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# Opportunities, incentives and challenges to risk sensitive land use planning. Lessons from Nepal, Spain and Vietnam.

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# Opportunities, incentives and challenges to risk sensitive land use planning. Lessons from Nepal, Spain and Vietnam.

#### 1. Introduction

As risk continues to increase globally, largely driven by increasing numbers of people and infrastructure built in highly exposed places, 'the global community' is exploring ways to reduce the occurrence of disasters (IPCC, 2012; UNISDR, 2011). Both the 2011 Global Assessment Report and the 2012 IPCC Special Report on Extreme Events highlight that high exposure to hazard events results mainly from economic and demographic pressures on land use, especially in densely populated coasts, rivers and mountains. While these places often are the most productive or attractive locations to live, they are also potentially the most dangerous. It is also clear that there are complex interactions between the interests of the private sector and those of the public sector where governments are ultimately responsible for the safety of their citizens, for paying for disaster losses as well as for making decisions about land use and how to allocate public funds for disaster risk reduction (DRR).

One of GAR 2013's key questions is "how do investment decisions in the private sector (in a context of incentives and regulation by the public sector) increase levels of disaster risk and, in some cases, transfer risk from private investors to governments and to other sectors of society". This paper responds to this question by analyzing both private and public investment decisions and the interplay between regulations, acting as various incentives or disincentives, with lessons learned from three case studies from Nepal, Spain and Vietnam. Based on the UNISDR (2009) definition of risk as resulting from hazards, vulnerability and exposure, this paper focuses primarily on drivers of exposure, as investment and regulatory decisions ultimately affect where people live and under what conditions. Yet it is difficult to discuss reducing exposure without also including vulnerability reduction. Nevertheless, true measures to reduce vulnerability<sup>1</sup> and influence access to resources, is more the domain of structural measures to reduce social inequalities, market access, literacy and poverty (Sen, 1982; Wisner et al., 2004). However, it can be argued that land use planning can also be instrumental in adjusting social inequalities by providing safer places to live, regulating land tenure issues and including marginalized populations in participatory planning processes.

The paper highlights three interlinked drivers of exposure: *economic liberalization* which has given incentives to private investors to intensify real estate development in exposed and risk-prone areas; *urban expansion*, which has led to over-development, environmental degradation and risky development investments; and *weak public policies* which have led to social inequality, lack of risk information, weak planning tools and weak environmental regulations. The case studies in this paper bring various examples of poor land use practices, which have led to increasing risk through exposure: economic liberalization in Vietnam and Spain leading to

<sup>&</sup>lt;sup>1</sup> There are many definitions of vulnerability but in this paper we define it as "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" (UNISDR, 2009)

opportunistic development in risky areas and in Nepal, informal settlements established in a high risk area to gain access to economic opportunities. In all cases, weak policies and institutions allowed the private sector to seek gains through risk prone development, whether driven by real estate companies or private individuals.

We then focus on the role of policy instruments in reducing exposure: financial incentives, land use regulation and public participation, are an important, yet often overlooked component of risk reduction. This paper postulates that risk sensitive land use planning is one useful approach to mitigating exposure and to some extent vulnerability, yet is only effective if accompanied by a strong institutional setting.

As the case studies demonstrate, creative solutions are required to balance short term economic interests with long term risk reduction measures, especially in the absence of strong institutions. Examples include innovative development projects where both environmental and disaster impacts are taken into consideration, incentives to local governments for risk sensitive planning, tax incentives to reduce development in dangerous areas, insurance schemes that allow for greater private sector participation in reducing risk and financial incentives to invest in more sustainable risk reduction. Finally, public participation in risk reduction - possibly involving NGOs in partnerships with local government for improved planning, risk awareness and public accountability - is a solution that has a much higher potential for reducing risk, especially in countries where few regulatory and financial incentives are available.

According to Burby et al. (1999), risk sensitive land use planning is planning that integrates risk reduction, to allow communities to find the right mix of both development and risk reduction, in other words, accepting some risk for economic gain and vice versa. Although substantive literature was published on risk sensitive land use planning over two decades ago, notably by Burby (1998) and Godshalk, D.R., Kaiser, E.J. and P. Berke (1998), eliciting debate on the subject, collaboration between planning administrations and disaster reduction authorities is still not common. Encouraging such an approach is urgent, considering the fragmented approach to DRR, which is still dominated by a post-disaster, civil protection approach rather than emphasizing preventive approaches through spatial planning and long term investments in DRR (Greiving et al., 2012; Johnson, 2011). There are thus opportunities and limits to spatial planning as a policy instrument for efficient and balanced territorial development, including the long term planning required for effective disaster risk reduction and especially the little studied role that ecosystem management can play in reducing risk, also referred to as 'natural- or ecological infrastructure' or 'green solutions' for DRR (Dudley et al., 2010; Gupta and Nair, 2012; Kousky, 2010; Kazmierczak and Carter, 2010; Renaud et al. forthcoming).

Risk sensitive land use planning is thus at the center for reducing exposure, the factor causing most increase in disaster risk and for which the least progress has been made in achieving HFA objectives (UNISDR, 2011; UNISDR, 2009). To address this complex topic this paper asks a number of sub-questions to the above GAR 2013 question: "How effective is risk sensitive land use planning for reducing disaster risks?"; secondly, "How are risks transferred between public and private actors?"; and finally "What are the solutions in terms of the main financial and non-financial incentives for reducing disaster risks?". To answer these questions, we examine a variety of issues related to land use planning issues in three countries, Nepal, Spain and Vietnam, based on three independent studies with case specific yet complementary research questions, combining various methods from sustainability science, hazard studies, ecology and spatial planning. It is based both on a literature review and first hand lessons from three case studies on various types of issues in addressing land use planning and risk in Nepal, Spain and Vietnam, followed by a discussion of possible solutions and limits that can be brought to reducing risk through risk-sensitive land use planning. The case studies provide additional examples to highlight the above discussion about the interplay between public regulations and incentives for reducing DRR through both public and private actors. They represent different types of risk situations in countries with different levels of economic development and capacities for managing risks through land use planning, regulations and various types of incentives, both financial and non-financial.

# 2. Case studies

## 2.1 Vietnam case study

Contributors: Matthias Garschagen and Fabrice Renaud, UNU-EHS

Along with Vietnam's rapid economic growth and socio-economic transformation, the country has been experiencing substantial urbanization which is expected to continue in the future (UN-DESA 2011). This urban growth is not only linked to political liberalization in terms of migration and private industries but also in terms of property rights and land markets. Hence, private sector real estate developers have been gaining in influence and are today equipped with substantial power to shape urban planning and development. However, these trends bear a considerable challenge for long-term disaster risk prevention and mitigation in Vietnam's cities. This is because cities sprawl into areas that are highly exposed to known and potentially new natural hazards, thereby creating new potential for disasters. Many of these areas had previously been blocked from development due to known exposure of already existing hazards, notably flood hazard. Yet, under the increasing pressure from population growth, industrialization and real estate development – the latter often targeting short-term profits through land speculation – existing land use zoning is often put aside and gives way to urban expansion into the exposed areas. While Storch and Downes (2011) demonstrate how the new developments in the south of Ho Chi Minh City are sprawling into highly flood-exposed areas, similar trends can also be observed in Vietnam's other urban areas, particularly in the highly dynamic mid-sized cities such as Can Tho City (**Error! Reference source not found.**).



Figure 1. Can Tho, Cai Rang district, Vietnam. SPOT Image Mosaic 2005 and 2009

With a population of around 350,000 people, the urban core of Can Tho can be considered the demographic and economic centre of the Vietnamese Mekong Delta. The city provides not only central services for the Mekong Delta region in terms of, for example, trade, higher education, specialized health or commerce but also hosts extended – and growing – industrial zones in its peri-urban fringe and is the Delta's largest receiver of net in-migration (Garschagen et al., 2012; GSO, 2009). Within Can Tho City, major parts of the envisaged new urban developments are concentrated in a district called Cai Rang which can be considered to be amongst the most dynamically developing districts in urban Vietnam (Garschagen et al., 2011). Currently hosting around 90,000 inhabitants, the development master plan until 2025 envisages new residential constructions for an additional 120,000 to 150,000 people, covering an area of 700-800 hectares (SRV, 2006). Most of these

developments will be concentrated in three wards (Hung Phu, Hung Thanh and Phu Thu) at the confluence of two major rivers (Hau River and Can Tho River). In addition, two new industrial parks are planned for the district, covering another 600-700 hectares (SRV 2006).

Linking Cai Rang's trends in urban growth and development to the emerging knowledge and awareness of climate change-related hazard exposure, two main questions arise: First, how is future-oriented risk management framed and implemented in Cai Rang? Second, how are the respective responsibilities, tasks and costs distributed and counter-measures regulated or incentivised? These questions relate to the policy domain of urban planning and management (under the Department of Construction, the Department for Urban Planning, and external consultants) and to the interface it shares with the policy fields of disaster risk management (under the Department for Agriculture and Rural Development) and climate change adaptation (under the Department for Environment and Natural Resources). Urban planning in Vietnam comprises socioeconomic development planning, land use planning and construction planning. The formal planning legislation envisages that these elements are merged in a triad of plans, i.e. the general plans, zoning plans and detailed plans. Hence, there would – in theory – be two main options for integrating prevention or at least mitigation mechanisms in terms of hazard exposure and disaster risk. First, zoning plans could identify areas of high exposure which are either blocked entirely from development or are assigned strict regulations or counterincentives through obligatory insurance schemes or other (financial) risk burdening mechanisms. Second, detailed plans could prescribe standards for architecture and infrastructure (e.g. minimum level of landfill or capacity of drainage systems) in order to limit the exposure and susceptibility of buildings and infrastructure and to increase their functionality coping range.

However, expert interviews<sup>2</sup> with urban planners and administration officers in Can Tho and in sub-national planning institutes have revealed that such risk mitigation measures have been applied only to a very limited extent. A number of institutional reasons could be identified. One of the underlying reasons is the fragmented administrative systems with separated responsibilities for the three policy fields and the lack of integrated planning and knowledge exchange. Hazard exposure was largely not considered when drafting the zoning plan and particularly no detailed scenarios of future flood conditions were taken into consideration – partly because they had not been available during that time and partly because there had been insufficient data exchange and a lack of awareness for the need to do so. Further, the zoning plans largely follow the interests of the real estate developers who aim for short-term speculation gains and do not consider long-term flooding risk. Decision makers who draft or approve the zoning and development plans should in theory counter-balance and regulate these real estate and speculation interests. Yet, the research has shown that in reality, many of them are, at the same time, stakeholders of the real estate industry and hence do not have an interest in blocking these developments or in burdening them with financial or other counter-incentives. Many key informants therefore critically noted that even if, for example, detailed Digital Elevation Models or flood scenarios had been available for Cai Rang, they would probably not have resulted in restrictive zoning that could have tamed the establishment of these new, highly exposed, real estate projects.

In addition, the regulations regarding the land infill and elevation of infrastructure was largely based on the maximum flood levels observed in the past – partly due to the lack of awareness towards future climate change trends and partly in order to limit the costs for the land developers. Moreover, the issuing of investment and building permits was often not in line with the master plan and was not based on stringent reviews of the building details. An independent research initiative by one of the interviewed key informants found that the

<sup>&</sup>lt;sup>2</sup> Semi-structured interviews with 68 key informants at national, province, district and ward level have been conducted in 2009, 2010 and 2011. The group of these key informants comprised urban planners, urban administration officers, staff of international organizations working in Vietnam, researchers and NGO practitioners. All interviews were conducted within the framework of the WISDOM project (www.wisdom.eoc.dlr.de).

investment project permissions that had been issued in Cai Rang would in fact sum up to residential buildings for roughly 250,000 new residences - in contrast to the 120,000 to 150,000 envisaged in the master plan. Many key informants consider such numbers far beyond the demand, meaning that a large share of these constructions might in fact never be developed. However, most of the land has already been cleared which not only means that previously productive agricultural land has been converted and flood retention areas reduced but also that the district might turn into a mosaic of developed patches mixed with already impermeable open spaces and fallows, which in turn can contribute to aggravating the flood hazard. At a later stage, such a low density patchwork development might reduce the financial efficiency, and hence the acceptance, of undertaking disaster mitigation infrastructure investments, such as a dyke system or pumping infrastructure. Similar observations can be made in the case of industrial parks where often, large expenses of impermeable open spaces are present or where undeveloped spaces are cut off from their original drainage canals. In this case, increased exposure to flooding can result not only in damages to industries, but also generate secondary disasters such as the release of toxic chemicals into waterways which are used by a majority of the Delta population for their everyday livelihoods (from transport to drinking water). Moreover, this type of patchwork development disrupts or disconnects the natural drainage flows in the city, making it difficult for authorities to effectively manage flooding in an integrated, cost-efficient way that combines the use of water bodies such as wetlands, rivers and streams, for their flood regulatory functions, and thus forcing greater reliance on engineered infrastructure which requires additional financial investment by the state.

In conclusion, the case study sheds light on different types of inter-linkages between land use planning, urban planning and disaster risk management. It underscores how a coherent and stringently implemented urban land-use planning process could contribute to long-term disaster risk management. Yet, it also shows which challenges can emerge if the planning framework is not capable to convert these potentials in a coherent manner.

#### 2.2 Spain Case study

#### Contributor: Urbano Fra Paleo

The take-off of the Spanish mass tourism industry in the 1960s turned the country into an international holiday destination, particularly for other Europeans, and progressed into a vital economic sector. Although also based on its cultural and historical heritage, the 'sun, sand and sea' model is dominant, particularly in the Mediterranean area and the Canary Islands. Progressive human encroachment of beach resorts, residential housing and suburban development on farmland illustrates the transition from a primary to a service sector-based economy and so called 'impulse construction'. But tourism development and population densification in coastal zones brought a considerable increase of human pressure on coastal zone environments and a leap forward in the exposure to coastal hazards and anticipated impacts of climate change. Generalized loss of fragile key habitats, widespread environmental impacts to natural coastal processes and local recurring disasters (i.e. coastal erosion and flooding) triggered by natural and man-made hazards have created undesirable, unexpected and ignored side effects.

Rapid growth of construction did not simply follow the rapid development of tourism but continued to escalate particularly during the 1990s and the 2000s, resulting in a real estate bubble (Thomas and Minder, 2012). The burst of the bubble and the collapse of the housing market in 2007, in parallel with the financial crisis, showed that vulnerability was systemic, not just environmental but also financial.

'A Frouxeira' is a seashore lagoon and wetland in northwestern Spain closed by a sandbar of secondary and tertiary dunes whose environmental values have been recognized by its designation as a nature reserve, as a Special Protection Area in 1979, Ramsar Wetland of International Importance in 1992, and European Site of Community Importance in 2004 (**Error! Reference source not found.2**). A Frouxeira is located in the

metropolitan area of the city of Ferrol, with a population of 160,000, a decaying historical district and former industrial centers, but with an extended, booming suburban area. In the last decades of the 20th century, the coastland attracted the interest of neighboring urban residents, and the beach soon became a popular summer bathing area. The initial dominant form of settlement was progressively followed by a rapid process of suburbanization, with former farms and agricultural lots turning into vacation properties through infill and expansion. Farming expanded in the surrounding area during the 20th century up to a maximum land occupation that reached the limits of the wetland and sand dunes. Subsequently, the vegetated sand dunes which were not favorable for farming, were forested with pine trees (*Pinus pinaster* and *Pinus radiata*) and the previously common land was privatized. A number of lots close to the lagoon shore were developed and other constructions invaded the fixed sand dunes.



Figure 2. 'A Frouxiera' lagoon and nature reserve (central and western area) and suburban area (east). Source: Xunta de Galicia, Spain. POL.

The sand dunes thus became degraded due to human intervention and eventually breached under natural wave action. Following a national programme, the Spanish Coastal Authority started to build an oceanway corridor between the urbanized area and the lagoon and identified the nominal inland coastal boundary marking the property line that delineates private from public land. In November 2002, the Galician Regional Administration, responsible for the management of the natural protected area, decided to place a barrier to protect the lagoon and wetland from the environmental impact caused by the pollutants of the Prestige oil spill in 2002, off the coast of Galicia. This led to a seasonal artificial impoundment of the freshwater flowing from streamlets, the rise of the lagoon water level, and the recurrent flooding of private properties, homes and public oceanway along the eastern shore. Damages consisted in blocked access to approximately 20 homes, flooded sewage system and deterioration of fencing and other public infrastructure. In view of these problems, the barrier was removed in 2004.

Flooding and its controversial management activated a latent conflict between social and environmental interests. Water levels naturally oscillate according to multiple factors: the flow of freshwater from contributors, the infiltration through the sand barrier, and the opening or closure of the discharge channel by the cyclic processes of beach sand erosion and deposition. Local residents had traditionally responded to the natural flooding of farmland with opening the outlet when it was closed (Dalda, 1968). Later the aperture of the discharge channel continued to be operated by the local government without any kind of environmental

control. After the Prestige oil spill, the operations were carried out by the Regional Government, which pursued varied goals and actions: to prevent flooding using heavy machinery to open the outlet, to regulate water discharge by placing a rip-rap groyne in 2008, or to remain reluctant to intervene. By 2011, the latent conflict among stakeholders with apparently opposing goals, i.e. environmental conservation, risk mitigation and residential area development, emerged visibly. Property owners, supported by the local government, demanded an urgent solution to mitigate flood risk and increase safety, and to recognize the legal nature of their property and housing development to gain security of tenure. At the same time, two major environmental NGOs neither shared a common interpretation of the natural processes taking place, nor had a consensual solution for resolving the problem. The key questions that arise from this case are: *What processes in governance have driven an increase in risk exposure and the lack of consideration of environmental values?*; Secondly, *Do development incentives originate a wicked risk problem in which consensus among actors is not feasible?* 

Political responsibility for the management of the area is split among three levels of administration. The local level is responsible for land use and spatial planning, the Regional Administration manages nature protection and risk, and, finally, the National Administration is accountable for the use and protection of coastal areas. However, the complexity of the situation is not derived solely from failure in the interaction between these three levels but mostly from weak regulatory compliance and policy enforcement. The Regional Government had to take part in undertaking risk mitigation and environmental conservation in the face of growing pressure from different groups, but a solution has not yet been envisaged because the conflicting interests are difficult to resolve. Pressure was put on the Regional Administration to design an environmental protection management plan for the site, but also on the National Administration to re-delineate the coastal boundary in light of the oscillating water level of the lagoon that led to partisan conflict.

While some experts estimate that the natural properties of the lagoon should prevail, (i.e., natural sedimentation processes, colmatation or clogging of the lagoon, dune and water oscillations) others believed that a more picturesque lagoon (i.e. managed for aesthetics) should prevail, opposing any actions allowing freshwater discharges. Uncertainties and lack of knowledge about the natural processes led to a number of erroneous development decisions: the misplacement of the private-public boundary, the faulty construction of a surrounding road, the emergence of private interests in neighboring plots and the award of permits by the local government to build both houses and concrete wall fences in environmentally sensitive areas. On the one hand, the local government is interested in urban development in order to collect additional taxes, with poor consideration of the associated costs, and has developed a spatial planning policy that strongly favours urban land uses. On the other hand, the Regional Government has the responsibility for evaluating the context in which development takes place and the capacity to enforce environmental, landscape or risk regulations to promote sustainability; it holds the key responsibility over supervision of local spatial plans. The Regional Administration has proposed an engineered solution that would function similar to a dam and that would allow regulating the water level of the lagoon; however, this intervention might support the perception of safe development and help increase environmental pressures on the wetland and increased susceptibility to hazard events.

This case illustrates how coastal suburbanization drives encroachment of housing units in hazard-prone areas, sometimes vulnerable habitats themselves, built by private individual investors or landowners, but supported by weak public policies or public acts of negligence. Disputes over land uses between stakeholders and administrations finally have evolved to the point where there is no simple solution, as multiple interests matured under pressure from private real estate interests, protection of environmental services and conflicting political stances. Thus, the local government acts as a mediator and advocate for the interests of local land owners and private developers at the regional level rather than representing all public interests, including environmental concerns.

#### 2.3 Nepal Case study

Contributors: Karen Sudmeier-Rieux and Michel Jaboyedoff

Dharan Municipality is situated on a large alluvial fan in the upper part of the Terai region of Nepal, below the Siwalik foothills, with an average elevation of 400-500 meters above sea level. The region is characterized by a tropical climate and intensive monsoon rainfall period between June and September with average rainfall in Sunsari district of 2,600 mm per year (Dharan Muncipality, 2011). Two major rivers running north to south, define Dharan's limits: Sardu Khola River to the west and Seuti Khola River to the east. Two other rivers also cross the city, which are temporary in character but with high flows when it rains, causing frequent flash flooding. Similarly, there are number of active landslides within the catchment. Low lands adjacent to these rivers/streams in the area are often affected by floods.

The city was severely damaged by the 1988 earthquake (6.8 in Richter scale), which killed 138 people, injured 2,117 people and damaged 2,500 buildings (NSET, 2011). Yet, flooding is the most common hazard to settlements along the major rivers Sardu Khola and Seuti Khola Rivers, many of which are directly in the flood plain, on terraces in the river bed. This encroachment has especially occurred over the past 5 years by landless people emigrating here for access to employment and education (Figure 3). The most exposed households have to rebuild their houses almost once a year because of flooding. Smaller tributaries, which cross the city, Khahare Khola and Turke Khola Rivers are also subject to inundations and flash flooding. In September 2009, a school collapsed because of flooding along Khahare Khola River. In addition to floods, slope failures causing landslides are common on the western bank above Sardu Khola River and in the upper catchment of Seuti Khola River. In the event of a mid- to high-intensity earthquake, there is the possibility of a large landslide blocking Sardu Khola River and creating an artificial dam, putting the river's communities in great danger. River bank erosion also poses a threat to houses along the left bank of Sardu Khola River.





Figure 3. Left: Sardu Khola River, Dharan Municipality, 2005. Google Earth Image; Right: Same river in 2009. IKONOS image. Informal settlements with over 200 shanty houses in 2009, mainly migrants from Middle Hills to the flood plain. Community forests on hillsides enabled improved forest cover and less landslide risk, yet flood risk remains very high.

The questions guiding research on Dharan were: "What are the major risks to the city and its possible coping strategies?"; Secondly, "What is the range of incentives to the informal settlements and public sector for reducing risks?" Data were gathered in 2009 based on household surveys of the most marginalized river communities and one marginalized neighborhood in central Dharan (n=80). Housing conditions for these communities were very poor, with most living in one story makeshift huts constructed out of bamboo, iron sheets, or other light materials. There was a large difference between the poor landless communities, many living along the rivers and wealthy retired British army recruits living in immaculate three-story houses sometimes only 1 km away from poor river communities. Most people living in the river communities were stone collectors, gathering stones from Sardu River and breaking them into gravel manually, most having migrated here from other places in the Middle Hills of Nepal. As flooding is frequent, their houses located in the river bed, are flooded annually.

The main coping strategy of the communities is to rebuild, clean and maintain any valuable household items dry during frequent flood events. Some gabion walls were built by the community itself for flood protection but these are not entirely effective, as all respondents claimed that they were still flooded several times every year. Wealthier residents upstream had erected stronger more effective protection measures, shifting the flooding problem to the poor communities. All respondents were very worried about flash floods and considered the probability of repeated flooding very high. Yet according to survey results, their main priorities were development related: mainly education, employment, road development, and secondarily, flood mitigation.

The main challenge for the Dharan Municipality is clearly the provision of clean and regularly available drinking water, which is in acute shortage for half of the year, proper sanitation and basic services such as garbage collection and education. On-site visits with municipal technical staff to areas frequently affected by flash flooding demonstrated that although they were highly aware of the flooding problem, their capacities to address this problem were limited. Besides drinking water and sanitation, they stated that they were actually more preoccupied with enforcing retrofitting codes to reduce earthquake risk, rather than the more frequent flood risk. Yet much of the municipalities' water shortages could be addressed through better planning, addressing the upper watershed degradation and undertaking structural measures for protecting dense urban infrastructure.

A project to establish a watershed management program in the upper watershed of Dharan was initiated with the International Union of Conservation and Nature, in partnership with the Dharan Municipality and several local civil society organisations (IUCN, 2011). A feasibility study was conducted to evaluate the possibility for establishing a payment for ecosystem services (PES) project in order to protect the water supply including protection of the upper watershed, which would also have led to benefits for reducing landslide risk. A number of households residing in the upper watershed had already been offered incentives through land in the lower part of Dharan and restrictions were installed to prohibit settlements in this critical area for Dharan's water supply. Some residents were forcibly removed from the upper watershed, due to lack of capacity of the municipality to enforce the restriction. Likewise, the PES scheme did not come to fruition most likely due to the lack of a direct "producer" and a willing payer, as consumers in Dharan pay little for municipal drinking water, and the "producers" were not well organized. One positive outcome of the project was the strengthening of environmental governance in the watershed through the establishment of a platform for dialogue between civil society organizations and local government.

Several policies exist to regulate land use and development in Nepal. The Guided Land Development and Land Pooling Acts are two public initiatives to guide urbanization for municipalities, with the goal of providing space for urban infrastructure for transportation, water supply, drainage, etc. Infrastructure development is still driven by a sectoral approach, with few master plans to guide piece-meal constructions (ADB, 2006). The Local Self-Governance Act of 1999 empowered municipalities to manage their urban areas and new legislation on

land use and land reform are currently being discussed. Additionally, in 1997 the Town Development Fund was established to provide financial resources, loans and technical expertise to assist municipalities with local development planning and infrastructure projects. According to the Asian Development Bank, "(...) the lack of coordination and mutual support among the institutions remain the main stumbling block in the planning, construction, and maintenance of urban infrastructure and facilities. Institutional confusion regarding the assignment of responsibility, authority, and handling of resources remains contentious" (ADB, 2006, p. 210).

Summary of main problems facing the Dharan Municipality :

- 1) addressing basic needs for drinking water, sanitation and education;
- 2) lack of capacity to ensure compliance with building codes for new construction and retrofitting of buildings for earthquakes;
- 3) flash flood risk;
- 4) increasing number of people in informal settlements in exposed river areas;
- 5) a major lack of technical, economic and human resources to undertake the above actions.

This situation highlights a very common problem in Nepal: municipalities and local government are overwhelmed with basic every day livelihood issues of water supply, sanitation, and basic maintenance, without being able to properly address other issues, such as flooding, landslides, earthquakes or other physical safety issues. Low budgets, low salaries, and a 'brain drain' of educated professionals migrating out of the municipality are hampering local development and urban planning. Thus for reducing climate and disaster risks, the problem is not access to information about flooding or how to interpret climate models, but rather lack of capacities and budgets to address the most urgent local needs of today (Sudmeier-Rieux et al., 2012). Therefore, long-term planning to anticipate climate change induced flood risk, even if adequate local data were available, is not the first priority of the Dharan Municipality.

# 3. Case study discussion

There are commonalities in all three cases in spite of differing levels of institutional capacities, regulations and economic development they describe. In Vietnam, dynamic urbanization is linked to political liberalization in terms of migration, private industries, land markets and urban planning. The rapid urban growth thereby contributes to increase risk due to urban sprawl into hazard prone areas that had previously been blocked from development. The case study highlights rapid expansion into the peri-urban fringe of Can Tho City, where long-term planning is to date insufficiently equipped to reconcile urban development pressures and precautionary risk governance.

In northwestern Spain, the 'A Frouxeira' seashore lagoon and wetland are characterized by a sandbar of dunes that naturally protect the coastline and are designated as special protection areas. Agriculture expansion, dune mining, tree plantations, tourism, the Prestige oil spill in 2002, and ultimately urban sprawl in the coastal zone have placed significant pressure on this fragile ecosystem, leading to social and environmental conflicts and increases in vulnerability to floods. Under growing pressure from multiple stakeholders, the Regional Government has begun a process of risk mitigation and environmental conservation; however, a final solution is yet to be envisaged.

Finally in Nepal, poor food security, landslides and more intense rainfall patterns are pushing people out of mountainous areas to the plains and abroad. In Dharan, Eastern Nepal the population has grown exponentially over the past five years with informal settlements springing up in flood-prone riverbanks. Governance capacities are inadequate to regulate informal settlements but the city has now become liable for the safety of persons residing in these dangerous areas. Environmental degradation of the watershed is directly a cause of poor water quality and supply for the municipality's drinking water.

To further analyse case study findings, Figure 4 was developed to illustrate main drivers of exposure and to some extent vulnerability. The next section looks at which lessons can be distilled from the case studies to explain each factor of the conceptual framework.



Figure 4. Key factors leading to risk-prone development, increased vulnerability and exposure, and their interplay in different risk scenarios, (1) Vietnam, (2) Spain and (3) Nepal.

# 3.1 Weak public policies

In all three case studies, ensuring public safety in face of hazard events would seem to be the role of government, yet due to poor governance, incompetence, or lack of social and environmental priorities, etc., hazard situations can escalate into major disasters (Lewis and Kelman, 2012). This is a very likely scenario in both the Nepal and Vietnam case study areas where risk sensitive planning and disaster preparedness are the least advanced. Another common denominator between the three case studies is existing regulations on land use yet with very different means for enforcing them. The three cases illustrated various types of ways that *weak public policies* and institutions allowed the expansion of informal settlements or poorly regulated development in areas exposed to hazards. The Nepal case illustrated *weak planning and enforcement* of zoning regulations and difficulties in providing safe alternatives to settlers. In all three case study areas, *planning instruments* and capacities for land use planning were inadequate, including Spain, where private development and shared interests with local government led to over development in a sensitive coastal area. The Vietnam

case illustrated a 'middle ground' example, with higher planning capacities than in Nepal yet not sufficient for withstanding economic pressures that led to 'risk-prone development'. All three situations resulted from serial and incremental investments, a source of major conflict and manifestations of weak or inexistent public risk reduction policies. In Nepal, the case study also highlighted difficulties facing informal settlements due to poor access to secure tenure, and a lack of rights to safe places to live, or *social inequality*. Neighborhoods in Dharan, Nepal, which could afford it erected their own gabion walls to protect themselves from flooding, shifting flood risk down the river to those with no means for erecting protection walls. Likewise, public and private compensation for damages is often insufficient to cover disaster losses, especially in lower income countries, depending on whether local homeowners and business are able to secure insurance protection. Insufficient damage compensation then affects the marginalized to a greater extent. These examples are about transferring risk from the rich to poor, an ethical question that ought to be addressed by governments but is a common experience found in high- and low-income nations alike.

Finally, *weak environmental priorities* were observed in all three case studies, but especially in Nepal and Vietnam where budgets, regulations and enforcement capacities are lacking. Unfortunately the result is a negative feedback spiral where further environmental degradation then fuels risk. Exceptions include the development of community forests in Nepal, where government incentives and regulations have provided capacities to improve forest management. The result has been positive with reduced landslide occurrence and increased livelihood resources (Jaquet et al., forthcoming).

Weak policies, institutions, and enforcement of land use are only part of the problem. *Lack of risk information, and lack of risk awareness* both among authorities and decision makers but also among the public (mainly due to poor public participation and public information about risk) may contribute substantially to increasing disaster risks. This is clearly the case in Nepal, where new migrants most often lack adequate knowledge about flood risks in their newly settled areas as compared to indigenous populations. However, even for indigenous populations with high risk awareness, there may be little option but to continue living with risk of hazard events when faced with low food security and economic options (Nathan, 2009; Sudmeier-Rieux, 2011). For such populations, livelihoods options must be combined with risk reduction activities, making public participation in DRR projects, or municipal land use plans, a very high priority. It is conceivable that higher public participation, alongside better enforcement of the water protection area of upper Sardu Watershed of Dharan would have led to more positive outcomes for both water quality and risk reduction. In Spain, public participation is part of the land use planning process, as stipulated by law yet due to a poor institutional and regulatory environment, public input was not channelled in a productive manner and only emerges in case of conflict.

Yet there is much greater potential for public participation (in Fig. 4 referred to as access to information and awareness) as a cost-effective and "soft" solution to creating more ownership of the risk reduction process, especially when combined with a means to adequately follow up on public inputs.

# 3.2 Urbanization

Population growth partially explains how difficult it is to reduce exposure to disaster risks. The world's human population has increased four-fold in the past 100 years and is projected to increase from 7 billion in 2012 to 8.9 billion by 2050 (UNESA, 2004), while the amount of land available for human settlement is assumed to remain constant or shrink due to sea level rise and coastal erosion. Most of the world's growth is taking place in coastal urban areas in southern countries. In 2000, 49% of the world's population lived in urban areas and this number is projected to rise to 59% by 2025 (UN Habitat, 2011). The share of urban populations living in low-elevation coastal zones is expected to rise from 56% to 68% in Asia and from 82% to 90% in South America (UN Habitat, 2011). Rivers also attract large numbers of people, with an estimated 78% of Europeans living in an urban area near inland water in 2000, compared to 84% in North America and 71% in South America. All these figures are expected to rise by 2025 increasing the worldwide trend of urbanization along coasts and

rivers (Biesbroek et al., 2008; Satterthwaite, 2010; UN-Habitat, 2011). Urban growth and sprawl in Vietnam and Nepal are part of this evolution. Population growth in Spain has tapered off –if we do not consider the contribution of immigration- yet growth in the tourism industry spawned new constructions until 2007.

Resulting from fast paced economic growth (as in the cases of Vietnam and Spain) or limited rural income opportunities (as in the case of Nepal) are *informal settlements* and urban sprawl that often overwhelm the capacity of local governments to regulate, provide adequate services and safe places in case of hazard events. Households in informal settlements usually lack legal land tenure, erect houses that are often not able to withstand hazards and are thus extremely vulnerable to both intensive risk (high impact, infrequent hazard events) and extensive risk (low impact, frequent hazard events) (O'Donnell, 2011; UNISDR, 2011).

Informal settlements may benefit from access to economic opportunities, transportation, services, infrastructure and provide low cost labor to the urban economy but receive little to no hazard protection, are usually not able to insure their homes, nor can they expect much public disaster relief should their homes and assets be destroyed. Oftentimes newly settled residents in unsafe areas are either not aware of disaster risks, or more likely, their short-term economic risks are higher than the perceived probability of future hazard events occurring, as discussed above (Nathan, 2008; Sudmeier-Rieux et al. 2011). Informal settlements are emblematic of the poverty – disaster nexus and illustrate why investments in poverty reduction should also be investments toward disaster risk reduction. Following informal settlements is a more organized form of development through the *real estate bubble*, which will be discussed in session 3.3 "Economic liberalization".

Informal and formal settlement patterns, which have tended to follow an expansion of land use with little planning or regard for local ecological features, have led to various levels of land use pressures, ranging from real estate developments in the Spain and Vietnam case studies to the informal settlements in the Nepal case study. For the case studies, these pressures affected a volatile river bed in Nepal, a sensitive coastal area in Spain and dynamic river delta in Vietnam.

As illustrated in the case studies, urbanization has resulted in *environmental degradation*, another central factor leading to extensive risk, highlighted by several influential policy and scientific synthesis documents (UNISDR, 2011; IPCC, 2012). Environmental degradation actually amplifies risk by a factor of three: first by increasing the magnitude of hazards (e.g. degraded slopes are more likely to lead to landslides); second, reduced availability of natural resources amplifies household vulnerabilities; and finally, dangerous areas are best maintained as 'green spaces' where possible, thus reducing exposure. In Nepal, the degraded upper watershed area, which is not covered by community forests is clearly affecting water quality and supply to the city, in addition to leading to higher landslide risks. In Spain, disturbed coastal processes, (i.e. sand dune removal) due to private land development are increasing coastal risks to the 'A Frouxiera' community.

The final outcome is *risk-prone development,* which not only increases exposure but often vulnerability and the core of disaster creation and the transfer of risk, most often to public spheres and the poor (see section 3.4).

# 3.3. Economic liberalization

The third major driver of exposure highlighted by the case studies is economic liberalization, especially through the liberalization of the land markets and recent growth of the real estate industry. This is not just a powerful economic sector for any country but also involves a complex and interlocked network of players -among them mortgage finance lenders, large landholders, insurance companies, lobbying organizations, home builders, apartment owners or residential brokerages (Wong, 2010), with its own specific interests, processes and expectations. But beyond these major actors, we should neither overlook nor diminish the role of citizens as land owners, promoters or consumers and, ultimately, decision-makers at a local and large scale. It should be

noted that 87% of households' wealth in Spain was held in property in the early 2000s, and this proportion might have increased over the decade (Esteban and Altuzarra, 2008).

The latest *real estate bubble* in Spain is very illustrative of the interplay of salient forces and factors that have driven not merely a financial crisis but an important coastal ecological and landscape impact, and presumably have established the conditions for future localized coastal disasters. The drivers of this escalating demand were economic growth, employment opportunities and per capita income, and population growth to which inmigrants contributed notably (Esteban and Altuzarra, 2008). Favorable financial conditions were created with descending mortgage rates and the influx of foreign capital investment – mostly in coastal real estate - that peaked in 2004 when it represented 0.91% of GDP, and which responded to "…expectations of substantial capital gains in an environment of cheap and easy borrowing" (Esteban and Altuzarra, 2008 p 368). But not all the advantageous conditions for real estate industry were external or neutral, namely house price formation, building costs and land prices due to the process of *liberalization* (Esteban and Altuzarra, 2008).

In the case of Spain, liberalization of real estate through the mortgage market played a critical role and acted as *indirect incentives to decreased costs and increased benefits* in the housing industry. It was spurred by several Government acts with the manifested aim of increasing offer and decreasing prices, and decoupling the role of the developer and the land owner, placing economic interest first without any additional provisions regarding the environmental and social conditions of land development. The pronounced goals of liberalization were to return control to the market and dismantle rigidities, leading to a housing boom, land ownership concentration, rising land prices of over 20% in 2004, and unconstrained availability of land for development and satisfaction of the ever-increasing demand of housing (Esteban and Altuzarra, 2008).

Finally, *incentives to the private sector* may actually create more risk than reduce it. In countries with little insurance coverage, both public and private domains bear the cost of disaster and both are responsible for creating and reducing it, while where public insurance programmes have been implemented, these may exert perverse disincentive effects. Since many insurance companies may not be willing to insure homeowners living in hazard zones, governments may provide them with reinsurance backing, rather than encourage homeowners to relocate elsewhere or retrofit their houses. For example in Spain, the public insurance organization (Consorcio de Compensacion de Seguros) provides public backing in case of disaster and, in the absence of private insurance coverage, will pay for damage losses. This point will be discussed in more detail in the next section on incentives. Secondly, public policies and relief compensation for disaster losses from national governments may encourage people to rebuild their homes in the same dangerous places, rather than move to higher ground or away from coasts (Burby, 1998).

In addition to the pressures coming from the private – liberalized – real estate and development market, local governments themselves often create new risks and development incentives. This happens particularly through the development of new infrastructure such as roads, bridges, or dykes all of which can function as incubators for additional investment and development from within the private market. The case studies hinted (e.g. Vietnam) to the important fact that such decisions are often driven by individual or collective motivations of political decision makers with conflicting interests, which might differ quite substantially from sustainable planning perspectives. As a result, the development of projects, which are not only risk insensitive but often beyond the needed capacity to manage risks, can in particular be observed in rapidly growing countries like Vietnam. In that sense, *incentives for risk insensitive developments* in the private sector are often fueled or supported by the public sector – which in theory should instead regulate 'counter-productive' developments in the private sector, even in liberalized markets.

As in the case of Spain, the private sector might furthermore receive financial incentives for developing new projects, which originally had been in state responsibility (such as housing provisions) but are liberalized due to the above mentioned reforms. Thus, low land prices and perverse market incentives may actually attract more social housing in hazard prone areas (UNISDR, 2009). However, when risk information is available and the

market is transparent, information on risks can have an impact on housing prices and act to dissuade development projects in risk prone areas (Bin, Kruse and Landry, 2008; World Bank, 2010).

## 3.4 Increase in exposure and vulnerability leads to transfers of losses to public and private entities

To conclude this section on drivers of exposure and to some extent, vulnerability, the case studies highlighted various ways in which disaster risk is created. In all three cases, risk is rooted in individual and collective decisions about investments in risky development based on differing and often conflicting interests, needs, and perceptions about risk as compared to public concerns about safety. As reducing risk bears a cost, this cost was either transferred from private to public actors, or from wealthy to poor households following a path of least resistance. We can thus consider how disaster losses are transferred in two ways, either as a socialization of losses or a privatization of losses. Borrowing financial terms, the socialization of losses refers to public absorption of losses, either leading to losses being passed to tax payers, a redirection of public expenditures from other areas, or from the international community. This is most often the case in developing countries where private insurance of private and public property is low. Privatization of losses refers to the absorption of losses by citizens, private owners, either wealthy or marginalized populations, which are the least likely to have any type of insurance, nor the savings to recover losses. Figure 5 illustrates the various actors affected by disaster losses. The three case studies illustrated all various types of actors and losses, from the wealthy population with property along Spain's coasts to the marginalized population in Nepal. Figure 5 also illustrates various processes that exacerbate these transfers of losses, namely (i) business in unsafe locations transferring losses to both private insurance and governments, (ii) compensation of losses actually creating more risk, (iii) losses covered by the government, and (iv) transfers of losses from wealthy to poor populations when mitigation structures are most often erected in rich neighborhoods, transferring the hazard situation downstream to poor neighbourhoods. The following sections discuss in more detail the various transfers of risks based on lessons from the case studies.





#### • From Local to National Government

In most countries, even when risks are created locally due to poor preparedness, early warning or lack of planning, the national government becomes ultimately responsible when a major disaster occurs. For example after the 2011 Mississippi floods, the U.S. Government declared a state of major disaster in numerous counties

in three states, providing federal funding to state and local governments for repairs and relief (CBS/AP, 2011). In other words, where local government fails to regulate land use, ultimately national authorities, or the international community become responsible for disaster outcomes and public safety. The same conclusion can be drawn from all three case studies although there will be obvious differences in the capacities of Nepal, Vietnam and Spain to ensure public safety and compensate for losses.

The level of de facto and official responsibility for public safety varies for each country and will depend on several factors including the level of tolerable or acceptable risk a society is willing to assume, expectations on government roles and economic and technical capacities to address risk. Local government is usually at the front line of risk reduction as they are responsible for approving development projects and building plans. Yet they may not have the adequate technical capacity and financial resources and they may be influenced by competing interests and corruption (Lewis and Kelman, 2012). Expectations on governments for public safety and risk reduction also vary considerably. We might hypothesize that as countries improve their economic and governance capacities, they may become more able to take responsibility for public safety. Consider the tangible differences between our case study countries, Nepal, Spain and Vietnam. In Nepal, remote communities are almost entirely self-sufficient, with little response and reconstruction assistance expected nor received from government in case of a hazard event. While in mountainous areas of developed countries, communities will still be quite self-sufficient but they also expect and will receive government assistance in case of an emergency.

# • From Private to Public

Increasing disaster risk emanates not only from small to middle sized low income urban centers, but plagues high income countries likewise, as reflected in the exponential increase in economic losses due to disasters over the past two decades (Swiss Re, 2011). This trend is partly explained by relatively weak land use legislation and enforcement on the one hand, versusstrong economic pressures to develop land even in hazard prone areas on the other hand. Secondly, whether recognized as a natural resource or as a fundamental component of landscapes or ecosystems, land undeniably has an associated economic value, particularly in agricultural systems and urban development. Current –and future- use of land is thus one among the multiple causes and effects of acquiring a market value. Expectations on future development, zoning and land use regulation are factors that steer land use change, and the occupation of both non-exposed and hazard-prone areas.

The large amount of private investments, which normally represent a majority of a country's GDP, implies that private investments, whether informal settlements or real estate companies are highly impacted by disasters but also that they are highly responsible for generating risk (UNISDR, 2012). This is true as so often short term private economic interests supersede long term risk considerations. The private sector therefore shares responsibility with the public sector for the increase in both intensive and extensive disaster risk. Our case study examples illustrate a spectrum of private investments which create public risk: from the real estate development along the environmental coastline in Spain, the development of a master plan for housing and an industrial park in flood prone Can Tho City, to informal private investments along Sardu Khola River in Dharan, Nepal.

# • From Rich to Poor

Most high income countries have invested in risk reduction measures that reduce extensive risks, such as reoccurring flooding for densely populated areas. However, these measures may protect well-off cities to the expense of poorer rural areas. Flood management policy in the Mississippi river basin is a good example of high structural investments to protect cities from annual flooding, with periodic flooding of lowland agricultural areas during above normal floodwaters. Additionally, Hurricane Katrina demonstrated the short comings of decades of physical engineering of its river basin, mainly affecting poor populations. Likewise, the exceptional Thai floods in autumn 2011 following Tropical Storm Nock-ten and heavy monsoon rains were managed to

avoid flooding Bangkok's wealthy financial center to the expense of its outskirts, affecting Thailand's manufacturing industry and angering poor local residents (Bangkok Post, Nov. 28, 2011). Similar lessons were learned from our case studies: in Nepal, poorer downstream populations are more often flooded due to private protection measures upstream. In Spain, real estate development for wealthy secondary home owners led to coastal degradation and increased flooding costs for the entire community.

To summarize the issue of transfer of losses and risks:

- from private home owners and private sector to government (e.g. compensation paid for losses as described above)
- from wealthy to poor or marginalized populations (as protection is often given to rich first)
- from private owners to insurance companies, and eventually from private to government (when public backing of insurance as described above)
- from government to private sector individuals and businesses (e.g. when government decisions to protect certain areas over others lead to uncovered losses)
- from the private sector to individuals when businesses and services provided are located in hazardprone areas

This diagram of actors and interactions between actors can certainly be applied to all three case study countries, although the main difference will be the respective weights of public versus private sectors in covering disaster losses and taking responsibility for risk reduction: i.e., the role of the insurance industry, levels of public insurance in providing compensation for losses. In Nepal, the brunt of disaster losses was carried by private owners, namely businesses and especially marginalized populations, in contrast to Spain where the government and public insurance assumed a greater financial burden for losses, and thus should logically have a greater stake in pursuing greater risk reduction measures. Vietnam with a very modest to burgeoning insurance market illustrated a middle grounds distribution of loss-sharing between public and private actors.

This next section explores in more detail the different types of incentives for reducing risk, while considering the many actors and actions involved in bearing responsibility for reducing risk.

# 4. Solutions for reducing risk

One of the main problems with reducing risk is that it either ends up being paid for by tax payers or marginalized populations. Thus one important way to reduce risks is to better analyze and reduce such transfers of risk, and oblige those who create risks to also pay for it. In light of the above discussion, we examine the legal, financial or market based, and other types of incentives, such as the important role of public participation for both the public and private domains to reduce risk. However, at times, the three can be difficult to distinguish as they are often interwoven. Figure 6 illustrates the three main types of policy instruments for reducing exposure: financial incentives, land use regulation and public participation, an important, yet often overlooked component of risk reduction. Many of these elements can be generated and managed through risk sensitive land use planning when accompanied by a strong institutional setting. The following sections discuss these three policy instruments in more detail.



Figure 2. Interplay of incentives and disincentives in the three studied risk scenarios (1) Vietnam (2) Spain, (3) Nepal

#### 4.1 Legal incentives and regulations

Regulations regarding land use for DRR would seem to be the most effective way to prevent development in unsafe locations (Timothy and Earl, 2008). Regulatory measures usually cover two types of measures: location and design. The goal of the 'location approach' to risk reduction is to limit development in hazardous areas, while the 'design approach' is to build safe constructions in safe or in hazardous areas (Burby, 1998; Greiving et al. 2012). Yet the reality is more complex, as regulations are not always enforced or enforceable, due to lack of capacities and budgets, as we observed in the Nepal case. In Spain and Vietnam, short term economic interests superseded existing regulations, not necessarily due to the lack of enforcement capacities but rather due to weak institutions and possible conflicting interests of local politics. Moreover, even when regulations are enforceable, new zoning regulations are less likely to be effective for already established settlements, as the economic and political costs of relocation can be very high, unless residents are forced to relocate due to frequently occurring hazard events or high probability of an extreme event (Burby, 1998). However, regulations and land use planning are likely to be more successful for new developments or reconstructions after disasters, as being planned for reconstruction after the 2011 Japan earthquake, where zoning is to be strictly enforced, placing green belts by the coast and hospitals and schools further inland (Onishi and Ishiwatari, forthcoming).

Regulations for design of new constructions may also be highly effective, depending on how enforceable building codes may be. Retrofitting of buildings is often conducted with a combination of regulatory and

financial incentives, such as government or international grants to retrofit schools. These are unfortunately often not undertaken until the aftermath of a disaster forces retrofitting, under public pressure.

Regulations that have led to positive risk sensitive land use planning for DRR include more recent flooding and water legislation in Europe: The Water Framework Directive (EC 2000) which recognizes that a structural approach to flooding cannot completely eliminate flood risk, together with concerns about the environmental impacts of river engineering. Secondly, after a number of major floods struck Europe between 1998 and 2004, the EC Flood Directive (EC 2007) was enacted to coordinate flood risk management, especially with regards to transboundary water issues. It was also an attempt to address major deficiencies reported in the transposition of the Water Framework Directive into national law. The Flood Directive requires States to undertake flood hazard and flood risk maps and devise flood risk management plans by 2015 (Llosa and Zodrow, 2011). The binding nature of this legislation has led many States to revise their national flood legislation and increase their efforts in this field (Llosa and Zodrow, 2011).

The result of these two EC directives led to a number of country programs, including the Dutch 'Room for the River Programme', which promulgates the use of former agricultural areas, wetlands, peat bogs, and other natural spaces as reservoirs for excess water (Corvers, 2009). A combination of environmental and economic arguments, together with legislation on ecosystem based flood management have led to a powerful force for change in river management practices in recent years and has informed the development of an array of alternative, ecosystem-based approaches (Wharton and Gilvear, 2006). At the core of these approaches (ecological design, river restoration and more strategic integrated approaches) is the acceptance that rivers are meant to flood and must have room to move (Gilvear et al., 1995) a recognition that rivers are dynamic, and linked to their surrounding floodplain (Wharton and Gilvear, 2006).

# 4.2 Financial or market based incentives

In the absence of strong institutions for enforcing regulations on land use, financial or market based incentives could offer persuasive incentives, including government based disaster relief, tax-write offs and insurance incentives (Jackson, 2011). However, our three case studies did little to illustrate how this could be done in practice. In Nepal, financial incentives and land were offered to residents to relocate away from a hazard prone water conservation area, to little avail as residents returned to their original homesteads one year later due to lack of enforcement capabilities. In Vietnam, forced relocation can take place from flood prone areas to village clusters built by the local and national authorities although the success of this is sometimes debatable. In Spain, insurance companies paid for damages to homes, and in case of absence of coverage, a public reinsurance company pays for the compensations, when a hazard event has been declared a disaster.

As discussed in previous sections, many financial incentives actually translate into perverse incentives for homeowners to settle in hazard prone areas or dissuade them from relocating elsewhere (Godschalk et al., 1998). Relief, although often inadequate may lead to complacency as individuals and communities may not be willing to take necessary steps to reduce their vulnerability to disasters. Relief also does little to dissuade people from moving back to the same disaster prone location and same construction designs (Burby, 1998). Tax-write offs for home improvement and disaster losses are common in many Western countries and do not necessarily carry any clauses requiring improved home design or relocation to disaster safe areas. However, the potential is great for making them into strong incentives for moving homes and business away from dangerous places.

Business and home insurance, if regulated, may provide one of the most persuasive financial incentives for safer construction and locating homes and businesses in safer places (Burby, 1998). If insurance rates increase in hazard prone areas to the extent that it is no longer financially viable to live in such unsafe places, then

people will move elsewhere. Insurance policies may push for more hazard-proofing, such as blocking low windows, elevating houses or retrofitting buildings for earthquakes. Yet as mentioned above, as reinsurance is often difficult for insurance companies to find, governments may back insurance companies or provide alternative federal protection. U.S. Flood Insurance Program was established in 1968 (Kerjan, 2010) to provide protection for home owners in hazardous area, who were not able to take out standard flood insurance. This government program has thus created perverse incentives for staying or settling in flood plains (Kriesel and Landry, 2004).

Two examples highlight some of the various fundamental problems with disaster insurance. Insurance coverage may prevent both relocation and investment in mitigation measures (Kerjan, 2010). "One flood-prone house in Baton Rouge, Louisiana, for example, has received over \$200,000 in flood insurance payments since the owner purchased the dwelling in 1991 for \$30,000. Needless to say, the owner has no interest in relocating the structure to a flood-free site" (Burby, 1999: 253).

"When insurance companies began cancelling policies in Florida following Hurricane Andrew, for example, the State of Florida instituted a surcharge on property insurance policies to create the Hurricane Catastrophe Fund, a reinsurance fund for private insurers" (Burby, 1998: 7).

The use of risk transfer mechanisms, such as insurance, that allow for greater private sector participation is still very limited in developing countries, with a low coverage of only 3% of disaster losses. Insurance coverage in agriculture is especially low despite the sector's economic importance in these countries, with premiums accounting for only 0.01% of GDP (Burby, 1998). Insurance in general has low penetration among lower income groups due to its lack of affordability. As a result, there is still insufficient experience, though promising, to clearly demonstrate that insurance for developing countries can be used to better manage risks. Insurance is generally intended to soften disaster impacts, but may dilute the incentive to prevent, unless the insurance premium reflects the risk and the prevention measures that the insured must undertake.

Nonetheless, the insurance industry is growing rapidly especially in emerging market economies. And there are more and more examples, mainly from industrialized countries, that show how insurance tools can be used to work together with other risk reduction measures and to incentivize such measures. That is, risk reduction measures can be used as a prerequisite to insurance coverage.

To what extent such preconditions for risk insurance can be tied to improved risk sensitive land use planning remains an open question. There is a move toward 'sustainable insurance principles' to entice insurers to integrate environmental, social and governance issues into a company's management and operations, alongside developing new kinds of risk management products and services (UNEP, 2012). In some cases, insurers themselves have paid directly for risk reduction through direct investment or lending. For example, Tokio Marine & Nichido Fire Insurance Co., Ltd., an insurance company, has invested in the protection of mangrove plantations in Indonesia, Myanmar, the Philippines, and Thailand, which reduce the risk of storm surges affecting areas further inland; protecting mangroves reduces the risk of losses both to plantations as well as insured assets inland. Box 1 illustrates further examples of how some insurance companies have been able to link land use with risk management.

#### Box 1. Examples of insurers promoting ecosystem-based risk reduction strategies

#### **Promoting reforestation in Spain**

The insurance company MAPFRE created an insurance scheme for forest plantations in Spain designed to help owners meet the costs involved in reforestation after a fire. Within the European Union, Spain is the country most exposed to forest fires, experiencing on average the highest surface area affected per year, with 20,000 fires year affecting around 147,000 hectares. The MAPFRE forest insurance policy is to guarantee reforestation after a fire, and in order to receive compensation, MAPFRE's technical staff must check that reforestation has been undertaken in accordance with the conditions stipulated in the contract. When establishing the insurance premium, MAPFRE takes into account the type of management carried out by the insured plantation, and bonuses are offered to those plantations that adopt an environmentally sustainable management policy.

#### Restoring rivers to tackle flooding in the UK

The RSA Insurance Group is working together with the Thames River Restoration Trust and World Wide Fund for Nature (WWF) in developing urban river restoration in the London area. River restoration is viewed as one measure for developing low cost, environmentally sustainable flood defences. In the past, rivers in urban settings are often channelized in order to move water as quickly as possible between two points. During periods of intense rainfall, the fast-moving water can create major flooding problems downstream. The project will recreate the natural meander of the Thames River, remove the concrete channels and recreate the floodplain providing more space for water flow. The project aims to investigate whether urban river restoration schemes reduce flood risk in a cost-effective manner.

Source: United Nations Environment Programme's Finance Initiative (UNEP FI), "Principles for Sustainable Insurance Initiative" forthcoming

# 5. Public participation as a key incentive for reducing disaster risks

There are other non-regulatory or market based incentives for reducing risk that can also have a significant impact on reducing exposure. Where the public has been included to actively partake in the planning process and in partnership with a broad array of stakeholders there is more opportunity for success in implementation, since the public's interests have been incorporated and awareness has been increased (Burby, 2003). Participation can actually be considered a non-monetary type of incentive perhaps as powerful as regulatory or financial incentives (Burby, 2003). Public participation in land use planning has become standard in many countries and even mandatory for new projects through Environmental Impact Assessment (EIA), and Strategic Environmental Assessment (SEA) processes, which are becoming common instruments for decisions at policy, plan and program levels (Gupta and Nair, forthcoming). Hence, gaining access to information about future development and risk reduction plans, the ability to participate in decision making, demand greater public accountability and offer local knowledge can be very empowering and provide strong incentives to gain ownership over planning and risk reduction (Burby, 2003; Fordham, 1999; Pearce, 2003). Box 2 provides an example of an SEA that sought a broad stakeholder involvement for addressing reconstruction plans in northern Sri Lanka, taking into account disaster risks, development and environmental considerations.

# Box 2. Integrated Strategic Environment Assessment for the post-conflict recovery and development in the Northern Province, Sri Lanka

The end of over 30 years of internal conflict in Sri Lanka in 2009 provided a complex scenario in planning for the reconstruction and development of the Northern Province. This period was characterized by national government agencies having old data or missing information; competing development and conservation interests; weak coordination amongst conservation, development and regulatory agencies; and a large number of scattered, sector-specific development plans being proposed for the Northern Province.

A modified Strategic Environment Assessment or *Integrated* Strategic Environment Assessment (ISEA) in line with Local Risk Assessment was adopted for guiding development planning in the Northern Province (five districts), starting in November 2009. This process brought over 30 different actors: government agencies, universities, private sector and the general public. It compiled multi-agency data; initiated field generation of missing or required information; and using GIS software, compiled proposed development plans (e.g. for roads, electricity, agriculture, urban settlements, etc) which was then overlaid with environmental baseline data (e.g. forests, coastal lagoons, water resources, cultural heritage sites, etc) as well as hazard information (which did not include updated vulnerability data due to restricted access to many parts of the Northern Province at the time). The purpose was to ensure that future development of the Northern Province is sustainable and resilient to disasters.

During the process, which involved intense inter-agency government collaboration and dialogue, land uses for the forest, wildlife, geological and mining were prioritized allowing wild elephant corridors to be kept intact and protecting environmentally sensitive and culturally important areas from development and mining. While releasing low priority forest and wildlife areas for development, some other areas were selected to preserve as conservation areas and to support eco-tourism. Similarly, the proposed resettlement plans and road traces were revisited and optimized based on agency inputs including city plans. Compilation of environmental baseline data with proposed development plans resulted in the creation of an "Opportunity Map", a key output that highlighted the spatial distribution of areas available for development with minimum environment and disaster constraints. The outputs were shared with local authorities and general public through a series of consultations. While more localized environmental impact assessments may still be required for specific development project, overall the ISEA approach provided a framework for investments, local risk financing (LRF) and sustainable development efforts.

Among the critical elements for success were timing, political endorsement at the highest levels, and its multi-stakeholder, inter-agency approach. As a result of the ISEA, a number of infrastructure plans and proposed developments have been improved due to the analysis, and training of planners at national and district levels on the further use of ISEA information is underway. The ISEA approach has been endorsed at the highest level as an approach to be replicated in other provinces.

Authors: Ananda Mallawatantri (UNDP Sri Lanka), Damith Chandrasekera (UNDP Sri Lanka) and Buddhi Marambe (University of Peradeniya, Sri Lanka) The case study from Spain illustrated how local environmental NGOs were able to participate in the planning process and offer expertise about environmental processes, most likely contributing to improving the balance between development and coastal environmental and hazard protection, even if the outcome remains uncertain. It involved so called "third sector" actors, NGOs which can be considered private actors or semi-public depending on the NGOs (Burby, 1998). There are many examples of such NGO – governmental partnerships successfully collaborating to guide sustainable regional and community planning from many cities in North America and Europe (i.e. Chesapeake Bay programme, Charles River Watershed project, Portland City planning project). In Europe, the Green and Blue Space Adaptation for Urban Areas and Eco Towns (GRABS) project brings together local authorities, academia and NGOs to facilitate the exchange of knowledge and experience and the actual transfer of good practice on climate change adaptation strategies to local and regional authorities (GRABS, 2012).

In the absence of strong institutions or financial incentives, especially in developing countries, it is possible that such participatory processes combining local, national or international NGOs with local government may be one of the most promising solutions to more sustainable measures for reducing exposure. In the Dharan Municipality, although local NGOs were not successful in creating a sustainable solution to water management problems a strong partnership was created with the municipality that could carry forward future DRR and water conservation measures. In Spain, environmental NGOs and community based organisations, if working in a more coherent manner, could act as strong catalysts for promoting more public participation – and accountability - in risk reduction decisions in spite of weak institutions. In Vietnam public participation in urban planning is now increasingly promoted by legislative reforms and could act as a strong catalyst to buy-in risk mitigation measures. However, how far the new policies will in fact be implemented from paper into practice and how much critical discourse will be allowed in participation processes remains to be seen. A true opening can currently be only observed at the margins.

# 6. Opportunities and limitations to risk sensitive planning for reducing exposure

Figure 7, shows various types of investments made in disaster risk reduction as reported by countries to the HFA Monitor for 2009-2011. We observe a large discrepancy between high and low income countries especially for investing in urban and land use planning, in spite of its cost-effectiveness (UNISDR, 2011). Reasons for this divide are discussed throughout this paper: the difficulty in reducing public risks due to weak institutions or lack of capacities through regulating risk-prone development. Investing in land-use planning requires a long- to mid-term commitments that are more likely in high versus low income countries. Land use planning, when backed by strong institutions, could be considered an instrument for negotiating and "equalizing" risks before they are transferred to marginalized populations or taxpayers.



Figure 7. Countries reporting on investments made in disaster risk reduction measures, as broken down by income. (UNISDR, 2011)

As argued in this paper, a properly conducted participatory planning process and risk sensitive land use planning can allow communities to strike a balance between the two, in other words, accepting some risk for economic gain and vice versa, while utilizing ecosystems for protection and vulnerability reduction (Burby, 1999). Also, zoning, or designating areas for various land use purposes, may be a flexible enough instrument to accommodate both location to the design approaches, different and changing political preferences and interests. The three case studies touched upon ways in which this was possible: in Nepal, protection of the watershed would protect the water supply as well as reduce run-off, in Spain, sand dunes are well known natural barriers of coastal erosion and storms, in Vietnam, preservation of a flood retention area in a mosaic of open spaces and lower density development is a possibility. Yet, these options were not utilized fully mainly due to economic pressures and lack of institutional capacities. Of the three, Spain illustrated the strongest regulatory framework and capacities to incorporate ecosystem management in risk sensitive planning, mainly also due to strong local public participation.

However, risk sensitive land use planning will only be as strong as the institutions which lead it, as demonstrated in all the case studies. In Vietnam, private real estate interests prevailed over regulations due to weak planning and enforcement mechanisms. In the case of Spain we learned how environmental considerations at the local scale might have prevented risk-prone development but, in the absence of this vision in local institutions, higher levels of administration have the political and technical capability to change the land use provisions. In Nepal, the very weak state of institutions provided a planning vacuum, filled in by private informal settlements in a dangerous area. Thus, even in the case of Spain, where a planning process was undertaken, land use planning failed to negotiate or "equalize" risks back to the private sector.

There is hope for risk-sensitive land use planning, which incorporates ecosystem considerations especially when it includes a broader territorial or regional approach, taking into account the entire physical context affected by risk (Etkin, 2009; March and Henry, 2007). Land use planning has an overwhelmingly more positive cost-benefit ratio as compared to approaches such as relocation and retrofitting and mitigation measures for disaster risk reduction and, naturally, as compared to bear the costs of disaster (Figure 5) (UNISDR, 2012; Burby, 1998). These three approaches do not exclude each other, yet they need to be combined in order to respond to specific contexts. Other success factors include fitting land use management programs to the local context, considering the large difference in regulatory and incentive frameworks in each country (Henstra, 2010).

Admittedly, land use planning is likely to be most successful in areas yet to be developed or facing reconstruction (Burby, 1998; March and Henry, 2007). Relocation can be extremely difficult to effect due to costs incurred, not only economic but social costs. Residents are generally unwilling to move unless there are strong push and pull factors (i.e., high risks vs. compensation, safer location). Finally, there are successful examples of the provision of safe land to informal settlements for reducing poverty and risk, for example in Argentina (World Bank, 2010). Finally, perhaps the best way to summarize successful risk sensitive land use planning is finding the right mix of regulatory, financial and other incentives for guiding urban expansion and redevelopment to locations that are free of hazards with planning programs that eliminate the possibility of significant damage (Burby, 1998).

# 7. Conclusions : potential of risk sensitive land use planning for reducing risks

This paper has responded to the GAR 2013 question: "how do investment decisions in the private sector (in a context of incentives and regulation by the public sector) increase levels of disaster risk and, in some cases, transfer risk from private investors to governments and to other sectors of society?"

This paper examined this question through a spectrum of possible solutions, mainly through risk sensitive land use planning but also financial incentives and public participation in reducing disaster risks. The key barriers to risk sensitive land use planning can be summed up by the institutional capacities to carry forward plans and enforce them, the amount of public participation in planning and the amount of political leverage to support the planning process. Additionally, innovative financial incentives, such as tax incentives and insurance initiatives to encourage risk sensitive planning are needed, rather than creating perverse incentives for risk-prone development. This will also require improved collaboration between agencies such as urban and land use planners, civil protection, environmental management, the private sector and NGOS who work on various aspects of DRR but rarely in a coordinated manner. Promoting cooperative governance among administrations can be extremely powerful rather than the command-and-control approaches, that have failed to successfully implement risk reduction policies (Burby and May, 2009).

Obviously, considering the fast growing pace of many small- to medium cities, as illustrated by our three case studies, it is clear that exposure and risk cannot be eliminated or drastically reduced through land use planning alone. Actors in the three case studies have very different levels of capacities and access to land use planning tools for DRR, which could be used more effectively had they the capacity to reconcile multiple interests and promote more long term investments in DRR. Hence, this paper concludes that in spite of the multiple land tenure, political and economic forces, more effective risk reduction is possible through improved planning.

Perhaps one of the strongest arguments in favour of risk sensitive land use planning is its cost-effectiveness, considering the high costs of structural measures to reducing risk, drawing upon many tools and approaches from sophisticated to simple. It encompasses comprehensive, coordinated planning at all scales, from national to local, aiming at an efficient and balanced territorial development. This can include ecosystem management, an often overlooked element of DRR for reducing hazard magnitude, reducing vulnerability by providing livelihood resources and even exposure when dangerous areas are used as open spaces.

Finally, we conclude that in order for risk reduction to be successful, a combination of both regulatory and financial or market based incentives are required to both offer "hard regulations and financial disincentives". This includes non-coercive incentives and information about land use planning if it is to become a more viable part of DRR (Berke, 1998). This will also require better incentives and enforcement of regulations of private informal settlements and market actions, which are largely causing risk, while encouraging more private actor responsibility for risk. The case study examples highlighted this point, especially in Vietnam and Nepal, where incentives other than regulatory ones may be necessary to achieve risk reduction through land use planning.

Ultimately, meeting human needs and improving quality of life are key drivers and the strongest incentives for change (Fra Paleo, 2009). Yet to achieve these goals, support from NGOs, public and private sectors is needed to increase the capacities of local and national governments to provide incentives and regulations for the private sector and to ensure safe places for people to live.

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