loss Loss of property Livestock loss Human life loss	Economical loss Loss of property Livestock loss Human life loss	Economical loss Human life loss Livestock loss Loss of property
Main social implications	Rising costs for insurances Rising costs for structural measures Land loss	Rising costs for insurances Rising costs for structural measures Land loss	Life loss Resettlement need Total loss of property Rising costs for structural measures Impacts on agricultural production Land loss
Adaption and Mitigation			
Regional political programs and initiatives	* Directive 2007/60/EC * Water Framework Directive 2000/60/EC * International Commission for the Protection of the Rhine (ICPR) – Action Plan 2020	None	*Mekong River Commission *ADMEER (Disaster Relief) * AHA Centre (Disaster Relief)
National political programs and initiatives	*German Flood Protection Law * German spatial planning laws (e.g. construction planning laws) * Insurance systems for compensation economic loss for private and business (different in all countries with some	* Flood Control Act / 1928 * PPD 8 / 2011 * FEMA * USAEC * NFIP * Social Vulnerability Index (SoVI)	*Thailand's Master Plan for Flood prevention * Integrated and combined national response system

	having mandatory requirements for populations settling in flood prone areas) * laws encouraging public participation in early Disaster risk Management phases * nationwide disaster relief training for all involved agencies		
Technical and economical adaptation capability	High	High	Medium – low
Levels dealing mainly with Disaster Risk Management	EU, member states on national, regional, local level and international bodies like ICPR	National, state, local	ASEAN (partly), Member states on national, regional and local level
Biggest constrains	Social acceptance of Disaster Risk Management measures in areas not affected by flood EU bureaucracy very slow.	Political resistance on local level (especially for flood ways operations) Lack of public contribution National insurance system bankrupt?	Lack of data and information Lack of Insurance system Lack of people's participation Lack of Social Vulnerability Index (SoVI)
Most important issues	Re-naturalization of river flows Increase of retention areas Introduction of national compensation scheme / law for controlled flooding Increase acceptance in general populations	Re-establish financial soundness of NFIP Re-naturalization of river flows Increase acceptance in general populations	Increase general acceptance of mitigation measures Increase early participation in planning and implementation of mitigation measures Establish SoVI Establish insurance systems for covering losses of the poor Gathering of data Enforce existing treaties and laws

Source: HDFF, 2013

Policy recommendations National Level

Recommendation one:
Revise and after that implement (existing) laws and policies under the focus of spatial planning and reducing/regulating land use near rivers

Recommendation two:
Establish an always updated national data base of flood prone areas including mapping of vulnerable population and zoning of flood risk areas

Recommendation three:
Establish a Social Vulnerability Index (SoVI) especially for populations in disaster / flood prone areas

Recommendation four:
Establish regulations for a national flood insurance scheme based on the principle of solidarity

Recommendation five:
Increase local participation and community involvement in early planning and implementing stages of disaster risk mitigation measures

Recommendation six:
Increase efficiency and effectiveness of the cooperation between various agencies responsible for disaster management on national as well as national and provincial and local level

Recommendation seven:
Increase the use of re-naturalization strategies to mitigate flood related disasters

Recommendation eight:
Audit and review regularly (at least annually) all flood protection and mitigation measures

Policy recommendations ASEAN Level

Recommendation one:
Initiate regional flood insurance penetration and availability for the poor

Recommendation two:
Initiate pressure on all countries to develop and update their NAPs

Recommendation three:
Initiate a regional land rights forum with a special sub-group on Disaster Risk Management and Land Rights

Policy recommendations (action table)

What	Who	Remarks
National Policy		
Revise and after that implement (existing) laws and policies under the focus of spatial planning and reducing/regulating land use near rivers	Prime Minister, Office of the Prime Minister, Ministry of Interior, Ministry of Agriculture, Ministry of Transportation et.al.	Flood related building codex, control and enforce land use near rivers if needed resettlement (Compensation!)
Establish an always updated national data base of flood prone areas including mapping of vulnerable population and zoning of flood risk areas	Prime Minister, Office of the Prime Minister, Ministry of Interior	Regarding demography, economic assets, vulnerability (special focus on children, elderly and disadvantaged people)
Establish a Social Vulnerability Index (SoVI) especially for populations in disaster / flood prone areas	Prime Minister, Office of the Prime Minister, Ministry of Interior	Country wide permanent up-dated data base

Establish regulations for a national flood insurance scheme based on the principle of solidarity	Prime Minister, Office of the Prime Minister, Ministry of Finance, Ministry of Interior	Obligatory, recommended bundle system, state-supported
Increase local participation & community involvement in early planning and implementing stages of disaster risk mitigation measures	Ministry of Interior, Ministry of Education, Provincial governors	Consultation before design and implementation, share knowledge
Increase efficiency and effectiveness of cooperation between various agencies responsible for disaster management on national as well as national and provincial and local level	Prime Minister, Office of the Prime Minister, Ministry of Interior	Incl. joint trainings
Increase the use of re-naturalization strategies to mitigate flood related disasters	Prime Minister, Ministry of Agriculture	e.g. spatial planning retention rooms, flood ways, re-forestation
Audit and review regularly (at least annually) all flood protection and mitigation measures	Prime Minister and all line ministries as well as provincial and local levels	
ASEAN Policy		
Initiate regional flood insurance penetration and availability for the poor	Prime Minister, Ministry of Foreign Affairs, Ministry of Finance	
Initiate pressure on all countries to develop and update their NAPs	Prime Minister, Ministry of Foreign Affairs, Ministry of Interior	e.g. Upstream measures at the Mekong should not increase flood risk downstream
Initiate a regional land rights forum with a special sub-group on Disaster Risk Management and Land Rights	Prime Minister, Ministry of Foreign Affairs	Include proper land rights considerations in disaster management plans