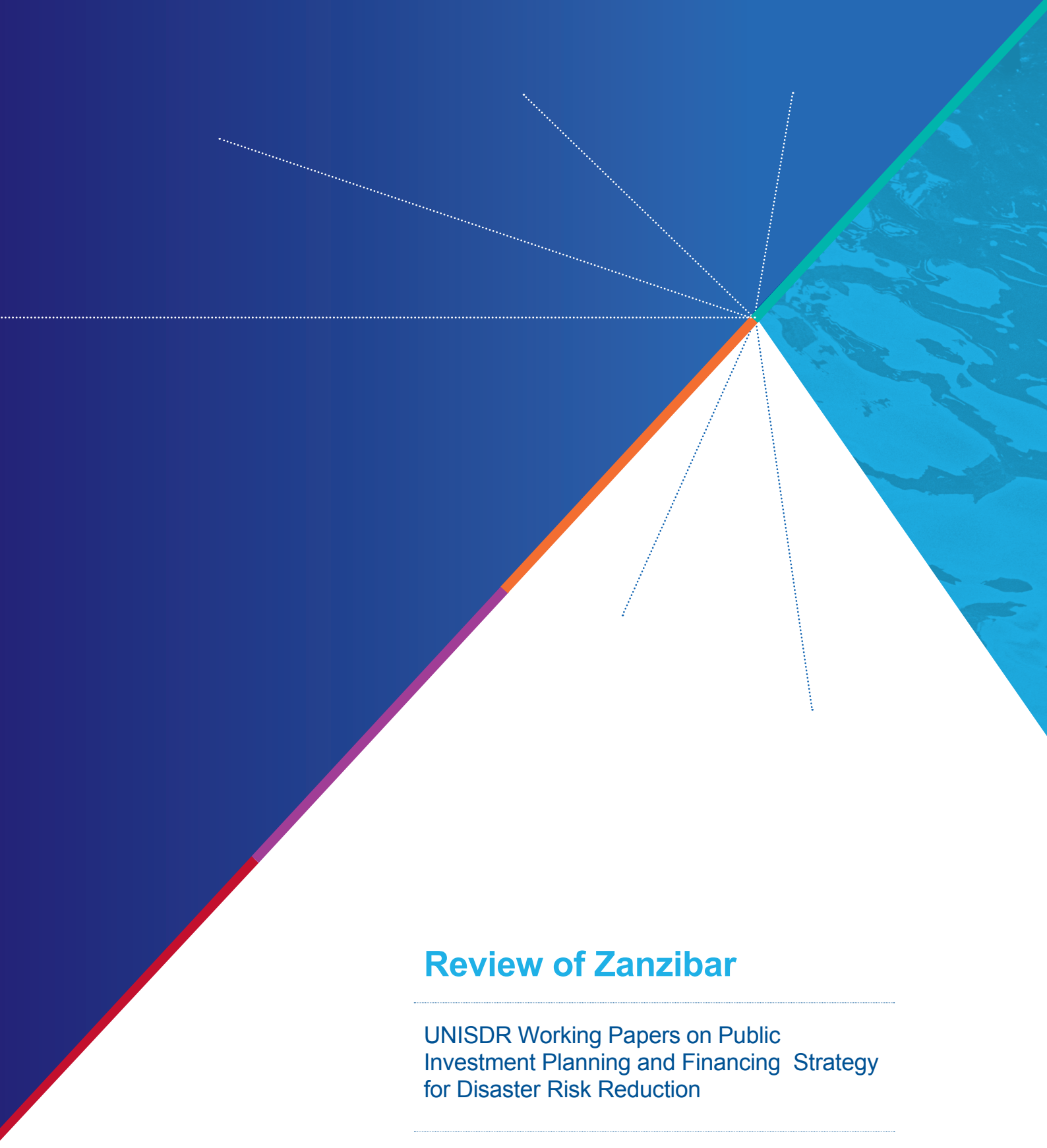

Review of Zanzibar

UNISDR Working Papers on Public Investment Planning and Financing Strategy for Disaster Risk Reduction

February 2015

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Review of Zanzibar

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UNISDR Working Papers on
Public Investment Planning and Financing Strategy for Disaster Risk Reduction

This series is designed to make available to a wider readership selected studies on public investment planning and financing strategy for disaster risk reduction prepared for use in co-operation with Member States. Authorship is usually collective, but principal authors are named.

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Working Papers describe preliminary results or research in progress by the author(s) and are published to stimulate discussion on a broad range of issues on disaster risk reduction.

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List of Acronyms

AAL	Annual Average Loss
BoT	Bank of Tanzania
CAPRA	Comprehensive Approach for Probabilistic Risk Assessment
CATSIM	CATastrophe SIMulation
CBA	Cost Benefit Analysis
CCA	Climate Change Adaptation
DMD	Disaster Management Department (SVPO)
DRM	Disaster Risk Management
DRR	Disaster risk Reduction
EIA	Environmental Impact Assessment
EU	European Union
FVPO	First Vice President's Office
GAR	Global Assessment Report on Disaster Risk Reduction
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
HFA	Hyogo Framework for Action
ICT	Information and Communication Technologies
IFMS	Integrated Financial Management System
IIASA	International Institute for Applied System Analysis
IMF	International Monetary Fund
IOC	Indian Ocean Commission
JICA	Japan International Cooperation Agency
NDRRMC	National Disaster Risk Reduction and Management Centre
NGO	Non-Governmental Organization
NPV	Net Present Value
PML	Probable Maximum Loss
RSBR	Risk Sensitive Budget Review
SIDS	Small Island Developing States
SVPO	Second Vice President's Office
TASAF	Tanzania Social Action Fund

UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
URT	United Republic of Tanzania
WB	World Bank
WCDRR	World Conference on Disaster Risk Reduction
ZDMF	Zanzibar Disaster Management Fund
ZMC	Zanzibar Municipal Council
ZRA	Zanzibar Revenue Authority

Acknowledgements

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This report was mainly drafted by Mr. Gerard Hendriksen, consultant in Zanzibar, and by Ms. Kazuko Ishigaki (UNISDR) who also coordinated of the overall development of this report. Substantial help to the drafting process (especially Annex A) was provided by Ms. Lezlie Moriniere. Annex B and C were drafted by Ms. Junko Mochizuki, Mr. Stefan Hochrainer, Mr Reinhard Mechler, Mr. Keith Williges (Annex B only) and Callahan Egan (Annex C only) of International Institute for Applied Systems Analysis (IIASA). Many valuable inputs were received from Mr. Sylvain Ponserre from UNISDR (disaster loss of Chapter 2) and Ms. Mabel Cristina Marulanda Fraume from UNISDR (disaster risk of Chapter 3). The overall project including organizing a series of workshops was coordinated by Mr. Julio Serje (UNISDR). Ms. Lezlie Moriniere edited the publication.

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Executive Summary

In 2013, following a grant agreement signed between UNISDR and the Indian Ocean Commission, a joint UNISDR/ISLANDS project was started entitled "Strengthening Capacities for Unified Climate Change Adaptation and Disaster Risk Reduction Through the Facilitation of Risk Transfer and Financing Mechanisms". It was implemented within the "ISLANDS Programme for Financial Protection against Climatic and Natural Disasters". It also forms a part of UNISDR's global project for around 30 countries: "Building Capacities for Increased Public Investment in Integrated Climate Change Adaptation and Disaster Risk Reduction: 2012-2015" financed by the European Union.

Four island countries in the Indian Ocean as well as the Government of Zanzibar participated in the ISLANDS programme composed of three components: the establishment of reliable disaster loss database (Component 1), risk evaluation and probabilistic risk assessment profiles (Component 2) and incorporation of risk management into public investment planning (Component 3). Economic analysis and policy reviews were developed as a package. This report aims to summarize all activities implemented in the project with a focus on public investment planning (Component 3) while a technical report on Components 1 and 2 is also available[1].

As a first step (Component 1), data cards on disaster losses and events between 1980 and 2013 were registered in a national disaster loss database. Though over 150 cards were registered, the loss records due to natural hazards were only ten. Economic loss due to natural hazards is estimated at approximately USD 1.3 million (2012 constant price) and most of the loss was due to fire (USD 1.1 million). In the following probabilistic risk analysis (Component 2), Average Annual Loss (AAL) for seismic risk was estimated at USD 0.2 million, with Probable Maximum Loss (PML) of USD 1 million for a 100-year return period.

The loss and risk information highlighted the need to reduce risk to natural hazards. However, it, in itself, did not suggest policy guidance. Based on loss and risk analysis, a thorough policy review and economic analysis were implemented (Component 3).

CATSIM analysis developed by IIASA identified that Zanzibar has sufficient fiscal resources to cope with its earthquake risk, even in the case of catastrophic event (500+ year event). However, this is due to relatively low seismic risk in the country. The main hazards that Zanzibar is facing are droughts and floods and it is predicted that these will be aggravated by climate change. For those hazards, Zanzibar should collect more loss data and develop probabilistic risk assessment. Based on the loss and risk information, CATSIM analysis should be applied to those more frequent risks.

The probabilistic cost benefit analysis (CBA) was implemented to examine the cost efficiency of the surface water drainage component of the Zanzibar Urban Service Project to reduce flood risks. The process and results highlight key challenges regarding limited loss data available in Zanzibar, which seems to lead to an underestimation of probabilistic benefit associated with the drainage improvement project. In spite of the reduction in expected annual losses of over USD 100,000, the project was evaluated to be cost-inefficient. Notwithstanding the results, it is meaningful to emphasize the importance of loss and risk information and to explain how probabilistic CBA can support specific evidence-based decision making

Based on these findings, current Disaster Risk Management (DRM) policy and especially public finance including DRR investment and risk financing mechanisms were examined. In spite of much progress in HFA implementation, no definite and systematic DRR investment policy exists in Zanzibar. Several sectoral ministries make risk sensitive investment implicitly. Cost benefit analysis, although required for large-scale projects, does not take disasters risk into consideration. Critical infrastructure may not be sufficiently protected against disaster risk and especially in the long term as effects of climate change become more obvious. Contingency financing mechanisms are also under-developed.

To explore the financial aspects of DRM policy, Zanzibar also estimated the current investment in disaster risk management by applying a DRM Marker method in an examination of national budgets, proposed for the OECD by the World Bank in partnership with UNISDR.

[1] For component 1 and 2, please see UNISDR /IOC (2014). Component 1 and 2: Comoros, Madagascar, Mauritius, Seychelles and Zanzíbar. Building capacities for increased public investment in integrated climate change adaptation and disaster risk reduction: 2012-2015. European Commission - Directorate General for Development and Cooperation. Geneva, Switzerland.

About 3 % (Tsh 21 billion, USD 0.2 million) of the budget 2014/2015 was estimated to be dedicated to DRM: 80% of DRM investment was through “significant” category that is embedded in development projects and mainly dedicated for prevention/mitigation. This represents the level of DRR mainstreaming in Zanzibar. Compared to AAL, this was a positive balance, but Zanzibar identified that budgets need to be linked to specific hazards (in this case earthquake) to be more meaningful. Much of the investment in DRR is related to expected impacts of climate change.

During several meetings with the Ministries of Finance in the IOC region, it was established that a scattered approach to DRM is inefficient and there is need for stronger collaboration between the DRM agency, Ministry of Finance and other key sectoral ministries. Continuous capacity building on risk terminology and concepts, loss and risk information management and economic analysis was recommended by Ministries of Finance in the region.

The loss and risk information should be examined from the perspective of both DRM policy maker and financial planners. Given the importance of public investment in DRR, continuous refinement of loss and risk information should be promoted through regular dialogue with data users. In the process of economic analysis, Ministries of Finance understood and appreciated the importance of loss and risk information. On some cases, they identified several mistakes and inconsistencies in the records in disaster loss databases and the data were corrected. Such exchanges of information will improve overall quality of knowledge management to support DRM decision making.

Government needs to develop investment and financing strategies to address both extensive (small scale but high frequency) and intensive (low frequency but high impact). Climate change will increase risks in terms of frequency, geography and intensity. Understanding risk structures and the expected economic impact in the country is the critical first step to determine the optimum policy mix for each risk layer. In developing investment and financing strategies to address disaster risk, DRR investment and risk financing should not be considered separately. Depending on risk layers, the most appropriate policy mix changes and DRR investment and risk financing are not mutually exclusive. For example, DRR investment often decreases insurance premiums.

This packaged approach with a focus on financial planners in government will be standardized and replicated in Asia, Africa, Latin America and other regions in the coming years and the knowledge is planned to be archived and presented globally in a working paper series of UNISDR on “Public Investment and Financing Strategy for DRR”. The report summarizing activities in IOC region will thereby contribute to increasing the global knowledge base.

Introduction: Conceptual Framework [2]

In 2012, the UNISDR started a project called "Building capacities for increased public investment in integrated climate change adaptation and disaster risk reduction: 2012-2015" under the financial sponsorship of EC-Development and Cooperation (EC-DEVCO). The initiative supports approximately 30 countries in Asia, Pacific, Africa, Latin America and the Caribbean to systematically account for disaster loss and to develop probabilistic estimations of future risk. It provides a baseline for an economic approach toward better public investment planning.

In the Indian Ocean Commission (IOC) region, this initiative has been separately planned and implemented in 2013-2015 in the cooperation with ISLANDS, in accordance with the project design developed by UNISDR and implemented through the "ISLANDS Financial Protection Programme against Climatic and Natural Disaster Risks".

The initiative has three components:

- Component 1: disaster loss
- Component 2: probabilistic disaster risk assessment
- Component 3: public investment planning

Component 3 of this initiative considers disaster risks in economic analysis to support and facilitate risk-proof public investment decision-making. It especially aims to contribute to the progress of HFA priority areas monitored through core indicator 4.6 "procedures are in place to assess the disaster risk impacts of major development projects, especially infrastructure" and 3.3 "Research methods and tools for multi-risk assessments and cost benefit analysis are developed and strengthened".

UNISDR has been in charge of designing methodologies for Component 3 and in the process, considered how natural science can be linked to social science to contribute to better decision making in public investment planning. In the Indian Ocean Commission (IOC) region, this project has been planned and implemented from 2013 to 2015 in cooperation with ISLANDS, in accordance with the project design developed by UNISDR.

This report summarizes all activities implemented for Zanzibar[3]. Chapter 1 introduces basic country structure as background. Chapters 2 and 3 outline loss and risk as the starting point of analysis. Chapter 4 briefly explains the DRR policies of the country. Chapter 5 outlines the current state of risk-sensitive public investment planning and risk financing policy as well as brief summary of three types of economic analysis implemented in the country.

In Component 3, we introduced tools a) to monitor DRM budgets to analyse the current state of public investment (called the "risk sensitive budget review"), b) to measure the impact of disasters on public finance and on the economy at the macro scale (CATSIM analysis), and c) to measure the impact of DRR investment on society (probabilistic cost-benefit analysis).

In Chapter 6, recommendations for policy makers are presented drawing from the analyses implemented. Annexes A, B and C provide theoretical and technical background and detailed case studies on each tool.

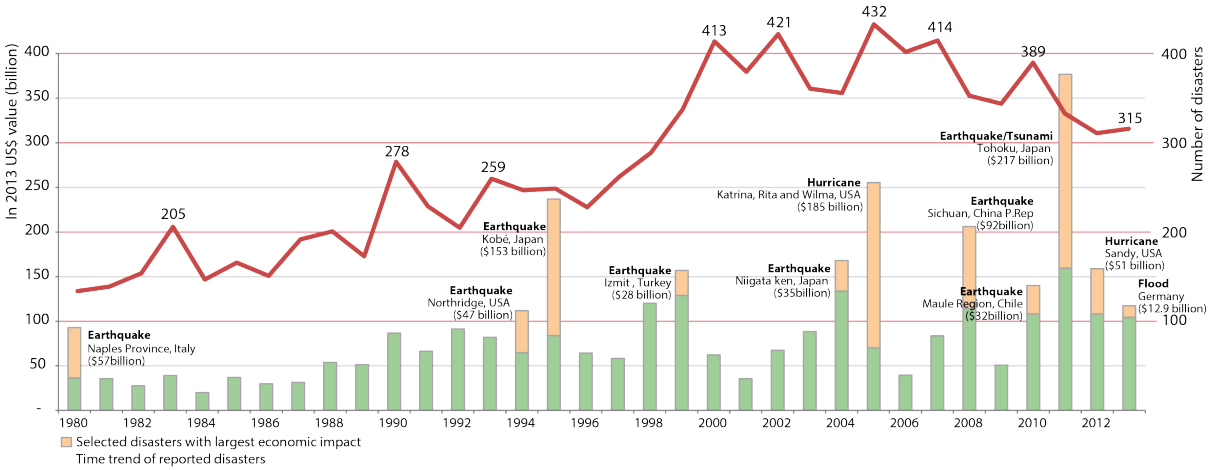
In this introductory chapter, the background, especially why we need risk-sensitive public investment, is explained. Then, the overall streamlined process from loss data analysis through probabilistic risk assessment into economic analysis is explained. Lastly basic concepts of economic loss are defined to provide a common understanding of key terminology.

[2] This chapter was drafted by Kazuko Ishigaki (UNISDR)
[3] A series of workshop/meeting implemented in IOC region are listed in Annex D.

A. Background: what are challenges?

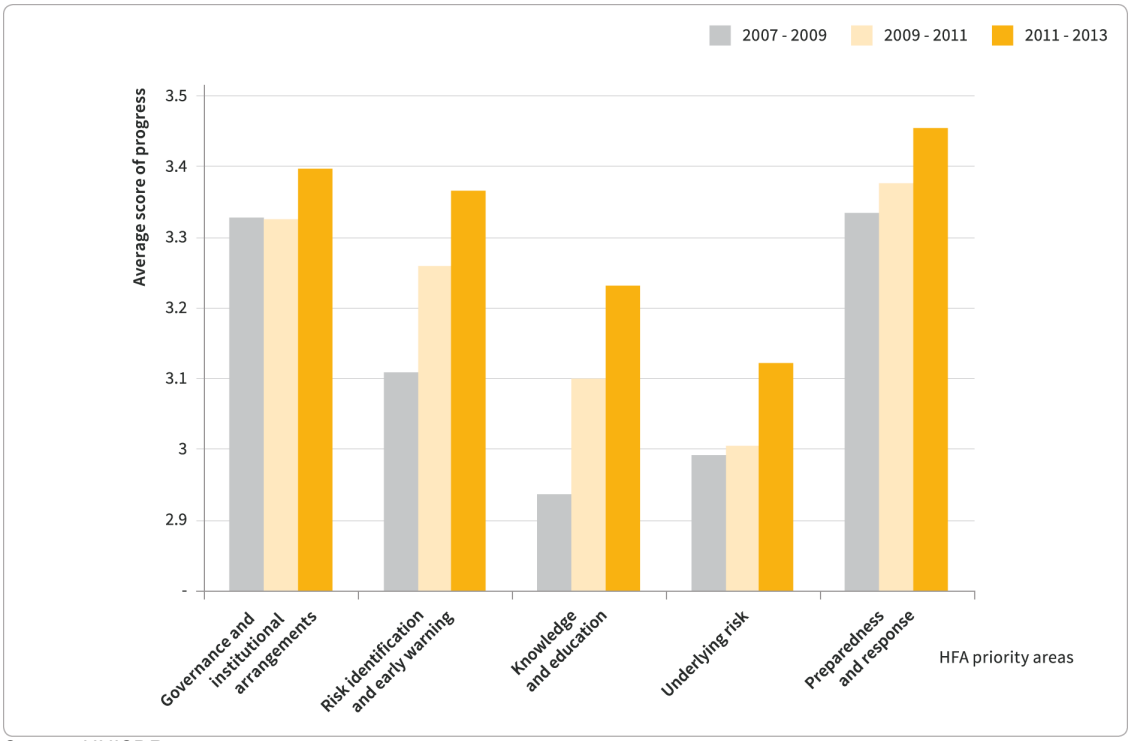
Why do we need to promote risk-sensitive public investment? First of all, economic loss due to disasters has been increasing in spite of substantial progress in DRR policies promoted by Hyogo Framework of Action (HFA) (Figure 1 and Figure 2). HFA priorities have been progressing in all areas mainly due to the effort of DRM agencies. Especially during the past decade, capacity in monitoring and risk assessment has been developed in many countries.

Figure 1: Economic loss due to natural disasters, 1980-2013



Source: EM-DAT

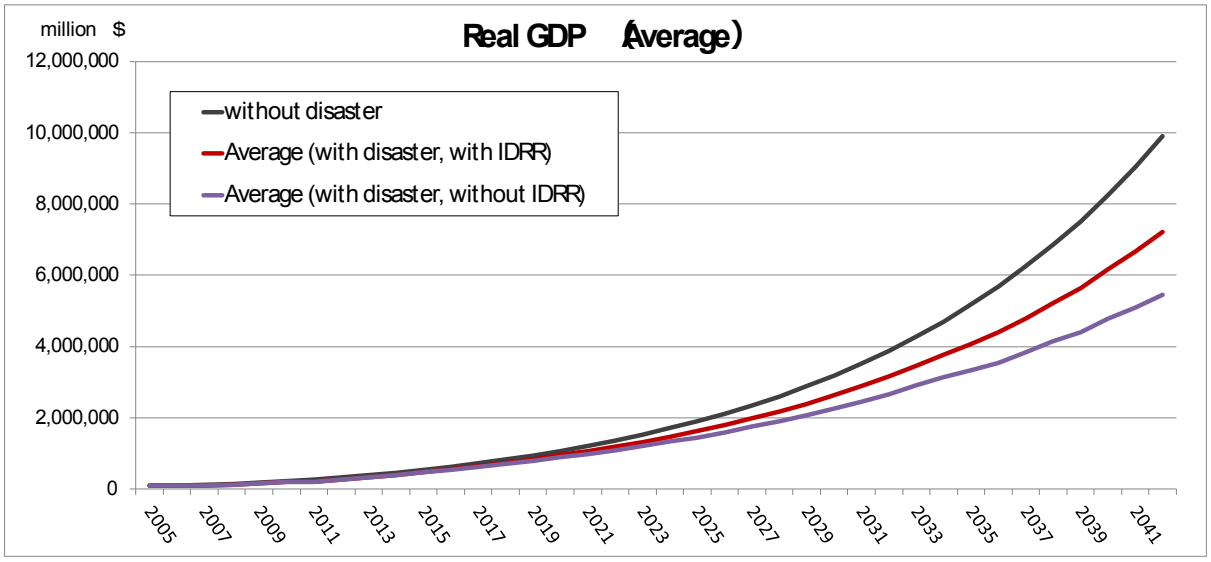
Figure 2: HFA Progress



Source: UNISDR

Disaster interrupts or slows down economic growth by damaging public and private infrastructures and negatively affecting people and economic activities. Figure 3 portrays the Pakistan GDP growth estimate calculated by JICA, clearly demonstrating that disasters will slow down economic growth and that DRR investment will mitigate the impact.

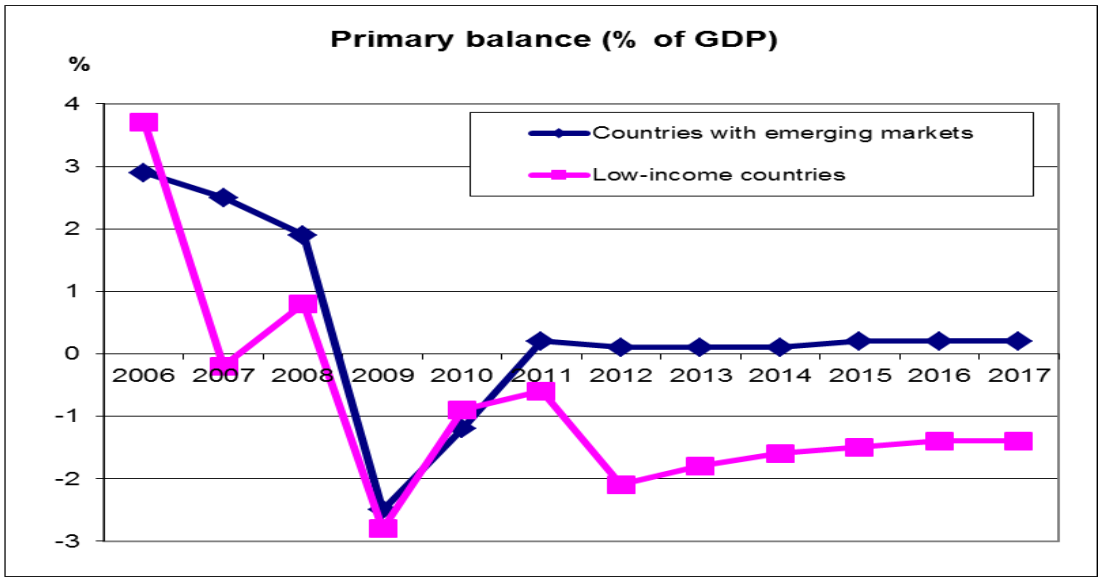
Figure 3: Pakistan GDP estimate, 2005-2041



Note: IDRR means DRR investment.
Source: Author based on the figure provided by JICA

Secondly, to reduce the impacts of disaster, governments need to invest in DRR. However, governments in most countries are suffering from tight budget constraints. Fiscal primary balance is expected to be negative in the coming years (Figure 4). The financial situations of low-income countries are especially tight. If we consider the debt and interest payment of many developing countries, the budgetary situation would be even tighter than the graph portrays.

Figure 4: Primary balance (% of GDP), 2006-2017[4]

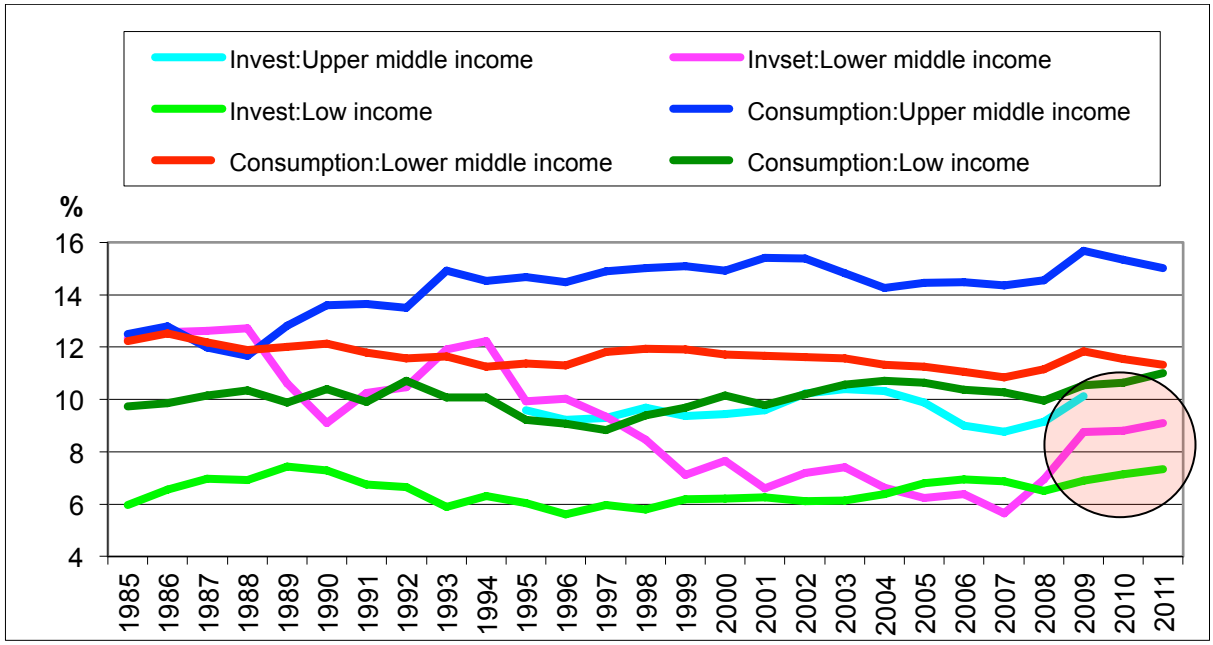


Source: Author based on IMF

[4] The primary balance is the difference between a government's revenues and its non-interest expenditures; it is the most accurate reflection of government fiscal policy decisions. A country with a primary deficit, for example, spends more on roads, schools, defense, than it takes in from taxes and other revenues. Source: http://www.imf.org/external/np/fad/histdb/.

Going deeper into the details of public finance, we can see the additional influence of budget constraints. Figure 5 portrays how public investment has been under pressure due to constant or increasing financial need for government consumption. Public investment, especially in low and lower middle-income countries, is very volatile. On the other hand, in spite of these constraints, public investment is significant, recently representing 6 to 10 % of GDP in developing countries. Governments must protect the hard-won fruits of these investments.

Figure 5: Government consumption and investment (% of GDP), 1985-2011



Source: Author based on the World Bank Development Indicators

Why does disaster risk matter in public finance? Although "risk as opportunity" has become an attractive political motto, on the ground, disaster risk simply represents costs for financial planners (both public and private) and society. While we often focus on disaster loss and impacts, the overall cost of disaster risk is a summation of a) ex-ante DRR investment and risk financing mechanisms, b) post-event response, recovery and reconstruction cost and c) disaster loss and impacts. The cost of disaster risk management distracts financial resources from other priorities regardless of ex-ante or post event efforts. The impact of disaster risk on public finance should be considered based on the overview of these three categories of costs.

Recently there is increasing attention on risk-sensitive private investment (GAR2013). However, disaster risk management mechanisms should be first considered as an issue of public finance because national governments assume primary responsibility to protect people and assets from disasters, and the risk preventive infrastructure represents public goods to remedy the problem due to market failure.

In economics, **public goods** are characterized both as non-excludable and non-rivalrous in that individuals cannot be effectively excluded from use and use by one individual does not reduce availability to others. Classic examples of public goods include street lighting, police service, and fresh air and water. Paul A. Samuelson, in his seminal paper of 1954 entitled *The Pure Theory of Public Expenditure*, defined a public good (what he called "collective consumption good") as follows: "[goods] which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtractions from any other individual's consumption of that good."

Disaster risk reduction mechanisms are also public goods satisfying conditions of non-excludability and no-rivalry. Sea walls and early warning system protect many people and assets at once and do not exclude anyone. The

problem of public goods is that no one wants to pay for the service and the goods are likely to be under-produced (*i.e.* free-rider problem[5]).

The argument of public goods is closely related to **market failure** in economic theory. Market failure is a situation in which the allocation of goods and services by free market is not efficient. Market failures are scenarios in which the individual pursuit of pure self-interest leads to results that are not efficient – that can be improved upon from the societal point of view[6]. The typical causes that lead to market failures include lack of information, externalities, or public goods.

When private sector does not properly assess the disaster risk, it tends to over-invest. While it is important for all members of society to properly recognize disaster risk, risk assessment is often costly and beyond the capacity of small and medium enterprises.

Furthermore, the impact of disasters can be felt beyond private sector investment and spill over to society (*e.g.* damaged factory interrupts traffic and prevents response activity or interrupts production causing income decrease of the employee). In this case, portions of disaster costs are transferred to others in society. This phenomenon is called negative **externality** in economics. When externality exists, private sector does not have incentives to decrease investment in hazard prone areas even if they properly understand the risk. Government needs to commit to disaster risk management mechanisms precisely to provide sufficient risk information to society and thereby remedy the lack of information and externality problem.

Assuring sufficient disaster risk management mechanisms reduces exposed and/or vulnerable areas and facilitates private investment in such areas. In this sense, disaster risk management mechanisms constitute important infrastructure supporting economic development of society. That is also a reason why government needs to commit to integrating disaster risk in public investment planning.

In spite of **decentralization** trends, the role of national government does not diminish. Disaster risk management infrastructure, such as sea walls, are often very costly and beyond the financial ability of local governments. Given the positive externality of such infrastructure, national governments are justified to financially commit in the investment. Catastrophes such as Indian Ocean tsunami in 2004 (just before HFA adoption) and Great East Japan Earthquake in 2011 (whose experience will influence post-2015 Framework for DRR informally called HFA-2) refocused the role of national government on their capability to prepare for and respond to intensive disaster risk. In the context of developing countries, accumulated impacts of low-to-mid scale disasters damage local level capacity and need support from national governments.

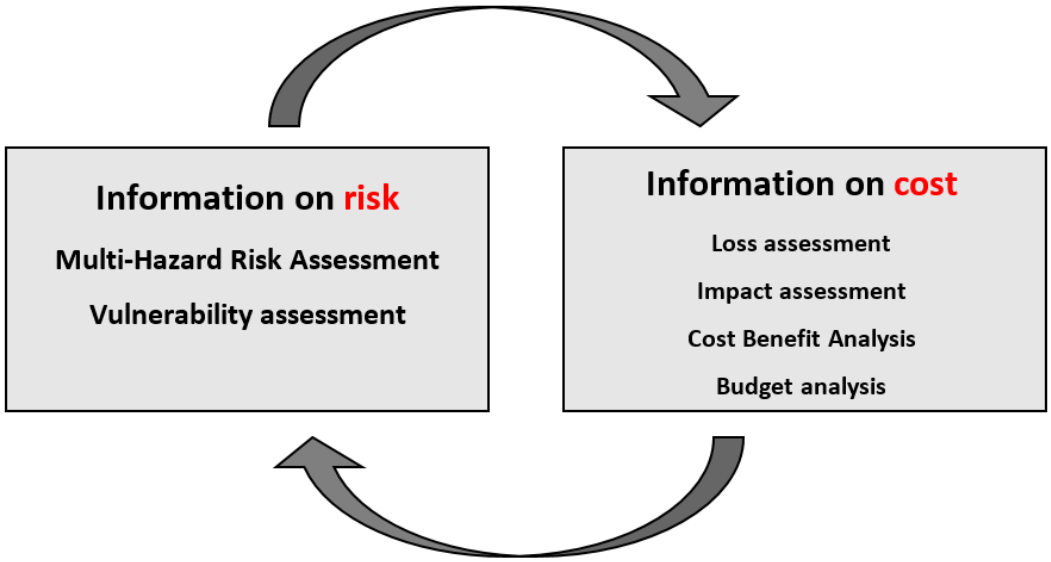
In case of catastrophe, horizontal risk transfer mechanisms such as insurance may often not be sufficient. DRR investment is, unlike risk transfer mechanism, considered inter-generational risk sharing. Following the definition of sustainable development by the Bruntland Committee, only development that addresses the existing risks without compromising the ability of future generations to address them should be promoted.

In summary, public investment in disaster risk management is theoretically justified and commitment of national level government is critical in spite of decentralization trends.

What are the gaps to be filled? It is important to focus on the lack of linkages between natural science and social science, especially in economics. Risk information produced by natural science is not well connected to cost information examined by social science. Even when risk information exists, if it is not linked to cost information, it is difficult to promote DRR Investment (Figure 6). For example, Solomon Islands states "If policies based on risk information would lead to increased project costs, *budget constraints may limit utilization of the risk information. Promoting cost benefit analysis is necessary in order to counteract this "*[7].

[5] Typical examples of free rider problem include congestion in public roads and pollution of air and water.
[6] A socially desirable state is called Paleto Optimum in economic terms.
[7] HFA Report of Solomon Islands, 2009-2011 Reporting Cycle

Figure 6: Required linkages between risk information and cost information



Source: Author

Related to the lack of cost information is an opportunity cost issue. Ministries of Finance are not concerned only about disaster risk. They need to respond to other competing country priorities. In many countries DRR is not a high priority and policymakers tend to allocate limited financial resources to other urgent needs such as poverty reduction, education and public health. It is also difficult to explain why there is *a sense of urgency surrounding DRR*, a challenge that often leads to problems securing financial resources. A classic dilemma for policy makers is whether they can justify giving up investment in growth and in order to invest in DRR? In other words, risk needs to be examined through a socio-economic lens in each country.

In the DRM cycle, response, recovery and reconstruction also place pressure on the allocation of DRR budgets. Reconstruction and compensation for those affected is imminently needed in the majority of cases. In such situations, budget restructuring following a disaster often takes money away from DRR for use in reconstruction. To assure sufficient money for DRR investment, it is necessary to be able to justify the cost effectiveness of that DRR investment –as compared to expenditure in response and reconstruction.

What exacerbates this difficult situation even more is that most countries do not have DRM labelling or dedicated budget lines for DRM in their public accounting system. So they don't know how much they spend on DRR, response and reconstruction. Sectorial DRR is especially hard to label, as it is often embedded in larger projects. For example, earthquake proof school building is included under the larger category of school building so that the part of budget dedicated to strengthen the facility is not visible, making investment tracking almost impossible. Not having a DRM budget monitoring system results in the inefficient use of resources and an insufficiency of funds. Without knowing their current budget status, countries cannot properly evaluate the current level of DRM and estimate how much funding is required for further promoting DRM activities. Nepal claims "*The budget allocated for disaster preparedness and mitigation is spread among different projects which render it ineffective. There is a need to develop and implement a financial tracking system to monitor all DRR related expenditures for mitigation, preparedness and emergency response*"[8].

Considering all, the key questions that governments must tackle would be, "how much money should be allocated to DRM in total?" and "how to decide the most efficient and effective allocation of money between risk reduction and risk financing?" (Table 1). Subsequently, more specific issues need to be examined: the design of risk sensitive investment mechanisms and risk financing mechanisms (*i.e.* appropriate combination of contingency funds, insurance and other tools).

[8] HFA Report of Nepal, 20xx

Table 1: DRM structure

Risk reduction			Risk financing		Disaster management	
Prevention	**Mitigation**	**Preparedness**	**Transfer**	**Proactive retention**	**Response**	**Reconstruction**
e.g. **land use planning**	***e.g.*** **housing retrofitting**	***e.g.*** **contingency planning**	***e.g.*** **insurance**	***e.g.*** **contingency fund**	**Emergency management**	**Build back better**

B. Streamlined process for evidence based decision making

Given challenges identified in Section B, how to combine risk and cost information? The initiative introduced a five-step process (Figure 7). The first step was to identify loss trends and produce risk profile (mainly activity of Components 1 and 2). Subsequently, the current state of DRR policy, public investment policy and budget was examined to verify the gap between risk and DRR efforts. Expected impact on public finance was examined with more detail using the CATSIM model. Lastly, to examine the degree a DRR policy could mitigate the negative impact of a hazard, probabilistic cost benefit analysis was conducted. It is of note that there should be a cost benefit analysis for all kinds of DRR policies and this initiative presented a methodology using only one example. These analyses, combined, are expected to provide insights on and facilitate evidence-based decision making for risk-sensitive public investment planning.

Figure 7: Overall design to support evidence based decision making

STEP 1: Identify loss trend and produce risk profile

(Loss analysis, risk assessment)

STEP 2: Check the gap between the risk and current levels of DRR policy

(Policy review, budget review)

STEP 3: Measure the impact of disaster on economy and public finance

(Macro-economic analysis)

STEP 4: Measure the impact of investment on DRR

(Probabilistic Cost Benefit Analysis)

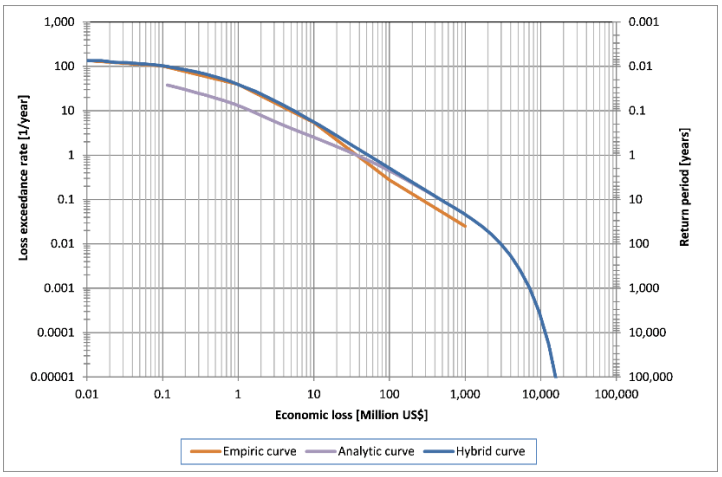
STEP 5: Political discussion based on evidence

(What to do with the gap between risk and current DRR?)

Source: Author

Understanding loss and risk in a country is the first step to evidence-based decision making. Loss and risk data present what has historically been lost and what is likely to be lost in future. Both loss and risk information contribute to produce hybrid curves portraying all possible combinations of probability of an event happening and the expected loss (Figure 8) in all risk layers including intensive (low frequency and high loss) and extensive (high frequency and small loss) (See Chapters 2 and 3). However, as outlined above, this information alone cannot determine how much should be invested in DRR.

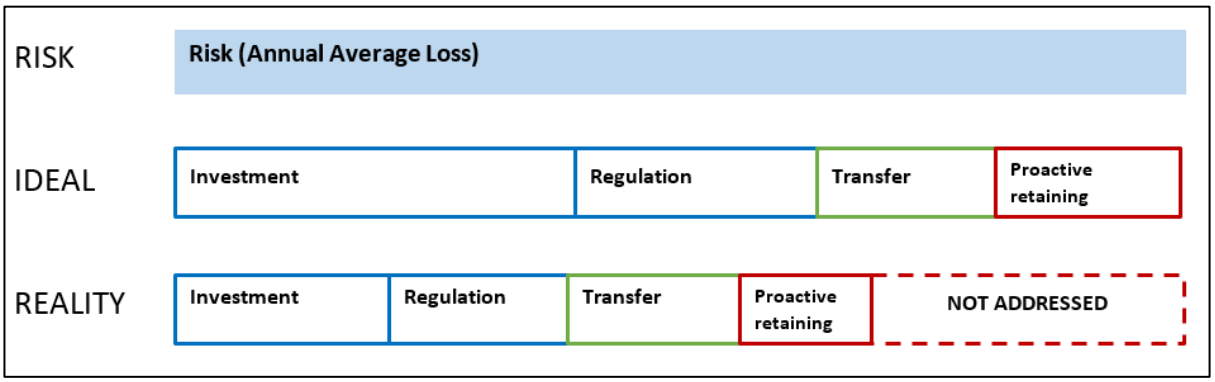
Figure 8: Hybrid loss exceedance curve



Source: UNISDR

Step 2 aims to determine the gap between risk and current levels of DRR policy. An examination of current DRR and investment policies and a comparison between risk levels and DRR investment will provide insights on how much investment in DRR is needed to fill the gap (Figure 9). (See Chapters 4, 5 and Annex A).

Figure 9: Gap identification, drawn from budget and policy analysis



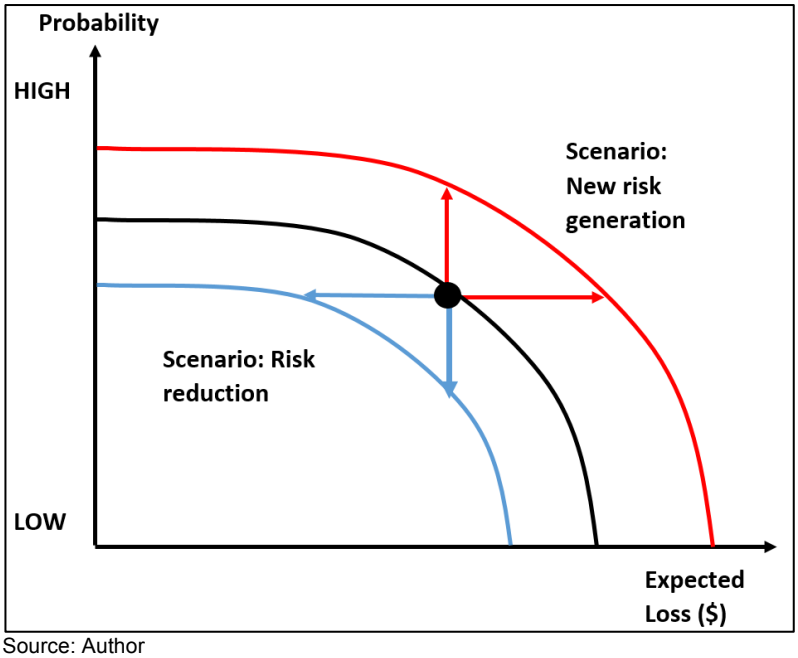
Note: Impact of investment usually lasts for certain project periods and therefore reduces AAL the following year.

Source: Author

Step 3 measures the impact of disaster on economy and public finance, to further verify the expected impact of disasters on a country. The focus is not necessarily limited to direct loss and indirect loss, and macro-economic impacts are considered to a certain extent depending on the model. In the Indian Ocean Commission (IOC) region, the CATSIM model developed by IIASA and taking indirect loss to a certain degree was used to measure the impact of disasters on public finance (See Chapters 5 and Annex B).

Step 4 aims to measure the impact of policy on DRR. Some policies are more cost efficient than others, meaning that such policies reduce risk more with less investment. Cost benefit analysis is implemented in this step. (See Chapter 5 and Annex C). DRR policy can shift the risk curve inward (i.e. lower frequency of event happening and/or decrease of expected loss) (Figure 10).

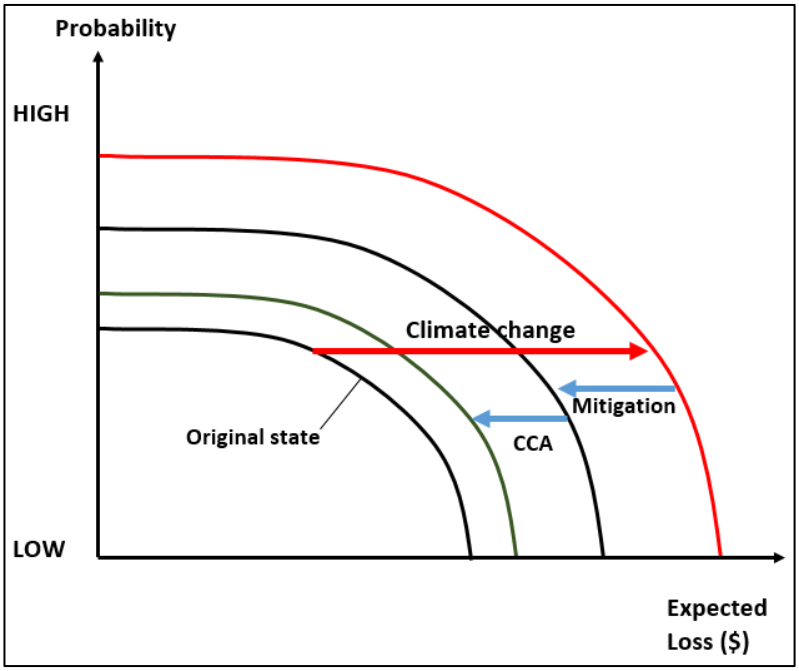
Figure 10: Shift of loss exceedance curve by DRR investment (blue) and new risk generation (red)



Source: Author

Climate change will also influence loss exceedance curve. However, investment in mitigation and adaptation can reduce the total cost. This is graphically expressed in Figure 11. Climate change will shift the curve upward while mitigation and CCA will work to shift the curve to original position. Climate change impact can be integrated into economic analysis of disaster risk applying the same methodological concept when disaster and climate change risk assessment are integrated.

Figure 11: Climate change impact

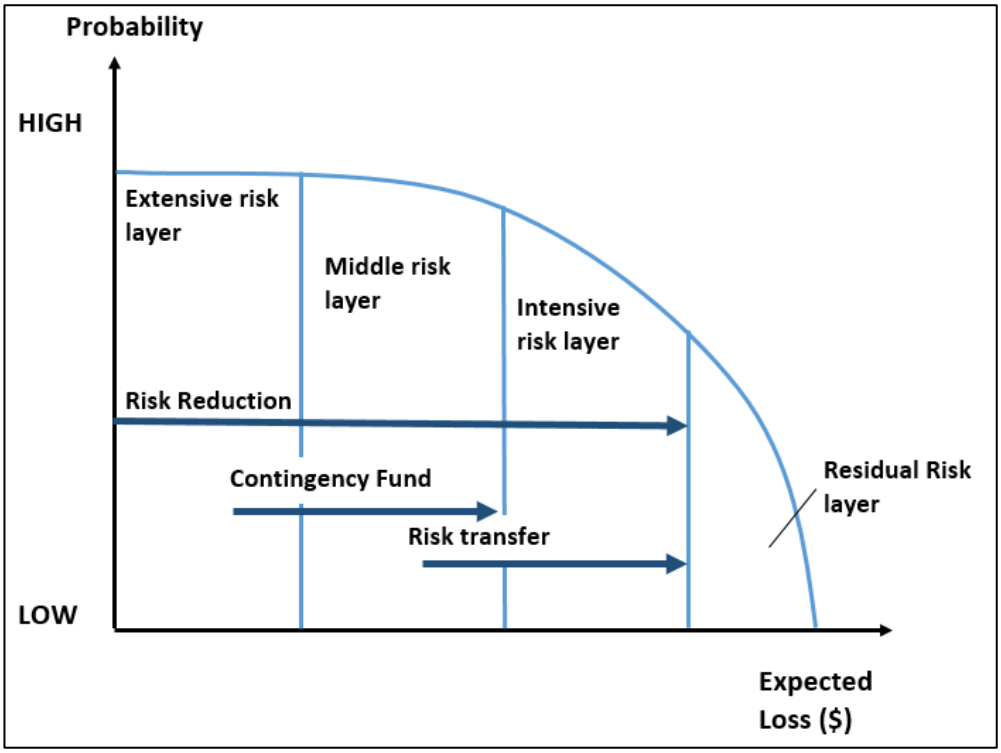


Source: Author

These analyses, in combination, suggest that a risk-layered approach is crucial to manage disaster risk (Figure 12). In the extensive risk layer (high probability and low expected loss), investment for risk reduction is basically the most cost-efficient. However, some measures for risk reduction (*e.g.* emergency drills as preparedness) can be cost-efficient (and efforts should be devoted to) all risk layers. However, in the intensive layer (low probability

and high expected loss), risk reduction is often an unaffordable and prohibitive option. Regarding risk financing, contingency funds will be effective in middle risk layers. However, to prepare for intensive risk, risk transfer schemes, such as insurance, would be more cost-efficient. It is important to note that DRR efforts decrease the scope for risk financing mechanisms, bringing risk premiums down and making insurance more affordable. DRR investment and risk financing mechanisms, therefore, should be considered in synergy to identify the optimum mix in public finance policy.

Figure 12: Risk layered approach

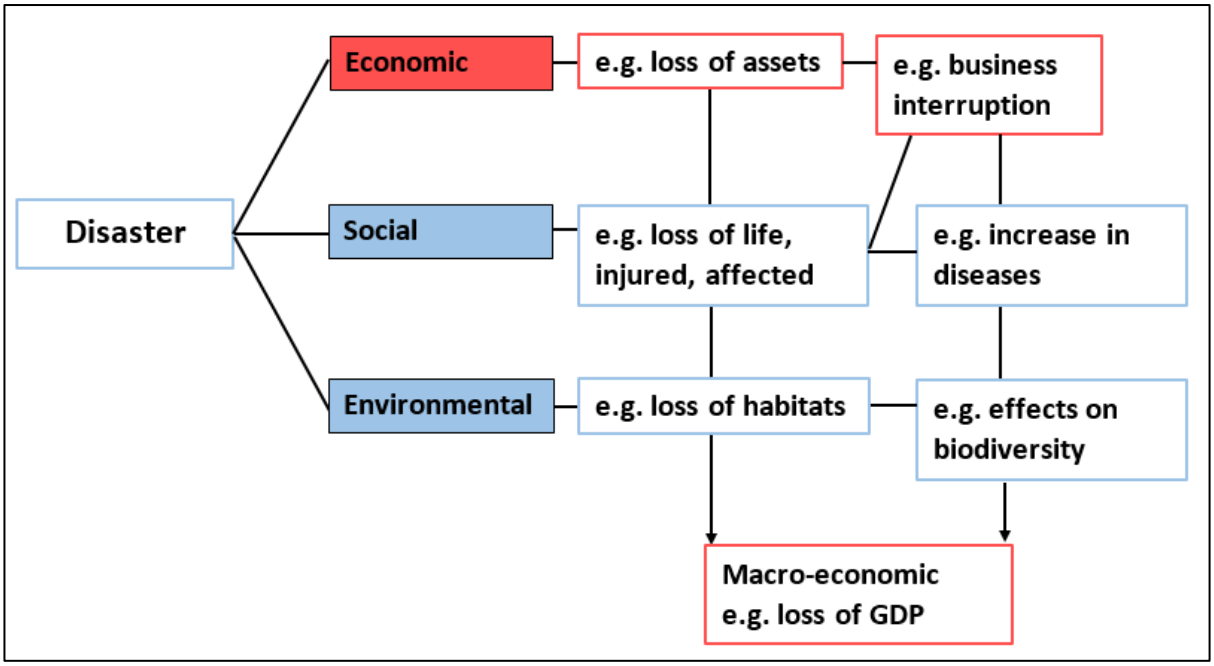


Source: Author

C. Basic concept of economic loss: direct loss, indirect loss and macro-economic impact

Disasters have diverse impacts on society; they are often categorized into economic, social and environmental impacts (Figure 13). Economic impacts include, for example, loss of assets and business interruptions. Social impacts include death, injury and changes to the functioning of communities, to name a few. Some impacts are both economic and social. For example, increased poverty and unemployment would be interpreted from both perspectives. Environmental impacts are for example, loss of habitats for animals and deforestation due to natural fire. When these are all combined, disaster can have a macro-economic impact, for example, the reduction of GDP and trade balances. Economic analysis only focuses on the economic impacts of disaster.

Figure 13: Impact of Disaster

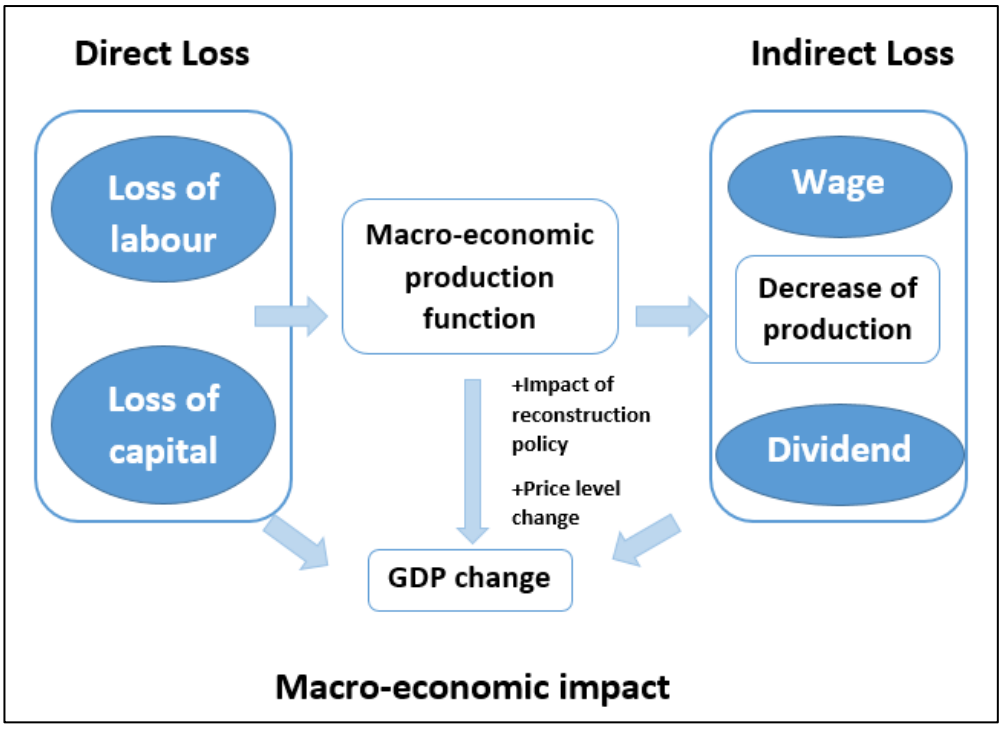


Source: Author

It is important to clarify the difference between direct loss (physical loss centred), indirect loss and macro-economic impact at the start of analysis (Figure 14, Table 2). National disaster loss databases often focus only on direct loss. Probabilistic risk assessment is also often limited to physical impacts of disasters. In these cases, economic analysis based on available loss and risk data will also be limited to direct loss only. The initiative underway in this project is not an exception. Our focus in the cost benefit and CATSIM analyses is on direct physical loss and does not include indirect loss and macro-economic impact[9].

[9] CATSIM analysis includes indirect loss to certain extent because it considers "implicit liability" of government, which means compensation to the affected. For Madagascar, the impact of public finance on macro-economy was also estimated.

Figure 14: Direct loss, indirect loss and macro-economic impact



Source: Author

Table 2: Direct loss, indirect loss and macro-economic impact

	Direct loss	Indirect loss	Macroeconomic impact
Typical examples	Loss of capital stock	Loss of economic activities (e.g. Business interruption) after the event	GDP Inflation trade balance
Time frame	Within the first few hours	Up to multiple years	Up to multiple years
Concept	stock	flow	flow

Source: Author

C.1. Direct loss

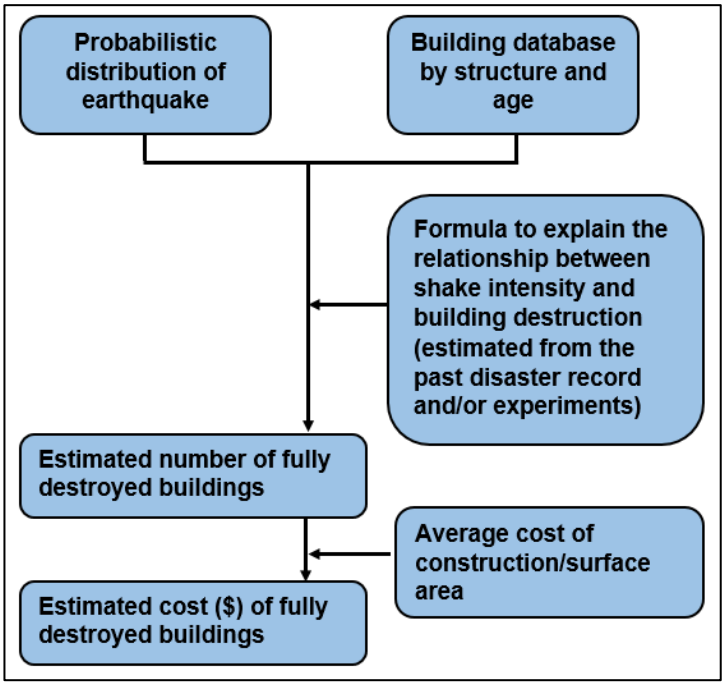
Direct loss is nearly equivalent to physical damage. Examples include death and loss to physical assets such as damaged housings, factories and infrastructure. Direct losses usually happen within the first few hours after the event and are often assessed immediately after the event to estimate recovery cost and claim insurance payment. These are tangible and can be relatively easily measured. However, there are still technical challenges, for example, how to assign monetary value to such damage. Or, should direct losses should be estimated as purchased value, book value[10] or replacement cost[1112]?

[10] Book value means the current value of the asset on accounting book taking depreciation into consideration.
[11] Replacement cost can be cheaper than the price at which the asset was purchased. For example IT machines usually have become much cheaper during this decade. In this case, loss reported using purchased price means overestimation of the loss.
[12] Due to lack of data availability and urgent need to identify the recovery costs, replacement costs are often used in the world as a practical solution.

There is another important issue in measuring direct loss; "How to evaluate human loss?" There are some methodologies, for example, that evaluate human loss as lost income. However, this remains an on-going debate among economists because assigning monetary value to human life is an ethical issue, considered morally wrong. If we use the lost income approach, the life of a rich person is more valuable than a poor person. But sometimes, monetary value is assigned to human loss. For example, after 911, NY City estimated the monetary value of human loss in the World Trade Center, Many were high income, young to middle-aged people who pay high taxes and consume and invest heavily in the NY economy. The economic planner of city government practically would have needed the economic and financial impact of loss of such people, but this is a very rare case. It is not common to monetize human loss[13].

In the case of earthquake impacts on building assets, if data on probabilistic distribution of earthquake hazards, building by structure and age, and the past disaster record are availabe, we can estimate the value of expected building damage. If we multiply the number of houses destroyed by average cost of construction, then we can estimate monetary value of such building loss (Figure 15[14]).

Figure 15: impact of earthquake on building



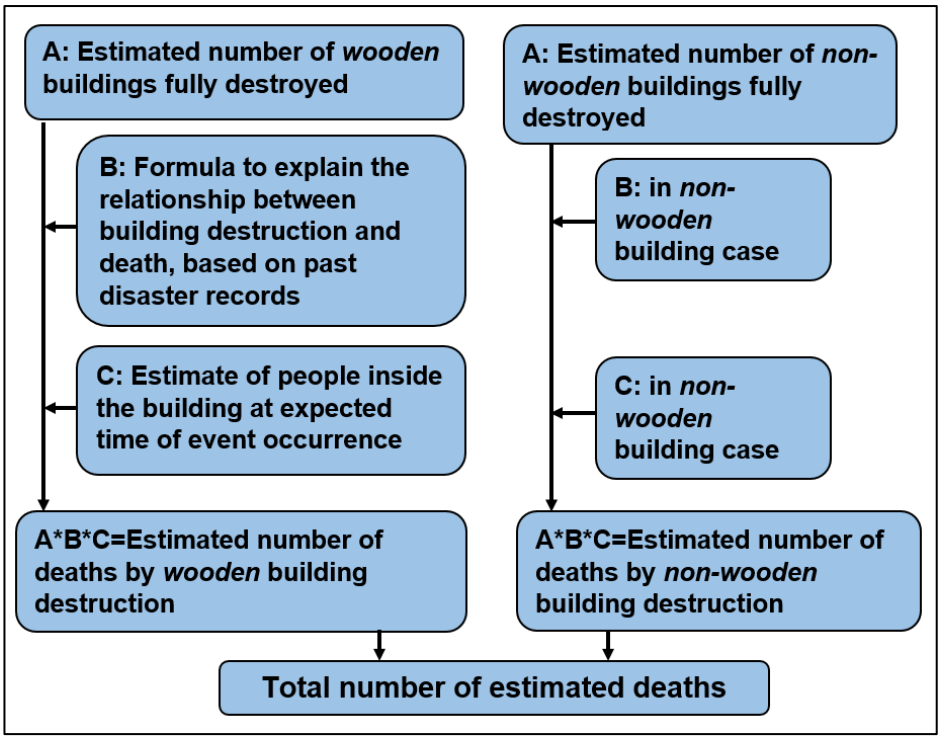
Source: Author

Regarding human loss due to earthquakes, if similar data such as probability, building structure and age, and past disaster records are available, then we can also estimate mortality.

[13] This does not necessarily mean policy makers should not evaluate human loss at all. Most economists simply claim that human loss should not be evaluated at monetary value. Human loss should be counted as number of person killed, injured etc. Cost-effectiveness approach is developed for economic evaluation to determine options, for example, to reduce mortality. In a similar way to cost-benefit analysis explained in Annex C, this approach compares several options and evaluates cost-efficiency given certain objective such as x % reduction of mortality.

[14] The formula in the figure is often called "vulnerability function" in probabilistic risk assessment.

Figure 16: Mortality estimate process



Source: Author

It is clear from the examples that we need to have risk profiles, past loss data and baseline data, for example number of buildings by structure and age to estimate the loss.

C.2. Indirect loss and macro-economic impact

Indirect loss is more complicated. For example, a reduction in labour force and physical capital will cause business interruption and therefore a decrease in production. The reduction of production might be instantly recovered but most often it lasts several years. Damage to economic activity, therefore, should be monitored over a longer period. Indirect losses are conventionally estimated within maximum of five years; it is reported that most loss occurs in the first two years after the disaster. Measurable impacts are often loss to production and income due to destruction of physical assets[15]. Though these indirect losses might be seemingly measurable, it is difficult to isolate the impact of disaster from others, for example, global financial crisis[16]. Technically speaking, to estimate indirect loss, it is necessary to have a "production function" linking labour and capital with production.

There are immeasurable indirect losses, which can be positive or negative, for example, human suffering (negative) or increased sense of mutual help (positive). Though they are not easily measurable, it is important to recognize such issues.

Macro-economic impact is much more complicated, because economic activity is interlinked. For example, production decreases are likely to push prices upward, if demand level remains stable. The rise of price level will increase interest rates[17]. High interest rates will bring private investment demand down. Reconstruction activity through public spending might produce effective demand for depressed economy but might crowd out private investment in growing economy. To estimate macro-economic impact, it is important to model the causal relationship of all these factors. Macro-economic impacts such as GDP, inflation and trade balances will often

[15] Decrease of production will impact the wage level and dividend level.
[16] Another difficult issue would be for example, that lost product has two prices, which are producer price and consumer price. When measuring production sector's loss, then producer price would be more appropriate. On the other hand, if it is desirable to measure the loss from the interrupted service, consumer price would be better.
[17] The reason for this increase is because people want to withdraw money from the bank, and banks need to set high interest rates, as incentives to maintain deposit levels.

persist for several years and should also be monitored over time. They are conventionally estimated within maximum of five years after disaster events.

Indirect loss and macro-economic impacts are highly analytical and the results change depending on many factors. First, the result depends on geographic scale, for example, municipality, region, or nation. For example, the impact of the Great East Japan Earthquake on the national economy is estimated to be negative (*i.e.* a loss in production). But if we look at the regional scale, while Miyagi prefecture including Sendai City-- severely affected by the tsunami-- had a negative impact, Tokyo had a positive impact --an increase in production to cover the loss in Miyagi prefecture.

Second, the result depends on the time an impact is estimated. As time passes, more information is gathered but some information will also be lost. For example, the estimate of one month after the event usually cannot integrate the impact of reconstruction activity on macro economy. In the case of intensive disasters, even after one year, the impact of reconstruction activity cannot be fully evaluated.

Third, the result also depends on the availability of baseline economic scenarios. The impact of a disaster on the macro economy should exclude other factors. For example, if the economy has been declining for the past decade and is likely to decline in coming five years, even if the GDP decreases after the disaster, that might be reflecting the general economic trend more than the event itself.

Forth, the results depend on the definition of impact, which is likely to be politically influenced by main concern for society and its policy makers. In case of 911, the Asia-Pacific Economic Cooperation (APEC) estimates included the increase of security costs. After Niigata earthquake of Japan --which also caused nuclear power plant problems, though much smaller scale than Fukushima, Niigata prefecture included an estimate of the impact of "reputation loss" due to the nuclear problem.

C.3. Macro-economic impact

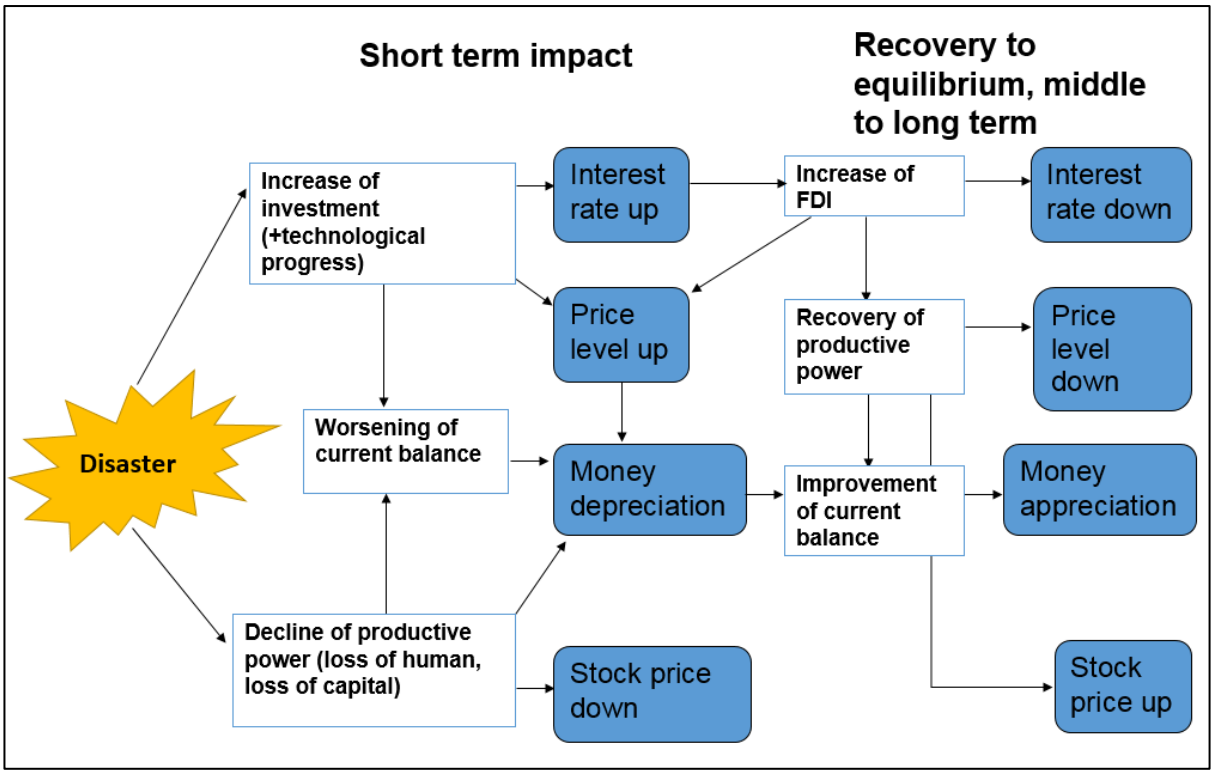
In analysing macro-economic impact, it is very important to analyse the impact from supply and demand sides and short and long-term perspective (Table 3). From supply side, decrease of production due to capital loss can be observed as a negative impact in the short term. However, in the long term, replaced new and more productive factories can improve efficiency and produce positive impact. From the demand side, decline of income, asset value, and population can be all observed as negative impacts in the short term. However, reconstruction demand can have a positive impact, especially for depressed economies that lack effective demand. The total impacts can be evaluated as the balance of supply and demand side impacts. A macro-economic model is constructed based on many assumptions reflecting causal relationships that impact both the demand and supply sides.

Table 3: Macro-economic impact

		Short Term Impact	Long Term Impact
Supply	Decline of production capacity due to capital loss	Negative	
	Technological progress (*e.g.* replacement of factory)		Positive
Demand	Decline of income	Negative	
	Decline of asset value	Negative	
	Population decrease	Negative	Negative
	Reconstruction demand	Positive	Positive

Source: Author

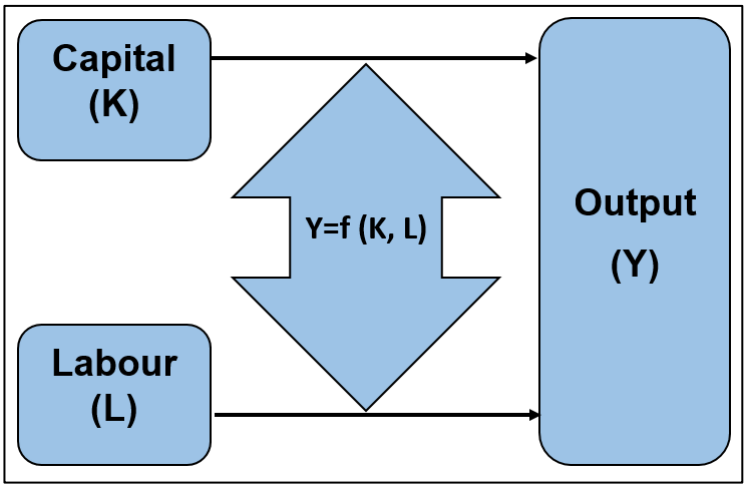
Figure 17: Example of economic modelling



Source: Author

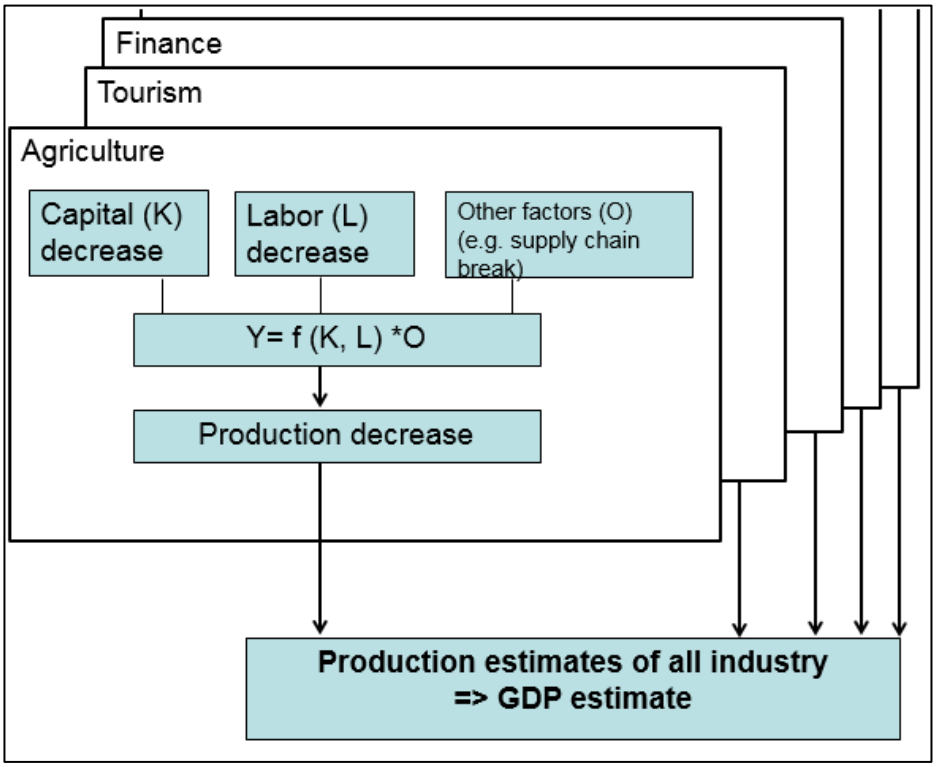
When macro-economic modelling is not available or a more micro-level approach is more practical, a sectoral-based approach might be preferable. The essence of estimating economic impact is in how disasters impact labour and capital --the two most important factors for economic growth (Figure 18). If capital and/or labour decrease, production will decrease based on the production function. Each sector, or even each company, has a different production function. Those results will constitute GDP estimates (Figure 19). Sectors often assessed are infrastructure, schools, hospitals, energy etc. However, when summarizing them, we need to be careful about double-counting and the inter-relationship between sectors. When each sector is not well coordinated, double-counting often occurs. Inter-relationships between sectors also should be checked using an input-output table, if possible.

Figure 18: Production function



Source: Author

Figure 19: Production function by sector

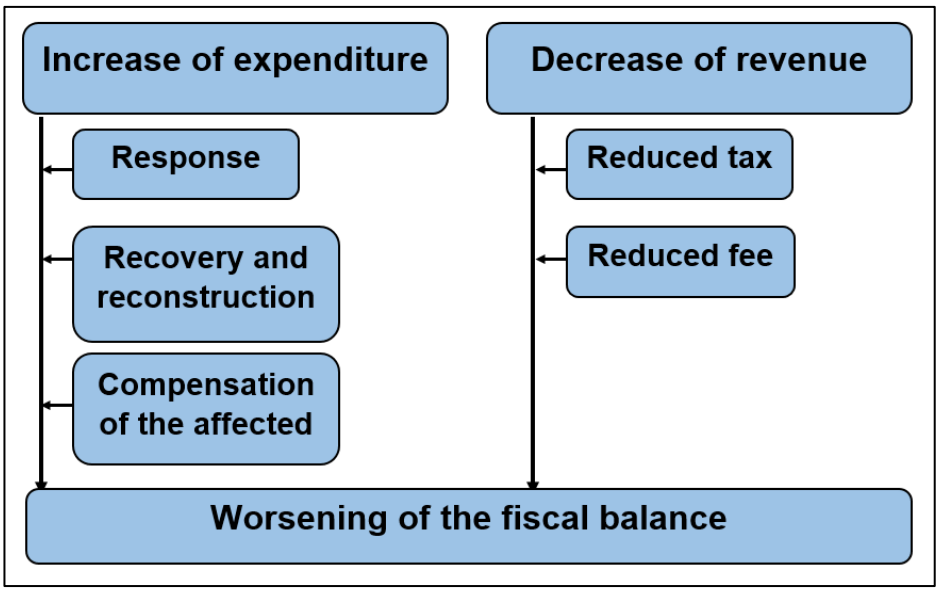


Source: Author

C.4. Impact on public finance

When considering the impact of disasters on public finance, similarly we need to explore the demand and supply sides of public finance. On the demand side, increased need for expenditure in response, recovery and reconstruction are always observed. On the supply side, decrease of financial resources by reduced tax and fees can be also noted. Therefore, fiscal balances almost always worsen (Figure 20).

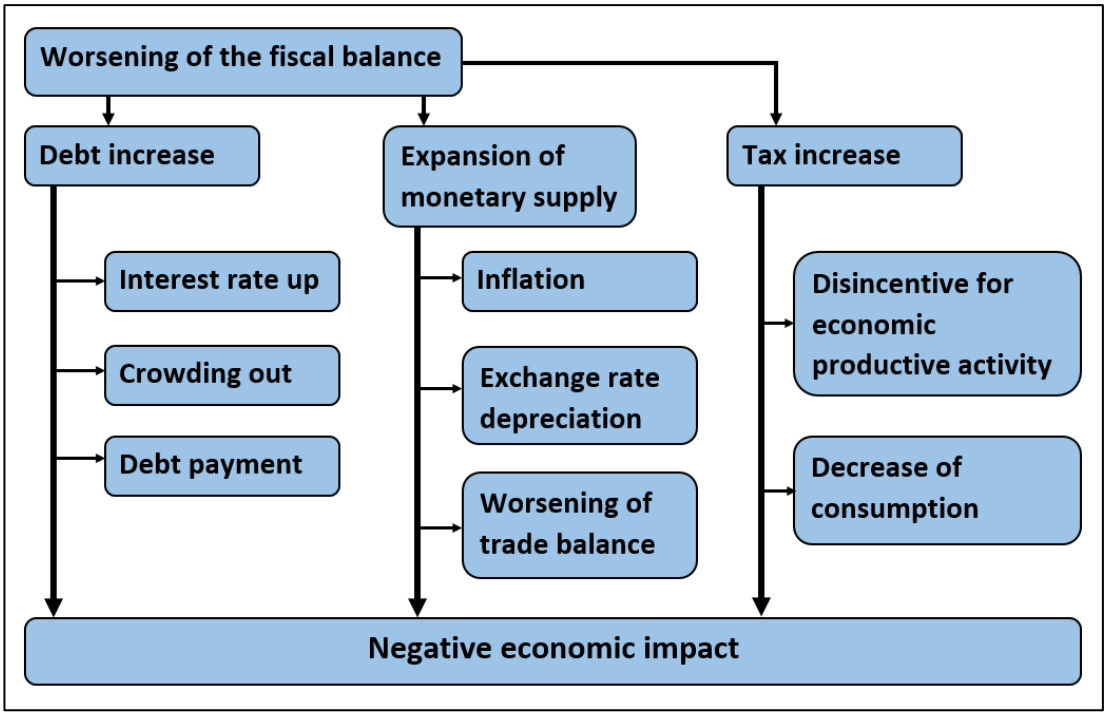
Figure 20: Fiscal impact of disasters



Source: Author

A worsened fiscal balance often has a negative impact on the macro economy. Figure 21 below presents three cases of a negative chain of fiscal impact: debt increase, expansion of monetary supply, tax increase. Whichever option a government takes, it will have a negative impact on macro-economy. IIASA's CATSIM model estimates the impact of public finance on macro-economy.

Figure 21: Relationship between fiscal impact and economic impact



Source: Author

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IMF

World Bank Development Indicators

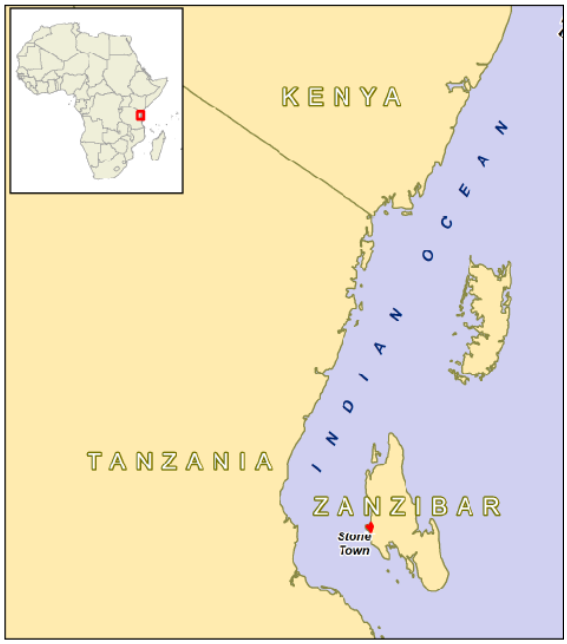
1. Country Structure[18]

The Zanzibar islands (Unguja and Pemba) are located about 5 – 6 degrees south of the equator (Figure 22). The total land area of Zanzibar is 2,560 km2. Unguja is 1464 km2 and Pemba 985 km2. The islands are mainly low lying with highest points of 120 and 95 meters, respectively.

Zanzibar enjoys a tropical climate with mild temperatures with an average annual high of 30.3^0 C and low of 23.5^0 C. The islands have relatively high levels of precipitation with long rains in March to May, and shorter rains in November to December. The dry season lasts from June to October. However, there are differences across the two islands (Unguja and Pemba) in temperatures and average rainfall and considerable variability across years. El Niño and La Niña are important factors in the annual weather patterns.

Figure 22: Islands of Zanzibar

A. Zanzibar Islands and the coastline of Tanzania mainland



B. Unquja and Pemba Islands

[18] This chapter was drafted by Gerard Hendriksen

A. Population

The Table 4 below provides some of the most important population data. Most of the data are based on the Population and Housing Census carried out in Aug 2012.

Table 4: Zanzibar population information

Description	Data	Source of data
Total population	1,303,569 (2012)	Population census 2012
Population Density (people/km2)	530 (2012)	
Population growth	2.8% (av 2002-12)	
Average household size	5.1 (2012)	
Urban population (% of total population)	47% (2012)	
Age dependency ratio	86%	UNFPA; Youth in Zanzibar, Facts and figures, 2012
Population below national poverty line)	44% (2009)	Household Budget Survey 2009/10
Literacy rare (% of population age 15+)	Men 90.5% and women 81.4% (2010)	Tanzania Demographic Household Survey (TDHS), table 3.3.1 page 36
Human Development Index	0.66	Zanzibar Human Development Report 2009. Data from 2002/03

The Population Census of 2012 reports that 47% of the people live in urban areas. The Town District (Zanzibar Municipal Council, ZMC) which includes Stonetown, the heritage site and neighbouring areas, counts 223,000 people (approximately 20% of total population) and is surrounded by the West District, with a population of 370,000 (approximately 30% of total population), mostly bordering the ZMC and adding to the urban sprawl. Other urban centres are much smaller in size, a maximum 3 to 5,000 inhabitants (Nungwi is the biggest with 10,000 people). These concentrations are therefore of a different scale than the ZMC area.

B. Political Structures

Zanzibar is a semi-autonomous state within the United Republic of Tanzania (URT) that was established in 1964 combining Zanzibar and the former Tanganyika. The relationship between these two countries is determined through the national constitution or “Katiba” which is currently being reviewed. This process is attracting much political attention as it can very well bring significant changes in the current arrangements.

Zanzibar has its own administration (the Revolutionary Government of Zanzibar of RGZ) composed of the Revolutionary Council (Cabinet of Ministers) and the House of Representatives with 81 Members. A total of 50 Members are elected by popular vote, 10 appointed by the President, five reserved for the Government appointed Regional Commissioners, 15 filled by women on a party basis in proportion to the elected seats and one seat reserved for the Attorney-General. Members serve five-year terms.

Zanzibar is also represented in National Assembly of the URT. Security, foreign affairs, immigration, monetary issues (Central Bank), deep sea fishing and oil and gas are among the so-called union matters while all other affairs are directly governed by Zanzibar.

After the last general elections held in 2010, Zanzibar formed a coalition government between the most popular parties: the Chama Cha Mapinduzi (CCM) and the Civic United Front (CUF), which in the previous elections had often violently clashed. The current president of Zanzibar is Ali Mohamed Shein and there are two Vice Presidents, one of them being the leader of the CUF. There are 16 Ministries and a total of 28 Ministers and Deputy Ministers (Table 5).

Table 5: List of ministries in Zanzibar

	Ministry
1	Office of the president includes the Planning Commission and the Regional Administration
2	First Vice President Office (includes Department for Environment and Climate Change Unit)
3	Second Vice President Office (includes Department for Disaster Management)
4	Ministry of Finance
5	Ministry for Public Services and Good Governance
6	Ministry of Constitutional Affairs and Justice
7	Ministry for Infrastructure and Communication
8	Minister for Education and Professional Training
9	Ministry for Health
10	Ministry for Lands, Housing, Water and Energy
11	Minister for Agriculture and Natural Resources
12	Ministry for Livestock and Fisheries
13	Ministry for Social Welfare, Women and Children Development
14	Ministry for Information, Culture, Tourism and Sports
15	Ministry for Trade, Industries, and Marketing
16	Ministry for Labour, Peoples Economic Empowerment and Cooperatives

Source: http://zanzibar.go.tz/

The Zanzibar Planning Commission (ZPC) in the President's Office coordinates the country's Sectorial Development and Poverty Reduction strategy (MKUZAII) which is in line with the international Millennium Development Goals and national ambitions.

The Department for Disaster Management is administered under the Second Vice President's Office while the Department of Environment and the new Climate Change Unit falls under the First Vice President's Office.

The local Government in Zanzibar is administered under the President's Office. The country is divided into five regions (three in Unguja and two in Pemba) and these are further sub-divided into 10 districts and 331 Shehias. The Government appoints the Regional Commissioners. Another important institute of the local Government is the Zanzibar Municipal Council, which is responsible for the largest urban settlement in the islands. This includes Stone town, which is a UNESCO World Heritage Site and is a major tourist attraction.

C. Economic Structures

Table 6 below provides an overview of the key economic data of the country over the period of the last five years (all figures in USD real terms).

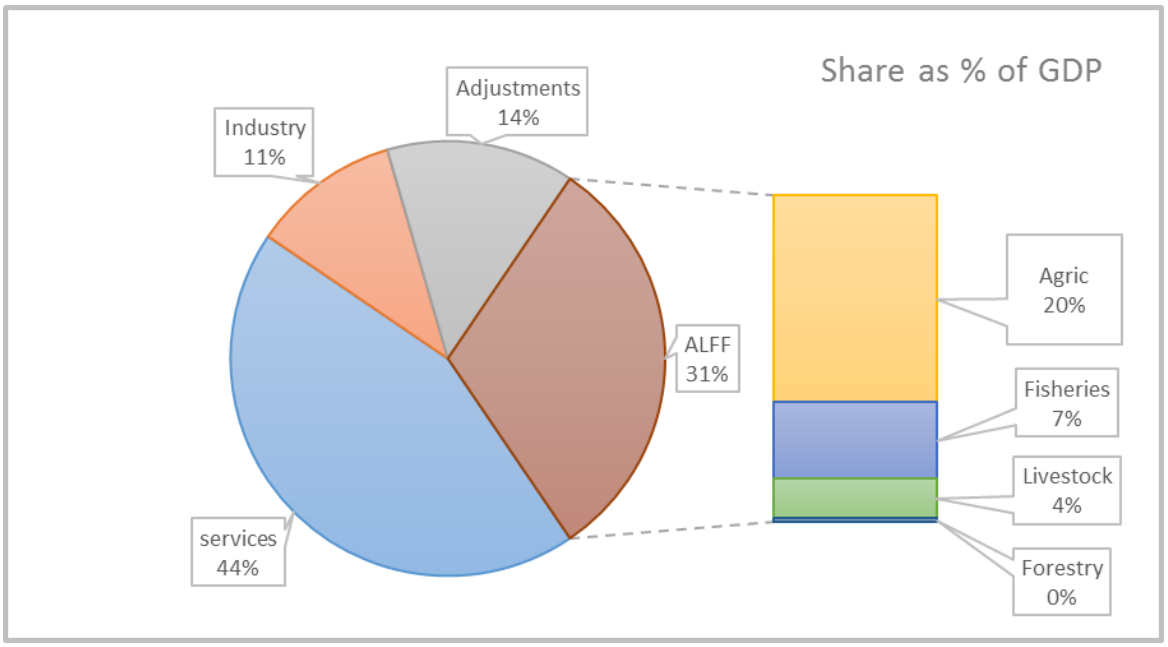
Table 6: Zanzibar key economic information

	2009	2010	2011	2012	2013
GDP (USD million)	670	675	766	854	893
GDP/Capita (USD/cap)	555	557	614	655	667
Gross capital formation (USD million)	128	128	146	165	145
Current account balance (USD million)	-7	6	-12	69	-34

Source: Socio Economic Survey 2013.

Zanzibar's GDP is reported in the Socio Economic Survey (SES) to be Tsh 1.442 billion (USD 892 million) for 2013. The most important sectors in the economy are services (which includes trade and tourism and the natural resources (ALFF: agriculture, livestock, fisheries and forestry). The shares of the national GDP in 2013 are represented in the graph below (Figure 23).

Figure *23* GDP 2013 by sector



Source: Social Economic Survey, adapted by author.

The **tourist** sector has become an important driver in the economy. The sector has grown rapidly over the last ten years and the records show total arrivals of 181,000 tourists for 2013. The tourist business is concentrated on Unguja island where there are hundreds of hotels of different sizes and qualities mainly along the beaches on the east and north coasts. Pemba Island has very few tourist hotels and receives only a fraction of the number of guests. The tourist sector in Zanzibar has so far been little affected by disasters due to natural hazards as there are no extreme events recorded over the past years. Longer term impacts of climate change, however, might be more important as weather patterns change and beaches and coral reefs become more affected and weather patterns less predictable.

By far the largest share of the population still lives off Zanzibar's natural resources through crop and livestock production, fisheries and forestry activities. **Agriculture** is basically smallholder farming with a diversified range of crops. Among the food crops, rice is by far the most important cereal and cassava, banana and sweet

potatoes are the most important other food crops. Natural products account for about 85% of the total export value of Zanzibar and are dominated by cloves and clove products which were about USD 50 million in 2013. The export of the second crop, seaweed, is reported to have been USD 2.5 million. This makes the national economy very susceptible to changes in crop production and world market prices of cloves.

Fishing provides an income for the population along the coastline. Statistics show an increasing number of people engaged in this activity. For 2012, the fish catch was recorded at close to 30,000 tons and valued at Tsh 112 billion (about USD 70 million). Fish catches per fisherman are reported to be declining, as the number of fisherman increases and fish are more difficult to catch. The Zanzibar fishing fleet exists out of small traditional boats and very few of them are engine powered. Deep-sea fishing is regulated under the Union Government and licenses are provided to fishing vessels coming from various corners of the world.

The local **industry** accounts for 11% of the national GDP and focuses mainly on food and beverages (including bakeries). The islands do not have many large companies and Small and Medium Enterprises (SMEs) produce most of the goods.

D. Public Finance

Budget process

The Financial Year in Zanzibar runs from July to June as is the case in all countries in the East Africa Community. Each year, the Ministry of Finance (MoF) prepares guidelines for the budget for the following year and the medium term plan. Priorities are set according to the poverty reduction plan (MKUZAII) and maximum expenditures ceilings are provided for each ministry and budget entity (the 2014/14 budget shows 50 entities including Ministries, Commissions, Regions, security, police and fire services). The different Ministries and entities starting in February prepare budgets and the draft are submitted to Ministry of Finance by end of March. A review process takes place involving the MoF, the concerned ministry and members of the Budget Committee of the House of Representatives. The draft budget is provided in hard copy to the House of Representatives by end of May. The Minister of Finance presents the budget to the House in June where it is further debated and adjustments may be proposed and approved. In principal this process is completed before the end of June by the start of the new financial year on 1st July. However, there have been delays in the process. For the coming year 2015/16, the Government wants to move from a line item approach towards a Program Based Budget (PBB) that has already been piloted in a few key ministries and will be applied to all other institutions. This is expected to result in a more effective allocation of government resources according to the national priorities and objectives.

The MoF keeps track of the expenditures of the different line ministries using their Integrated Financial Management System (IFMS). Changes in the budget can be made during the financial year after approval by the Permanent Secretary of the concerned Ministries and institutes. After the closure of the financial year on 30 June of each year, the MoF prepares the overview of actual expenditures. The financial statements are verified by the Auditor General before an official and approved record is provided of the expenditures of the past financial year. This process can take four to six months. The review provides figures on total expenditures of a ministry or institution but not necessarily all the details of the budget lines.

Government Revenues and Expenditures

The Ministry of Finance is responsible for the collection of revenues and operates through two agencies: the Tanzania Revenue authority (TRA) which covers the whole of the United Republic and collects all customs revenues plus other taxes such as PAYE[19], company taxes and others. The Zanzibar Revenue Authority (ZRA) collects Value Added Tax, petroleum levies, airport services charges and excise duties, to name the most important ones.

The Table 7 below provides the Government Domestic Revenues aggregated from TRA and ZRA and other key figures of the Ministry of Finance in Zanzibar. The figures have been collected from the Socio Economic Survey published in March 2014 that provides data series of the last financial plus the four earlier ones. The data appear to show large difference between Government revenues and expenditures. A possible explanation is that the amounts budgeted for foreign aid sources have not always been forthcoming as quickly as the figures suggested.

[19] PAYE means Pay As You Earn system, a system of income tax withholding that requires employers to deduct income tax and remit the deducted amount to the proper government authority.

Table 7: Zanzibar key national financial data (US$ million)

	2008/09	2009/10	2010/11	2011/12	2012/13
Government domestic revenue	104	102	128	143	165
Government expenditure	178	233	249	245	217
Recurrent expenditure	61	82	189	180	171
Gross Public Investment (capital expenditure)	53	104	90	95	83
Foreign aid	36	79	68	73	65

Source: Socio Economic Survey March 2014

The Bank of Tanzania (BoT) publishes annual reports which also include figures on the Government revenue collection, expenditures and donor funding. The BoT reports that in each of the previous five years, the Government total expenditures were well below the proposed annual budgets. While the recurrent budget is usually only a few percentage points different, the capital expenditures are 40 to 60% below the planned figures. The reason given for this is due to unavailability of donor funding.

E. Other socio-economic elements

E.1. Youth education and employment

The population of Zanzibar is very youthful in character with 43.8% under 15 and 35% between 15 and 35 years old. Age dependency ratio (the proportion of dependents (people younger than 15 or older than 64) to the working-age population (ages 15-64)) is 86%. School enrolment rates have risen from 50.9% in 1990 to 81.5% in 2010, which is still behind the 95.4% recorded in the mainland and still some way from reaching the MDG 2 target of universal primary education. There have also been questions raised on quality of education as reported by the UNFPA report[20]. The same report also states that only 35% and 57% of young women and young men respectively are employed in 2012. Young women living in Zanzibar are almost twice as likely to be unemployed in comparison to the same cohort living in mainland Tanzania.

The Government is aware of the challenges posed by the rapid growing population. The MKUZA II targets vulnerable groups including youth. The strategy prioritizes the creation and support of economic activities in productive and service sectors that involve youth. Strategies brought forward in MKUZA focusing on youth are, amongst others, enhancement of implementation of Zanzibar employment policy, job creation and entrepreneurship programs and technical and vocational education.

E.2. Transport infrastructure and energy

Zanzibar has a dense network of surfaced and unsurfaced roads served by public transport (called *dala-dalas*) and private vehicles. Most places within the islands are within one to two hours reach from the commercial centres of the islands. Unguja has an international airport with 56,000 air movements (many of them small aircraft serving national destinations) and 925,000 passengers were recorded in 2013. Ferries connect the islands with mainland Tanzania and are reported to have moved about 2.8 million passengers in 2013. The Zanzibar harbour handles international container cargo as well as goods to and from the mainland transported by both traditional boats (dhows) and modern ships.

Over 50% of the population is connected to the electricity network that is much higher than in the other countries in East Africa Community but well below the other small island states. Electricity for the islands is brought in from the mainland through submarine cables of 100 and 20 MW capacity for Unguja and Pemba respectively. Stand by diesel generators of 25 MW and 5 MW respectively are only used in case of emergencies because of the high operating costs. This makes Zanzibar very dependent on mainland Tanzania for its electricity resources that can be considered a strategic good. The EU supports Zanzibar with a program focusing on renewable energy and energy efficiencies. Feasibility studies are being implemented for wind and solar power but financial costs and grid stability issues will determine their potential. Zanzibar is likely to remain dependent on mainland resources to supply the backbone of the grid.

[20] UNFPA; Youth in Zanzibar, Facts and Figures, 2012

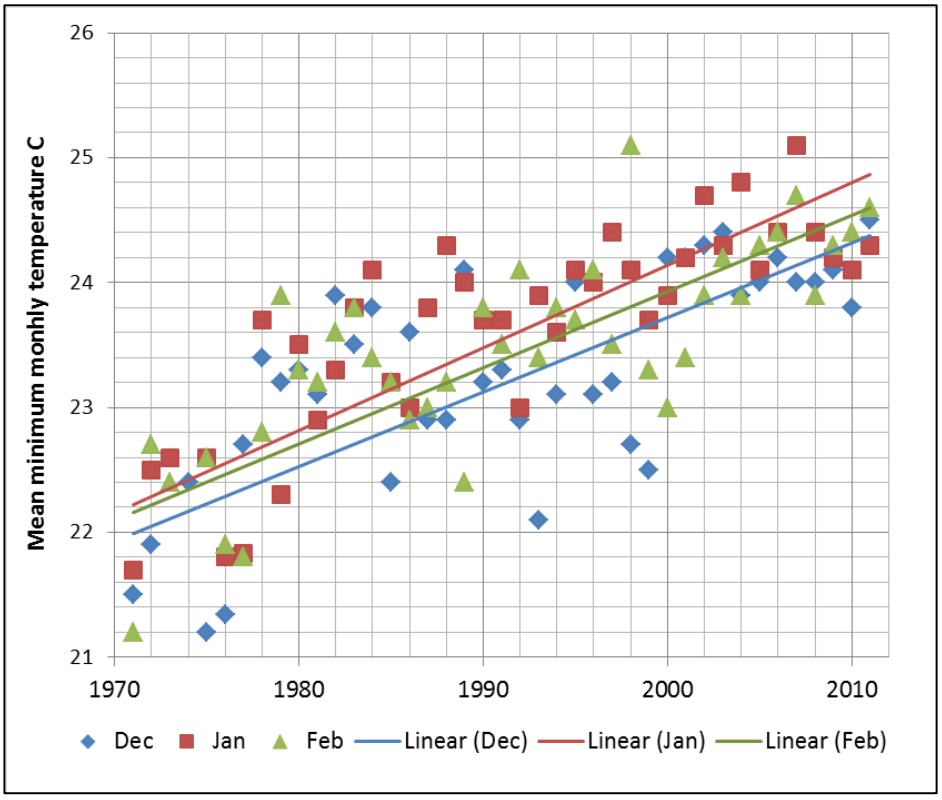
Wood, charcoal and biomass residues are by far the most important sources of fuel for cooking, resulting in serious pressure on natural forests, coral rag and other tree resources. Large quantities of charcoal and firewood are also imported from mainland Tanzania using local boats. Most of this trade is informal and discouraged because of the perceived damages it causes to the natural forests in the mainland.

E.3. Climate Change

Climate Change is already affecting the islands. Data of the Meteorological Authority show that minimum temperatures are – on average – around two degrees higher than thirty years ago (Figure 24). Changes in average annual rainfall do not appear to have changed significantly since 1971. However, the records do show a large variation in rainfall (from below 1000 mm to over 2500 mm) making agricultural production unpredictable (Figure 25).

The Climate Change Strategy also provides information on changes in sea water level and increasing wind speed. The latter is particularly important and seems to be contributing higher and stronger waves and increased beach erosion.

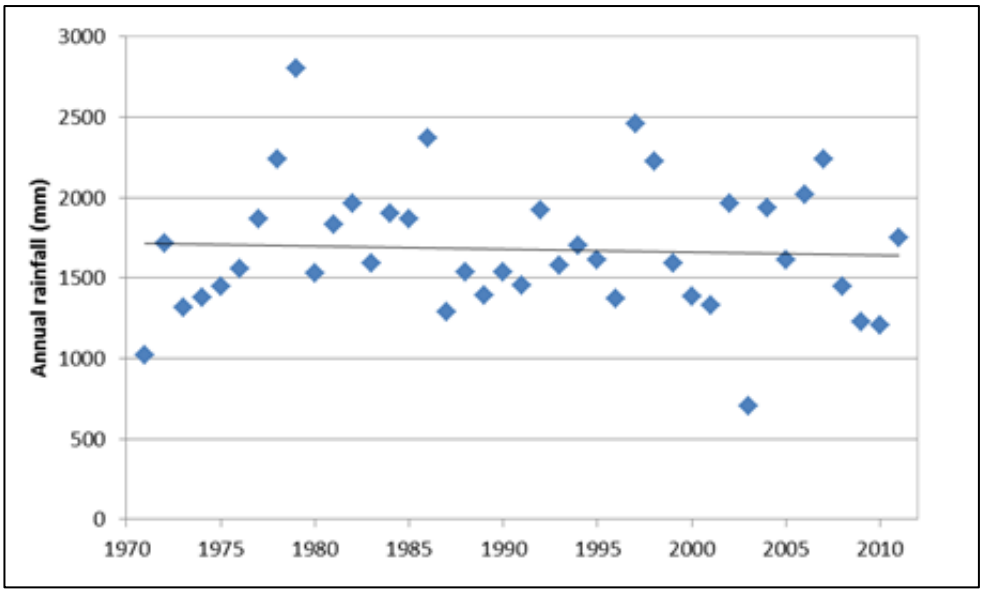
Figure 24: Trends in temperature attributed to climate change



(Mean monthly Minimum Temperature Trends Jan – Mar (°C))

Source: TMA, Climate Change strategy

Figure 25: Trends in precipitation



Annual rainfall: Zanzibar Airport, (mm) 1971- 2011

Source: TMA data, Climate Change Strategy

References

1) Zanzibar Climate Change strategy 2014
2) Tanzania Demographic Household Survey
3) UNFPA; Youth in Zanzibar, Facts and figures, 2012
4) Zanzibar Human Development Report (2009)
5) Bank of Tanzania Annual Reports: 2009 to 2013
6) Zanzibar Household Budget Survey 2010, Published May 2012
7) Zanzibar Socio Economic Survey 2013
8) Zanzibar Census data 2012
9) Tanzania (URT) 2012 Population and Housing Census 2012

2. Disaster Loss[21]

A. Overview

Component 1 of this initiative was to build a disaster loss database that registers not only large scale disasters but also small-to-medium scale disasters. The small-to-medium scale disasters are rarely registered in the international disaster databases, because their effects are considered to be less relevant from a macroeconomic perspective. However, such disasters usually impact the livelihoods of poor people, perpetuating their level of poverty and human insecurity, and eroding government budgets. They exacerbate local level sustainability and pose serious problems for the development of a country as a whole.

The analysis of disasters at all scales allows the identification of aggregated effects over time, regional areas and hazards targeted as high priority, and impacts on housing and livelihoods of local communities.

Loss information contributes to comprehensive risk assessment by providing an estimate of the risk of high frequency but small-scale risk. It also gives information on non-modelled hazards. Furthermore, it can be utilized as an input to economic analysis, for example cost benefit and economic impact analysis[22].

The key concepts introduced in the loss data analysis are:

Intensive disasters: high-severity, mid to low frequency disasters, mainly but not exclusively associated with high profile fast-onset hazards. UNISDR classifies disasters as intensive when at least 30 people are killed, and/or a minimum of 600 houses are destroyed.

Extensive disasters: low severity, high frequency disasters, mainly but not exclusively associated with highly localized and often slower-onset hazards. All disasters with less than 30 people killed, and/or less than 600 houses destroyed, are classified as “extensive”. There is no minimum number of deaths or damaged houses to be considered extensive[23].

During the project, data on large scale as well as small-to-medium scale disasters were collected for 1980 to 2014. The data were registered by sub-national region, which allows more detailed examination of loss distribution in the country. The current loss database basically registers direct physical loss data only. Indirect and socio-economic loss data are not registered in principle. Even if registered, it needs to be analysed with caution due to ambiguity of definitions. The disaster data not directly associated with natural hazards (*e.g.* traffic accident, marine accident, epidemic, shark attack) were registered in the database but excluded for analysis in this report[24].

The disaster loss database takes into account the different disaster types and registers a series of indicators to classify loss such as:

- Damaged houses;

- Destroyed houses;

- Basic human loss (mortality, injured, affected).

The loss data were assigned monetary value by applying the methodology developed by UNISDR, which allows comparison across countries[25].

The Zanzibar Department of Disaster Management hosted Component 1. The Department has since the beginning of 2014 collected disaster related data from various sources and is hoping to go back to the 1960s using information from the National Archives in Zanzibar.

[21] This chapter was drafted by Kazuko Ishigaki (UNISDR) with the support of Gerard Hendriksen.
[22] As an example of loss data use for cost benefit analysis, please see case study of Annex C.
[23] The most well-known international disaster loss database called EM-DAT registers disasters for a minimum of 10 deaths (see http://www.emdat.be/criteria-and-definition).
[24] Fire is included in the analysis, though.
[25] For methodology of assigning monetary value to loss, see http://www.preventionweb.net/english/hyogo/gar/2013/en/gar-pdf/Annex_2.pdf

The data is open to public in the following site:

http://www.desinventar.net/DesInventar/profiletab.jsp?countrycode=znz

B. Disaster loss in Zanzibar[26]

Ten data cards were analysed regarding natural hazards. All cards were categorized as extensive disasters. Out of ten extensive disasters, fire is ranked the first (7), followed by electric storm, rain and windstorm (one for each). Total mortality is one, due to electric storm.

Economic loss (physical) totals USD 1.3 million at 2012 prices. Most of loss was due to fire (USD 1.1 million) (Table 8).

Table 8: Summary of disaster loss in Zanzibar

	Data cards	Mortality	Economic loss (physical)
Extensive			
Electric storm	1	1	-
Fire	7	0	1,136,310
Rain	1	0	146,937
Windstorm	1	0	3,498
Total	10	1	1,286,745

Source: Author based on Zanzibar National Loss Database

Though past loss data is not sufficiently recorded, Zanzibar's disaster events are mainly related to rainfall. Long periods of little or no rain will cause droughts and result in crop damage or even failures. On the other hand, too much rain can lead to local flooding and damage to infrastructure, housing and crops. Rainfall figures have been recorded between 1000 – 2500 mm per year since 1971 (Figure 24). Fortunately, direct deaths attributed to these disasters are limited.

Floods cause regular disruption and some damage in the low-lying informal urban settlement areas in Zanzibar where people have moved in. Reports mention that annually 20,000 people are affected in those areas during the rainy season. Because of the gentle slopes, there are no strong flash floods and the physical damage to houses and infrastructure tends to be limited. In this sense, floods in Zanzibar are mostly extensive in nature. Although there are general reports on the impacts of flooding and water logging, the local authorities are reluctant to keep official records of damages in the informal settlement as this might give the impression that the Government might be willing to assist the affected people. However, the official line of the authorities is that people have moved to those low-lying areas despite the warnings not to do so. Therefore no compensation or support is provided in case of these local disasters.

The biggest flooding event in the recent history of Zanzibar was the downpour in April 2005 that brought an incredible 400 mm of rain in less than two days and is recorded as the heaviest for 40 years. Reports suggest that an estimated 10,000 people were made homeless and about 800 houses were submerged. One person was reported to have been killed. There are also reports of damages to roads and a bridge while some boreholes for the water supply systems were disrupted[27]. The International Federation of the Red Cross provided some relief efforts that were valued at CHF 110,000 (about USD 114,000).

[26] For detailed methodology, see UNISDR/IOC (2014) and http://www.desinventar.net/methodology.html
[27] Economics of Climate Change Zanzibar, volume 1 (2012)

In the case of **drought** in Zanzibar, there is time to respond and provide relief as the population is easily accessible, in contrast to many of the typical drought disasters in remote places in some other countries in Africa.

For example, Zanzibar experience the effects of the same drought that affected East Africa and the failure of the short rains from October to December 2005, resulted in wide spread crop failures in the harvest season. A rapid vulnerability assessment (RVA) was coordinated by the Ministry of Agriculture, Livestock and Environment in March 2006. The RVA estimated that the cultivated areas for the six main food crops (rice, cassava, maize, sorghum, millet, and cow peas) were nearly 40,000 acres, of which only 22,00 acres were planted and the rest left as farmers' feared the poor rainfall condition. The report also found that in 54% of the planted areas crops failed or withered. The lack of fodder and water resulted in increased livestock susceptibility to diseases, and reduced productivity for instance milk was down by 50%. At the extreme, cattle deaths were reported particularly in the Southern District of Unguja. Some herders were forced to sell animals at alarmingly low prices. The RVA also mentions that supply of clean drinking water was disrupted in some areas resulting in people using unsafe sources and incidences of diarrhoea were reported. The report unfortunately does not provide an estimate of the total economic costs of the drought that must have affected the national economy[28].

The Zanzibar Disaster Policy (2011) also mentions an example of the situation in 2008, which resulted from the rise of global food and fuel prices and inadequate and erratic rainfall. According to WHO (2009), the levels of acute malnutrition following the food shortage and food insecurity across Zanzibar islands significantly elevated with 22.5% (300,000 people) requiring food mainly for children under the age of five as well as pregnant and lactating women who were malnourished. The population at risk for food insecurity was about 700,000.

There are reports from **seismic** activity. The US Geological Survey has data records of 11 earthquakes within 200 km circle radius cantered around Stone Town. One tremor of magnitude 5.2 was registered at 159 km from Stone Town. The nearest tremor of magnitude 5.0 occurred 18 km north of Stone Town on January 15, 2005[29]. However, there are no reports of any damages.

If we look long back in history, there are also records in Zanzibar of a **hurricane** that swept over the islands in 1872 and destroyed two thirds of the clove and coconut trees. The hurricane particularly hit Unguja. Pemba which is slightly further to the north, escaped with little damage.

Table 8 shows only a small portion of the registered data in national loss database. There are many other data cards on **marine accidents**. Ferry accidents have claimed hundreds of lives over the recent years[30]. However, these accidents are not included in the present analysis as they are not caused by natural hazards. **Epidemics**, another important hazard for Zanzibar is also excluded from the analysis here. Drought, which is important in many parts of Zanzibar, should be included in the database but data was missing.

The most important direct loss, indirect loss and macro-economic impacts linked to natural hazards are summarized in Table 9. The examples mentioned here are local flooding, droughts and storm damage.

[28] Rapid Vulnerability Assessment of the Effect of Prolonged Dry Spell on Agriculture, Livestock Production and Environment in Zanzibar during the Agricultural Season 2005/06.
[29] JICA fish market study (2012)
[30] Two large ferry accidents occurred in 2011/12. Ferry Islander accident caused 159 death and 1,370 missing and Ferry Skagit accident caused 81 deaths and 212 missing.

Table 9: Natural hazards and their anticipated losses and impacts

Hazard	Direct Loss / Impact	Indirect Loss / Impact	Macroeconomic impact
Local flooding	Flood damage to private houses and property in low lying urban areas due to intensive rainfall	Water borne diseases such as cholera, malaria and others	Limited as the scale of the disasters is usually limited to low lying urban areas
How to measure or estimate these costs/values?	Flood reports providing details on number of houses affected, duration of floods, costs of lost property. Insurance reports may support information	Health records of the local clinics showing increased incidence of diseases	
Droughts	Loss of crops and possibly livestock	Malnutrition especially of the vulnerable members of the community	Loss of national income/GDP. Imported food supplies will affect the trade balance.
How to measure or estimate these costs/values?	Crop assessments and livestock data collected by ministries of agriculture and livestock	Regular food security and nutrition assessments by Min of Agriculture. Vulnerability assessment of severe incidence	Reports by Ministries and Bank of Tanzania
Severe storms	Marine losses and deaths. Damages to infrastructure	Loss of income for families affected. Reduced communication network	Macro-economic impact depends on the scale of the events
How to measure or estimate these costs/values?	Reports of dead and missing persons. Reports of damage to bridges, roads and electricity lines etc.		

Source: Provided by Gerard Hendriksen

The criteria used to distinguish extensive disasters (number of lives and houses lost), are not really applicable to Zanzibar (and the other small islands) as 30 lives and 600 houses are large numbers compared to the total population.

References

1) Economics of Climate Change Zanzibar, volume 1, GCAP (2012)
2) JICA Feasibility study Malindi Fish landing and marketing facilities, 2013.
3) Rapid Vulnerability Assessment of the Effect of Prolonged Dry Spell on Agriculture, Task Force Team coordinated by the Ministry of Agriculture, Livestock and Environment (MALE)
4) Livestock Production and Environment in Zanzibar during the Agricultural Season 2005/06
5) Zanzibar Climate Change Strategy (2014)
6) The Zanzibar Disaster Policy (2011)
7) World Health Organization, Humanitarian Appeal 2009, Country Profile

3. Disaster Risk[31]

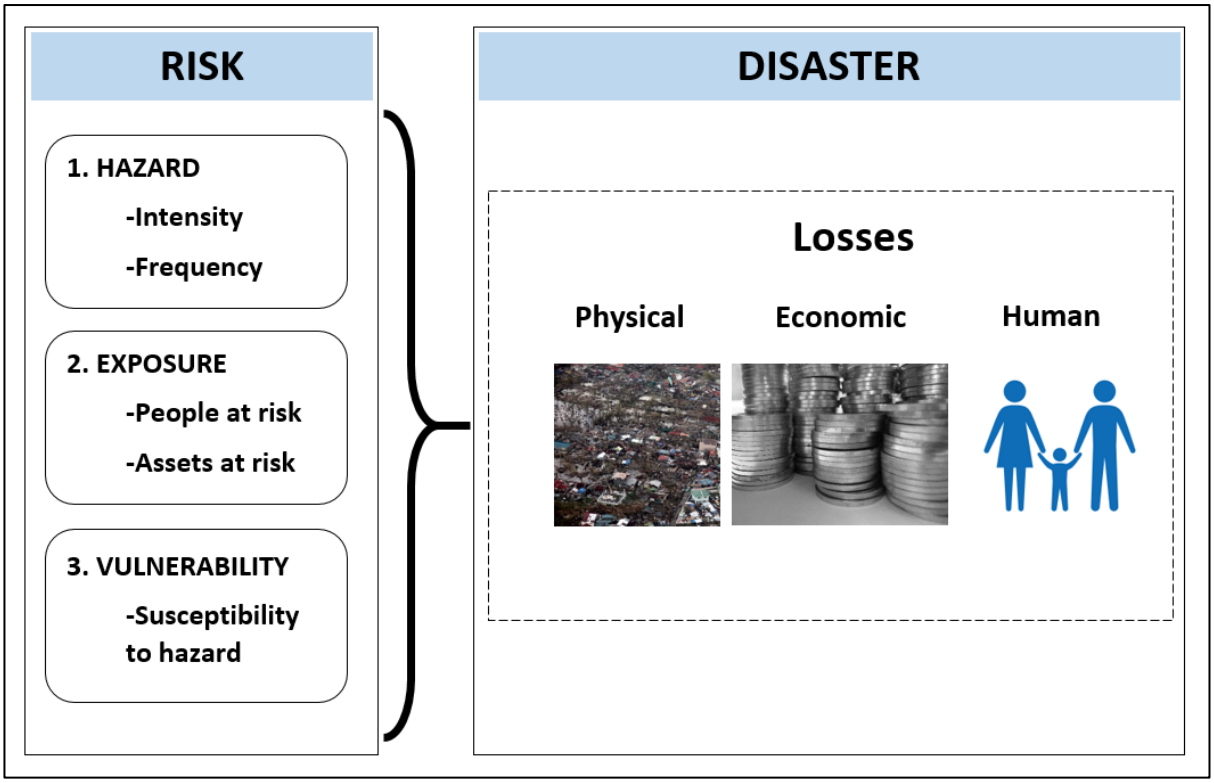
A. Overview

Component 2 of this initiative aimed to build a database for probabilistic risk assessment. UNISDR facilitated the identification and consolidation of a national focal point for disaster risk information and enhanced the understanding of risk concepts and risk assessing methodologies through capacity building workshops

Probabilistic risk assessment differs from a "deterministic" risk assessment in that it attributes a probability to hazardous events. Probability indicates the likelihood of the event to occur during a given year; it is estimated using frequency and is expressed in terms of "return period" or "loss exceedance rate". Risk is expressed as a combination of the probability of the event occurring and the expected loss when such an event occurs.

In probabilistic risk assessment, risk is composed of three factors: hazard, exposure and vulnerability (Figure 26). Hazard data are basically calculated from a set of stochastic scenarios and in this initiative the data were extracted from global datasets[32]. **Exposure** data measures the degree to which people and assets will be at risk when a hazard hits, and often consists of inventories of buildings, population and infrastructure. In this initiative, we used a combination of global exposure databases and data compiled by national experts (processed to construct a proxy). **Vulnerability** indicates the susceptibility of exposed population or assets to suffer damages and loss. This is important because hazard affects exposed element in different ways. For example, a certain wind speed affects a wooden house more heavily than a concrete building. In other words, vulnerability data shows the relationship between hazard intensity and the expected values of damage. In this initiative, vulnerability data were also taken from global data sets.

Figure 26: Key concepts of probabilistic risk assessment

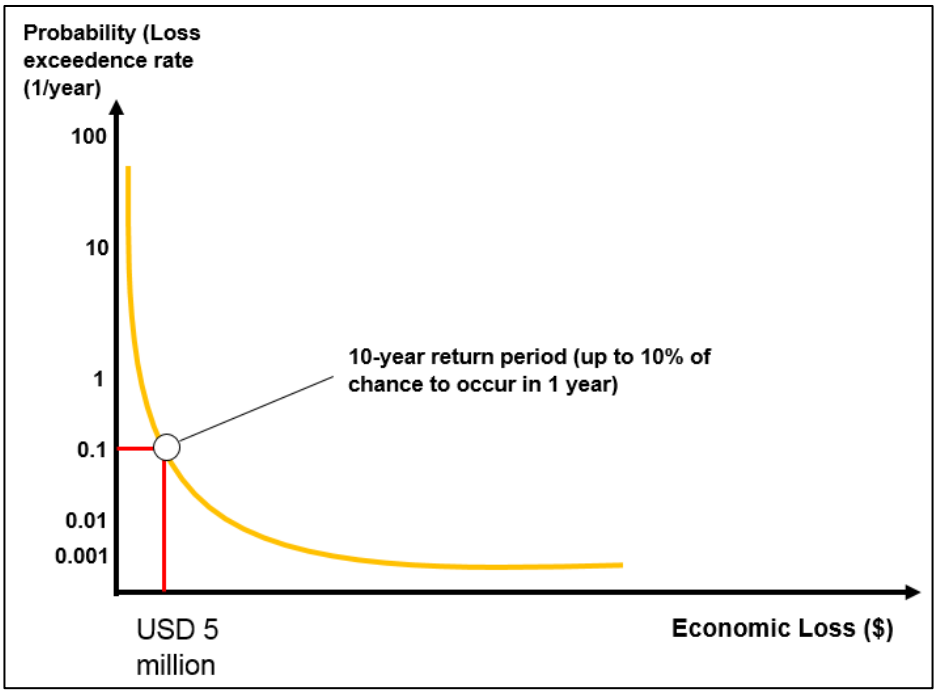


Source: Author

[31] This chapter was drafted by Kazuko Ishigaki (UNISDR).
[32] Hazard, exposure and vulnerability data used for the risk assessment in Zanzibar is outlined in INGENIAR (2014) and UNISDR/IOC (2014).

Based on probabilistic risk assessment, a loss exceedance curve for each hazard is produced (Figure 27). The curve shows the relationship between each value of the losses and the likelihood (probability) of having such loss during one year.

Figure 27: Loss exceedance curve



Source: Author

This curve enables the calculation of important national risk metrics called Annual Average Loss (AAL) and Probable Maximum Loss (PML). The AAL is basically the combination of all the potential losses that can occur every year due to a particular hazard, weighted according to their likelihood of occurrence. Simply said, the AAL is the loss that can be expected every year, regardless of whether it actually occurs or not. It gives insights into investment planning because the value shows how much risk should be reduced or transferred annually to prepare for all layers of risk. The PML is the loss associated to a specific, usually long return period. PML is a loss that is not frequent, therefore usually high, but still possible. PML is a useful reference value to draft a worst-case scenario and prepare for intensive events.

Probabilistic risk assessment can be utilized for diverse policy areas, from emergency management planning to land use planning and financial and investment planning. However, caution should be given to the limitation caused by scarce data that feed into probabilistic risk assessment, and simplified modelling of complex phenomena.

In the IOC region, UNISDR supported building of probabilistic risk assessment for tropical cyclone (wind) and earthquake hazards. Tropical cyclone was selected because it was clear from the disaster loss data outlined in Chapter 2, that the region (especially Madagascar and Mauritius) has been hit by cyclone very often causing much loss. Earthquake was selected due to data availability given the short time frame of the initiative, even though it is not a major hazard for the region.

UNISDR and the national team collaborated to produce hybrid loss exceedance curves that combine probabilistic risk curves based on data collected in Component 2 with empirical risk curves based on historic loss data registered in Component 1 (see Chapter 2). Probabilistic risk assessment tends to underestimate the extensive risk and historic loss data is used to remedy this problem. In Zanzibar, loss data was not sufficient to produce hybrid lox exceedance curve.

The challenge is that the current historic loss databases have time series that are too short to produce high quality risk assessments. Achieving more detailed risk assessments requires continuity on capacity building

processes, improvement of data/information and commitment of institutions, technical personnel and decision makers.

As described above, the probabilistic risk assessment implemented in this initiative is very often based on global data and does not have high resolution. Therefore it cannot be utilized for detailed cost benefit analysis, local planning and insurance premium calculation. The result is currently also limited to the assessment of physical assets due to data availability. However, the result can be very useful to raise awareness of disaster risk and initiate dialogues on incorporating DRM into the country's public investment planning.

In Zanzibar, the Office of Chief Government Statistics and Disaster Management Department participated in disaster risk assessment activities in Component 2. In Zanzibar the risk assessment is not yet being used for decision-making but this may be possible when more historic datasets become available and probabilistic models are developed that reflect the island's conditions.

B. Probabilistic Risk Assessment in Zanzibar[33]

In Zanzibar, UNISDR and the national team only conducted seismic risk assessment because cyclone risk was judged to be negligible.

Table 10 presents the AAL and PML in absolute and relative values to exposed assets, Gross Capital Formation (GCF) and GDP. The seismic risk in Zanzibar can be considered low. AAL is USD 0.2 million and constitutes 0.14 % of gross fixed formation[34]. PML is 0.4 million for 50 years of return period and it increases when return periods get longer. Even though a loss of USD 34 million may seem high, it only occurs on average, every 1000 years, and even then it represents only around 2.6% of the total exposed assets. However, despite the fact that the risk is low, they should not be considered negligible because an extreme event, even if only very localized, can generate high disruptions, damages and casualties.

Table 10: AAL and PML for earthquakes

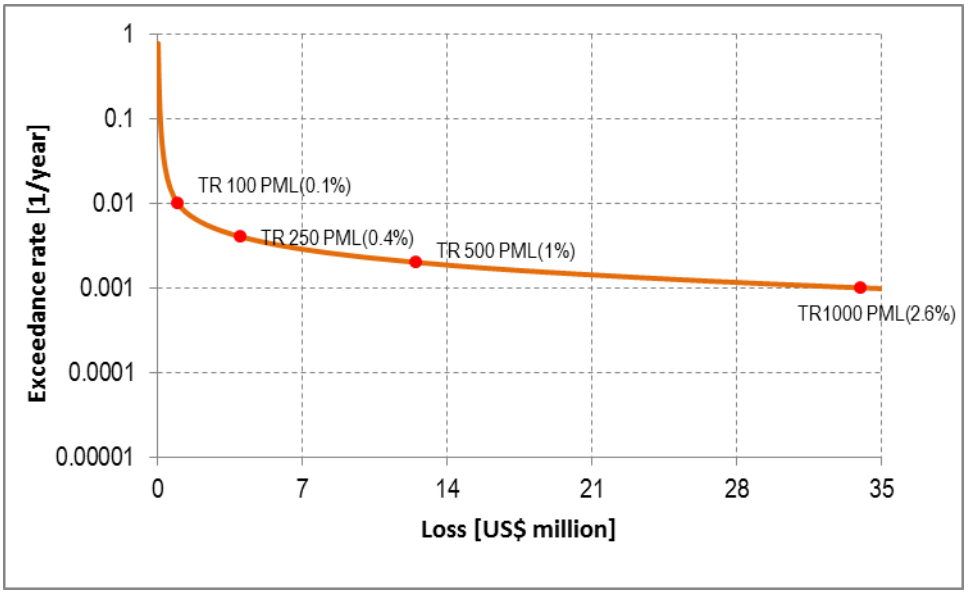
		Exposed Assets	**GCF (2013)**	**GDP** (2013)
	USD million	**1,317**	**144**	**893**
	Absolute	*Relative*		
Annual Average Loss (AAL)	**0.2**	*0.15‰*[35]	*1.39‰*	*0.22‰*
Probable Maximum Loss (PML)				
Return Period (years) 50	**0.4**	0.03%	*0.28%*	0.04%
100	**1.0**	0.08%	0.69%	0.11%
250	**4.0**	0.30%	2.78%	0.45%
500	**12.5**	0.95%	8.68%	1.40%
1000	**34.0**	2.58%	23.61%	3.81%

Sources: Exposed Assets, AAL, PML: INGENIAR (2014), UNISDR/IOC (2014), GCF and GDP: Zanzibar Socio Economic Survey 2013

[33] For detailed data source and methodology, see INGENIAR (2014) and UNISDR/IOC (2014)
[34] The AAL should be better compared with Gross Fixed Capital Formation; however the data on GFCF was not available for Zanzibar.
[35] Mille is a mathematical term that means per thousand, as its name in French suggests. It is represented by the symbol ‰.

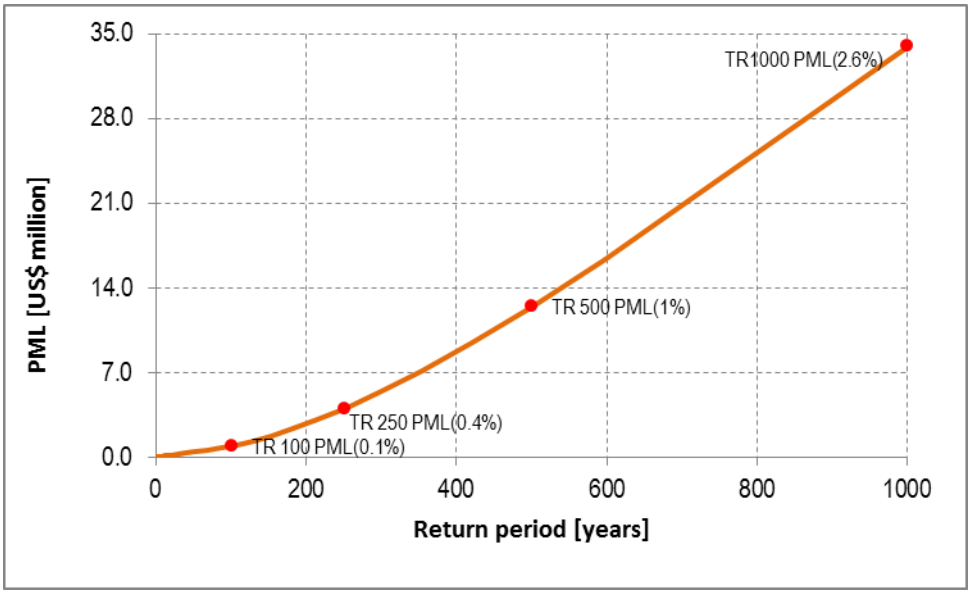
Figure 28 shows the loss exceedance curve while Figure 29 shows the PML curve. In addition, the loss exceedance curves for different PML given different periods, specifically 50, 100 and 200 years, are presented in Figure 30. These plots show the probability of exceeding a certain value of loss in a given time frame; for example, the probability of exceeding loss of USD 13 million (PML for a 500-year return period) in the next 50 years is approximately 10%.

Figure 28: Loss exceedance curve for earthquakes



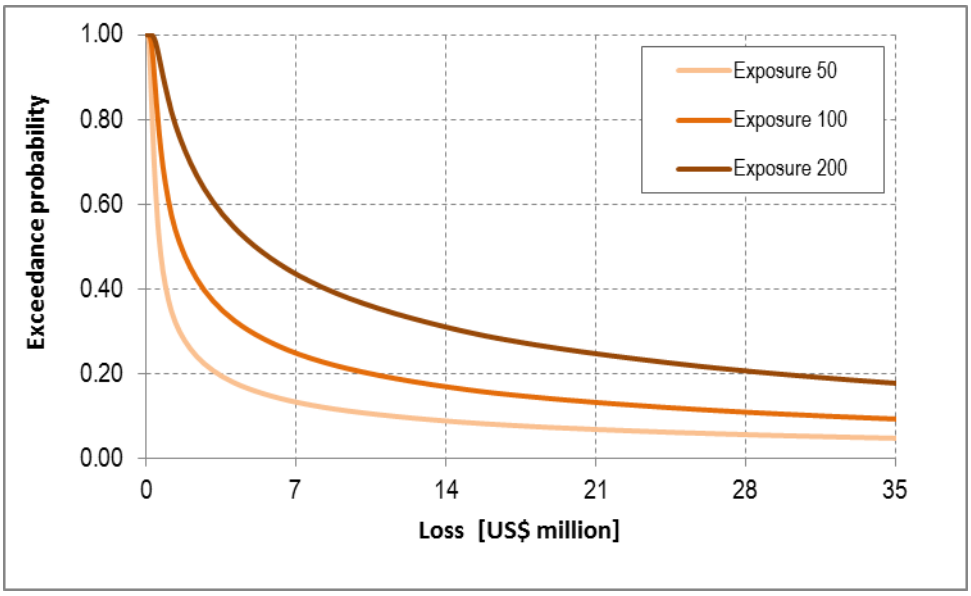
Source: INGENIAR (2014), UNISDR/IOC (2014)

Figure 29: PML curve for earthquakes



Source: INGENIAR (2014), UNISDR/IOC (2014)

Figure 30: Exceedance probability curves given different times



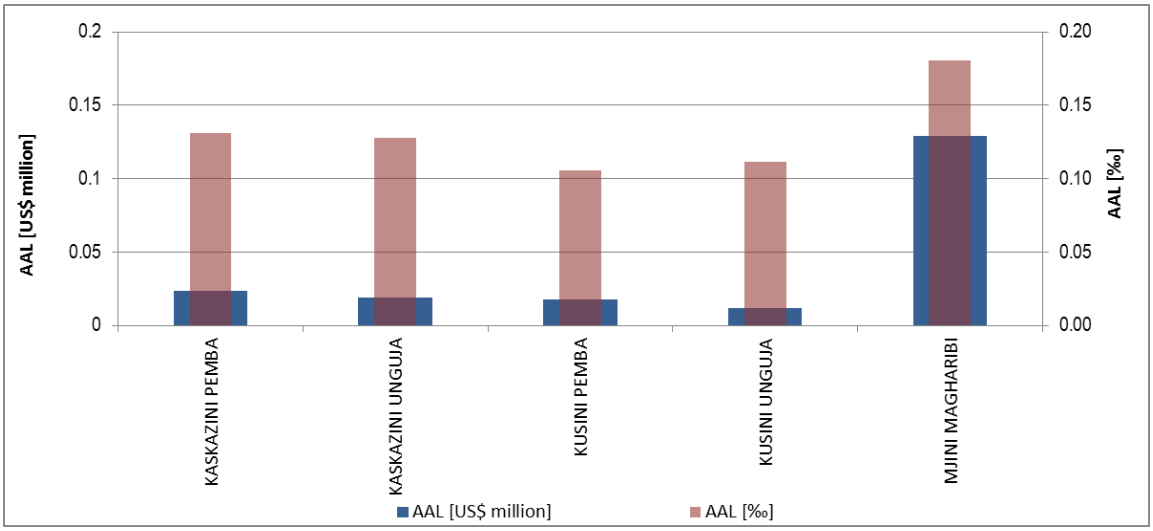
Source: INGENIAR (2014), UNISDR/IOC (2014)

The analysis of risk concentration is first carried out for the different districts, and then for the different sectors (for both the public and private sectors, and for the main components of infrastructure at national level). Figure 31 and Figure 32 show the AAL (absolute and relative to the exposed value) by district.

Mjini Magharibi is the District with the highest AAL, in both absolute and relative terms. It also has the higher exposed value and concentration of population. On the other hand, Kusini Unguja District shows a low exposed value, but high AAL in relative terms. This can be explained by looking at the vulnerability of the exposed assets. The construction quality of the buildings, in terms of seismic resistance, is probably lower in Micheweni than in other districts.

AAL in Mjini Magharibi is 0.18‰ relative to the exposed value, which means that, in general terms, that the total value of Mjini Magharibi can be lost every 3,500 years. Although it may seem as a very long period of time, it is important to recognize that it corresponds to a mean estimate and a worse scenario can happen. Therefore it shouldn't be neglected.

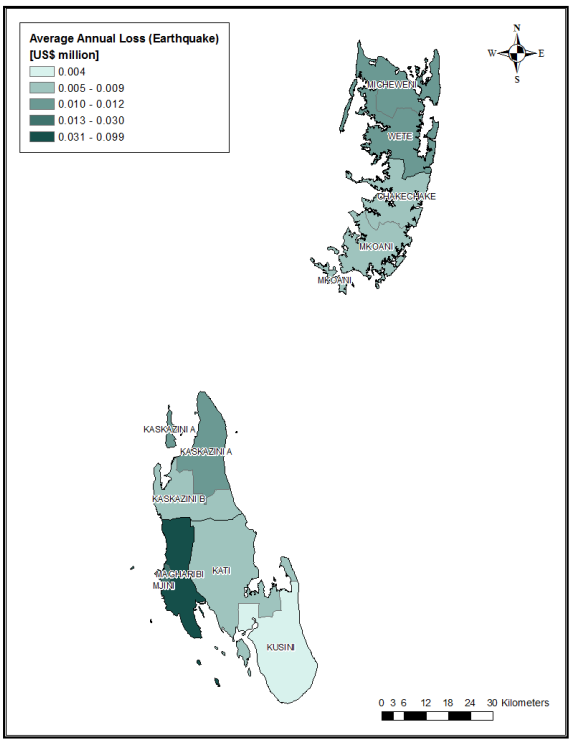
Figure 31: AAL by district for earthquakes



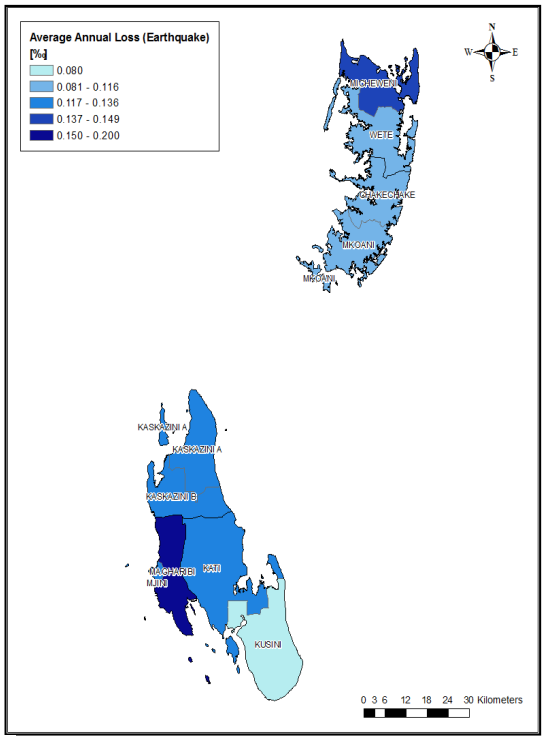
Source: INGENIAR (2014), UNISDR/IOC (2014)

Figure 32: AAL (absolute and relative) by district for earthquake

Absolute AAL



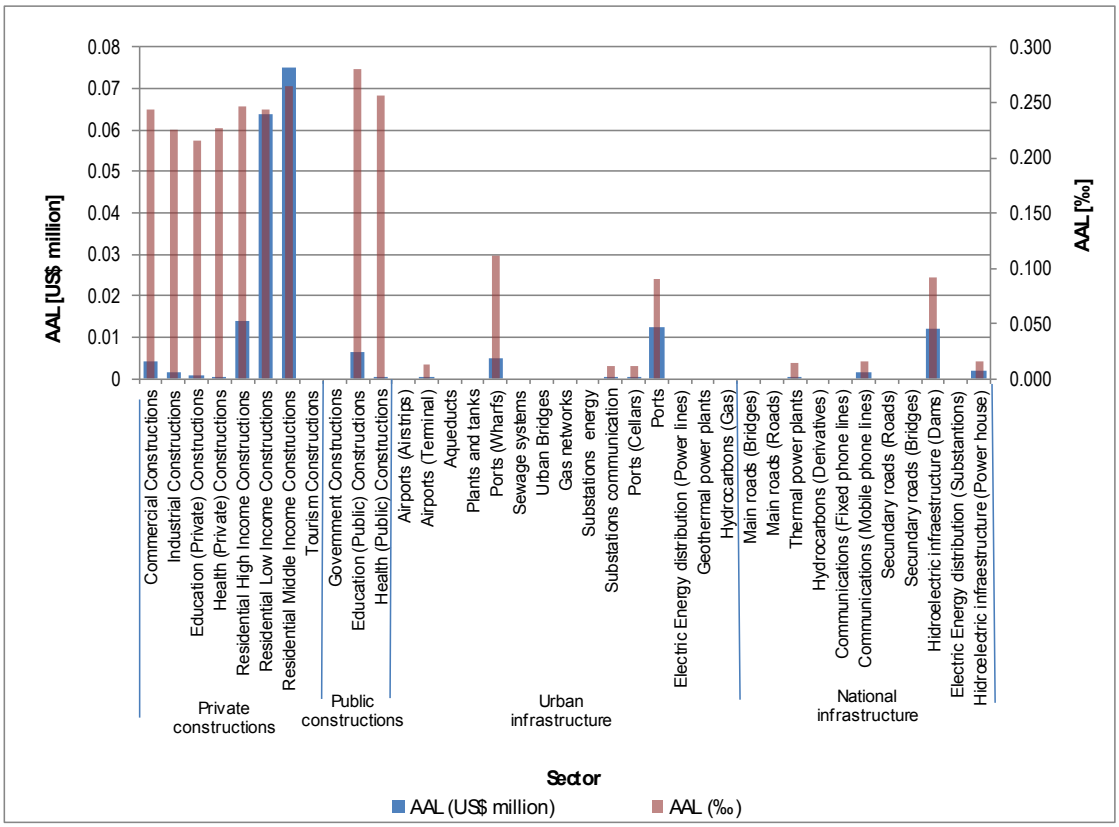
Relative AAL



Source: INGENIAR (2014), UNISDR/IOC (2014)

Figure 33 summarizes the AAL (absolute and relative to the exposed assets) for each sector. Both in absolute and relative terms, the "Residential Low-Income Constructions" and the "Residential Middle-Income Constructions among the built environment assets database have the highest risk level in Zanzibar. In terms of relative value, the private constructions present the highest values and the public education and public health have similar relative AALs to the private constructions even the absolute average annual loss is not as big as the residential sectors. Generally speaking, the high risk of these constructions can be clarified by the fact that the private constructions present the highest level of the exposed values in the country. It is worth to highlighting that ports (wharfs) and hydroelectric infrastructure register important levels of absolute AAL by reaching USD 44 million and USD 131 million respectively.

Figure 33: AAL by sector for earthquake



Source: INGENIAR (2014), UNISDR/IOC (2014)

Due to the limited data in disaster loss database outlined in Chapter 2, we could not produce a hybrid curve.

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UNISDR- Risk Knowledge section/IOC (2014). Component 1 and 2: Comoros, Madagascar, Mauritius, Seychelles and Zanzíbar. Building capacities for increased public investment in integrated climate change adaptation and disaster risk reduction: 2012-2015. European Commission - Directorate General for Development and Cooperation. Geneva, Switzerland.

INGENIAR (2014). Building capacity on probabilistic risk assessment. Country Risk Profile: Zanzibar. In the frame of the project: Strengthening capacities for unified climate change adaptation (CCA) and disaster risk reduction (DRR). Bogota, Colombia

Zanzibar Socio Economic Survey 2013

4. National DRM/DRR/CCA Framework[36]

A. Institutional Structures

A.1 Disaster Risk Management

The Disaster Management Department (DMD) was established in 2006 based on the Disaster Management Act of 2003. According to the Act, the department is the overall institution responsible for: 1) coordination of disaster risk reduction issues, 2) development and implementation of policies, plans, laws and operational guidelines, 3) capacity building in disaster risk reduction, 4) preparing disaster risk profiles, vulnerability assessments and disaster risk reduction information and communication systems and 5) conducting public awareness on disaster risk reduction.

The DMD is placed under the Second Vice President's office and its mandate and activities are guided by:

- Disaster Management Act, No.2 of 2003 (which is currently under review)
- Disaster Management Policy August 2011
- National Operational Guidelines for DMP, 2013
- Emergency Preparedness and Response Plan (2011)
- Disaster Communication Strategy (2011).
- Monitoring and Evaluation framework for disaster management in Zanzibar (2013)

The DMD is headed by a director, appointed by the President of Zanzibar. The department has currently 22 staff working in five major sections/units:

- Planning and Research
- Finance and Administration
- Operation
- Communication and Information
- Education and Community mobilization

The department is also supposed to recruit disaster management officers at district level that will liaise to disaster risk reduction activities at district and shehia levels.

The National Disaster Management Committee is headed by the Second Vice President (in future this will be the Chief Secretary) and includes all Principle Secretaries from the other ministries. In addition there are disaster management committees at district (10) and shehia (331).

Other institutions that play an important role in early warning of impeding disasters include the Tanzania Meteorological Agency which has a branch in Zanzibar and is mainly responsible for weather related hazards (wind and rain but also possible seismic and tsunami activities). The Ministry of Agriculture and Ministry of Health are responsible for early warning on food security and health related issues including epidemics.

A.2 Climate change

Over the last years, the issue of Climate Change and the possible impact on Zanzibar has become more prominent. The mandate for mainstreaming Climate Change into the Government plans, is with the First Vice President's Office. A national action plan is underway in close collaboration with the Zanzibar Planning Commission, the Ministry of Finance and the key ministries affected by climate change issues.

B. Legal Structures

B.1 Disaster Risk Management

Zanzibar has established itself as a nation at the forefront of disaster risk reduction within the public sector. To ensure that disaster risk reduction is a national priority, the government has introduced disaster risk management in various national frameworks such as the Zanzibar Vision 2020 and the Zanzibar Strategy for Growth and

[36] This chapter was drafted by Gerard Hendriksen.

Reduction of Poverty. To implement this, the Government has introduced the Disaster Management Act in 2003 and established the Disaster Management Department in 2006.

Based on the Act, the DMD has introduced various frameworks, including the introduction of Disaster Management Committees at National, District and Shehia levels; introduction of a sub-national Platform and establishment of focal persons at all sectors relevant for disaster management. Sectorial policies and plans reflect disaster issues. Participation of private sector and the communities is also considered.

Zanzibar's Disaster Management Policy of 2011 refers to the importance of the national, regional and international fora on Disaster Risk Reduction that are conducted periodically. It also states that Zanzibar is participating in these fora inconsistently which results in a lack of opportunities of sharing experience with other countries in the region and internationally. The Policy mentions that the Disaster Management Committee will be the principal functional body for disaster risk management in Zanzibar and responsible for overall coordination for Disaster Management Policy, programmes, plans and strategies at all levels. It will also coordinate and collaborate with national, regional and international disaster risk reduction bodies. This includes the United Nations Agencies and other Regional and International Agencies because they provide human resources, equipment, financial and technical support. The Emergency Preparedness and Response plan mentions that when the required response is beyond the capacity of the Revolutionary Government of Zanzibar, a request for damage assessment may be made to the Government of the United Republic of Tanzania (URT) or to regional or international organizations.

The DMD has put various frameworks and guidelines to encourage other disaster risk management stakeholders to fully participate in its implementation. These include Disaster Management Policy of 2011, The Zanzibar Emergency Preparedness and Response Plan 2011, The Zanzibar Disaster Communication Strategy (ZDCS) 2011, National Operational Guidelines for Disaster Management Policy 2013, Monitoring and Evaluation Framework for Zanzibar Disaster Management Policy 2013, and Districts Emergency Preparedness and Response Plan (for Mjini, Magharibi, Kaskazini A, Wete and Micheweni Districts). Currently, the DMD is in the process of reviewing the disaster management Act of 2003.

The Department has created networking with all important sector ministries and institutions. These include Ministry of Health, Ministry of Agriculture, Ministry of Infrastructure and Communication, Tanzania Meteorology Agency (TMA), Tanzania People's Defense Force (TPDF), Police Force, Special Departments, Local Governments etc.

At local level, the Shehia Disaster Management Committees have been introduced at almost all Shehias with full participation of all groups of society (women, youth, elders, people with disabilities, representatives from Red Cross if available in Shehia or from other NGOs). The reporting system of disaster issues from Shehia to National level has also been introduced.

B.2 Climate change

Zanzibar is subject to the international agreements on climate change under the umbrella of the URT. The URT ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 1996 and 2002 respectively. The Vice President's Office – Division of Environment on Mainland Tanzania is the entity responsible for the Clean Development Mechanism and climate change-related activities. It is the National Climate Change Focal Point for the whole of the URT, fulfils the function of the Designated National Authority and has the responsibility for international negotiations, preparation of national communications and in the future for Nationally Appropriate Mitigation Actions (NAMA) and National Adaptation Plans (NAP) activities.

The URT produced a first national communication in 2003 and a National Adaptation Programme of Action (NAPA) in 2007. One of the priority projects identified in the NAPA was the Shifting of Shallow Water Wells Affected by Inundation on the Coastal Regions of Tanzania Mainland and Zanzibar.

The mainland government of Tanzania adopted a National Climate Change Strategy in early 2013 but that does not specifically cover Zanzibar. The Strategy proposes the establishment of a National Climate Change Fund (NCF) to finance its implementation. It is expected that this fund would become the channel for official flow of finance from UNFCCC international mechanism and development partners. It is not clear how Zanzibar will be included in the structure and would benefit from the NCF, if it is established and becomes operational (which is not guaranteed at this point in time as Government and development partners are still discussing different options).

The Economics of Climate Change study for Zanzibar was carried out in 2011 and provided data on the changes in the climate (the lack of long data series makes this challenging) and the impacts of major weather events on the national economy. The study also provided detailed information on the energy situation and opportunities for low carbon development. This was followed up by the formulation of the Zanzibar Climate Change Strategy that was approved by the Government in early 2014.

The objectives of the Zanzibar Climate Change strategy are:

1. To provide Zanzibar a coherent and consistent view on the vulnerability and risks from current climate variability and future climate change on the islands,
2. To establish a response framework to address these risks, and to enhance low carbon sustainable development opportunities.
3. To help build capacity and knowledge, raise awareness, and promote climate aware and sustainable livelihoods practices
4. To guide the mainstreaming of climate change adaptation (and low carbon sustainable development) across government and wider society
5. To propose ways to develop and strengthen the institutional and coordination arrangements
6. To encourage the transfer, adoption and diffusion of technologies for increasing resilience and promoting low carbon sustainable development.

There is a debate on-going as to the most appropriate financing mechanism for Zanzibar to ensure funds from national and international resources will be used effectively and efficiently. This might include the establishment of a separate Climate Fund as has been already done on a number of other countries.

C. Status of Hyogo Framework for Action

The national (URT) progress report (2011-2013) on the implementation of the Hyogo Framework for Action (2011-2013)37 was prepared by national focal point in the Prime Minister's Office in Dar es Salaam. In several instances, the report refers to the activities and progress in Zanzibar through the DMD in the Second Vice President's Office. Table 11 provides an overview of the activities undertaken and progress made in Zanzibar against the 5 priorities under the Hyogo Framework for Action.

Table 11: Progress of Zanzibar against the Hyogo Framework for Action

	Explanation of Progress to Date in Zanzibar
Priority 1: **Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation**	The progress under the Disaster Management Act and DMD is explained in the main text.
Priority 2: **Identify, assess and monitor disaster risk and enhance early warning**	According to the Disaster Management Act, the Disaster Management Department has overall responsibility for coordinating disaster issues in Zanzibar. Important issues for early warning are done by other sectoral ministries and institutions. For this matter the department has closely worked with all institutions responsible for early warnings like TMA, Ministry of Health, Ministry of Agriculture and Ministry of Livestock. In the events of disasters, the DMD through the structured framework of disaster response

[37] Tanzania (URT) National progress report on the implementation of the Hyogo Framework for Action (2011-2013). Update: 18 November 2012

	in Zanzibar has the role of collecting, analysing and issuing early warnings. The new proposed legislation will establish the centralized centre for early warnings particularly for natural hazards.
Priority 3: **Use knowledge, innovation and education to build a culture of safety and resilience at all levels**	The DMD tries to work with all groups/ levels with the aim of building the culture of safety and resilience. While preparing disaster management frameworks, the department has been presenting the draft document to the Members of Zanzibar House of Representatives, the Cabinet, the Inter-Ministerial technical committee, Ministerial technical committee (the Second Vice President's Office), and the sub-national Platform. This is not only focusing in obtaining their contributions, but also is one among the way to build capacity of those officials. At another level, the DMD has been conducting meetings and workshops on DRR to teachers and students at all levels (from primary schools to higher learning institutions). The DMD has also running the essay competitions to primary and secondary students in Unguja and Pemba. Knowledge on DRR has been provided to the shehia disaster management committees and other public and community organizations. The department has prepared and aired TV and Radio programs to increase awareness.
Priority 4: **Reduce the underlying risk factors**	Amending the Disaster Management Act of 2003, is not only for the aim of making appropriate framework for DRR in Zanzibar, but also for promoting reduction of underlying risk factors. The existing Act and the new proposed legislation have mentioned the offences and penalties part. All the trainings and other awareness programs conducted has resulted into positive impacts on awareness building and are reducing underlying risk factors.
Priority 5: **Strengthen disaster preparedness for effective response at all levels.**	Several efforts have been taken by the Government and the DMD under the Second Vice President's Office in collaboration with UNICEF and UNDP to enable the country (at all levels) to prepare and respond to disasters. Such efforts include establishment of DM committees at all levels, DRR frameworks, Disaster preparedness warehouses at Unguja and Pemba, DRR trainings etc. Since the marine accidents occur frequently in Zanzibar, the Office has also managed to create a strong network with local institutions to strengthen marine rescuing.

Source: Zanzibar Disaster Management Department

5. DRR/DRM/CCA in Public Investment Planning[38]

This chapter provides an overview of the current status of public investment planning related to disaster risk reduction/management and climate change adaptation in Zanzibar. It moreover contains a summary of the findings of the three types of analyses conducted under the initiative; namely the Risk Sensitive Budget Review (RSBR), CATSIM analysis and the Cost Benefit Analysis. Main stakeholders are identified after such analysis description.

A. Current Status of DRR/DRM/CCA in Public Investment Planning

Disaster risk management and particularly risk financing are not yet integrated in Zanzibar investment policies and there are as yet no clear laws and guidelines in this area. Cost benefit analysis is carried out for major investment projects especially those supported by the development banks and partners. The Zanzibar Planning Commission has a program to build more internal capacity as well to guide the decision-making process for internally funded projects.

Environmental Impact Assessments are being enforced for all investments either in the public and the private sector and the guidelines have been drafted to screen projects in climate risks and this is being mainstreamed in the line ministries. This initiative is led by the First Vice President's Office with support from UNDAP and involves among others the Ministry of Finance and the Planning Commission.

Critical infrastructure such as ports, roads / bridges, electricity network and airports do not have a special protection plans but long term impacts of climate change are being considered in the case of long term investments. However, this is work in progress and more capacity building is needed. The national disaster management and preparedness efforts are led by the Second Vice President's Office.

The Disaster Management Policy (2011) and the draft Disaster Management Act of 2012 propose the establishment of a Zanzibar Disaster Management Fund (ZDMF) to ensure the accessibility of enough resources for disaster preparedness, mitigation, response and recovery. The sources of the ZDMF shall consist of:

- any monies voted to it by the House of Representatives for that purpose
- any monies made by way of donations or grants made within and outside Zanzibar
- subscriptions by the public
- any monies as a result of fines imposed as penalties under this Act

It is not yet clear if the ZDMF will actually be approved by the Zanzibar House of Representatives and if so, when it will be put in place.

The Government of Zanzibar is committed to investments in disaster preparedness and mitigation as is, for instance, reflected in the implementation plan for the Zanzibar Strategy for Growth and Poverty Reduction (MKUZA II) for 2012 to 2016. The issue is mentioned in a few places:

- Cluster I: through the Tanzania Agriculture and Food Security Investment Plan (TAFSIP) contributing towards Disaster Management and CC Mitigation by improving adoptive capacity against disasters. The project is implemented through the Ministry of Agriculture and the total amount allocated in the implementation plan is Tsh 12.2 billion (USD 7,6 million) for four years.

- Cluster III: Preparedness and response to disasters guaranteed by 2015. The objective is to strengthen disaster management capacity in Zanzibar. MKUZA lists five projects covering DMD, fire services, early warning systems, and enhancing disaster management knowledge in the communities. Total budget allocated is Tsh 23.7 billion (USD 14.8 million) for 2012 – 2016 and mostly implemented through the SVPO.

The sums above amount to approximately Tsh 35 billion (USD 21.8 million) or 1.4% of the overall budget (Tsh 2,591 billion) for the MKUZA II implementation plan. It is expected that this will be funded from Government sources and from donors but the MKUZA does not provide detailed figures for this.

[38] This chapter was drafted by Gerard Hendriksen.

Most other institutions do not allocate funds for disaster related activities in their annual budget resulting in inadequate preparedness and mitigation measures for most of the hazards, hence putting the country at high risk.

There are no separate codes or dedicated categories for disaster preparedness and response within the budgets of the line ministries that could be used for tracking of disaster risk funds. Also it is difficult to track expenditures for disaster risk reduction, preparedness and response as these are often incorporated within the activities of the police and defence forces and in other ministries.

B. Contingency Finance Mechanisms

Governments take not only the legal and explicit liability but also the implicit liability where they are expected to intervene promptly to provide relief and recovery to the affected population (damaged and destroyed housing, loss of property). Zanzibar has had the fortune to be spared from large disasters from natural causes such as earthquakes, cyclones or flash floods. That is one of the reasons that disaster recovery mechanisms are less well developed than in some of the other islands. However, the Government of Zanzibar is aware of the lack of proper risk financing mechanism and is taken measures to strengthen its position in case of unexpected expenses due to natural or human induced disasters. There are a few finance mechanisms for managing disasters, summarized in Table 12. These mechanisms mainly address recovery and reconstruction costs. Thereafter, follows a discussion of the main measures listed.

Table 12: Finance mechanisms for disaster management

EX-ANTE MECHANISMS	
Contingency budget line	Government funds under Unallocated (Vote UN, Tsh 8.5 billion (US 5.3 million) 2014/15)
Contingency funds	Consolidated Fund (Vote 45, Tsh 70 billion (USD 43.8 million) 2014/15)
Insurance	Limited use of insurance, in particular not for the low costs buildings that are most easily affected by natural events. No information if infrastructure is insured.
Others	-
EX-POST MECHANISMS	
Diverting funds from other budget items	Government has used this mechanism in some cases for instance to support the costs caused by the ferry disasters
Imposing or raising taxes	There are no records of such measures immediately after any event. However, this might happen on longer term.
Taking a credit from the Central Bank (either prints money or depletes foreign currency reserves)	Government of Zanzibar may borrow from Bank of Tanzania that serves both mainland and the islands.
Borrowing by issuing domestic bonds	Government of Zanzibar can issue Government Bonds as well as borrow from the Social Security fund
Accessing international assistance	Development partners and aid agencies (*e.g.* IFRC in 2005 floods)
Borrowing from multilateral institutions	Borrowing from multilateral institutions is possible in collaboration with the Ministry of Finance in mainland Tanzania. IMF has borrowing limits
Issuing bonds on the international market	Government of Zanzibar does not access the international market directly for bonds but could do in collaboration with the URT. However, issuing of international bonds is new in the region.

Source: Author

The Disaster Management Policy of 2011 states that there are no national financing mechanisms established specifically for the disaster risk management activities. Past experience shows that the Government mainly responds to disasters after these have occurred and the emphasis has been on relief support rather than disaster risk management per se.

In case of emergencies, NGOs and other origination provide assistance as well that is off budget. For instance after the severe floods of April 2005 the International Federation of the Red Cross reported to have supported the population with relief goods worth CHF 110,000 (USD 110,000) (source: Tanzania Red Cross Society- DREF bulletin 16 March 2007).

The Government has disbursed emergency funding from the Consolidated Fund Services, or budget vote 45 that is about 10% of the national budget in 2014/15 and usually covers interest payment, securities and bond repayments as well as miscellaneous payments.

In case of large emergencies as for instance happened after the two large ferry disasters that occurred in 2011 and 2012, the Government has resorted to reducing the budgets of line ministries in order to cover for the immediate costs of the disasters. It is reported that after the MV Skygate ferry disaster, the Government spent about Tsh 571m or USD 350,000 (equivalent to about 0.1% of the annual budget) mainly for supporting rescue efforts and providing compensation.

The Tanzania Social Action Fund (TASAF) [39] is another structure that can be used in case of severe longer-term stresses such as caused by droughts for instance. TASAF implements programs and projects that target the poor through cash transfers as well as labour intensive public works such as rural roads construction, reforestation and public buildings. Communities are directly engaged in the selection of programs and beneficiaries. In Zanzibar, TASAF is managed under the Second Vice Presidents' Office.

The insurance market is still relatively underdeveloped. There are a number of private and public owned insurance companies operating on the market in Zanzibar and some of these are connected to companies in the region. The Government established the Zanzibar insurance Company (ZIC) in 1969. The corporation is a parastatal organization owned by the Government of Zanzibar through the Ministry of Finance. The ZIC provides insurance products for motor vehicles, fire damages and burglary. Other regional companies offer medical packages. However, there are no products as yet that cover damages due to large disasters.

C. Economic analysis to support risk sensitive pubic investment planning

Based on the philosophy explained in the introduction chapter, three types of economic analysis were conducted. A summary of analysis follows for the Risk-Sensitive Budget Review, the Macro/CATSIM assessment and the Micro/Cost Benefit Analysis. Each of the theoretical and technical elements is also described in greater detail in corresponding Annexes A, B and C.

C.1. Summary of the Risk-Sensitive Budget Review

(See also Annex A for theoretical and technical backgrounds and a detailed case study)

Overview: The Risk-Sensitive Budget Review (RSBR) aims to apply the DRM Marker method to identify the degree to which government has budgeted or/and invested in DRR/DRM/CCA. To that effect, the budgets of key Ministries and Departments have been analysed to mark those projects whose "significant" (but not main) objective is DRR and those projects specifically addressing DRR, which would not have been undertaken without the "principal" DRM objective.

In addition to categorizing the budget/expenditure for different projects, functions and administration activities as Significant or Principal, they were classified into four distinct categories of disaster risk management, namely, Risk Prevention/mitigation, Preparedness, Response/Relief and Reconstruction.

Scope: Table 13 below summarizes the scope of the budget review.

[39] www.tasaf.org

Table 13: Scope of the risk sensitive budget review

Year	The budget 2014/15
Coverage	Government budget for FY 2014/15. Focus was on 11 ministries and institutions which are most involved in DRM and CC.
Budget or expenditure	Budget
Current or Capital	Both current and capital budgets
Targeted hazards	Fires, droughts, human and animal epidemics and long term effects of climate change

Results: The overall estimated investment in DRM/CCA identified in this review is in total about Tsh 21 billion (USD 0.2 million), which is approximately 3% of the total Zanzibar budget of Tsh 708 billion (about USD 440 million). Most of the budget is identified under the category "significant" as shown in Table 14 below.

The budget review also tried to divide the marked budget in categories according to allocation within the DRM process. By far the most important category is for disaster prevention and mitigation as shown in the table below. No interventions were classified as reconstruction as Zanzibar has been spared of any major disasters due to natural hazards over the last years.

Table 14: DRM/CCA investments across 4 components 2014/2015 budget

Budget allocations per Risk Management phase/category	Significant (Tsh billion)	Principal (Tsh billion)	Total (Tsh billion)	Percentage of Total Marked
Prevention/mitigation (1)	17.0		17.0	80%
Preparedness (2)		1.0	1.0	5%
Response (3)		3.1	3.1	15%
Reconstruction (4)			0.0	0%
Total budget allocations			21.2	100%
Share of total budget (% of Tsh 708 billion)	2.4%	0.6%	**3.0%**	-

Source: Author based on Budget 2014/15

The expenditures can also be divided between DRM and CCA investments and this analysis shows that 43% of the identified expenditures are DRM related and these are in particular for activities implemented through the Ministry of Health. The balance of 57% has been classified as CCA measures for instance for agricultural research and for irrigation development.

Component 2 of the project determined an average annual loss (AAL) of USD 0.2 million to earthquakes in Zanzibar. A simple comparison of estimated AAL to the most current annual investment in DRR indicates a **equal balance** (Table 15). However, it is important to keep in mind that AAL is only estimated for earthquake risk and to go back to the actual marked activities to determine if they are linked to earthquake risk. If this 2014/15

investment could be reasonably linked to earthquake risk reduction, it would seem to offset the AAL by many years[40].

Table 15: DRR budget, loss and risk

	DRR budget, 2013/14	AAL (Earthquake only)	Loss, 1980-2014 (10 data cards)
Value	USD 0.2 million	USD 0.2 million	USD 1.3 million, (Annual average: USD 0.04 million)
Status		NO GAP	NO GAP

Source: Author

As reference, loss data were also compared to the budget. This comparison shows a positive balance. However, given that only 10 cards are registered for disaster loss database, the database may be incomplete; this also merits caution.

Although this is only a very simple and straightforward example that cannot be extrapolated to other hazards or years, it serves to underscore the utility of both the AAL/past loss data and the budget review as a combined tool to move Zanzibar towards risk-sensitive public investment in light of their most important natural hazards.

There were challenges in concluding the budget review. Planning and technical staff in sectorial ministries is only partly aware of DRM and what it could mean for their institutions. Disasters are largely seen as human related due to severity of the recent marine accidents. Disasters are considered to be the prime responsibility of the Department for Disaster Management in the Second Vice President's Office and the relief services, fire brigade, police and defence forces. On the other hand, staffs in the ministries of health and livestock classify some of their programs as prevention and disaster preparedness (epidemic related) and such programmes were readily included in this budget review.

While the DMD is well established with dedicated staff and budget, this is less obvious for climate change which is situated under the First Vice President's Office and has very limited resources in terms of manpower and funding. The Government has programs to mainstream Climate Change in all ministries but that is still in its early stages. However, ministerial staff is more aware of climate change issues and the possible long-term impacts. Changing weather patterns, sea level rise, increased beach erosion and salt-water intrusion are often mentioned in this context.

The RSBR scoped for interventions that can be categorized as disaster risk reduction such as water management, irrigation expansion and (re)forestation. Most of these activities are classified as "significant" as they would be implemented as best practice in any case.

There are (as yet) no specific explicit budget lines exist for DRM/CCA. There is mention of establishing special funds for Disaster Management (as indicated in the DRM policy of 2011) and for climate change but no final decisions have been taken as yet if these are the most appropriate mechanism for Zanzibar circumstances.

There is also still very little understanding of risk financing within the government budget. However, there are signs that change is taking place. Staffs within the Ministry of Finance and the Accounting General Office are being trained with expertise provided by the National Board of Accountants and Auditors on risk profiles and management.

While the RSBR is a useful tool to estimate to what extent the Government is investing in DRR, it is necessary to realise the limitations of the DRM marker, as it cannot quantify the exact amount of DRM activity and only provides a best estimate. Especially in the recurrent budget, it is difficult to mark investments as these are often divided into human resources and operating costs without directly referring to certain activities and outputs.

[40] In reality government expenditures are not to support/repair any damages related to earthquakes. Housings regularly collapse in Stonetown but that is due to no maintenance.

Projects within the capital budgets are easier to mark but then actual expenditures are often 40 to 60% lower than was expected.

C.2. Summary of Macro-Analysis / CATSIM
(See also Annex B for theoretical and technical backgrounds and a detailed case study)

Overview: CATSIM analysis evaluates the ability of governments to manage potential fiscal and economic risk arising from earthquakes. The Government is generally not responsible to provide all reconstruction needs because private households and businesses will assume responsibility of their own reconstruction needs. Therefore, we assume that the government will take the following responsibility in case of a disaster:

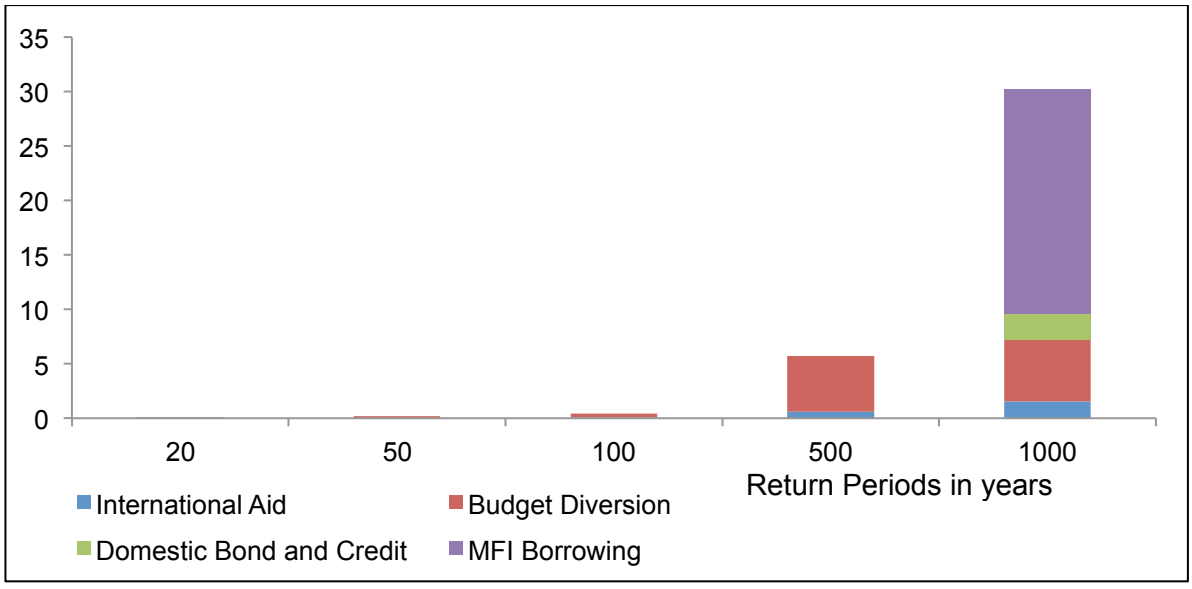
- The Zanzibar government will be responsible to finance reconstruction of public assets, including roads, bridges, schools and hospitals, etc. (Explicit liability)
- The Zanzibar government will extend partial support for private relief and recovery including provision of support to the poor (Implicit liability)

AAL was estimated to be USD 0.18 million. Total liabilities of Zanzibar Government were estimated as USD 0.29 billion based on capital stock data. Then, the options to finance reconstruction and recovery were examined and same assumptions across IOC countries are applied. As a conservative case, USD 85 million was estimated to be assured through diversion from budgets, domestic bonds and credit and international market borrowing.

Combining direct risk and fiscal resource availability information compiled, we then estimated the governments' potential fiscal resources gap year—the return period at which the government will face difficulty in raising sufficient funds for reconstruction.

Results: It is estimated that Zanzibar has sufficient fiscal resources to cope with its earthquake risk even in the case of catastrophic event (500+ year event) (Figure 34). In other words, the fiscal gap for earthquake risk was not found in Zanzibar. While Zanzibar has up to USD 85 million available to cope with disasters excluding international assistance, earthquake risk is relatively low with 500 and 1000-year events expected to result in USD 11.4 million and USD 30.2 million in damage respectively.

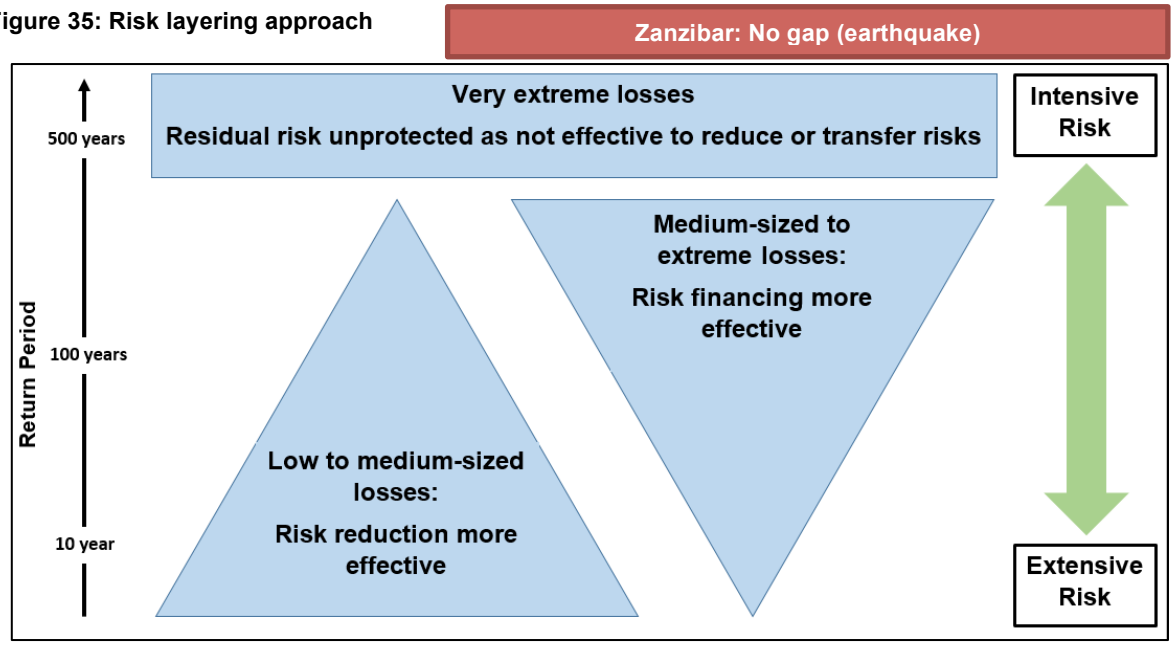
Figure 34: Resources gap year analysis for Zanzibar: No financing gap observed



Source: IIASA

The government is encouraged to take a 'risk layered management' approach where resources are allocated based on the varying levels of risk facing the country, with a priority given to reducing existing risk and preventing the creation of new risks in the extensive risk layer (Figure 35). The CATSIM analysis conducted from Steps 1 to 3 has illustrated the need for improved management of disaster risk in Zanzibar.

Figure 35: Risk layering approach



Source: Author

Further challenge: Data gaps and way forward

The present study identified data gaps and sources of uncertainty regarding fiscal risk assessment. The present studies did not fully account for indirect effects of disaster damage, and further studies are needed to quantify and evaluate the indirect risks caused by disaster damage.

For Zanzibar, there is no fiscal gap at the moment due to earthquake risk. It is important to note however that this assessment only pertains to the earthquake risk, and other potential hazards in Zanzibar such as flood are not taken into account. There is clearly a need for further investigation of such risks, evaluating the fiscal resources availability to cope with the potential for other catastrophic disasters. Further studies are certainly needed to address risks of smaller and localized events such as floods and droughts that are currently under-reported.

Given the relatively short period of data availability, high uncertainty can be expected of catastrophic risks with return periods of above 500. It is advisable, therefore, further data collection, validation and analysis performed in an iterative fashion to reduce the range of uncertainty.

A technical and institutional support package is necessary to establish iterative risk management system in Zanzibar and other IOC countries (Table 16). In terms of technical needs, knowledge regarding probabilistic risk assessment and economic assessment tools (CATSIM) would be needed along with general awareness of risk related concepts and statistics. Given the limited availability of risk experts in IOC countries, a regional approach to training and capacity building (*e.g.* regional workshop for training of trainers/ regional sharing of risk knowledge experts, etc.) may be an effective way to leverage local capacity and resources. Institutional support for iterative management should be embedded in the existing DRR/CCA policy framework of Zanzibar.

It is important to discuss and update fiscal resilience parameter and value at critical time, for example, when administration changes or after disaster. Financing mechanism for disaster management (see Table 16 in Chapter 5) should be checked regularly. Defining government liability more concretely is also recommended.

Some of the important policy questions to ask in Zanzibar would be:

- What is the desirable level of fiscal preparedness in the country? What would be the policy goal in mid to long-term (maintain or reduce fiscal gap etc)?
- How can you balance the need for risk reduction and risk-transfer?
- What are the priority areas of action regarding DRR in your country?
- What are tangible milestones and goals in the DRR priority areas in your country?
- What further risk assessment is needed to achieve the goals of DRR priority areas in your country?

Table 16: Identified data gaps, technical and institutional capacity needs

Data needs:	-Risk information regarding additional hazards such as flood, cyclone (rain & storm surge), drought will improve the scope of analysis -Uncertainty regarding larger return period events is high given the relatively short period of data availability (In Component 1, loss data was collected since 1980). Further data collection will improve accuracy especially for higher return period events
Technical capacity needs:	-Technical training on risk assessment and economic modeling including CAPRA and CATSIM training. -Further sensitization of risk-based thinking. General familiarity of risk based terms such as the annual average loss, the probable maximum loss, exceedance probability must be explained to decision-makers.
Institutional capacity needs:	-Coordination, where both risk and socio-economic data are jointly collected and managed by relevant agencies (DRM agency plus Ministry of Finance). -Clarity on the specification of the role of each agency in data collection and analysis to avoid the duplication of the efforts.

Source: Author

C.3. Summary of Probabilistic CBA
(See also Annex C for theoretical and technical backgrounds and a detailed case study)

Overview: Cost benefit analysis (CBA) is an established tool in economics. This analysis can be used for both sectorial and project analysis. Many countries already adopt cost benefit analysis as a requirement of large-scale public investment projects. In this initiative, probabilistic CBA was applied to account for the benefits of risk reduction. The benefit is estimated by measuring how much annual average loss (AAL) will be reduced after the investment.As probabilistic risk assessment for flood has not been developed, historic disaster loss data were used as input (backward- looking probabilistic CBA).

Case study of Zanzibar Urban Service Project: Probabilistic Cost-Benefit Analysis regarding a surface water drainage component of the Zanzibar Urban Services Project (ZUSP) was implemented. The process and results of this CBA highlight key challenges regarding limited damage and loss data available in Zanzibar. The severe lack of documentation regarding past disaster damage and losses seems to lead to an underestimation of probabilistic benefit associated with drainage improvement project— despite the reduction in expected annual losses of over USD 100,000, the project was evaluated to be highly cost-inefficient, with a Net Present Value (NPV) of USD -9.2 million evaluated at the 5% discount rate.

The probabilistic CBA results diverge significantly from results of existing non-probabilistic CBA performed by the World Bank, in which the project was evaluated to be cost-efficient with an estimated NPV of over USD 20 million at the 7% discount rate. The extremely large difference in results between this study and that of the World Bank is due to differences in approach and basic assumptions. This highlights the importance of robust loss and risk data when assessing the economic viability of a disaster risk reduction project and the large uncertainty associated with data on disaster risk.

It is also important to keep in mind that the present assessment did not take into account many of the indirect and intangible losses, such as loss due to business interruption and any reduction in land values that may result due to frequent disasters. These are clear limitations of this current analysis and further studies are certainly needed to improve the accuracy and comprehensiveness of our analysis.

D. Stakeholders in mainstreaming DRR/DRM/CCA in public investment planning

Based on the analysis thus far, the main stakeholders that are involved, or should be involved in risk sensitive pubic investment in Zanzibar include:

- Disaster Management Department that should ensure that planners and decision makers in the government institutions are aware of the country's risk profile and realize the need for incorporating DRR strategies in their annual and long term planning.
- Ministry of Finance in collaboration with the Planning Commission to set priorities and budget ceilings for the line ministries. Ministry of Finance also needs strategy how and where to access resources in case of disaster events requiring emergency funding (such as the Consolidated Fund).
- Line ministries (health, natural resources, infrastructure, etc) to mainstream DRR in their annual and long term planning.
- Disaster response agencies (police, coast guard, fire services), local government, and Bank of Tanzania (responsible for monetary issues). In case of emergencies, special rules may be adapted to provide access to additional funding for immediate relief efforts but also to reduce impact on national economy.
- Communities through the disaster management committees at districts and shehia levels.

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ZUSP, Hydrology report for proposed Zanzibar Urban Srvices Project, Golder Associates, 2010,

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6. POLICY RECOMENDATIONS[41]

In this initiative, the Zanzibar DMD established a national disaster loss database with inputs received from different central and local institutions. The database is shared internationally on the UNISDR website. Historical data range back to 1980 and were further expanded using the national archives. The currently available data records (155) include both disasters related to human and natural hazards. Only 10 are registered as natural hazards, all of which are categorised as extensive disasters. Out of the 10 reported extensive events linked to natural hazards, there was one life lost and material losses of USD 1.3million (88% attributed to fire; for other events, data are very scarce).

The database still contains important omissions (*i.e.* the 205 flood-- largest in 40 years was not registered). Drought events have serious impacts in Zanzibar in terms of livelihoods affected and economic losses. However, these events are slow-onset events and not well captured in the disaster database. There is also confusion on definitions such as houses destroyed (a rare event in Zanzibar) versus houses flooded and/or damaged, people affected or evacuated (i.e. length of evacuation), "intensive versus extensive" disasters, etc.

Zanzibar also prepared a probabilistic risk profile on earthquake in collaboration with UNISDR. The seismic risk in Zanzibar can be considered low. AAL is USD 0.2 million and constitutes 0.14 % of gross capital formation. PML is 0.4 million for 50 years of return period and it increases when return periods get longer. However, despite the fact that the risk is low, they should not be considered negligible because an extreme event, even if only very localized, can generate high disruptions, damages and casualties.

To prepare for disaster risk, Zanzibar has the fundamentals in place for effective disaster risk management, the necessary legal framework, a policy, a preparedness and response plan and a communication strategy. The Disaster Management Department was established in 2006 and disaster committees have been set up at central and local levels. There is a proposal to establish a disaster management fund but that has not yet been put in place.

The Government is aware of the anticipated long-term effects of climate change and the possible impact it might have on the frequency and intensity of disasters due to natural hazards and the need for adaptation and preparedness. For example, climate change is likely to increase rainfall intensity and may lead to more local flooding. The frequency of agricultural droughts is likely to increase and will cause economic losses and as well as human distress. A climate change strategy was approved in 2014.

The MKUZA II implementation plan 2012 – 2016 allocates about 1% of the overall budget to disaster preparedness. Many other activities included in the budget of ministries, however, are not clearly earmarked as such.

Disaster risk, however, is not well integrated into public investment planning. The budget process does not have clear votes that are allocated to DRM and it is difficult to get an overview of DRM investment. In this initiative, risk-sensitive budget review contributed to enhanced understanding of the need for comprehensive overview on DRR investment. CATSIM analysis presented the financial resource gap year. Though the country is likely to be financially well equipped for earthquake risk, it is necessary to continue the research to check the financial capacity against other hazards that the country is likely to be exposed to (*e.g.* flooding and drought).

Probabilistic Cost-Benefit Analysis in light of a surface water drainage component of the Zanzibar Urban Services Project (ZUSP) highlights the importance of robust loss and risk data when assessing the economic viability of a disaster risk reduction project and the large uncertainty associated with data on disaster risk.

The lack of well-documented and accepted risk profiles for the various sectors makes it difficult for planning and budget officers to argue for investments in specific risk mitigation and preparedness measures. While costs of such measures can be high, benefits maybe uncertain. There is few staff in the line ministries with economics background that can assist technical staff in making optimal decisions.

There is little experience in Zanzibar in risk sensitive public investment planning and risk financing. Capacity in Government institutions to prepare risk profiles and design appropriate mitigation measures that balance costs

[41] This chapter was drafted by Gerard Hendriksen.

and risks is still under developed. The insurance companies are only accessed by small portion of the population and focus on few products. This leaves the Government as the last resource to manage small or large disasters.

Based on these conclusions, the recommendations include;

- The Zanzibar disaster database needs to be further expanded historically but more importantly by incorporating the direct economic losses into the system. This requires close cooperation between the DMD, as the custodian of the database, and the other institutions that work on disaster risk management.

- Government should consider both extensive and intensive risks and take risk-layered approach to prepare for every-day risk and catastrophe, through continuous monitoring and assessment of loss and risk, and capacity building of risk assessment and economic analysis. There are also issues with internationally used definitions that require further clarification to ensure that they are meaningful for conditions in Zanzibar.

- The Ministry of Finance should introduce budget codes that can help to better track expenditures related to DRM and CCA. This will enable greater transparency, accountability and even taking credit for growing investments in risk reduction and management.

- Further studies are needed to apply CATSIM to risks of smaller and localized events such as floods and droughts currently under-reported. In addition, technical and institutional support will be necessary to establish iterative risk management system in the IOC countries, including Zanzibar.

- The Planning Commission and planning departments of the ministries require increased capacity to carry out meaningful CBA and verify CBA carried out by others. The use of probabilistic CBA needs to be further developed internally over the coming years as well as access to independent sources that can assist in this methodology.

- Regional and/or national systems can be put into place so that each of these tools (disaster loss database, probabilistic risk assessment, budget review, macro-economic analysis (such as CATSIM) and cost benefit analysis) are updated regularly and applied as appropriate to support the Government of Zanzibar's increasing focus on risk reduction and their risk-sensitive pubic investment.

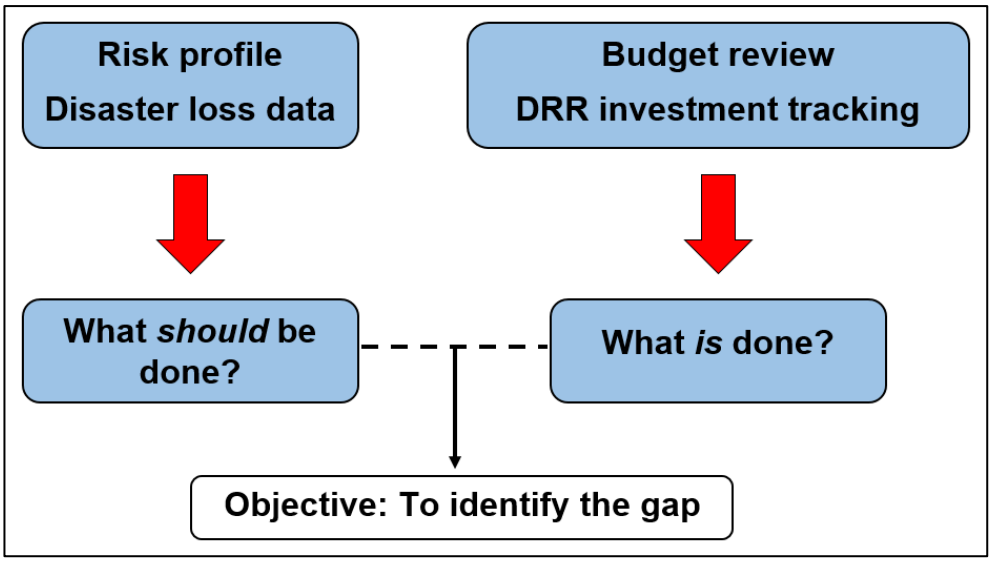
- In the process of capacity building for policymaking, DMD and MoF should collaborate to promote risk sensitive public investment planning, sectorial ministries and other key stakeholders should engage in the process.

Annex A. Risk-Sensitive Budget Review (RSBR) [42]

A. Overview

The objective of the Risk-Sensitive Budget Review (hereafter called budget review) is to explore the gap between risk level and DRR investment (Figure 36). While CATSIM analysis outlined in Annex B will identify the financial gap year by comparing risk and financial capacity of the country, the budget review aims to clarify what has already been done to reduce risk. It also checks the balance between disaster risk reduction/mitigation, preparedness, response and reconstruction. Understanding the costs of response and reconstruction is an opportunity to re-consider the importance of DRR investment.

Figure 36: Objective of budget review



Source: Author

Budget review is expected to bring about improved efficiency and accountability. Systematic budget analysis requires the cooperation of all stakeholders, thereby improving budget coordination and leading to a more effective use of financial resources. Budget review clarifies the current level of DRR activities and enables a thorough analysis of the gap to explain how much funding is required for further DRR implementation.

In the HFA Monitor, Indicator 1.2 aims to monitor the DRR budget. However, not many countries report their budgets due to lack of monitoring system for their DRR budget. Table 17 below, shows the reported value in selected countries. While we need to be cautious when comparing the values across countries, due to the application of different counting methods, this table shows that out of five countries, three invested significantly more in relief and reconstruction than in DRR and prevention.

[42] Section A-C of this chapter were drafted by Kazuko Ishigaki (UNISDR) and Section D was drafted by Gerard Hendriksen.

Table 17: DRR Budget in selected countries (% of total budget)

Country	Year	DRR and prevention (%)	Relief and Reconstruction (%)	Total (%)
Belarus	2013	0.160	0.160	0.320
Ecuador	2013	0.300	1.600	1.900
Indonesia	2013	0.286	0.413	0.699
Mozambique	2013	4.610	0.350	4.960
Papua New Guinea	2012	0.100	1.000	1.100

Source: Author based on HFA Progress Report for each country

In response to the need for DRM budget monitoring, several initiatives have progressed to date. The first effort has been to create a consolidated budget line for DRM. This approach has mainly been taken in Latin American countries. For example, Columbia established the Adaptation Fund (2010). Mexico has been utilizing the Natural Disaster Prevention Fund (FOPREDEN), the Natural Disaster Fund (FONDEN) and the Fund for Assistance of the Affected Rural Populations by Climate Contingencies (FAPRAC). Peru has also established a National Budgetary Programme for Vulnerability Reduction and Emergency Response.

The second effort is to assign codes to budgetary line items that indicate DRM measures. This is promoted by the World Bank and OECD in partnership with the UNISDR; they propose the "DRM marker" to monitor DRM elements in Official Development Assistances (ODAs) which are registered in OECD's Credit Reporting System[43]. DRM marking allows the monitoring of donors' policy objectives in relation to DRM in each aid activity. Compared to consolidated budget lines, the DRM marker is a less drastic reform and has potential to be the first and simplest analytical step toward risk-sensitive public investment. Therefore, the DRM Marker, with some adjustment, was applied to Zanzibar.

B. DRM Marker

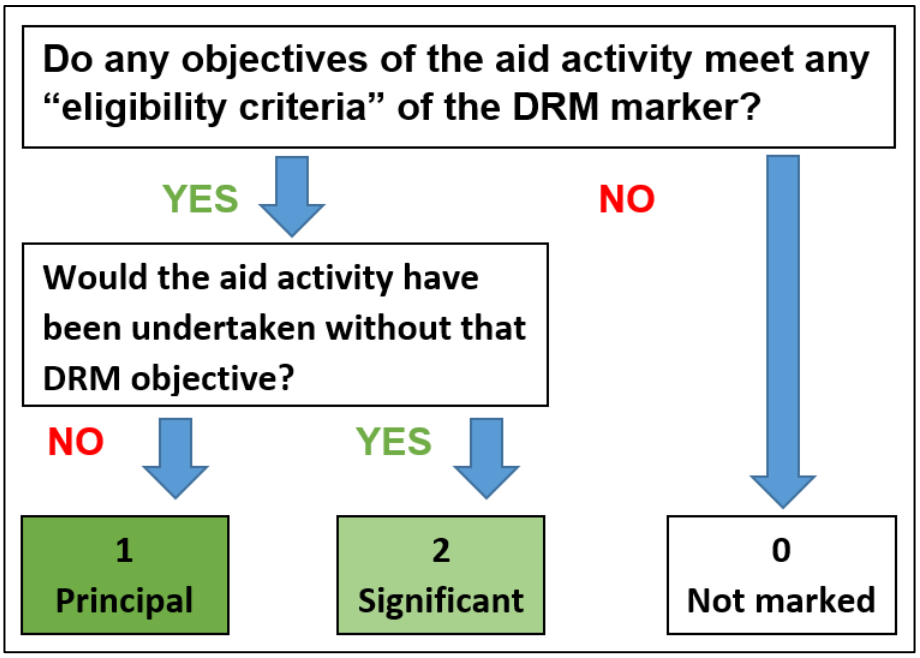
The DRM marker allows (a) capturing "embedded" investment by distinguishing between stand-alone versus mainstreamed DRR investment (*e.g.* retrofitting in school renovation program), (b) strengthening the ability to analyse, measure and report activities in DRR, and (c) improving regulatory conditions to facilitate tracking of budgetary allocations and expenditure in DRR and even (d) tracking pre-disaster (DRR) versus post-disaster (relief/reconstruction) investments, with simple addition of a rule.

The first eligibility criterion for an element to be marked is that DRM must be included in "the programme objectives" (Figure 37). The DRM element is defined as any "strategy, policy, effort or measure that improves the understanding of disaster risk, fosters disaster risk reduction or transfer, and promotes continuous improvement in disaster preparedness, response and recovery practices" (OECD, 2014[44]). If a budgeted activity meets any of those elements, it becomes "marked" as DRM.

The second level criterion is to examine how important the DRM objective is to drive implementation of the activity. The exact question is "would the aid activity have been undertaken without that DRR objective?" If the answer is affirmative, then it is marked as "significant" and if negative, it is marked as "principal"[45].

[43] The Rio Marker monitors CCA aid activity since 2011. DRM Marker is proposed using the similar methodology.
[44] OECD, 2014. A Proposal to Establish a Policy Marker for Disaster Risk Management (DRM) in the OECD DAC Creditor Reporting System (CRS).
http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DCD/DAC/STAT%282014%293&docLanguage=En
[45] Still certain level of ambiguity remains. For example, distinction between principal and significant is not clear and might require subjective judgment. However this is a notable progress for systematic monitoring.

Figure 37: DRM Marker process



Source: OECD (2014)

By applying this DRM Marker methodology across time and space, it is expected that data homogeneity and comparability will be assured. Furthermore, especially by introducing the "significant" category, incentives to mainstream DRM in development activities become visible. In the past, DRM has conventionally been delivered through stand-alone projects. However with progress achieved in implementing the HFA, more governments have been recognizing development mechanisms and instruments as important to reduce risks and strengthen resilience. It becomes more important to monitor a wide number of DRR related projects and investments embedded across different sectors either at central or local government levels in order to provide comprehensive overview of DRR policies.

In spite of such benefits, it is necessary to clarify the limitations of the DRM marker. The DRM marker cannot quantify the exact amount of DRM activity and only provides a best estimate. It is often impossible to extract a DRM element from overall programmes/projects, therefore overall programme/project budget are registered, leading to over-estimation of DRM budget. Furthermore, because the objective of the activity is the only criteria used to "mark" the budget item as DRM, if policy makers are unaware of DRM benefits, the activity will never be "marked". While it is clear to most that flood control and early warning are DRR policies, policy makers may not naturally recognize the contributions to reduce disaster vulnerability made, for example, by poverty reduction and ecosystem restoration. In this regard, a DRM Marker system may miss DRR elements embedded in all development activities. The DRR activities, which must have DRR elements but are not recognized as DRR, might underline an awareness gap of policy makers in the given sector.

C. The budget review methodology: Application of DRM marker

In applying the methodology of the DRM Marker in a risk-sensitive budget review, the following three steps were taken (Figure 38, Annex A-1 for more details). The first step is to define what should be monitored, *i.e.* the scope of the budget review. In the DRM Marker, the target was ODA data stored in OECD Credit Reporting System. However, in budget review, the scope of review needs to be clarified in the given context.

Then, the second step is to mark budget line items as significant and principal using DRM Marker criteria, count the budget in each item and sum up the value. In this step, sub-categories based on DRM elements is added to the original DRM Marker to show the balance between DRR (including prevention and preparedness) and disaster management (response and recovery). The last step aims to assess the resulting gap by comparing budget with risk. This analysis enables the identification of lessons to feed into the following year's budget.

Figure 38: Risk sensitive budget review process

STEP 1: Define what should be monitored/counted.

- **a. Coverage: national level, local level, state owned corporation, etc.**
- **b. Budget or Expenditure?**
- **c. Current and/or capital?**
- **d. Targeted hazards?**

STEP 2: Mark and Tag Budget items

- **a. Mark each line item as Principal (2) Significant (1) or leave unmarked.**
- **b. Tag all marked items where they make the greatest contribution.**
  - **Risk Prevention/Mitigation**
  - **Preparedness**
  - **Response**
  - **Reconstruction**

STEP 3: Count and analyse (*e.g.* comparison with risk, trend analysis)

Source: Author

In defining the scope of budget review, the following four aspects need to be clarified. The first is the coverage of monitored entities. Public sector consists of general government and state corporations. General government consists of central and sub-national governments. In developing countries, donor finance is also a non-negligible component of budget.

The second is whether to monitor budget or expenditure. In the context of developing countries, very often expenditure is far below the budget especially in capital investment due to its disposal of donor relationship.

The third point is whether to monitor current or capital budget/expenditure. Most infrastructures are classified under capital budget/expenditure, with sometimes multi-year budget commitment. Considering the importance of DRR in public investment, monitoring capital budget/expenditure is necessary. At the same time, current budget/expenditure includes important items such as expenses for training and early warning. Ideally, both should be monitored.

Lastly, there is often no disagreement in including activities targeted at geological (*e.g.* earthquake, tsunami, landslide), meteorological (*e.g.* cyclone, heat wave) and hydrological hazards (*e.g.* flood, landslide, drought). However, depending on countries context, epidemics and other hazards may also be included.

In Step 2, while the marking process based on DRM Marker methodology highlights investments in DRM in monetary terms, a parallel "tagging" process categorizes each marked activity as one of four components of DRM: prevention/mitigation, preparedness, response and reconstruction. Tagging is most easily represented as percentages in each category, the four categories summing to 100% of marked elements[46].

When each marked item is "tagged" in this way, we can start to understand how investments are distributed before and after a disaster. As countries can demonstrate more and more investment on the side of DRR (including prevention and preparedness), they can prove that they are accountable for risk reduction. As the value rises in components tagged as DRR, it will normally become evident that less funding is required in the post-disaster phase (response and reconstruction).

[46] In reality, the four components overlap. For example, some elements of reconstruction may be devoted to future disaster risk prevention/mitigation. However, for simplification, items are classified and tagged for four components based on their greatest contribution.

D. The risk sensitive budget review in Zanzibar

D.1. Scope of analysis

The scope of the budget review is defined as follows (Table 18).

Table 18: Scope of the risk sensitive budget review

Year	The budget 2014/15
Coverage	Government budget for FY 2014/15. Focus was on 11 ministries and institutions which are most involved in DRM and CC.
Budget or expenditure	Budget
Current or Capital	Both current and capital budgets
Targeted hazards	Fires, droughts, human and animal epidemics and long term effects of climate change

Year/Period

The risk sensitive budget review in Zanzibar has focused on the annual budget for the current financial year 2014/15. The national budget was approved by parliament in July 2014. This is the most recent budget available and includes under "Capital Expenditures" the development projects funded by the Revolutionary Government of Zanzibar (RGZ) and the development partners. However, it should be noted here that there are often large differences between the approved budgets and the actual expenditures (see Chapter1).

Coverage:

The Zanzibar government budget 2014/15 has been reviewed for ministries and institutions that are expected to somehow contribute to risk management (DRM and CCA) issues in terms of expenditures. These include:

- Second Vice President's office that covers the Disaster Management Department
- First Vice President's office including Department of Environment and the CC unit
- Regional Administration (under the President's Office)
- Ministry of Agricultural and Natural Resources (Forestry)
- Ministry of Livestock and Fisheries and Coastal Systems
- Ministry of Health
- Ministry of Land, Housing, Water and Energy
- Ministry of Infrastructure and Communication
- Tourist Commission
- Fire and rescue services
- Consolidated fund services used primarily for debt services but also miscellaneous expenditures. This can include disaster response if these are above the capacity of the ministries directly involved.

Table 19 below shows the recurrent and capital budget for the selected Ministries and institutions as these represent the ones making important contributions to risk reduction and response. Zanzibar's budget has in total 52 votes for Ministries and Government Institutions. The allocation of the Consolidated Fund Services (vote 45) is very high as compared to other budget lines as it includes reservations for payments of debt services. At the same time this budget line is used for unplanned expenses such as in the case of disasters that are going beyond the capacity of the line ministries.

The cumulative recurrent budget of the ministries (as per list above) represents 37% of the total Zanzibar government recurrent budget. For the capital budget this goes up to 72%. This share is very high due to the construction costs of the new international airport under the Ministry of Infrastructure and Communications. The further analysis in this review highlights proportions of the total national budget.

Table 19: Budgets of the ministries/ institutions reviewed. (Tsh thousands)

Vote	Description	recurrent budget	capital budget	total budget
5	Second VP Office	4,110,200	3,882,880	7,993,080
6	First VP Office	2,928,700	2,200,000	5,128,700
9	Regional Admin (PO Office)	4,036,400	200,000	4,236,400
20	Agriculture	13,758,000	9,611,002	23,369,002
22	Livestock & Fisheries	4,250,500	7,340,553	11,591,053
24	Health	22,747,200	28,206,897	50,954,097
25	Min of LHW&E	7,760,100	26,798,858	34,558,958
26	Min of Infrastructure	4,416,900	160,140,910	164,557,810
31	Tourist commission	1,387,658	250,000	1,637,658
32	Fire and Rescue Force	3,113,000		3,113,000
45	Consolidated Fund Services	69,875,100		69,875,100
	Total Selected budget	138,383,758	238,631,100	377,014,858
	Total Gov budget 2014/15	376,490,900	331,341,400	707,832,300
	Budget share reviewed as share of the total budget	37%	72%	53%

The annexes to this chapter illustrate the layout of the Zanzibar Government budget:

1) Overview of the budget of all Government ministries and institutions in Zanzibar (Annex A.2).
2) Example of the detailed budget for the Ministry of Agriculture (Annex A.3)
3) Detailed budget for one department (Annex A.4)

Discussions were held with staff in the planning department in the ministries and other institutions to get more information on the programs mentioned in the budget and to establish if these could be considered as having any relation to risk reduction.

Budget or Expenditure

As written above, there are reported significant differences between the budget that results from the budget preparation process and the actual expenses during the financial year. This is partly caused by the fact that during the planning process, not all details may be known and imperfect estimates are provided. During implementation, changes between the budget lines are made after gaining approval from the Principal Secretary of the concerned Ministry.

The more serious problem is external financing from various development partners, which provides 37% of the total national budget of 2014/15 and is mostly directed towards the capital expenditure as indicated in the Table 20 below.[47] The high dependency of the government budget and in particular the capital budget on funding from external sources, makes implementation of the programs and projects risky. Anticipated external funding may be delayed or even withdrawn depending on conditions that are often beyond the control of the Government of Zanzibar. Another aspect is that by far the largest part of external funding is through loans from international development banks (World Bank, AfDB, Korean EXIM Bank, BADEA and OPEC fund) that will result in increased pressure on the Zanzibar budgets when repayments are due. Most of these larger loans are for infrastructure projects such as the new airport facilities and road construction. These are not directly related to increased preparedness for natural hazards although they might have some additional provisions to withstand extreme natural events for instance large drainage systems to accommodate the expected higher rainfall intensities.

The Bank of Tanzania in its annual reports mentions that the Government total expenditures were well below the proposed annual budgets of the past five years. While the recurrent budget is usually only a few percentage points different, the capital expenditures are 40 – 60% below the planned figures. The reason given is unavailabbility of donor funding which impacts in particular on the development expenditures.

[47] Some funding is coming through General Budget Support (GBS) provided to the United Republic of Tanzania. Zanzibar is entitled to a share of 4.5% of this GBS funding.

Table 20: Zanzibar budget 2014-15 and share of external funding

Description	Tsh billion	%
Recurrent budget	376	53%
Capital budget (internal)	66	9%
Capital budget (external, grants and loans)	265	37%
Total Government budget	708	100%

Source: Author based on Zanzibar budger 2014/15

Within the context of this report it was not possible to find figures comparing budgets and expenditures for previous years. The official records of the actual expenditures of the previous budget year become available only after about six months after the end of the financial year in June. The latest actual expenditures records available for review are from the financial year 2012/13. The figures for the year 2013/14 were still under preparation during the time of the review. For this reason, the budget was used for the present analysis, and not the expenditures.

In the Zanzibar budget the word "expenditure" is used even for the current budget, although in reality these are estimates and not actual expenditures.

Capital (investment) or Current budget

The risk sensitive budget review for 2014/15 covered both recurrent and capital Expenditures. The capital expenditures are largely funded with support of development partners.

Targeted disasters

The Zanzibar budget review targets geological (*e.g.* earthquake, tsunami), and hydrological (*e.g.* flood, drought)[48] disasters, as well as epidemics.

Documents available and used for the risk sensitive budget review

The overall Government budget for all ministries and institutions covers about 500 pages with the detailed line budgets. The software used by the Ministry of Finance does not provide for a softcopy of the total government budget in excel format, which would have made the review easier to conduct. Instead hardcopies of the Budget are printed and distributed through the Government once the budget has been approved by the House of Representatives. For the present review, early printouts were provided for each of the ten selected government institutions. The budget portrays the recurrent expenditures (and recurrent revenues for some) and the capital expenditures for 2014/15

We have also reviewed special programs that are thought to be of particular relevance for DRM/CCA to get a better understanding of the nature of the proposed expenses. These include:

1) The Zanzibar Urban Support Program (ZUSP) supported by World Bank. It has components on solid waste management, seawall (re) construction and improvement of urban drainage;
2) Agricultural Services Support Programme (ASSP) and Agricultural Sector Development Programme – Livestock (ASDP-L) supported by International Fund for Agricultural Development (IFAD) among others;
3) Global Agriculture and Food Security Program (GAFSP) to expand rice production through improved seeds and management practices;
4) Korean Irrigation project for approximately 2000 ha;
5) Tanzania Social Action Fund (TASAF) III which includes the Productive Social Safety Net, the Livelihoods Enhancement and the Targeted Infrastructure Development at local level;
6) Zanzibar food security and nutrition framework from Ministry of Agriculture;
7) Ministry of Health Plan of Action 2013/14 (one of the ministries that is piloting performance based budgeting.

[48] There are no major meteorological disasters in Zanzibar.

These projects are usually implemented over a number of years and are mostly, but not always reflected in the capital budget. Another issue is that in case of delays, the same amount might return in budgets of following years and this partly explains why the implementation of the capital budgets is reported to be only 40-60% according to the Bank of Tanzania annual reports.

D.2. RSBR Results

Table 21 provides an overview the Zanzibar Government budget 2014/15 that have been identified as contributing to DRM and CCA using the DRM marker methodology described above.

Table 21: DRM/CCA related budgets in Zanzibar 2014/15 budget (million Tsh)[49]

Ministry/ Institution	Budgeted Activity Name	Budget (Tsh millions)		Category	DRM / CCA
		Significant	Principal		
Second Vice President's Office	Dep of Disaster Management (recurrrent costs)	-	263	2	DRM
First Vice President's office	Dep of Environment	113	-	1	DRM
First Vice President's office	Strengthening Environment and CC in Zanzibar	-	800	2	CC
Min of Agriculture,	Dep of Forestry and Natural Resources	1,605	-	1	CC
Min of Agriculture,	Department of irrigation	725	-	1	CC
	Institute of Agric Research	1,221	-	1	CC
	Dep of Forestry and NRNR, Pemba	95	-	1	CC
	Dep of Irrigation Pemba	90	-	1	CC
	Institute of Agric Research, Pemba	66	-	1	CC
	Irrigation program (Korea Support)	4,258	-	1	CC
	Community forest Management Program (HIMA)	64	-	1	CC
	Agr and Nat Resources Research	300	-	1	CC
Min ofLivestock and Fisheries	Dep of Veterinary Services Pemba	51	-	1	DRM
	Dep of Veterinary Services	704	-	1	DRM
	Control Bird Flue project	67	-	1	DRM
	Rabies control project Project, WSPA support	281	-	1	DRM
Min of Health	Preventive Department	250	-	1	DRM
	Preventive Department Pemba	145	-	1	DRM
	Zanzibar Malaria Control Program	2,900	-	1	DRM
	Zanzibar Health Promotion	1,310	-	1	DRM
Min of Lands Housing Water and Energy	ZNZ Alternative source energy	1,841	-	1	CC
	Sustainable Management of Land and Environment Project	948	-	1	CC
		-	-		
Fire/ Rescue Force	(Unguja)	-	3,113	3	DRM
	Totals	17,035	4,176		
	Grand total (Significant and Principal)	**21,210**			

Note: categories refer to the components of DRM shown in Table 21 (1: Prevention/mitigation; 2: Preparedness; 3: Response and 4: Reconstruction).

Source: Author based on Budget 2014/15

[49] In the review, the author did not find any clear budgets related to DRR in Ministry of Infrastructure and the Tourism Commission.

Table 22 below shows that the overall estimated investment in DRM/CCA identified in this review adds up to Tsh 21 billion (USD 0.2 million) which is about 3% of the total Zanzibar budget of Tsh 708 billion (about USD 440 million). Out of 21 Tsh million, most (2.4 out of 3%) are marked as "significant". The vast majority of marked elements being "significant" indicates a very horizontally integrated DRR investment in DRR, reflecting a positive move towards mainstreaming DRR.

The review divided the budgets in terms of:

- Significant (the intervention would have taken place even without DRM/CCA objective) :Examples are programs implemented under Ministry of Agriculture and Natural Resources to improve forestry cover and increase irrigation facilities, preventative disease programs from the Ministry of Health, the new renewable energy program supported by the EU in collaboration with ZECO (the electricity utility company).
- Principal (the intervention has a specific DRM/CCA objective): Examples are the cost of the Disaster Risk Management Department of the Second Vice President's office and the work being done to mainstream climate change adaptation in Government's planning and budgets through the UNDAP program under the First Vice President's office.

The budgets can also be divided between DRM and CCA investments and this is shown in the last column of Table 22. The analysis shows that 43% of the identified budgets are DRM related and these are in particular for activities implemented through the Ministry of Health. The balance of 57% has been classified as CCA-related, mainly in the agricultural and environment sectors such as for agricultural research and irrigation development.

Table 22: Share of DRM/CCA as percentage of total Government budget

	Significant	Principal	Total
Totals DRM/CC budget allocations	Tsh 17.0 billion	Tsh 4.2 billion	Tsh 21.2 billion
Percentage of overall budget	2.4%	0.6%	3.0%

Source: Author based on Zanzibar Budget 2014/15

Table 23 below provides an overview of the Tsh 21.2 billion for DRM/CCA interventions found in the 2014/15 budget. The review did not come across any intervention to classify as reconstruction. This is not surprising as Zanzibar has not experienced any major disasters over the last years that needed rebuilding of infrastructure. Expenses for minor damages and repairs to infrastructure may be hidden within the recurrent and capital budgets for the overall annual maintenance requirements.

Table 23: DRM/CCA investments in 4 DRM sub-components (Tsh billion), 2014/2015 budget

Budget allocations per Risk Management phase/category	Significant	Principal	Total	Percentage
Prevention/mitigation (1)	17.0		17.0	80%
Preparedness (2)		1.0	1.0	5%
Response (3)		3.1	3.1	15%
Reconstruction (4)			0.0	0%
Total budget allocations			**21.2**	100%
Share of total budget (Tsh 708 billion)	2.4%	0.6%	3.0%	-

Source: Author based on Zanzibar Budget 2014/15

- Prevention/mitigation accounts for 80% of the activities and this is due to the large investments in prevention of human and livestock diseases such as for instance the malaria and bird flu control programs respectively.

- To increase resilience against climate change there are significant investments in irrigation with support of the Korean government that is expected to increase the current irrigated area of around 500 ha with another 2000 ha. Agricultural research is focusing on water harvesting, drought resistant varieties and other technologies that can improve rice yields in non-irrigated areas. The costs of these programs are included in the budget of the Ministry of Agriculture and for this review have been classified as prevention/mitigation as it prepares the sector for the predicted increase in dry spells.

- In the category preparedness, the review has included the budgets for the Disaster Management Department in the Second Vice President's Office and the strengthening and mainstreaming of climate change program in the First Vice President's office.

- The budget allocation for the Fire and Rescue Force has been categorised under the category response as the interventions are mostly directly related to disaster events. However, most of these fire services respond to purely man-made events.

- There were no interventions included in the category reconstruction due to the fact that fortunately Zanzibar has not experienced large disasters of natural origin in recent years.

D.3. Gap between loss, risk and DRM budget

Components 2 of the project determined an average annual loss of USD 0.2 million to earthquakes in Zanzibar. The overall estimated investment in DRM/CCA identified for 2014/15 (one year) totals USD 0.2 million (Tsh 21 billion) (Table 24).

Table 24: DRR budget, loss and risk

	DRR budget, 2013/14	AAL (Earthquake only)	Loss, 1980-2014 (10 data cards)
Value	USD 0.2 million	USD 0.2 million	USD 1.3 million (Annual average: USD 0.04 million)
Status		NO GAP	NO GAP

Source: Author

A simple comparison of AAL to the most current annual investment in DRR indicates an **equal balance**. However, it is important to keep in mind that AAL is only estimated for earthquake risk and to go back to the actual marked activities to determine their link to earthquake risk. If this 2014/15 investment could be reasonably linked to earthquake risk reduction, it would seem to offset the AAL by many years. However, the assumption of linkage with earthquake seems unreasonable given recent low frequency and intensity of earthquake in Zanzibar.

As a reference, loss data was also compared to the budget. This comparison, especially when expressed per year during the reference period, shows a positive balance. However, given that only 10 cards are registered for disaster loss database, assuming it is incomplete, this also merits caution.

Although this is only a very simple and straightforward example that cannot be extrapolated to other hazards or years, it serves to underscore the utility of both the AAL/past loss data and the budget review as a combined tool to move Zanzibar towards risk-sensitive public investment in light of their most important natural hazards.

D.4. Challenges Experienced in Conducting Risk Sensitive Budget Review

Planning and technical staff in sectorial ministries is only partly aware of DRM and what it could mean for their institutions. Disasters are largely seen as human related due to severity of the recent marine accidents. They are considered to be the prime responsibility of the Department for Disaster Management in the Second Vice President's Office, Climate Change Unit of the First President's Office, and the relief services, fire brigade, police and defence forces. On the other hand, staffs in the ministries of health and livestock classify some of their programs as prevention and disaster preparedness (epidemic related) and such programmes were readily included in this budget review.

While the DMD is well established with dedicated staff and budget, this is less obvious for climate change which is situated under the First Vice President's Office and has very limited resources in terms of manpower and funding. The Government has programs to mainstream Climate Change in all ministries but that is still in its early stages. However, ministerial staff is more aware of climate change issues and the possible long-term impacts. Changing weather patterns, sea level rise, increased beach erosion and salt-water intrusion are often mentioned in this context.

The RSBR scoped for interventions that can be categorized as disaster risk reduction such as water management, irrigation expansion and (re)forestation. Most of these activities are classified as "significant" as they would be implemented as best practice in any case.

There are (as yet) no specific explicit budget lines exist for DRM/CCA. There is mention of establishing special funds for Disaster Management (as indicated in the DRM policy of 2011) and for climate change but no final decisions have been taken as yet if these are the most appropriate mechanism for Zanzibar circumstances.

There is also still very little understanding of risk financing within the government budget. However, there are signs that change is taking place. Staffs within the Ministry of Finance and the Accounting General Office are being trained with expertise provided by the National Board of Accountants and Auditors on risk profiles and management.

D.5. Next Steps to be considered: Other Levels and Categories

State Owned Enterprises

Zanzibar has a **n**umber of state owned enterprises in various sectors such as the utility companies, banking, harbour and airport facilities and in the hotel industry. The Government is in the process of disinvesting from some of these enterprises to reduce the burden on the budget as well as to improve services. Within the context of this survey the utility companies are the most relevant.

The Zanzibar Water Authority (ZAWA) is a semi-autonomous entity charged with the overall management of water supply services and water resource management in the islands. The national demographic survey of 2010 reports that 57% of the population has access to improved water sources. ZAWA is expected to collect revenues from water sales to meet costs of operation and maintenance. The work is in progress with the installation of water meters and the collection of water bills. ZAWA also has an important function in water conservation and reduction of water losses. Currently ZAWA is also setting up a water resource monitoring and management system and plays a crucial role in bringing together the different stakeholders in the water sector.

ZAWA is supported by a number of donor agencies of which the African Development Bank (ADB) and JICA are the largest investors in rehabilitation of existing systems as well as expansion. ZAWA is the largest single consumer of electricity on the islands to operate the pumps on wells and distribution networks. There are opportunities to reduce water losses and to increase pump efficiencies, interventions that could be classified as climate change mitigation. There is currently no evidence that there are specific investments to increase pumping efficiencies apart from a study under the ADB program that has highlighted the extent of the issue.

Zanzibar Electricity Corporation (ZECO) is the sole distributor of electricity on the islands. The electricity access rate was reported to be 38% in 2010 by the national surveys but ZECO claims that to date it reaches 56% of the population based on the number of connections. The distribution system reaches to practically all corners of the islands covering all five Regions and ten Districts. ZECO procures electricity in bulk from mainland Tanzania through submarine cables. It has backup diesel generators but these are rarely used due to the high costs. ZECO is supported by a number of donors (Norway, Sweden (SIDA) and Japan (JICA)) mainly to expand the distribution network and reduce losses. The EU has a program to assess the potential of alternative, renewable energy sources and this is focussing on wind and solar. Future investments in these technologies will to a large extent be based on the results of the assessments and will at least take a number of years.

Local Authorities

Zanzibar has five regions distributed over the two islands Unguja and Pemba. The total budget for 2014/15 for these five regions is Tsh 8 billion, just over 1% of the overall national budget of Tsh 708 billion. With very limited local tax, this means the regions have very limited resources and capacity to implement programs. The Government has a policy to increase the role of the regions and districts over the coming years.

The Zanzibar Municipal Council (ZMC) is an important local governance institution and responsible for the Mijini (Town) district, the economic, political and cultural centre of the islands. The district and the surrounding urban areas have a population of about 600,000 persons. Due to the high population pressure, it is also the area that is most affected by local flooding and poor waste management.

External Finance

The World Bank Zanzibar Urban Support Program (ZUSP) has provided a loan of USD 31millon to the Government to support the ZMC and related government authorities in the following areas:

1) Institutional Strengthening of ZMC (USD 4.3 million).
2) Indicative Structure Plan for the ZMC (USD 2.2 million to provide long term direction in different sectors such as roads, water supply, sewerage).
3) Construction of storm water drainage channels and surface water drains (USD 10.8 million)[50]
4) Street lighting in the ZMC areas (USD 2.6 million).
5) Solid waste collection and transportation (USD 2.8 million).
6) Construction of sea wall and promenade within Stone Town (USD 8.5 million)

The project implementation period is 2011-2016. Currently the large physical investments for drainage (estimated at USD10.8 million) and seawall (estimated at USD 8.5 million) are in the procurement stage and the tendering process is expected to be completed before 31 December 2014. Construction will take a number of years and funding will be released according to the contractual agreements. The disbursement in the financial 2014/15 is not yet determined.

[50] This component was examined for the cost benefit analysis in Annex C.

References

OECD (2014), A Proposal to Establish a Policy Marker for Disaster Risk Management (DRM) in the OECD DAC Creditor Reporting System (CRS).
http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DCD/DAC/STAT%282014%293&docLanguage=En

ZUSP_Project appraisal document. World Bank Jan 2011

Annex A-1. CHECKLIST for a risk-sensitive budget review

CHECKLIST to CONDUCT a RISK-SENSITIVE BUDGET REVIEW (RSBR)

1. DETERMINE WHAT SHOULD BE COUNTED

a. IDENTIFY YEAR / PERIOD that is appropriate and feasible

EXAMPLE: last fully-completed year or current year underway

ADVICE: Start with a single year, add other periods later, as feasible.

b. DETERMINE COVERAGE

EXAMPLE: all public sector (general and state corporations) or only General budget (central and/or sub-national budgets)

ADVICE: All public sector is desirable, but start with central budget and budget of national disaster management entity before moving onto other budgets. Smaller countries should be able to review all.

c. IDENTIFY BASIS FOR REVIEW

EXAMPLE 1: budget or expenditure?

ADVICE: if difference between two is large, go with expenditure; if small, go with budget.

EXAMPLE 2: investment (capital) and/or consumption (current)?

ADVICE: ideal to use both, usually reported separately in budget

2. OBTAIN COPIES of budgets covering all elements determined above

EXAMPLE: hard-copy or electronic copy—with 'objectives' stipulated per line item in enough detail to conduct next steps

ADVICE: review / study guidance for DRM Marker, taking note of the "eligibility criteria" discussion on pp3-4: (Review document entitled: DAC Working Party on Development Finance Statistics, A Proposal to Establish a Policy Marker for DRM in the OECD DAC Creditor Reporting System, 2014)

3. MARK and TAG BUDGETARY ELEMENTS

a. DRM MARKING: go through the budget(s) line by line, asking the question(s) at each line:

• "do any objectives of the budgeted activity meet any 'eligibility criteria' of the DRM marker?

• "If yes, would the budgeted activity have been undertaken without that DRM objective?"

ADVICE: Using spreadsheet, record total of the budget activity in three categories: Principle (2), Significant (1) and not marked (0) for easy summing

b. DRM TAGGING: go through the budget(s) again line by line, to categorize each MARKED activity by scheme in 3a above: "what percentage of total MARKED items fit best under prevention/mitigation, preparedness, relief and reconstruction?"

ADVICE: Work with DRM entity in your country to determine the best categorization

EXAMPLE: the most common standard is: 1. Prevention/mitigation, 2. Preparedness, 3. Response and 4. Reconstruction

4. CALCULATE AND COMPARE DRM INVESTMENT

a. Sum DRM/CCA investment per marker and DRM sub-category

b. Calculate gap by comparing sum with Risk/Loss data (Comp 1/2)

c. Document lessons learned

d. Time allowing, repeat all of the above with additional years, budgets, sectors, etc.

Annex A-2. Zanzibar Government Budget 2014/15 (in millions Tsh) *)

Vote	Description	recurrent budget	Dev Local	Foreign Aids	Total Dev Budget	Total Budget 2014/15
5	Second VP Office	4,110	1,100	2,783	3,883	7,993
6	First VP Office	2,929	1,400	800	2,200	5,129
7	Office Intern Cooperation (DIAS)	808			-	808
8	PO Revolutionary Council (MBLM)	1,458			-	1,458
9	Regional Admin (PO Office)	4,036	200		200	4,236
10	PO, State House an Good Governance	5,107	530		530	5,637
11	Office of Controller and AG office	2,023			-	2,023
12	zanzibar Commisssion for Aids	811	50	1,281	1,331	2,142
14	High Court Zanzibar	5,037	700		700	5,737
15	Attorney General office	999			-	999
16	House of representatives	14,565		711	711	15,275
17	Economic Brigade	9,483	150		150	9,633
18	ZNZ Training Centre for Offender	7,491	200		200	7,691
19	Min of Finance	27,768	27,203	14,294	41,497	69,265
20	Agriculture	13,758	1,500	8,111	9,611	23,369
21	Min of Trade, Industries and Marketing	3,531	2,336		2,336	5,866
22	Livestock & Fisheries	4,251	700	6,641	7,341	11,591
23	Min of Educatin & Vocational Training	86,202	3,300	24,133	27,433	113,634
24	Min of Health	22,747	3,850	24,357	28,207	50,954
25	Min of Lands, Housing, Water & Energy	7,760	3,950	22,849	26,799	34,559
26	Min of Infrastructure & Comm	5,678	8,400	151,741	160,141	165,819
27	President's office Labor nd Public Services	4,181	300	28	328	4,509
28	Min of Employment, Soc Welfare, Youth, Wo	3,641	1,524	2,406	3,930	7,571
29	Anti Smuggling Unit	11,567	500		500	12,067
30	Zanzibar Electroral Commission	1,314		1,750	1,750	3,064
31	Tourist commission	1,389			-	1,389
32	Fire and Rescue Force	3,788			-	3,788
34	People Voluntia Unit	4,660			-	4,660
35	Office of Directro of Public Prosecutions	1,366	200		200	1,566
36	Ministry of Constitution and Legal Affairs	3,109	200	1,580	1,780	4,889
42	Min of Information, Tourisnm, Culture and S	7,982	5,995		5,995	13,977
43	Zanzibar Registration& Identity Card Office	1,939			-	1,939
44	Min of State (PO) Public Service and Good Go	-			-	-
45	Consolidated Fund Services	69,825			-	69,825
46	Law Review Commission	498			-	498
47	Public Service Commission	754			-	754
48	Civil Service Commission	611			-	611
49	Planning Commission	3,339	1,612	1,979	3,591	6,930
50	Corruption and Economic Crimes Authority	815			-	815
51	National Commision for coordiantion and co	364			-	364
52	Referal Mnazi Mmoja Hospital	8,282			-	8,282
UN	Unallocated	8,500			-	8,500
	Sub total	**368,475**	**65,900**	**265,442**	**331,342**	**699,817**
	REGIONS					
37	Urban West Region (U)	1,758				1,758
38	South Region (U)	1,337				1,337
39	North Region (U)	1,363				1,363
40	South Region (P)	1,917				1,917
41	North Region (P)	1,642				1,642
	Sub total	**8,016**	-	-	-	**8,016**
	Total Gov budget 2014/15	**376,491**	**65,900**	**265,442**	**331,342**	**707,833**
	Total Selected budget	140,271	21,100	217,281	238,381	378,652
	Budget share reviwed as share of the total budget	37%	32%	82%	72%	53%

**): This is to illustrate how budget document looks like. The budget is based on an overview provided to the consultant during the RSBR exercise and not the final version approved by the House of Representatives. There have been some minor differences between the version for the risk sensitive budget review and the final version.*

Annex A-3. Example of Budget 2014/15 (Ministry of Agriculture)

Vote						
20	**Min of Agriculture and Natural Resources**					
Recurrent expenditures						
subvote		2012/13 (actual)	2013/14 (approved)	2014/15 (estimate)		
0301	Head Office Pemba	1,644,215,898				
0401	Dep Planning, Policy and Research	628,350,735	449,548,000	377,129,000		
0402	Kizimbani Agric College	288,800,000	500,000,000	427,000,000		
0701	Dep of Forestry and NRNR	1,224,181,025	1,299,318,000	1,605,448,000		
1101	Dep of Irrigation	571,469,800	607,066,000	725,370,000		
1301	Dep Admin & HR	712,520,052	1,130,634,000	1,543,027,000		
1401	Dep of Food Security and Nutrition	202,613,350	172,188,000	194,500,000		
1501	Dep of Agriculture	5,113,513,078	5,649,736,000	4,802,444,000		
1701	Institute of Agric Research	834,140,250	967,498,000	1,221,269,000		
1702	Planning and Policy Dep Pemba		25,080,000	60,000,000		
1703	Dep of Forestry and NRNR, Pemba		88,760,000	94,960,000		
1704	Dep of Irrigation Pemba		36,480,000	90,000,000		
1705	Dep Admin & HR, Pemba		1,556,052,000	2,409,853,000		
1706	Dep of Food Security and Nutrition, Pemba		18,240,000	42,000,000		
1707	Dep of Agriculture, Pemba		41,040,000	99,000,000		
1708	Institute of Agric Research, Pemba		27,360,000	66,000,000		
	Totals	11,219,804,188	12,569,000,000	13,758,000,000		
Revenues						
0301	Head Office Pemba	91,770,890	400,000,000	300,000,000		
0401	Dep Planning, Policy and Research	2,000,000	2,000,000	10,000,000		
0701	Dep of Forestry and NRNR	424,282,070	310,000,000	485,000,000		
1501	Dep of Agriculture	15,916,000	15,000,000	15,000,000		
1701	Institute of Agric Research	18,247,300	21,000,000	35,000,000		
		552,216,260	748,000,000	845,000,000		
Capital Expenditures 2014/15						
0401	**Dep Planning, Policy and Research**		**Gov cont**	**Foreign grants**	**Foreign loans**	**total**
610003	Community forest Management Program	039 Norway		84,000,000		84,000,000
610004	Irrigation program	029 Koica	400,000,000		3,858,000,000	4,258,000,000
610005	Strenghtening clove plantation	099 SMZ	300,000,000			300,000,000
610007	Food Security and Nutrition Prog	004 World bank	160,000,000	64,800,000		224,800,000
610008	Estab Agro processing Training Centre	099 SMZ	100,000,000			100,000,000
610014	Agri Sector Dev Program ASDP	084 IFAD/AGRA/ AfD	30,000,000		346,886,000	376,886,000
610016	Agr and Nat Resources Research	099 SMZ	300,000,000			300,000,000
610017	Marketing Infra Structure, Value Addition	084 IFAD/AGRA/ AfDI	60,000,000		3,008,416,000	3,068,416,000
610020	KATI Infrastructure		100,000,000	178,400,000		278,400,000
610021	Glofal agri and Food Security Project (GAF	006 USAID	50,000,000	570,500,000		620,500,000
			1,500,000,000	897,700,000	7,213,302,000	9,611,002,000

Annex A-4. Details of the budget for one department (Department of Agriculture, Ministry of Agriculture)

1501	Department of Agriculture	recurrent budget
		Tsh
211100	**Wages and salaries in cash**	
211101	Civil Servants	2,090,050,000
211104	Leave travel	10,000,000
211107	Overtime	3,000,000
211116	Special Allowances	38,604,000
211116	Sitting allowances	10,000,000
211117	Bicycles	2,880,000
211200	**Wages and salaries in kind**	
211202	uniforms	2,000,000
212100	**Actual Social contributions**	**209,586,000**
220100	**communication**	
220101	Telephone and telegram	7,800,000
220108	Internet service	-
220200	**Hospitality**	
220201	Food and refresh, seminars/ meetings	1,200,000
220202	Gifts/pprizes	2,500,000
220300	**Travelling expenses**	
	Domestic	4,900,000
	Foreign	-
220400	Utilities, fuel and Lubricants	
220401	Petrol	4,600,000
220402	diesel	23,000,000
220404	Lubricants	30,000,000
220407	Water bills	-
220408	Electricity bills	6,000,000
220500	**Office supplies and Services**	
220501	Stationary supplies	3,000,000
220504	Computer Accessoires supplies	4,500,000
220504	Sundr items	3,924,000
220508	Periodicals and Newspapers	1,800,000
220517	Annual planning and budgetting	1,200,000
220700	**Renovation of Physical**	
220701	Minor Civil Work	3,000,000
220800	**Maintenance of Machinery, Equipment**	
220803	Maintenance fo motro vehicles	7,000,000
220805	Tractor services	50,000,000
221000	**Agric Supplies and Services**	**-**
221100	Capacity building	-
263100	Transfers to other Gov Services	
263167	Regional Agric Services	2,228,400,000
263170	Plant protection division	50,000,000
282100	Miscellaneous expenses	
282100	Burial expenses	1,000,000
311200	**Acquisition of machinery**	
311203	Purchase motorcycles	-
311207	Purchase of computers	2,500,000
	Total Dep of Agric	4,802,444,000

Annex B: Macro / CATSIM Assessment[51]

A. Overview

Generally regarded as the 'insurer of last resort,' national governments assume primary responsibility in providing response, recovery and reconstruction resources in times of disasters (Mechler, 2004). Governments play an important role in the post-disaster period, conducting timely and accurate damage assessments, devising rehabilitation plans, and financing and executing rehabilitation projects. Reconstruction is often very costly. Appropriate assessment of existing risk and contingency liability, and reducing risk and preparing for fiscal contingency as much as feasible before events occur is therefore of paramount importance for government's strategic decision-making, planning and resource allocation.

To respond to such needs in 2006 the International Institute for Applied Systems Analysis (IIASA) invented the "CATSIM" (Catastrophe Simulation), an interactive simulation tool to build capacity of policy makers to estimate and reduce public sector financial vulnerability. The model has been applied to Madagascar in 2011 and to several other countries.

The CATSIM model consists of five-steps (See Table 25): In the first step, direct risk assessment is performed integrating information regarding the probability of natural hazard occurrence, the level of exposure and physical vulnerability (see Hochrainer-Stigler, 2012 for details). Direct risk is expressed in terms of economic value of asset at risk and return periods of natural hazards. In this initiative, we utilized the data collected in Components 2 to the maximum degree.

In the second step, public finance preparedness and vulnerability are determined by the national government's current ability to raise internal and external funds for disaster response and reconstruction ex-ante or ex-post. The government's ability to raise necessary fiscal means are typically constrained by a number of economic and institutional factors such as the country's current level of public deficit and cumulative debt, capacity to raise tax revenue and its ability to borrow from domestic and international credit markets.

In the third step, the government's current level of public finance preparedness is evaluated against the disaster risk. The model quantifies the notion of fiscal 'resource gap year'—*i.e.* the return period at which the national government's current level of fiscal preparedness will be insufficient against the risk it faces.

The potential occurrence of a fiscal resource gap and its longer-term growth implications are appraised through macroeconomic modelling in step four. Using the Monte-Carlo simulation approach, the model quantifies probabilistic macroeconomic growth trajectories based on the existing degrees of natural disaster risk and public finance preparedness.

Finally, a range of risk management options is evaluated against the costs and benefits in the fifth and final step. Governments may adopt a number of ex-ante and ex-post measures to prepare for the disaster risk, including structural mitigation, contingency fund, catastrophe insurance, catastrophe bonds, and contingent credit arrangements.

Since Zanzibar has not conducted CATSIM to date, as a first trial, this initiative has implemented only Steps 1 to 3.

[51] This chapter was drafted by Junko Mochizuki, Stefan Hochrainer, Keith Williges, and Reinhard Mechler, Risk Policy and Vulnerability Program, International Institute for Applied System Analysis (IIASA). Input was given by Zanzibar team and UNISDR.

Table 25: 5 Step CATSIM Modules

Steps	Tasks
1. Direct Risk Assessment	To estimate **economic asset at risk and return periods** of natural hazards.
2. Fiscal Resilience Assessment	To assess the country's current **fiscal resources availability and preparedness**
3. Fiscal and Economic Vulnerability	To estimate a '**fiscal resources gap year**' combining step 1 & 2
4. Economic impact Assessment	To estimate **indirect impacts** in terms of potential risks to macroeconomic growth
5. Risk Management/Reduction Option Assessment	To evaluate the risk management options

Source: Author

B. CATSIM analysis in Zanzibar

Step 1: Direct Risk Assessment

This study evaluates the ability of governments to manage potential fiscal and economic risk arising from earthquakes. Table 26 shows estimated loss at varying return periods for the risk of earthquake.

Table 26: Estimated PML at varying return periods (in USD million)[52]

Return period	CAPRA estimate (implemented in this initiative)
5	0.05
10	0.10
20	0.18
50	0.41
100	0.91
500	11.40
1000	30.22
AAL	0.18

The government is generally not responsible to provide all reconstruction needs because private households and businesses will assume responsibility of their own reconstruction needs. We assume that the governments assume the following responsibility in case of a disaster:

- The Zanzibar government will be responsible to finance reconstruction of public assets, including roads, bridges, schools and hospitals, etc. (Explicit liability).
- The Zanzibar government will extend partial support for private relief and recovery including provision of support to the poor (Implicit liability).
- Total contingent liabilities of Zanzibar Government were estimated as outlined in Table 27.

[52] The data collected from Component 2 were later revised to reflect new GAR 15 methodology. Chapter 2 was revised to update the data, but given short time frame, we could note reiterate the CATSIM assessment based on new data. The inconsistency with Chapter 2 stems from this issue.

Table 27: Estimated Government Contingent Liability

Item	Value (in USD billion)	References
Total Capital Stock	0.58	The total exposed asset value calculated in Component II
Public Capital (a)	0.18	Assumed as 30% of total capital stock based on Hochrainer-Stigler (2012)
Private Capital	0.41	Assumed as 70% of total capital stock based on Hochrainer-Stigler (2012)
Relief Spending (b)	0.12	Assumed as 20% of total capital stock based on Hochrainer-Stigler (2012)
Governments Total Liability (a+b)	0.29	N/A

Source: Author

Step 2: Fiscal Resilience Assessment

The options to finance reconstruction and recovery may be divided into: i) ex-ante and ii) ex-post resources depending on whether arrangements are made prior to or after a disaster event. The below are some of the ways in which governments typically raise fund to finance reconstruction:

Ex-Ante Resources

- Preparing contingency budget line
- Establishing reserve fund
- Arranging contingent credit
- Obtaining insurance for public infrastructure
- Issuing catastrophe bonds

Ex-Post Resources

- Diverting funds from other budget expenditures
- Raising additional tax
- Obtaining credits from central bank
- Borrowing and issuing domestic bonds
- Receiving international assistance
- Borrowing from multilateral finance institutions
- Borrowing and issuing bonds in international market

In this study, we have estimated fiscal resources availability based on available economic and fiscal statistics. Table 28 provides an overview of the estimated availability of ex-post resources such as international assistance, budget diversion, domestic bonds and credit, and international / multilateral financial institution (MFI) bonds.

We did not consider the tax option because this is largely considered as infeasible or undesirable option by Zanzibar. We also did not consider ex-ante options because of data availability issues.

Table 28: Estimated Ex-post Fiscal Resources Availability

Sources	Assumptions	Value
International Donor Assistance	10.4% of public liability based on international average[53]	10.4% of liability
Diversion from budget	5%>deficit, then 0 5%<deficit, then 5% of total revenue	USD 5.6 million*
Domestic Bonds and Credit	1% of gross domestic credit from private bank	USD 2.46 million**
MFI/ International bond market borrowing	SDR allocation	USD 77 million***
Total excluding international assistance		USD 85 million

Note: * based on the 'miscellaneous expenses' in the budget item; **assumed as limited to 4.5% of Tanzania's domestic bonds and credit as estimated in Hochrainer-Stigler et al. (2014); *** assumed as 4.5% of Tanzania's new external borrowing reported in 2013/2014.

Assumptions for fiscal resource availability

International assistance

International assistance, the amount of money made available to a country post-event in the form of donations from other countries and aid organizations, is assumed to be 10.4% of damages, based on regression analysis of historic data from Freeman et al (2002).

Diversion from budget

Budget diversion, representing the amount of funding from the central government's budget which can be re-directed and focused towards recovery, is assumed to be only possible if a government has a budget surplus or small deficit. For this analysis, we assume that countries with a 5% or larger budget deficit relative to GDP are unable to divert funding; as Zanzibar does not fit this criteria, available funds for diversion are calculated as 5% of the government's total revenues. Data for this calculation are obtained from the World Bank's World Development Indicators.

Domestic bonds and credit

After an event, a nation has the possibility of trying to finance recovery via domestic credit, either by printing money, issuing bonds, or borrowing from domestic sources. A pitfall to this avenue of funding is the risk of increasing the total stock of domestic credit, which could crowd out private sector credit and lead to more monetary expansion and increasing inflation (World Bank, 2011). For this reason, we assume that a government will be limited in this regard to a maximum of 1% of gross domestic credit from private banks, the data being sourced from World Bank Development Indicators. There is high uncertainty whether the domestic credit market can be accessed and these estimates deserve further verification.

Multi-lateral financial institution (MFI) / International bond market borrowing

[53] This value depends on the size of disaster. Therefore, we do not have any single value. In CATSIM, the availability for each scenario is calculated using this percentage.

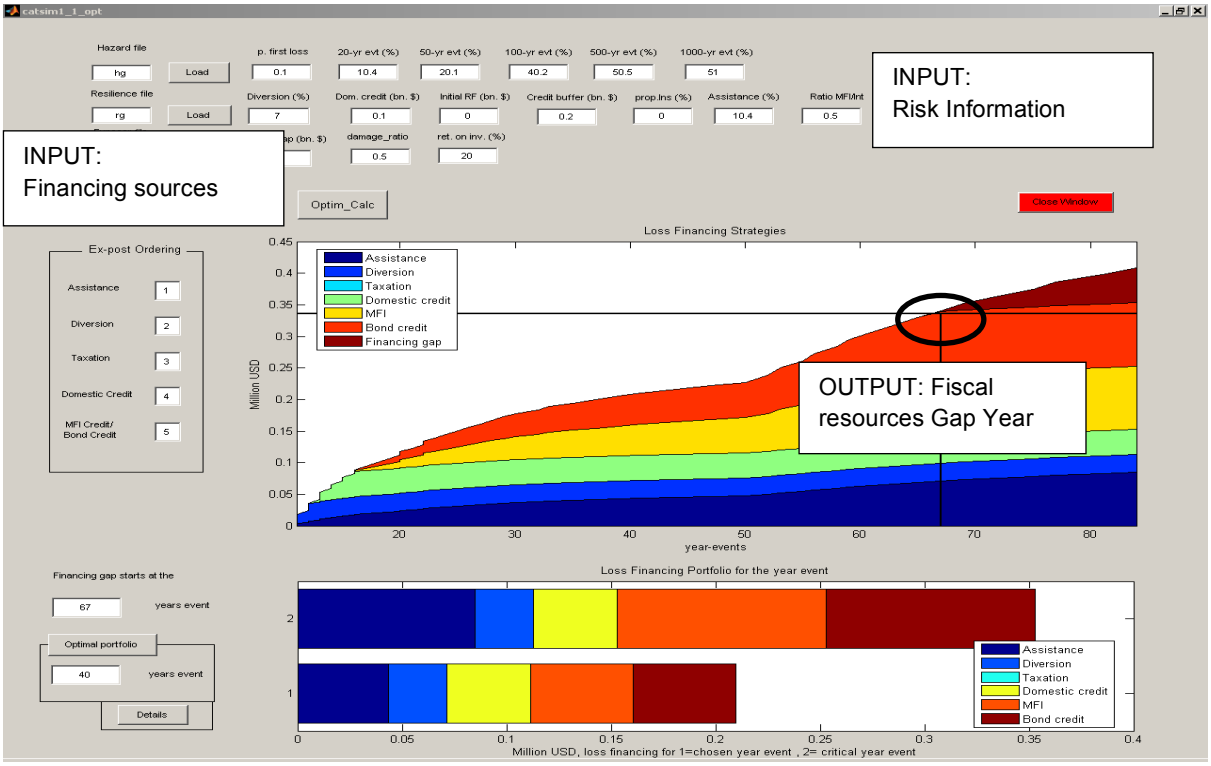
A further option for financing reconstruction and recovery comes from borrowing on international markets and from multi-lateral financing institutions. The International Monetary Fund's Special Drawing Rights (SDRs), which represent an international reserve asset, is used as a baseline estimate for how much international funding could be available post-event. SDRs are based on four currencies (the euro, Japanese yen, pound sterling, and U.S. dollar), and can be exchanged for usable currencies (IMF, 2014).

Step 3: Estimating potential "fiscal resources gap"

Combining direct risk and fiscal resources availability information obtained in previous steps, this section estimates the governments' potential fiscal resources gap year — the return period at which the government will face difficulty in raising sufficient funds for reconstruction (Figure 39). Given the considerable uncertainty regarding risk estimates, the result should be interpreted with caution and further studies are certainly advisable to validate assumptions in Steps 1 and 2.

While the concept of 'fiscal resources gap' illustrates the snapshot estimate of the country's resource availability, it is important to note that a large proportion of resources that will be used to meet this one-time disaster event is loan-based, suggesting that there will be a longer-term cost of repayment of these loans. While the precise fiscal and macroeconomic implications of such longer-term impacts must be analysed in a dynamic CATSIM framework, it is important to keep in mind that there are a number of costs associated with each option. In particular, the opportunity cost of diverting resources away from other development projects must be weighed carefully with the benefit of resources spent on disaster reconstruction and recovery.

Figure 39: Display of results of fiscal resources gap year

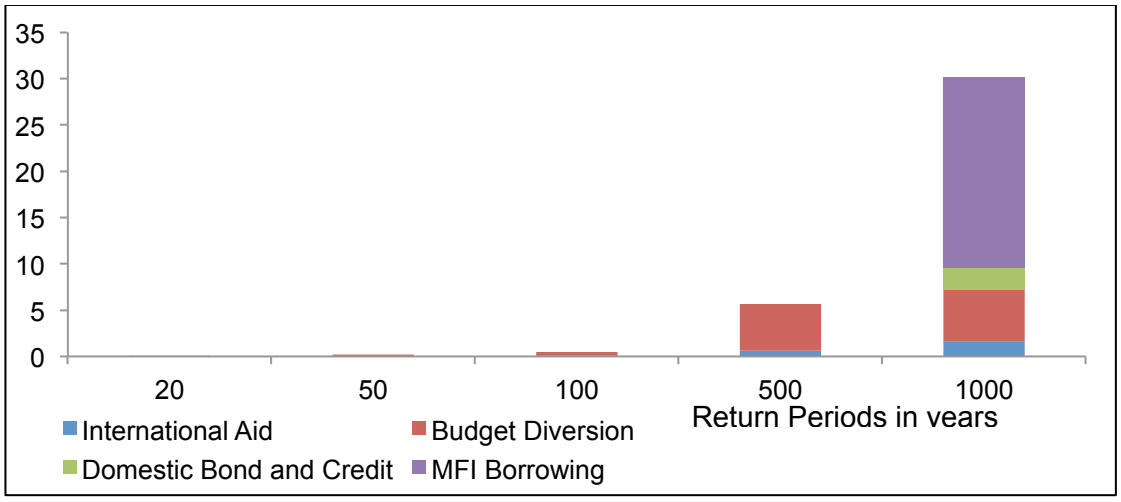


Source: Author

Based on the information gathered, it is estimated that Zanzibar has sufficient fiscal resources to cope with its earthquake risk even in the case of catastrophic event (500+ year event) (Figure 40). In other words, no fiscal gap for earthquake risk was identified. The Figure 40 compared estimated losses at different return periods with Zanzibar's available fiscal resources. While Zanzibar has up to USD 85 million available to cope with disasters excluding international assistance, earthquake risk is relatively low with 500 and 1000-year events expected to result in USD 11.4 million and USD 30.2 million in damage respectively.

From the point of view of risk spreading, it is also evident that Zanzibar's earthquake risk is low compared to its ability to respond. The following back-of-the envelope calculation illustrates this point: In case of a 500-year earthquake, the expected damage is estimated to be USD 11.4 million. While the total population of Zanzibar 1.3 million, this translates to approximately USD 17.5 in damage per labour force (assuming that the working population is 50% of total population). Given the per-capita Gross National Income (GNI) of USD 667 reported in Zanzibar, USD 17.5 in damage is equivalent of 2.6 % of per capita GNI, which is small and appears to be manageable.

Figure 40: Fiscal resources gap for Zanzibar: No fiscal gap observed.

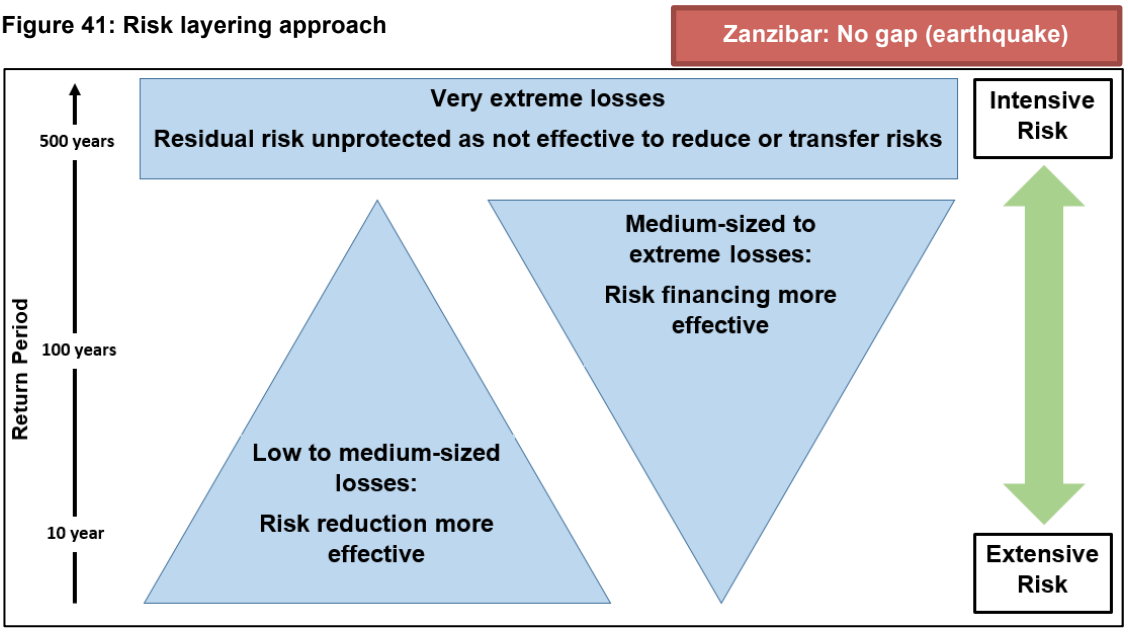


Source: Author

Conclusion: Toward risk layered approach

The government is encouraged to take a 'risk layered management' approach where resources are allocated based on the varying levels of risk facing the country, with a priority given to reducing existing risk and preventing the creation of new risks in the extensive risk layer (Figure 41). The CATSIM analysis conducted from Steps 1 to 3 has illustrated the need for improved management of disaster risk in Zanzibar.

Figure 41: Risk layering approach



Source: Author

Further challenge: Data gaps and way forward

The present study identified data gaps and sources of uncertainty regarding fiscal risk assessment. The present studies did not fully account for indirect effects of disaster damage, and further studies are needed to quantify and evaluate the indirect risks caused by disaster damage.

For Zanzibar, there is no fiscal gap at the moment due to earthquake risk. It is important to note however that this assessment only pertains to the earthquake risk, and other potential hazards in Zanzibar such as flood are not taken into account. There is clearly a need for further investigation of such risks, evaluating the fiscal resources availability to cope with the potential for other catastrophic disasters. Further studies are certainly needed to address risks of smaller and localized events such as floods and droughts that are currently under-reported.

Given the relatively short period of data availability, high uncertainty can be expected of catastrophic risks with return periods of above 500. It is advisable, therefore, further data collection, validation and analysis performed in an iterative fashion to reduce the range of uncertainty.

A technical and institutional support package is necessary to establish iterative risk management system in Zanzibar and other IOC countries (Table 34). In terms of technical needs, knowledge regarding probabilistic risk assessment and economic assessment tools (CATSIM) would be needed along with general awareness of risk related concepts and statistics. Given the limited availability of risk experts in IOC countries, a regional approach to training and capacity building (*e.g.* regional workshop for training of trainers/ regional sharing of risk knowledge experts, etc.) may be an effective way to leverage local capacity and resources. Institutional support for iterative management should be embedded in the existing DRR/CCA policy framework of Zanzibar.

It is important to discuss and update fiscal resilience parameter and value at critical time, for example, when administration changes or after disaster. Financing mechanism for disaster management (see Table 16 in Chapter 5) should be checked regularly. Defining government liability more concretely is also recommended.

Some of the important policy questions to ask in Zanzibar would be:

- What is the desirable level of fiscal preparedness in the country? What would be the policy goal in mid to long-term (maintain or reduce fiscal gap etc)?
- How can you balance the need for risk reduction and risk-transfer?
- What are the priority areas of action regarding DRR in your country?
- What are tangible milestones and goals in the DRR priority areas in your country?
- What further risk assessment is needed to achieve the goals of DRR priority areas in your country?

Table 29: Identified data gaps, technical and institutional capacity needs

Data needs:	-Risk information regarding additional hazards such as flood, cyclone (rain & storm surge), drought will improve the scope of analysis -Uncertainty regarding larger return period events is high given the relatively short period of data availability (In Component 1, loss data was collected since 1980). Further data collection will improve accuracy especially for higher return period events
Technical capacity needs:	-Technical training on risk assessment and economic modeling including CAPRA and CATSIM training. -Further sensitization of risk-based thinking. General familiarity of risk based terms such as the annual average loss, the probable maximum loss, exceedance probability must be explained to decision-makers.
Institutional capacity needs:	-Coordination, where both risk and socio-economic data are jointly collected and managed by relevant agencies (DRM agency plus Ministry of Finance). -Clarity on the specification of the role of each agency in data collection and analysis to avoid the duplication of the efforts.

Source: Author

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Annex C: Micro / Cost-Benefit Analysis (CBA)[54]

A. Overview

Cost benefit analysis (CBA) is an established tool in economics. This analysis can be used for both sectorial and project analysis. Many countries already adopt cost benefit analysis as a requirement of large-scale public investment projects. Although imperfect, CBA is one of the most important tools for financial decision making around the world.

There are two important general objectives in CBA. One is to improve efficiency of the project selection, because CBA facilitates the rational comparison of available options. The second objective is to improve accountability. In democratized countries, it is increasingly important that government explains why a given project is selected. This will also contribute to reduce corruption and in some cases, lessen inappropriate interference of politicians. In this regard, it is important to disclose the methodology and the original data for the analysis.

We can apply this methodology into public investment projects that contributes to DRR. However, there is a unique concern to be considered. For usual projects, the benefits can be tangible and visible. For example, in the case of a public transportation project, we can estimate the number of passengers and total fees paid by passengers. On the other hand, in a DRR project, the main benefit is avoided loss. In this case, we need to somehow estimate the benefit relating with an event not occurring. This introduces technical difficulty in DRR cost benefit analysis.

CBA can measure the impact of policy on DRR at sectorial or project level. While a budget review and CATSIM provide overviews of the country and help raise awareness of the effectiveness of DRR investment, CBA can provide more detailed insight for decision-making.

Depending on precise objectives and the resolution of available data, different levels of CBA are possible (Table 30). If the objective is an informational study to provide overview over costs and benefits, resource requirements (e.g. data, time and human capacity) are relatively not so demanding. However, if the objective is project appraisal, the resource requirements can be enormous in terms of financial and time aspects.

Table 30: Cost benefit analysis at different scopes

Product	Objectives	Resource requirements
Informational study	Provide a broad overview over costs and benefits	+
Pre-project appraisal	Singling out most effective measures	++
Project appraisal	Detailed evaluation of project	+++
Ex-post evaluation	Evaluation of project after completion	++

Source: Mechler (2008)

CBA is based on the following simple principle: If **the benefit-to-cost (B/C) ratio** (benefit divided by cost) is greater than one, invest. Comparing multiple projects, the higher the B/C ratio, the more preferable the project. Also, where the **net present value (NPV)** (benefit minus cost) is positive, invest. The larger the NPV, the more preferable the project.

[54] Sections A and B of this chapter were drafted by Kazuko Ishigaki (UNISDR). The Section C was drafted by Callahan Egan, Junko Mochizuki, Stefan Hochrainer and Reinhard Mechler, Risk Policy and Vulnerability Program, International Institute for Applied System Analysis (IIASA).

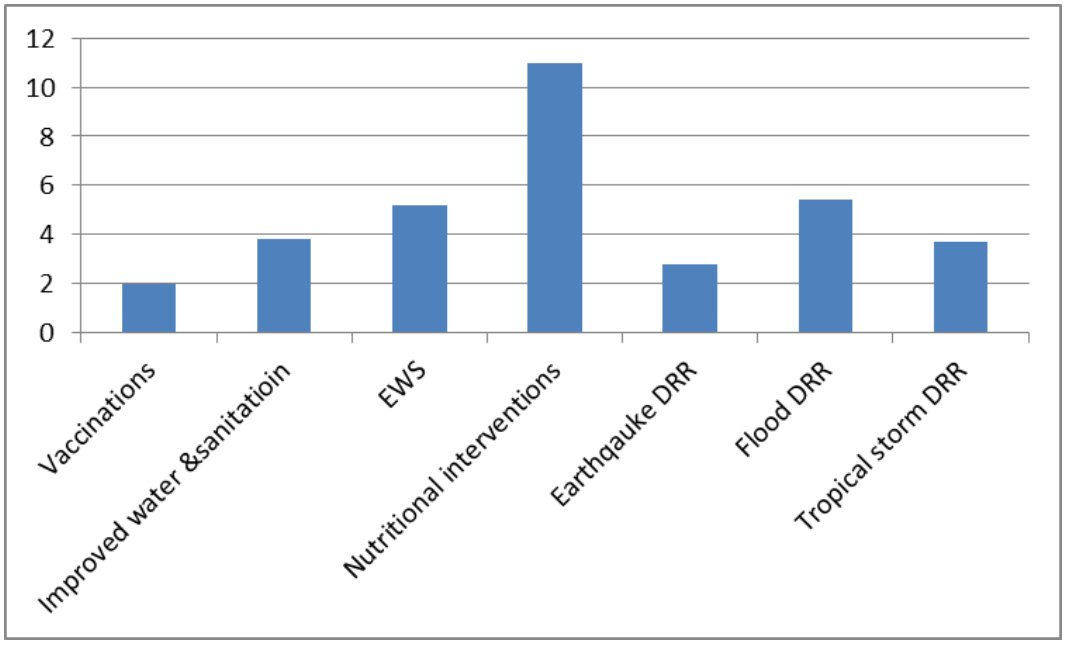
However, there are complex methodological problems that survive to date with no consensus of even modern economists (*e.g.* how to set the discount rate? How to assign monetary value to immeasurable, intangible items?). Furthermore, there are concerns regarding who conducts the CBA in order to retain objectiveness and accountability. Administrative costs for implementing CBA are also a concern for government.

When we assess from HFA Monitor the current status of CBA applications to DRR related projects, two issues arise. The first is that disaster risk is very often not accounted for in CBA for public investments, for example investment in infrastructure for transportation, education and health. The second issue is that direct risk preventive projects such as flood control infrastructure are often implemented without the routine grounding of a CBA framework.

The strength of the CBA is its ability to compare several options. For example, in reducing flood loss, the practical issue that financially constrained governments often face is how to choose between competing options such as Early Warning Systems (EWS), evacuation planning, sea wall construction, building retrofitting etc. Or in countries that face several hazards, questions are whether to prioritize risk reduction for earthquakes, floods, or cyclones, etc. CBA is a useful tool to provide insight on such prioritization issues.

Figure 42 summarizes examples of CBA to DRR policy implemented in several studies. We need to interpret the figure with caution because it is based on several studies and different contexts, however the interesting point is that in all of the featured projects benefit exceeds cost.

Figure 42: Benefit to cost ratio of DRR policies



Source: Wethli 2013 cited by the World Bank

In this initiative, probabilistic CBA was applied. The most important difference between probabilistic and non-probabilistic CBA is that the former accounts for the probabilistic benefits of risk reduction. While non-probabilistic CBA answers the question "what is the cost and benefit of sea wall construction *if a cyclone of a 50-year return period occurs*?" probabilistic CBA answers the question "what is the cost and benefit of sea wall construction *given that cyclones of different sizes occur stochastically with different return periods*?".

Probabilistic cost benefit analysis based on probabilistic risk assessment (forward looking probabilistic CBA) has been applied in several cases. When and where probabilistic risk assessment has not developed well, economists use historic disaster loss data (backward- looking probabilistic CBA) (Table 31). Now that more countries have risk profiles, more accurate forward-looking benefit estimation is increasingly possible.

Table 31: Forward-looking and backward-looking assessment

Type of assessment	Methodology	Data requirements	Cost and applicability
Forward looking assessment (*future risk* based)	Estimate risk as a function of hazard, exposure and vulnerability	Local and asset specific data on hazard, exposure and vulnerability	More accurate, but time and data intensive
Backward looking assessment (*past loss* based)	Use past losses as manifestations of past risk, then update to current risk	Data on past events and information on changes in hazard exposure and vulnerability Note: At least four credible data points of past loss are required	Rougher estimate, but more realistic for developing country contexts

Source: Mechler 2005, underlined by UNISDR.

In this initiative in the IOC region, forward-looking CBA was applied for Madagascar and Mauritius and backward-looking CBA was applied for Seychelles, Union des Comores and Zanzibar.

B. Methodology of CBA

CBA generally gets through five steps (Figure 43). CBA starts with setting project alternatives (Step 1). For example, when constructing dykes against flood, the government must choose the strength: how resilient should the dyke be? When planning dam building for river management, the government might need to decide between investing in two small dams or one big dam. It is also sometimes needed to compare investment and non-investment.

Step 2 is to estimate the benefit of policy. This is the most difficult step for DRR projects that will be explained below. Step 3 is to calculate benefit to cost ratio or/and net present value. Once benefit is defined and estimated, this is very simple. Step 4 is to carry out a sensitivity analysis to consider the possible variation in results due to the uncertainty of input variables (*e.g.* inflation costs).

Step 5 is distributional, or stakeholder analysis. CBA aims to measure the impact of a project on the society. Driven by strong economic assumption that the people who benefit will compensate for the loss to those who carry costs (Kaldor-Hicks Criterion), CBA does not consider distributional effects. However, reality is different. In making policy, distributional analysis is important to define stakeholders and care for those who may be negatively impacted. Therefore, in some cases, this complements the CBA. When those who benefit and those who pay for a project cost (including explicit and implicit) are self-evident, the government may be able to quantify the distributional impact. When it is not clear, qualitative analysis is implemented.

Figure 43: 5 steps of CBA

STEP 1: Consider project alternatives

STEP 2: Expect the benefit of policy (what are the expected benefits)?

STEP 3: Calculate Benefit to Cost Ratio (and/or Net Present Value)

STEP 4: Sensitivity Analysis

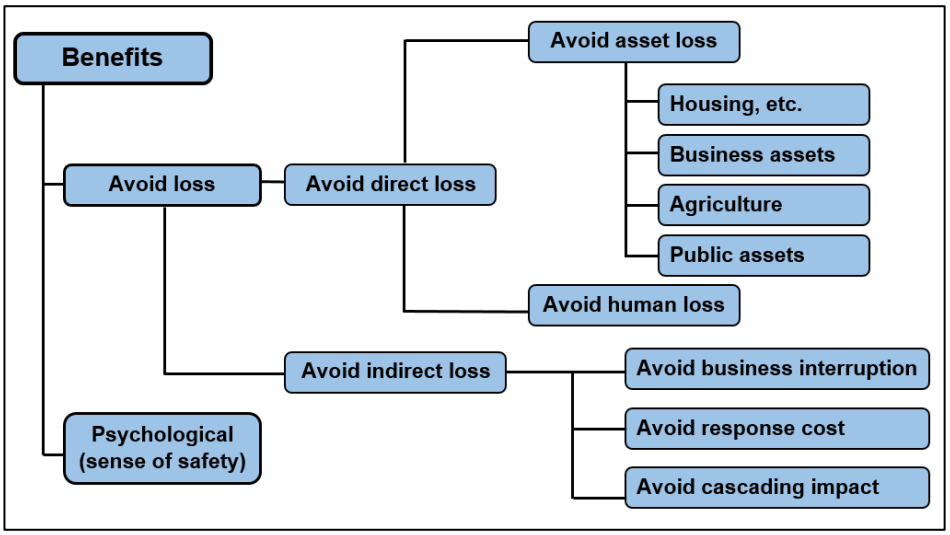
STEP 5: Distributional Analysis, Stakeholder Analysis

Source: Author

The expected benefits from DRR investments are diverse. These might include avoided direct damage or loss to physical assets, avoided indirect loss (*e.g.* avoided business interruption), and even purely psychological benefits

(*e.g.* sense of safety). Although listing benefits in a systematic way is important, we are not necessarily able to estimate or calculate all of the listed benefits (Figure 44).

Figure 44: Expected benefits from DRR investment

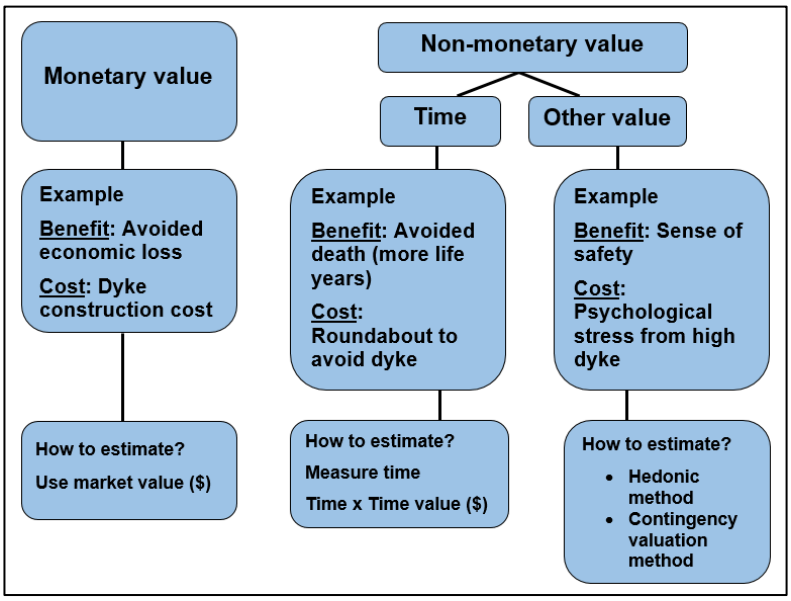


Source: Author

In estimating benefit, a main challenge is to assign monetary values to each expected benefit (Figure 45). If the benefits and costs have monetary values, the government can use them[55]. If the benefit is expressed by time (*e.g.* reduction of commuting time due to road infrastructure), the government needs to estimate the time gained and multiply it by the value of time (*e.g.* the average wage or minimum wage per hour).

Environmental economists have long tackled the monetization of intangible benefits and developed many methods. For example, one method is directly asking people how much he/she is willing to pay if the project is implemented and estimating the monetary benefits from the answers to that question.

Figure 45: Expected benefit classification



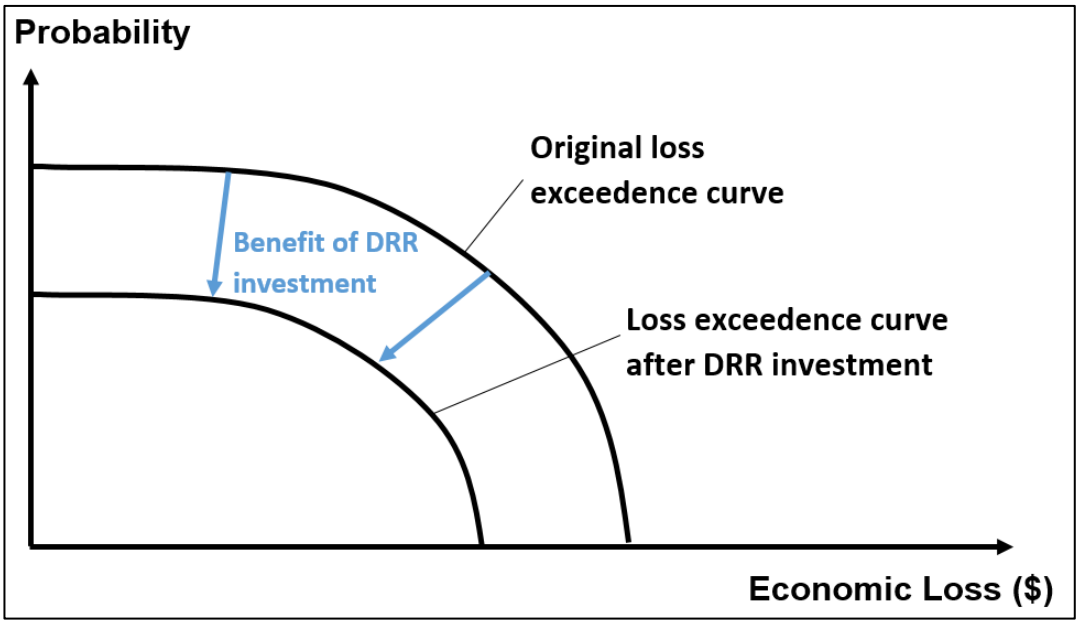
Source: Author

[55] More technically told, economists advocates using opportunity costs instead of the monetary value

It is important to keep it in mind that this CBA often reflects only partial benefits. In probabilistic CBA, estimation of avoided loss is based on probabilistic risk assessment (forward-looking CBA) or historic loss database (backward-looking CBA). In that sense, the scope of CBA analysis is defined by the scope of risk and loss data. For the case study described below, the risk assessment was limited to direct loss. Therefore, the CBA study also focuses only on the direct loss (written in bold in Figure 57). However, this is nonetheless a meaningful first step, because physical loss often needs to be recovered by reconstruction, which is very costly.

The benefit is estimated by measuring how much annual average loss (AAL) will be reduced after the investment (Figure 46). In case of forward-looking CBA, the data can be input into software such as CAPRA to estimate the AAL before and after investment. In case of backward-looking CBA, AAL before and after investment is calculated by using statistical methods (Simpson rule[56]).

Figure 46: Benefits in terms of reduced AAL



Source: Author

Estimating cost is relatively simple. Project cost and maintenance cost will be listed. Intangible costs (*e.g.* negative environmental impact) are sometimes also estimated.

After having translated benefit and cost into monetary value, the discount rate will be a critical issue with a large impact on the result of a CBA[57]. Discount rates express time preferences within the society. Low discount rates will evaluate future benefit higher than the case applying high discount rate. For example the present value of USD 100 million in 100 years later is about USD 37 million in 1% discount rate, USD 2 million in 4% discount rate and only USD 0.1 million in 7% discount rate. The discount rate has more impact when the project sustains for a long time, which is often the case for big infrastructure.

In CBA for public project, social discount rates are often defined by government (Table 32). If the government considers opportunity cost of capital, with more market based consideration, then discount rate tends to be

[56] To estimate the AAL given probabilistic losses and return period data, the Simpson rule is applied. If we know several data points of (return period, PML), depending on the amount of data points available, we can create probabilistic ranges between two data points and multiply the range by the estimated midpoint of loss in this given range. This is expressed by

AAL for range p1, p2= (p2-p1)*((L1+L2)/2)

L1 and L2 represent the maximum loss associated with a given event. P1 and p2 are the probabilities associated with each event. By summing up the AAL for each interval, or range (p1 to p2, p2 to p3,..) we have a an estimate for the total AAL.

[57] When setting discount rate, it is important to consider the impact of expected inflation, if discount rate is 10%, but expected inflation rate is also 10%, the inflation rate will offset the discount rate.

higher. However, if the government wants to politically reflect social time preference to balance the benefit of current and future generation, the rate tends to be set low. The International Panel for Climate Change (IPCC) recommends that governments adopt a low discount rate to recognize that benefits of future generations are equally important as those of current generation and future generation will be able to enjoy benefits from our actions today, in accordance with the concept of sustainable development (IPCC, 2012). It is important that government clarifies the rationale behind social discount rate setting; gaining accountability from the process is as important, or more, than the actual rate chosen.

Table 32: Discount rates in several countries

Country	Social discount rate	Rationale
USA	7%	Opportunity cost of capital
	3%	Social time preference
	4% (water)	Social time preference
New Zealand	7%	Opportunity cost of capital
Japan	4%	Opportunity cost of capital
EU	3.5%	Social time preference
UK	3.5%	Social time preference
France	4%	Social time preference

Source: Author based on Satoru Otani et al (n.d)

The result of CBA is dependent on some critical variables. It is therefore always good to implement sensitivity analysis to observe how the result changes when we apply different values to those variables. For example, changing the social discount rate explained above will significantly change the result of the CBA. Construction periods and costs are also critical uncertain factors. Approving uncertainty and preparing several scenarios will strengthen the credibility of analysis instead of weakening it.

While CBA is an explicit and rigorous accounting framework for systematic cost-efficient decision making and common yardstick with a money metric against which to measure projects for social improvement, there are some limitations. CBA often does not assess non-market values and indirect impacts, lacks accounting for the distribution of benefits and costs (due to Kaldor-Hicks Criterion), cannot resolve strong differences in value judgments, and is strongly influenced by discount rates. CBA should not be the sole criterion for evaluating policies and projects, but should be complemented by other, non-economic considerations.

C. CASE STUDY: Zanzibar Urban Service Project

I Project Proposal

The Probabilistic Cost- Benefit Analysis (CBA) is done on one component of the Zanzibar Urban Services Project (ZUSP) funded by the World Bank intended to strengthen the Zanzibar Municipal Council (ZMC), infrastructure and development. The specific component analysed here is the construction of surface water drainage system on the island of Unguja. The goal of the drainage system is to reduce the damage caused by flooding in the Municipality and particularly within the walls of the Old Stone town. The planned outputs of the drainage component are to construct about 20 km of surface water drains and related works within the ZMC areas outside of Stonetown. Six separate surface drainage systems will be constructed with a catchment of around 1700 hectares eliminating stagnant water ponds of over 170 hectares, which affects more than 20,000 persons living in, and around 3.645 houses (WB ZUSP PAD 2011). ZUSP is currently in the final stages of tendering these works and the actual construction is expected to start in 2015.

Figure 47: Flood in urban area of Zanzibar (left) and improved drainage systems (right)

Source: ZUSP documentation

II Approach

We analyse the costs and benefits of the project by using probabilistic rainfall and damage distributions to assess the changes in expected losses. Given there is no probabilistic risk assessment of flood using hazard, exposure and vulnerability information, we decided to implement **backward looking** probabilistic CBA. We rely on past rainfall and damage data to create probabilistic estimations. However, constraints with available past data on rainfall and associated losses significantly affects the results of the analysis. Economic assessment of the project originally performed by the World Bank finds significantly different outcomes than our present probabilistic CBA, due to differences in assumptions and methodologies. Therefore, we first present the results of this probabilistic CBA, followed by a discussion on the factors influencing the results, including a comparison to the original non-probabilistic CBA analysis performed by the World Bank. In our analysis we follow the general methodology for conducting cost-benefit analysis laid out by Mechler (2005).

III Probabilistic Flood Damages

In order to estimate the annual average losses (AAL) caused by rainfall in the Old Stone Town of Zanzibar, we needed to gather previous flood loss information. The availability of loss data was very limited[58] and resulted in the collection of only one data point gathered through documentations of relief and recovery efforts available online (IFRC 2005). This was of a 2005 flood (one of the biggest ever measured with 400 mm of rain in two days), in which, based on the data received, 64 houses were destroyed[59] within Stonetown. Economic losses were then estimated based on assumptions regarding the value of the housings. This flood is described “as the worst in 40 years” (IFRC 2005).

Given locally specific housing values were not readily available, we used an average housing value of Seychelles used in the 2013 Flood Post Disaster Needs Assessment (PDNA) adjusting for the differences in living standards based on per capita GDPs. We concluded that the average housing value is roughly USD 2,500 in 2011 prices. Therefore, the total damaged housing value was estimated to be USD 170,000 (roughly USD 2,500 times 64 housings damaged).

Furthermore, information was provided regarding disturbances to water and sanitation due to the 2005 flood, which resulted in an estimated USD 580,000 (adjusted to 2011 prices) in emergency response needs (ZAWA n.a.). With no other information of losses, direct or indirect, we assumed the loss from the 2005 floods to be the sum of the housing damage and the emergency water and sanitation response needs, cumulating to USD 750,000 (Table 33). It is important to note that this 2005 flood event, despite being the largest in 40 years was not listed in the disaster damage and loss dataset compiled in the Component 1 of this project, prompting the need to further analyse and validate the available damage and loss information.

[58] The data collected in component 1 was very scarce and we decided not to use data from national disaster loss database.
[59] [59] According to Gerard Hendriksen, consultant in Zanzibar, these houses would have been damaged, not destroyed. He suspects that the information sources may not be reliable.

Table 33: Estimated damage and losses due to the 2005 flood in Zanzibar

Damage and Losses	Economic Value (2011 USD)	References
Houses destroyed	170,000	IFRC 2005 Economic values are estimated based on DaLA Seychelles PDNA (2013)
Disturbances to water and sanitation	580,000	Zawa (n.a.)
Total	750,000	

From this data point, along with previous rainfall information source, estimations could be made about the return period of the 2005 event. It is important to keep in mind that risk curve estimation generally requires more than 3 credible data points (Mechler 2005), and the use of single data point with the probability of first loss estimate[60] adopted here cannot give as accurate loss estimate as recommended. Despite this data limitation, we have estimated a risk curve based on the extreme value statistics to perform illustrative probabilistic CBA. We have pre-tested the suitability of various distribution parameters, in which the Pareto distribution is found to fit the data best and was used in the subsequent analysis.

Losses caused by events of different return periods were estimated as well as the AAL caused by flooding events (Table 34). The expected annual loss is estimated applying the Simpson rule[61]. For example, based on the return periods identified, the expected loss up to a 5 year event is the cumulative probability of the 5 year event (0.8) minus the cumulative probability of the 2 year event (0.5) multiplied by the average loss between the 2 and 5 year events. In numerical terms:

EL (5-2 years)= (0.8-0.5)*((138.6+0)/2)= 20.8

This process is then done for all other intervals. For the last interval, it is assumed for this CBA that losses associated with events of more than a 200-year return period will result in the same losses as the 200 year event. Therefore in the last interval, 0.995 to 1, the expected loss is simply (1-0.995)*1498.96, yielding the value of 7.49. Cumulating the losses for all events, the AAL in the Municipality of Zanzibar is roughly USD 102,000. This value will be used as baseline when estimating the benefit as a result of the surface water drainage system.

Table 34: Return period and associated losses, AAL (in USD thousand)

Return period	Exceedance probability	Maximum Loss	expected annual loss

[60] First loss estimate means probability that a disaster event (of any magnitude resulting in some loss) will occur.
[61] Please see the footnote 56 regarding Simpson rule.

2	0.5	0	0
5	0.2	138.6	20.8
10	0.1	278.6	20.9
20	0.05	457.6	18.4
40	0.025	700.0	14.5
50	0.02	773.6	3.7
100	0.01	1,091.6	9.3
200	0.005	1499	6.5
			7.5
AAL			101.6

Source: Author

IV. Benefits

To assess the benefits of the drainage, assumptions have to be made about the economic losses that will be reduced as a result of the drainage project. There is no clear data on the expected amount of loss reduction resulting from the drainage system. As the 2005 flood event was the most damaging in recent years, it is assumed that the drainage system would be designed to protect against all damages caused by events with a return period up to 40 years (with loss of around USD 700,000). Events with larger return period would have losses reduced, but not eliminated (Table 33). As the actual reduction in losses is not known, particularly for extreme events, we set strong assumptions. With probabilistic CBA, it is difficult to determine if, and if so, to what extent a project designed to reduce loss for more frequent events will reduce loss against intensive (less frequent, more severe) events.

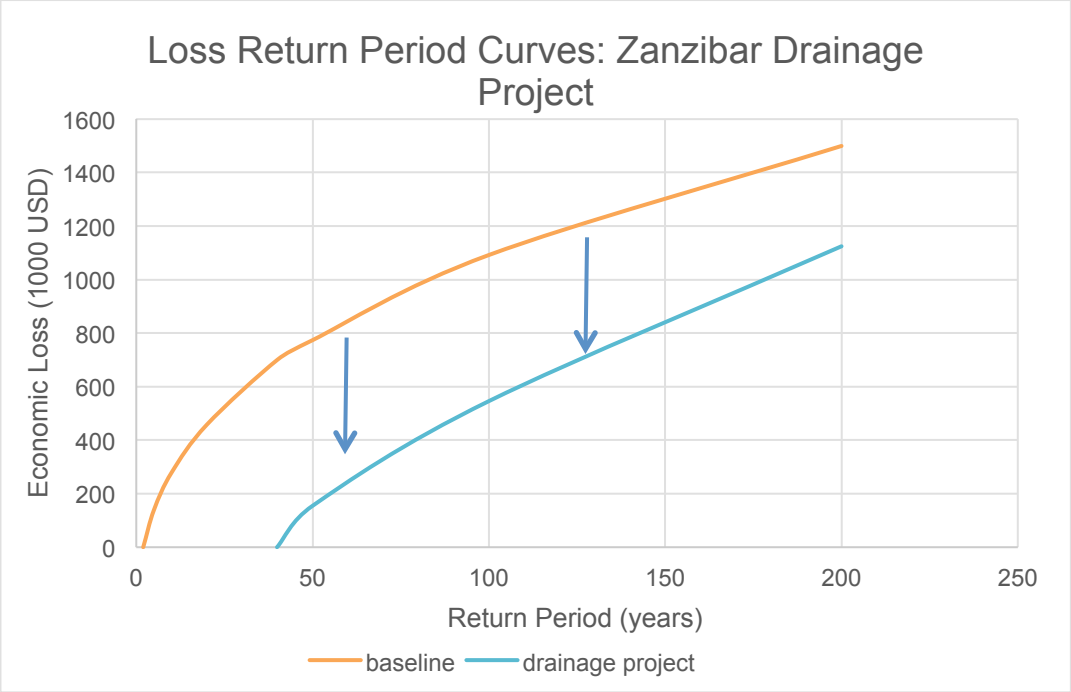
Table 35 below shows the estimated benefits as a loss reduction in individual events and the AAL as a result of the drainage project. As can be seen, the reduction in AAL, representing the annual benefit, is USD 85,300. Figure 47 displays the reduction in losses as a result of the project in graphic form. The shift in the loss return period curve represents the risk reduction of the region.

Table 35: Estimated annual benefits as a reduction in AAL due to the surface drainage system (in USD thousand)

Losses without drainage system (baseline)				Losses with drainage system		
Return period	Exceedance probability	Maximum Loss	Expected annual loss	Maximum loss	Loss reduction (%)	Expected annual loss
2	0.5	0	0	0	100	0
5	0.2	138	20.8	0	100	0
10	0.1	278	20.9	0	100	0
20	0.05	457	18.4	0	100	0
40	0.025	700	14.5	0	100	0
50	0.02	773	3.7	154.7	80	0.7
100	0.01	1,091	9.3	545.8	50	4.7
200	0.005	1,498	6.5	1124.2	25	4.9
			7.5		20	6.0
AAL			101.6			16.3
					Reduced AAL: Benefit	**85.3**

Source: Author

Figure 48: Loss Return Period Curves pre and post the Zanzibar Drainage Project



Source: Author

V Costs

The cost of the drainage project is estimated to amount to USD 9,971,340 (ZUSP final design report, 2010). This includes the cost of all six of the drainage subsystems in the project. The breakdown of the costs involved in the project can be seen in Table 36.

Table 36: Breakdown of drainage component costs

Item No.	Item Description	Cost Estimate (USD)
1	Preliminary and general	607,752
2	System C	2,958,812
3	System D	312,074
4	System E	2381,907
5	System F	227,229
6	System G	835,842
7	System 1	973,663
8	Subtotal 1	8,297,349
9	Contingency- 15%	1,244,602
10	Subtotal 2	9,541,954
11	Consultancy Fee- 4.5%	429,338
12	Total	9,971,340

Source: United Republic of Tanzania, the revolutionary Government of Zanzibar. ZUSP Construction of Surface Water drainage System, Final design report, 2010

While no data are available on the maintenance cost of the project, an estimated 0.5% of the project cost per year is included as a maintenance cost. This amounts to an undiscounted amount of USD 49,857 per year. The lifetime of the project is reported at an estimated 30 years (ZUSP final design report).

VI Time factors

VI.1 Discount rate.

There has been no official social discount rate in Zanzibar. Therefore, we start with an initial assumption of 5% (International Monetary Fund, 2013) but apply different rates in the sensitivity analysis.

VI.2 Increase in Exposed Assets

As the drainage project is intended to protect against flooding for a period of 30 years, it is assumed that the amount of exposed assets in the Municipality of Zanzibar will increase in a yearly basis. This is supported by the 4.5% annual increase in population (Ministry of Finance and Urban Affairs, Zanzibar, September 2010), suggesting that flood events will affect a greater number of people. For a baseline level, an increase of 1.5% of exposed assets per year will be applied to the analysis (Mechler, 2005). This will be represented as an annual increase of 1.5% to the annual benefits.

VII Results

Using the data, provided information, and assumptions described to this point, we are able to conduct a probabilistic cost-benefit analysis for the project. Table 37 below shows the net present value of the project with a 30-year lifespan, a 5% discount rate, and an annual increase in exposed assets of 1.5%. In this scenario, despite the reduction in losses of over USD 100,000 annually, the project is shown to be highly cost-ineffective, with a Net Present Value (NPV) of USD -9.2 million. Table 38 and Table 39 below show sensitivity analysis with regards to the discount rate and the increase in exposed assets.

Table 37: CBA of drainage project with a 30-year lifespan, 5% discount rate, a 1.5% annual increase in exposed assets (amounts in USD)

Calendar year	Project year	Benefits (1.5% annual exposure increase)	Costs	Net benefits (benefits – costs)	Discounted costs (5%)	Discounted benefits (5%)	Discounted net benefits (5%)
2011	1	0	9,971,340	-9,971,340	9,971,340	0	-9,971,340
2012	2	86,580	49,857	36,723	47,364	82,251	34,887
2013	3	87,878	49,857	38,021	44,996	79,310	34,314
2014	4	89,196	49,857	39,340	42,746	76,475	33,729
2015	5	90,534	49,857	40,678	40,609	73,741	33,132
2016	6	91,892	49,857	42,036	38,578	71,105	32,526
2017	7	93,271	49,857	43,414	36,649	68,563	31,913
2018	8	94,670	49,857	44,813	34,817	66,111	31,295
2019	9	96,090	49,857	46,233	33,076	63,748	30,672
2020	10	97,531	49,857	47,674	31,422	61,469	30,047
2021	11	98,994	49,857	49,137	29,851	59,271	29,420
2022	12	100,479	49,857	50,622	28,358	57,152	28,794
2023	13	101,986	49,857	52,130	26,941	55,109	28,169
2024	14	103,516	49,857	53,659	25,594	53,139	27,546
2025	15	105,069	49,857	55,212	24,314	51,239	26,926
2026	16	106,645	49,857	56,788	23,098	49,408	26,309
2027	17	108,244	49,857	58,388	21,943	47,641	25,698

2028	18	109,868	49,857	60,011	20,846	45,938	25,092
2029	19	111,516	49,857	61,659	19,804	44,296	24,492
2030	20	113,189	49,857	63,332	18,814	42,712	23,899
2031	21	114,887	49,857	65,030	17,873	41,185	23,312
2032	22	116,610	49,857	66,753	16,979	39,713	22,734
2033	23	118,359	49,857	68,502	16,130	38,293	22,163
2034	24	120,135	49,857	70,278	15,324	36,924	21,600
2035	25	121,937	49,857	72,080	14,558	35,604	21,047
2036	26	123,766	49,857	73,909	13,830	34,331	20,502
2037	27	125,622	49,857	75,765	13,138	33,104	19,966
2038	28	127,506	49,857	77,650	12,481	31,920	19,439
2039	29	129,419	49,857	79,562	11,857	30,779	18,922
2040	30	131,360	49,857	81,504	11,264	29,679	18,415
2041	31	133,331	49,857	83,474	10,701	28,618	17,917
total		3,250,080	11,467,041	-8,216,961	10,715,295	1,528,830	**-9,186,465**

Table 38: Sensitivity analysis with regards to the discount rate (at 1.5% increase in exposed assets)

Discount rate	0%	2%	5%	7%	10%	15%
NPV	-8,216,961	-8,722,552	**-9,186,465**	-9,376,635	-9,559,891	-9,721,907
B/C	0.28	0.21	**0.14**	0.11	0.08	0.05

Table 39: Sensitivity analysis with regards to rate of increase in exposed assets (at 5% discount rate)

Asset exposure increase	0%	1.5%	3%	5%	10%
NPV	-9,442,460	**-9,186,465**	-8,855,689	-8,253,101	-5,277,216
B/C	0.12	**0.14**	0.17	0.23	0.51

VIII Limitation of the analysis

Based on limited data, the surface drainage project seems inefficient use of funds, given the negative NPV and B/C ratios less than one, regardless of the discount rate or increase in exposed assets.

For estimating the AAL for Zanzibar, data only offered was one previous event, a 2005 flood. Given this event and probability of first loss, a probable maximum loss curve was created.

Information revealed inconsistencies in the damages caused by the 2005 flood. In the data received and analysed in this report, there were only 64 houses destroyed (IFRC 2005). Yet another source claim that “20,000 people” were affected in the 2005 flood event and still other source claims that 3,645 housings are affected annually by flooding (questions for expert opinions, 2011). However, with no concrete data other than the 64 housings destroyed and the water sanitation recovery costs, it is difficult to obtain a rather accurate amount of economic losses caused by the 2005 flooding in the region where the drainage system will be implemented.

In addition, the present assessment did not take into account many of the indirect and intangible losses that may result due to natural disasters, such as business losses due to floods, additional medical cost associated with morbidity and any reduction in land values that may result due to frequent inundation. These are clear limitations of this current analysis and further studies are certainly needed to improve the accuracy and comprehensiveness of our analysis.

IX Comparison with the World Bank analysis

To put our analysis in perspective, the World Bank has also done economic analysis on the drainage project with significantly different results. While the specific number included in their CBA are not known, comparing the assumptions between the two studies can help understand the difference in outcomes, as well as the importance of robust and consistent data. The following outlines the basic assumptions within the World Bank's project appraisal document for the ZUSP project in the section on economic analysis of the drainage system component (World Bank Report No: 57162-TZ, 2011)

- 3,645 households directly affected by stagnant water ponds and flooding
- Cost of dealing with flooding will increase 10% annually (10% increase in exposed assets)
- Cost of flood prevention and renovation is 5 USD per square meter, with the average housing size of 150 sq meters (750 USD per housing).
- Drainage system will increase household saving and housing value will increase (no specified amount).
- Discount rate is 7%.

There is no information regarding the lifetime of the project in their analysis (we assume as 30 years in this report). What the World Bank concludes is that "under these assumptions, it is estimated that about USD 4.429 million will be incurred by the household directly affected by floods in 2010". While not specified explicitly, it appears they estimate that annual losses incurred by households at USD 4.429 million. Using the data provided to us, we estimated an AAL to be slightly over USD 101,000. As a result of this very large discrepancy, the World bank finds a NPV of the project to be over USD 20 million, compared to this report's estimate of USD -9 million.

It is not the intention of this report to argue the accuracy of this report over another. Rather, what these discrepancies can show is the importance of the input information when conducting cost benefit analysis. As a number of reports claim 20,000 people affected by the floods in 2005, it seems unlikely that the data showing all losses as the 64 destroyed housings covers the true losses caused by the flood. However, lack of any further detailed information on the economic losses as a result of the flood limits the robustness of any attempt at accurately estimating the probabilistic losses caused by flooding or any other event. Without a robust assessment of the losses caused by past hazardous events, estimations of the benefits of disaster risk reduction investment will also be inaccurate.

VIII Conclusions

The results of this CBA on the surface drainage system in Municipality of Zanzibar highlights challenges regarding limited data and differences in reported losses and affected households and individuals. The lack of documentation regarding past disaster damage and losses seems to lead to underestimation of probabilistic benefit associated with drainage improvement project. The extremely large difference in results between this study and that of the World Bank results from difference in approaches and basic assumptions, highlighting the need for robust and complete loss and risk data when assessing the economic viability of a disaster risk reduction project.

Additional information regarding past damage and losses could also significantly change the results of present analysis. For a backward looking CBA as was done here, the data on previous disaster losses in combination with data on the severity of the weather events is critical to making accurate estimates for the AAL. Some of the previous loss data were rather limited, which suggests that potentially there was more unreported damage. This further emphasizes the importance of complete and accurate loss data when conducting backward looking CBA.

It is also important to keep in mind that the present assessment did not take into account many of the indirect and intangible losses, such as loss due to business interruption and any reduction in land values that may result due to frequent disasters. These are clear limitations of this current analysis and further studies are certainly needed to improve the accuracy and comprehensiveness of our analysis.

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Document: "Questions for expert opinion on Zanzibar Flooding Issue+budget_ response" Provided by the Zanzibar national consultant for Component 3.

Document: "ZAWA The Impact of Floods Disaster on Water Sector 2005" Provided by the Zanzibar national consultant for Component 3.

Wethli 2013 cited by the World Bank

Annex D: Workshops and Meetings in IOC region

Inception meeting

Dates: 15-17 April 2013

Venue: ICCS, Seychelles

Host: Ministry of Environment

UNISDR staff in charge: Julio Serje, Kazuko Ishigaki, Manuela Di Mauro

Participants: 34

Component 1: capacity building for national disaster loss database

Comoros national workshop:

Dates: June 11-13, 2013

Venue: Hotel Retaj

Host: the Civil Protection and the Ministry of Environment.

UNISDR staff in charge: Sylvain Ponserre and Julio Serje

Participants: 25

Seychelles national workshop:

Dates: 14 - 19 Jul 2013.

Venue: Seychelles Fishing Authority, Division of Risk and Disaster Management (DRDM)

Host: the Division of Risk and Disaster Management (DRDM)

UNISDR staff in charge: Sylvain Ponserre

Participants: 22

Madagascar national workshop:

Dates: 28 Jul - 01 Aug 2013.

Venue: Hotel Colbert

Host: The "Cellule de Prévention et Gestion des Urgences"(CPGU)

UNISDR staff in charge: Sylvain Ponserre

Participants: 36

Mauritius national workshop:

Dates: 24 - 29 Aug 2013.

Venue: Indian Ocean Commission headquarters

Host: Ministry of Environment

UNISDR staff in charge: Sylvain Ponserre

Participants: 40

Zanzibar national workshop:

Dates: 11-14 June 2013

Venue: Zanzibar Ocean View Hotel

Host: NBI Office

UNISDR staff in charge: XXXXX

Participants: 37

Component2: Capacity building for Probabilistic Risk Assessment:

First regional workshop

Dates: 21-23 October 2013

Venue: Indian Ocean Commission headquarters, Mauritius

Host: Ministry of Environment

UNISDR staff in charge: Manuela Di Mauro, Mabel Cristina Marulanda Fraume (consultant)

Participants: 40

Second regional workshop

Dates: 20-22 November 2013

Venue: Indian Ocean Commission headquarters, Mauritius

Host: Ministry of Finance

UNISDR staff in charge: Mabel Cristina Marulanda Fraume (consultant)

Participants: 22

Third regional workshop

Dates: 19-21 March 2014

Venue: Indian Ocean Commission headquarters, Mauritius

Host:

UNISDR staff in charge: Mabel Cristina Marulanda Fraume (consultant)

Participants: 31

Mauritius national workshop:

Dates: 17-18 February 2014

Venue: Indian Ocean Commission Secretariat

Host:

UNISDR staff in charge: Mabel Cristina Marulanda Fraume (consultant)

Participants: 10

Seychelles national workshop:

Dates: 23-27 June 2014

Venue:

Host: The Division of Risk and Disaster Management (DRDM)

UNISDR staff in charge: Mabel Cristina Marulanda Fraume (consultant)

Participants:

Component 3: economic analysis and public investment planning

First regional workshop

Dates: 24-26 June, 2014

Venue: ICCS, Seychelles

UNISDR staff in charge: Kazuko Ishigaki, Lezlie Moriniere (consultant)

Host: Ministry of finance

Participants: 15

Second regional workshop

Dates: 20-22, October, 2014

Venue: Indian Ocean Commission headquarters, Mauritius

Host: Ministry of Finance

UNISDR staff in charge: Kazuko Ishigaki, Lezlie Moriniere (consultant)

Participants: 19

Zanzibar national workshop:

Dates: 10 December, 2014

Venue: Zanzibar Ocean View Hotel

Host: Department of Environment

UNISDR staff in charge: Kazuko Ishigaki, Lezlie Morinière (consultant)

Participants: 30

Seychelles national workshop:

Dates: 02-03 Feb 2015
Venue: Conference Center
Host: Ministry of Finance
UNISDR staff in charge: Kazuko Ishigaki, Julio Serje, Lezlie Moriniere (consultant)
Participants: 30

Comoros national workshop:

Dates: 05-06 Feb 2015

Venue: Direction générale de la Sécurité Civile

Host: Direction générale de la sécurité civile

UNISDR staff in charge: Julio Serje, Lezlie Morinière (consultant)

Participants:55

Madagascar national workshop:

Dates: 28-30 Feb 2015

Venue: STC

Host: Ministry of Finance

UNISDR staff in charge: Kazuko Ishigaki, Lezlie Morinière (consultant)

Participants: 30

Mauritius national workshop:

Dates: tbc

Venue: tbc

Host: tbc

UNISDR staff in charge: tbc

Participants: tbc

UNISDR Working Papers on
Public Investment Planning and Financing Strategy for Disaster Risk Reduction

1. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of Mauritius, February 2015

2. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of Madagascar, February 2015

3. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of Seychelles, February 2015

4. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of Union des Comores, February 2015

5. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of Zanzibar, February 2015

6. Public Investment Planning and Financing Strategy to Reduce and Mange Disaster Risk: Review of South-West Indian Ocean Region, February 2015

The series offers analysis and policy guidance to national governments and other stakeholders to strengthen public investment planning and financing strategy to reduce and manage disaster risk. These reviews are part of a larger body of UNISDR work on disaster risk reduction, including loss database building, global probabilistic risk assessment, HFA Monitor and others. This work includes both theoretical reports and reports on specific countries or regions.

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