

# ROADMAP FOR INTEGRATED CLIMATE RISK MANAGEMENT IN GHANA

*Flood Risk  
Management &  
Transfer*

October 2021

**Author:**

Heike Allendorf

**Contributors:**

Matthias Range (GIZ)

Akua Acheampomaa Asante (GIZ)



## TABLE OF CONTENTS

05	List of abbreviations
06	Executive summary
08	<b>1 INTRODUCTION</b>
09	1.1 Purpose
10	1.2 Integrated Climate Risk Management – the concept
12	<b>2 INTEGRATED DISASTER RISK MANAGEMENT (IDRM) FOR URBAN RESILIENCE OF ACCRA</b>
13	2.1 Accra – Rapid growth and trailing infrastructure
14	2.2 Institutional & political framework
17	2.3 Flood risk in Accra
19	<b>3 PILOTING AN INTEGRATED DISASTER RISK MANAGEMENT APPROACH</b>
20	3.1 Introducing the pilot project
25	<b>4 IDRM FOR URBAN RESILIENCE – PREVENTION</b>
26	4.1 Risk assessment
26	4.1.1 Risk assessment – process
27	4.1.2 Risk assessment – results
28	4.2 Risk reduction
28	4.2.1 Risk reduction – process
28	4.2.2 Risk reduction – results
31	<b>5 RESIDUAL RISK – RETENTION &amp; TRANSFER</b>
32	5.1 Understanding residual risk
33	5.2 Risk retention & transfer – process
34	5.3 Risk retention & transfer – results
36	<b>6 IDRM FOR URBAN RESILIENCE – PREPAREDNESS</b>
37	6.1 Preparedness – process
39	6.2 Preparedness – results
39	6.2.1 Early-warning system
39	6.2.2 Contingency planning
41	<b>7 ROADMAP – FUTURE EFFORTS</b>
44	<b>8 REFERENCES</b>

This page is intentionally left blank

## LIST OF ABBREVIATIONS

<b>AED</b>	Annual Expected Damage
<b>AAL</b>	Annual Average Loss
<b>AMA</b>	Accra Metropolitan Area
<b>ARC</b>	African Risk Capacity
<b>BMBF</b>	German Federal Ministry for Education and Research
<b>BMZ</b>	German Federal Ministry for International Cooperation and Development
<b>CREW</b>	Community Resilience through Early Warning
<b>ECA</b>	Economics of Climate Adaptation
<b>GAMA</b>	Greater Accra Metropolitan Area
<b>GARID</b>	Greater Accra Resilient and Integrated Development
<b>GIS</b>	Geographic Information System
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit
<b>GMet</b>	Ghana Meteorological Office
<b>ICRM</b>	Integrated Climate-Risk Management
<b>IDRM</b>	Integrated Disaster-Risk Management
<b>IFRC</b>	International Federation of Red Cross and Red Crescent Societies
<b>MCII</b>	Munich Climate Insurance Initiative
<b>MMDA</b>	Metropolitan, Municipal and District Assemblies
<b>MSME</b>	Micro-, Small- and Medium-scale Enterprises
<b>NADMO</b>	National Disaster Management Organisation
<b>NIC</b>	National Insurance Commission
<b>PARADeS</b>	Participatory Assessment of Flood Disaster Prevention and Development of an Adapted Coping System in Ghana
<b>SAGABI</b>	Strategic Alliance GIZ, Allianz, BIMA
<b>UNDP</b>	United Nations Development Programme
<b>UNDRR</b>	United Nations Office for Disaster Risk Reduction
<b>WMO</b>	World Meteorological Organization

## EXECUTIVE SUMMARY

**Natural disasters and their associated damages severely impact people around the world every year. Increases in exposure and vulnerability at a global level, linked to the multiple concurrent trends such as climate change, population growth and globalisation of supply chains are making it imperative to find strategies to manage disasters more holistically.**

Integrated Disaster Risk Management (IDRM) is an approach for dealing with the risk and manifestation of natural disasters. It is characterised by a holistic perspective with regards to the various components of risk management. IDRM differs from previous concepts in the disaster-management paradigm, which focused almost exclusively on response, failing to pay attention to opportunities for reducing and transferring the risk and/or potential impact of natural disasters in an integrated manner.

This roadmap was developed from work undertaken on IDRM as part of the project “Developing Disaster Risk Management Approaches for Climate Risks in Ghana” and aimed at preparing the ground for implementing risk-transfer solutions within an integrated flood-risk management approach for municipalities of GAMA (Greater Accra Metropolitan Area) in Ghana. The project was implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Allianz Re in co-operation with local partners in Ghana, most notably the three pilot districts of Accra, AMA, Ga East and Ga West.

GAMA experiences perennial rain and thus, flood events on an almost annual basis, causing serious economic and physical losses in the area. Affected municipalities face significant challenges to finance reconstruction after such flood incidents, hence, a risk-transfer solution in the form of insurance could facilitate reconstruction, in particular if embedded in the broader framework of IDRM.

This roadmap describes both the approach taken and the route followed by the project partners in applying the IDRM concept in the context of managing flood risk to physical assets owned or managed by the three districts of Accra. It laid the foundation for adopting insurance after having proceeded step by step through three phases of IDRM that are most central to tackling the problem faced by the municipalities: prevention, risk retention & transfer and preparedness.

Capacity building underpinned each workstream, while the project started with risk assessment (survey of municipal assets, hazard/exposure modelling, vulnerability modelling) and explored risk-reduction measures on the basis of a cost-benefit analysis taking into account already existing DRM achievements and set-ups by the pilot districts. Specifically, the analysis proposed efficient and eco-based adaptation measures, estimated the cost of the measures, the risk reduction based on the adaptation measures and the impact and benefit of the proposed adaptation measures. Moreover, it developed a tailor-made budget-analysis tool to identify funding solutions and to facilitate the efficient allocation of funds and subsequently, proceeded to structuring a suitable insurance product to be later implemented in line with the needs and preferences of the individual municipalities. In parallel, the project brought together a broad array of stakeholders both from the national and local level to jointly examine existing disaster-response mechanisms and to improve contingency planning. Finally, the roadmap also provides recommendations on next steps, primarily related to the implementation of both risk-reduction measures and the risk-transfer solution as well as the constant updating and upgrading of response structures and plans.

Figure 1: IDRM Approach<sup>1</sup>



© GIZ / RMS 2019

<sup>1</sup> Adapted from GIZ, 2019



# 1

## Introduction



Arguably, natural disasters are not necessarily 'natural' – they can occur when the impact of a natural hazard exceeds the ability of the affected community to cope on the basis of its capacity and resources.<sup>2</sup> "Natural disasters are the manifestation of risks resulting from the combination of an exposure to hazard, the conditions of vulnerability and insufficient

capacity or measures to reduce or cope with the potential negative consequences."<sup>3</sup> Applied to the context of flood risk in Accra, it is how the city builds, expands, develops and is managed, that determines if and how quickly a hazard can turn into a disaster. Therefore, it is vital that such risks are monitored, assessed and managed.

## 1.1 PURPOSE

This document aims to serve as a roadmap – providing an overview and strategic guidance, identifying key tasks and milestones, and mapping out critical processes to describe both approach and application of Integrated Disaster Risk Management (IDRM<sup>4</sup>) in a specific context. While in this case IDRM was adopted to improve flood resilience in Accra/Ghana, the approach forms part of a series of similar projects, some of which already concluded and each with a different focus, e.g. MSMEs in Morocco, renewable energy in Barbados, urban infrastructure in China, agriculture in Ghana.

The aim of the flood-resilience project in Accra was to provide the groundwork for introducing risk-transfer solutions within an integrated flood-risk management approach for municipalities in the Greater Accra Metropolitan Area (GAMA), Ghana. It centered on the insurability against flood of public assets such as markets or schools, that are owned and managed by three communal entities of Greater Accra.

The project largely ran in parallel with the geographically broader and risk-reduction as well as infrastructure-focused "Greater Accra Resilient and Integrated Development (GARID) Project" of the World Bank (approved in 2019) covering the Odaw River Basin (Greater Accra region).<sup>5</sup> The intention of the project was to pilot activities on municipality level and to allow their subsequent integration into and scaling by the GARID project.

The project with its official name "Developing Disaster Risk Management Approaches for Climate Risks" (2018–2021), of which the roadmap described herein has been part, was jointly implemented by the Gesellschaft für Internationale Zusammenarbeit (GIZ) and Allianz Re. Activities were funded by the Public-Private Partnership programme "develoPPP.de" of the GIZ on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) and Allianz.

The information provided in this document draws on a broad range of research, assessments, specifications, guidelines and training modules that were specifically produced for this project.

2 SDC, Guidelines on Disaster Risk Reduction, 2018 and ADB, Incentives for Reducing Disaster Risk in Urban Areas, 2016

3 SDC, *ibid.*, p. 9

4 This paper is part of a series of Roadmaps for Integrated Climate Risk Management, yet, uses the term "Integrated Disaster Risk Management". While ICRM and IDRM are akin, they are not congruent. Given this paper's focus on flood disasters, the latter term is used.

5 The World Bank's USD 200m (2019–25) project has five components: a) climate resilient drainage and flood mitigation measures (structural and non-structural) mitigating a 1-in-10 years flood within the Odaw River Basin, b) solid waste-management capacity improvements reducing the amount of solid waste flowing into the primary Odaw channel, (community-based interventions, waste transfer & management, capping old dumps, extending disposal capacity), c) upgrading of flood prone low-income communities with participation of local governments (vulnerability reduction, climate resilience to flooding, public service provision in priority low-income communities, metropolitan planning and coordination, O&M of drainage infrastructure in the Odaw River Basin).

While the project effectively piloted an IDRM approach in three of GAMA's districts, the activities and results are not only relevant for Accra as a whole and Ghana's national DRM framework, but are also meant to inform strategies of other cities in the context of urban resilience.

The primary audience for this roadmap is policymakers and practitioners working in this thematic area, particularly within the

National Disaster Management Organisation (NADMO) and the Ministry of Finance and Economic Planning (MoF) on the national level and GAMA as well as other cities' representatives involved in city planning, public infrastructure and risk management. A potential secondary audience is the wider set of stakeholders working on disaster-risk management outside of Ghana, e.g. in international agencies, and/or those interested in learning about the application of an IDRM approach.

## 1.2 INTEGRATED CLIMATE RISK MANAGEMENT – THE CONCEPT

The ICRM approach, replicated as IDRM, was developed based on existing conceptual frameworks, to help governments, businesses, and individuals better manage ever-increasing climate and disaster risks.

The concept alludes to a comprehensive and fully integrated risk-assessment process with its components (risk identification, analysis and evaluation) as well as risk management. Previous concepts of DRM focused in terms of risk management on the phases Prevention, Preparedness, Response, and Recovery.

This "PPRR" approach, however, was missing an important phase: Retention & Transfer, which refers to the fact that, even when all the necessary steps in the PPRR phases have been taken, a certain degree of risk still remains. Moreover, adverse effects from climate change induce new forms of risks that are currently difficult to predict and quantify. For this reason, integrated risk management emphasises the importance of risk-transfer mechanisms, like insurance, in limiting potentially large economic losses for policyholders and in leveraging the other steps in the PPRR phases.

Specifically, a risk-transfer solution not only provides risk analysis and risk assessment on all levels, but also protects communities and individuals from the potential financial burden of asset and livelihood losses, thus, protecting economic growth. By transferring some of the risk to a third party, it can provide a buffering capacity to shocks and prevent knock-on effects causing further losses.

The imperative to broaden the original perspective comes from increases in the exposure and vulnerability at a global level, linked to the multiple concurrent trends of climate change, population growth and the globalization of supply chains.<sup>6</sup>

Integrated risk management is in sum a continuous process of risk analysis, reduction, transfer as well as the strengthening of preparedness and response, which are depicted in the outer layer of Figure 2. The process aims at identifying potential hazards and reducing both impact and vulnerability by reinforcing society's coping and adaptation capacities, in line with the results of risk analysis. An integrated risk-management approach requires the establishment of a risk-transfer solution to address residual risk and prevent new risks.

6 MCI/GIZ, Integrating Insurance into Climate Risk Management: Conceptual Framework, Tools and Guiding Questions, 2018

“Integrated” also means that the various phases can partially overlap or even be developed simultaneously; they interact and reinforce each other and thus, create circular synergies, which can act as a genuine catalyst.

Figure 2: Integrated Risk Management Cycle





# 2

## Integrated Disaster Risk Management (IDRM) for Urban Resilience of Accra

The following chapter briefly introduces urban resilience providing a snapshot of both the local set-up and situation of GAMA, before proceeding to examine relevant aspects of the institutional and political framework and examining flood risk in Accra more broadly.

Urban resilience describes the capacity of a city to maintain continuity irrespective of acute shocks (e.g. by way of natural disasters) or chronic stress (e.g. as a consequence of over-population or climate change), “while positively adapting and transforming toward sustainability”.<sup>7</sup>

“By strengthening its underlying fabric and

deepening its understanding of the risks that threaten its stability, a city can improve its overall trajectory and the well-being of its citizens.”<sup>8</sup>

“A resilient city assesses plans and acts to prepare for and respond to all hazards – sudden and slow-onset, expected and unexpected.”<sup>9</sup>

The Resilient Cities Network points to the essence in the challenge of managing a city: “Cities are systems – not silos...Planning for a resilient urban future requires tackling challenges and creating solutions in a place-based, integrated, inclusive, risk-aware, and forward-looking manner.” Therefore, applying IDRM in an urban context such as Accra can prove to be a game-changer.

## 2.1 ACCRA – RAPID GROWTH AND TRAILING INFRASTRUCTURE

Each of the 16 regions of Ghana consists of three types of assemblies representing local government: metropolitan, municipal and district – determined by population size and their rural/urban composition. The administrative authorities of these entities are called Metropolitan, Municipal and District Assemblies (MMDAs).

The Greater Accra Region with a population estimated at roughly 5.1m<sup>10</sup> in 2020, is made up of 26 MMDAs, three of which acted as project partners: Accra Metropolitan Area (AMA, approx. 546,000 inhabitants), Ga East (approx. 190,000) and Ga West (approx. 130,000).<sup>11</sup>

Urbanisation in Accra, as in other cities across the developing and emerging world, is rapid, unplanned, disorderly and largely informal. It is estimated that Accra’s population grows around 1.5–2% per annum and close to 50% of its residents are believed to live in slums.<sup>12,13</sup> Rapid urbanisation

outpaces infrastructure and services (to be) provided by public authorities, with repercussions across enforcement of building codes, lack of proper planning, resource constraints, poor maintenance of public assets, etc.

According to the Local Governance Act 2016 (Act 936)<sup>14</sup>, the functions of MMDAs include the overall development of the district; formulation and execution of plans, programmes and strategies for the effective mobilisation of resources necessary for the development of the district; and initiation of programmes for the development of basic infrastructure and providing municipal works and services in the district.

7 <http://urbanresiliencehub.org/what-is-urban-resilience/>

8 <https://resilientcitiesnetwork.org/what-is-resilience/>

9 <http://urbanresiliencehub.org/what-is-urban-resilience/>

10 <https://statsghana.gov.gh/regionalpopulation.php?population=MTM0NTk2MjQzOS4yMDE1&&Greater%20Accra&regid=3>

11 [https://www.citypopulation.de/en/ghana/admin/03\\_greater\\_accra/](https://www.citypopulation.de/en/ghana/admin/03_greater_accra/)

12 <https://www.macrotrends.net/cities/21107/accra/population>

13 <https://theconversation.com/accras-informal-settlements-are-easing-the-citys-urban-housing-crisis-104266>

14 <https://lgs.gov.gh/index.php/local-governance-act-of-2016-act-936/>

For illustration purposes, AMA's 2020 budget<sup>15</sup> of EUR 6.3m (in 2019: 12m) shows a total allocation of EUR 129,000 (2019: 103,000)<sup>16</sup> towards "disaster development and management". While 2020 shows an approx. 3/1 split between internally raised revenue by AMA and external partner funding; in 2019 there was an about 1:1 split between a contribution by the Government of Ghana and by internal revenue raised by the district. In that year, with the exception of EUR 4,000 ("emergency works") and EUR 31,000 ("training, seminar, conferences") funding was allocated to general administrative costs (salaries, vehicles cost, office equipment). In 2020, the donor funding of EUR 34'000 was allocated towards recreational parks while again the bulk of the budget line was dedicated towards general administration. Although there might be further budget positions subsuming aspects of disaster-risk management (e.g. in road works) and the two years might not be representative, this tight budget appears to leave little room for

effective structural or non-structural disaster-risk management purposes. Conversely, at least the 2019 budget document lists five key issues<sup>17</sup> for AMA, of which the first one states: "poor sanitation and slum, climate change and unplanned settlements lead to disaster and flooding", while others have some bearing on this too, namely "lack of engineered landfill" and "poor attitude of residence towards waste".<sup>18 19</sup>

In respect to the socio-economic context of natural disasters the World Bank<sup>20</sup> notes "the concentration of economic activities and assets, and complex interrelatedness of people and services in cities makes shocks particularly damaging with significant detrimental economic and social impacts. This will put more pressure on a growing population which is already struggling with poverty, unemployment, precarious housing and weak governance."

## 2.2 INSTITUTIONAL & POLITICAL FRAMEWORK<sup>21</sup>

Ghana has a national disaster management plan,<sup>22</sup> which is in the process of being updated, and in 2017 concluded work on a Ghana Disaster Risk Management Country Plan (focused on flood), developed with the support of the World Bank; there is also other flood-disaster management planning in place.<sup>23</sup>

In Ghana's National Urban Policy Framework, no objective explicitly focuses on disaster-risk management, but it is indirectly reflected in some of the objectives, e.g. urban safety/security, on strengthening MMDA's capacity for drainage planning, development and management, and on flood-disaster prevention, preparedness and management.

15 <https://www.mofep.gov.gh/sites/default/files/composite-budget/2020/GR/Accra.pdf> and <https://www.mofep.gov.gh/sites/default/files/composite-budget/2019/GR/Accra-Metropolitan.pdf>

16 at approx. publication date exchange rate (1.3.2020/7.3.2019), variations in budget allocations can be driven by exchange-rate differences.

17 p. 3

18 Ga East's 2021 budget provides EUR 19,000 (out of a total of EUR 2m) towards disaster-risk reduction and Ga West's 2021 budget EUR 10,000 (out of EUR 2.4m) (in both drainage systems in flood-prone areas are explicitly mentioned).

19 For national-budget information, there is a comprehensive analysis of public investment planning for disaster-risk reduction in Ghana using the risk-sensitive budget review methodology, see UNDRR, Ghana Risk-sensitive Budget Review, 2020.

20 World Bank, Enhancing Urban Resilience in the Greater Accra Metropolitan Area, 2017, p. 8

21 For detailed information, see also CIMA Research Foundation, Project "Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin", 2021

22 Ghana Plan of Action for Disaster Risk Reduction and Climate Change Adaptation, 2011, containing seven key components: disaster hazard mapping, education, training and research, emergency responses and relief management, rehabilitation, resettlement and reconstruction, monitoring and evaluation, financing, and disaster risk management system; it identifies six categories of disaster hazards that inform domestic prevention and response measures.

23 E.g. with the IFRC for the Disaster-Risk Emergency Fund, Final Report Ghana: Floods, 2020

In 2019, AMA (yet not the other two districts) issued a Resilience Strategy,<sup>24</sup> the first of its kind in Ghana, with the support of the 100 Resilient Cities initiative.<sup>25</sup> The strategy seeks to build resilience and trigger action through coordination, integration, prioritisation, and is organised around four key pillars: an integrated approach to infrastructure planning and service provision, optimising new and existing resources with accountability and transparency as well as embracing the informality's contributions to resilience building.

Collaboration between national, regional and local authorities including civil society and the private sector is key, yet the latter two stakeholders' participation remains limited.<sup>26</sup> The National Disaster Management Organisation (NADMO) developed a National Flood Contingency Plan and there are Disaster Management Plans at the district, regional and national levels along with a response team – NADMO in collaboration with MMDA departments are responsible for flood management within each municipality.<sup>27</sup>

Generally, national departments support MMDAs in formulating medium-term development plans. They are important in translating national policies to local planning and in providing MMDAs with guidance and technical support to ensure conformity, uniformity and participation.

Ghana's National Urban Policy intends to "[c]omprehensively intervene in the urban sector to facilitate and promote the sustainable development of Ghanaian cities and towns ... and promote a sustainable, spatially integrated and orderly development of urban settlements with adequate housing, infrastructure and services, efficient institutions, and a sound living and working environment for all people to support the rapid socio-economic development of Ghana."<sup>28</sup>

Yet "there is limited policy consensus on the ways in which Ghana could transition from its current incremental, slow and at times uncoordinated efforts to develop its cities to a state of accelerated progress that draws in local resources and unlocks urban potential to drive national development.... Ghana has all the requisite policy and governance architecture, and no obvious need for additional policy to support sustainable cities. The most pressing need, at this stage of Ghana's development, is to align the work of the many ministries, companies and development partners that operate within cities behind a few strategic imperatives."<sup>29</sup> On the local level, this is also the predominant factor behind the lack of urban-planning implementation and enforcing building codes. Nevertheless, stakeholders interviewed as part of a recent meta and primary study paper on flood-risk management in Ghana<sup>30</sup>, identified missing regulation on flood zoning, buffer/

24 In 2010, the Making Cities Resilient: "My city is getting ready!" Campaign was launched "to support sustainable urban development by promoting resilience activities and increasing local level understandings of risk" (UNISDR 2013, p. 3). The Campaign was guided by three central themes: to Know More, Invest Wisely, and Build Safer (set out in the "Ten Essentials for Making Cities Resilient," in line with the Five Priorities of the Hyogo Framework for Action (HFA) 2005-2015. Local governments commit to implement risk-reduction activities following the Ten Essentials. In 2015, to support the implementation of the new DRR Framework (Sendai Framework), the then UNISDR along with a group of over 100 distinguished city and expert partners, updated the "Ten Essentials." The New "Ten Essentials," building upon the previous set, focus on initiating advocacy activities towards urban resilience.

25 AMA/100 Resilient Cities, Accra Resilience Strategy, 2019

26 Notwithstanding, there are awareness-raising activities, community days, etc. E.g. UNISDR's Making Cities Resilient Campaign rallied multi-stakeholders from government, civil society, and the private sector to examine vulnerability factors in the urban space and share perspectives on what needs to be done to enhance urban resilience. Similarly, the Community Resilience through Early Warning (CREW) project implemented by NADMO under the supervision of UNDP, as well as the Flood Early Warning System (FEWS) Volta project contributed to the advocacy agenda by sharing practical experiences from community engagements on how authorities can effectively mainstream DRR in local-level planning and enhance community resilience.

27 Therefore, NADMO has a representative or even units embedded in every MMDA.

28 Government of Ghana, National Urban Policy Framework, 2012, 21

29 Ghana Urbanization Think Tank, Cities as a Strategic Resource: Guideline for Ghana's National Urban Policy Revision, 2020, p.19

30 A. Almoradie et al., Current Flood Risk Management Practices in Ghana, in: Journal of Flood Risk Management, Sep 2020; study paper funded by the German Federal Ministry of Education and Research (BMBF)

water-retention zoning and waste disposal (in connection with waterways) as major gaps in the legal framework.

Along the same lines, although NADMO has an impressive institutional set-up in place,<sup>31</sup> challenges in terms of the required technical and financial capacity inhibit a clear focus on disaster-risk reduction. Even though disaster management plans for the MMDAs exist, “there seems to be a disconnect between the national and local level NADMO offices. Hence, there needs to be communication and dissemination of these plans to the municipal and district assemblies to ensure that the right steps are taken. Also, it is necessary for the local officers to undergo regular training on the management plans established by NADMO.”<sup>32</sup>

Another study paper<sup>33</sup> concluded based on focus-group discussions also, that there was weak institutional co-ordination between the relevant national authorities (and national and sub-national ones, incl. the MMDAs), e.g. between urban-planning and flood-management institutions.

For instance, the National Disaster Management Organisation (NADMO), in fact run by six technical committees, only met when a disaster occurred. The paper identified “a need to improve linkages among these committees focusing on proactive actions and the definition of guidelines for the coordination of the interaction between agencies.”<sup>34</sup>

Risk governance was reported to be too centralised and thus, no operational regional or local decision mechanism had been created to tackle flood incidents. A previously established regional disaster-management platform in place until 2009 was no longer operational.

When it comes to risk-transfer mechanisms, ideally, any insurance programme for e.g. local physical assets would be framed by a national or regional financial-protection strategy and policy, which would for instance also mandate the insurance of (certain) public assets. Yet, as a result of a widely different risk exposure (to various hazards) experienced by the individual MMDAs, that in the aggregate, i.e. on (sub-)national level, may dampen the perception of urgency, some highly exposed districts may have to take the lead.<sup>35</sup>

When considering such a bottom-up approach, it has to be noted though that MMDAs so far have no or only very limited familiarity with insurance and thus, public infrastructure or equipment<sup>36</sup> remain uninsured. Nevertheless, by law MMDAs are permitted to enter insurance contracts.<sup>37</sup> The ability of MMDAs to insure physical assets hinges on their ownership or control of these assets (besides central government-owned assets such as regional hospitals, MMDAs either built and owned physical assets in their areas or had been tasked to manage assets built by other parties).

31 namely the Urban Search and Rescue Response Unit, the Emergency Operation Centre for Forecasting (mandated to disseminate weather forecasts), and the Disaster Management Committee.

32 CDKN/University of Ghana, Ecosystem-based disaster risk reduction: District-level collaboration for flood mitigation in Accra, Ghana, 2020, s.p.

33 A. Almoradie et al., Current Flood Risk Management Practices in Ghana, in: Journal of Flood Risk Management, Sep 2020; study paper funded by the German Federal Ministry of Education and Research (BMBF)

34 *ibid*, no page numbers

35 It has to be noted though that the government of Ghana is in the process of setting up and capitalising a National Disaster Management Fund and in 2020 Ghana became a pilot country for the new flood-risk insurance product of the African Risk Capacity (ARC).

36 With the exception of some municipality-owned vehicles that have a motor-insurance cover.

37 For further information about the relevant legal and policy framework in Ghana refer to GIZ, Sovereign Flood-Risk Pre-Feasibility Study, 2021, pp. 56



## 2.3 FLOOD RISK IN ACCRA

Flood events in Accra have been happening more frequently and by now effectively constitute a yearly event. The flood incidence in 2015 was described as a ‘wake-up call’ featuring as one of the ten deadliest disasters worldwide of that year, killing 150 people.<sup>38</sup> Collecting a list of Accra flood events starting in 1995 gives a striking picture – Accra was affected in 1995, 1997, 2001, 2010, 2013, 2014, 2015, 2016, 2017, 2018, 2019,<sup>39</sup> 2020<sup>40</sup> and on 2 September 2021<sup>41</sup> again.

Flood has been identified as the main and most damaging hazard in the city of Accra as well as in the Greater Accra Region. Flood in this area is primarily caused by torrential rain. There are plenty of studies analysing the exact sources and causes of flood events<sup>42</sup>, prepared over the course of the last 20 years, yet they can generally be summarised as: first and foremost, meteorological (rainfall, on occasion storm surges), hydrological (impervious urban surface, elevation landscape) and anthropogenic (rapid unplanned urbanisation, poor drainage system and waste management).<sup>43</sup> One of the major causes of the 2015 flood was the blockage of the Odaw river’s mouth from discharging water into the sea.<sup>44</sup>

As a consequence of sealing off urban surfaces and the encroachment on natural space (valleys, waterways, ponds/lagoons/swamps), natural disasters have become rampant in many of the

low-lying areas of Accra. Exacerbated by climate change (increasing temperature impacting precipitation patterns), rapid urbanisation and unplanned land use (changes) render local residents increasingly vulnerable, in particular those in informal settlements, which are characterised by poor structural quality and durability and inadequate access to sanitation and health facilities, clean water and public infrastructure in general.

“With urbanization, the infiltration capacity of the natural drainage basin system has drastically reduced in recent years. In the absence of adequate wastewater and solid waste collection, the inadequately maintained drains are commonly used as sewers and garbage collectors in all [districts], which, combined with siltation, chokes the channels further reducing the discharge capacity. The blockage of free-flow streams and drains render low-lying neighborhoods vulnerable to flooding anytime it rains...”.<sup>45</sup>

Thus, there is a pressing need to explore and implement urban-management interventions to deal with flood risk in the context of coding and planning of settlements and infrastructure, water and waste management, maintenance of public assets and disaster management to reduce vulnerability (and ideally, exposure) and increase resilience.

38 Predominantly as a result of an explosion at a gas station.

39 <https://www.bbc.com/pidgin/tori-48456992>

40 <https://floodlist.com/africa/ghana-floods-accra-june-2020>

41 <https://www.pulse.com.gh/news/local/watch-video-parts-of-accra-flooded-after-5-hour-downpour/0rlsss1>

42 Meta study on Flood Risk Management in Ghana reviewed 53 articles published in scientific journals between 2009 and 2019; it found that there was a high number of vulnerability and risk-perception studies in contrast to hazard assessments while there were significant gaps in the assessment of risk, most likely as a consequence of the lack of hydrological, rainfall, and land-use data. So qualitative tools to investigate peoples’ risk-perception and adaptation strategies were preferred given that they were easily accessible in data-scarce environments, see A. Almoradie et al., Current Flood Risk Management Practices in Ghana, in: Journal of Flood Risk Management, Sep 2020; study paper funded by the German Federal Ministry of Education and Research (BMBF)

43 See e.g. C. Amoako/E. Frimpong Boamah, The Three-dimensional Causes of Flooding in Accra, Ghana, in: International Journal of Urban Sustainable Development, Dec 2014, pp. 3

44 B. Wullobayi Dekongmen et al., Flood Vulnerability Assessment in the Accra Metropolis, southeastern Ghana, in: Applied Water Science, Jul 2021, p. 2

45 World Bank, Enhancing Urban Resilience in the Greater Accra Metropolitan Area, 2017, p. 29

In addition, the lack of early-warning and flood-anticipation systems poses a major challenge and condemns authorities to reactively responding to flood events.<sup>46</sup>

Nevertheless, inadequate preparedness and response in terms of flooding are also the result of institutional failings: poor co-ordination between relevant authorities, political interference, weak enforcement of planning and building regulations, as well as haphazard construction and inconsistent maintenance work. Without a doubt, this is exacerbated by resource/funding constraints (investment, staff, equipment).

“Cities such as Accra are becoming more vulnerable to the impact of climate change due to their high population density, associated extensive infrastructure development and complex inter-dependent systems. Much of the existing infrastructure is not well if at all adapted to current climate risks and [is] poorly placed to deal with future climate risks...[Therefore] an improved IDRM and the closure of the[...] protection gap is [...] much needed.”<sup>47</sup>

---

46 M. Poko-Boansi et al, What the State does but fails: Exploring Smart Options for Urban Flood Risk Management in informal Accra, Ghana, in: City and Environment Interactions, Jun 2020, p. 8

47 GIZ and Allianz, Exposure Modelling Accra, by HKV Consultants, 2019, p. 2



# 3

## Piloting an Integrated Disaster Risk Management Approach

The project that GIZ and Allianz Re supported in the three districts of Accra was itself cross-sectoral and contained several intersected

workstreams, yet it also represented a module in a broader initiative supported by a number of partner organisations.

### 3.1 INTRODUCING THE PILOT PROJECT

The roadmap described in this paper is connected to the project “Developing Disaster Risk Management Approaches for Climate and Health Risk”.

It was initiated in 2017 and had been jointly funded by the Public-Private Partnership programme (develoPPP.de) on behalf of BMZ and Allianz Re.

The SAGABI component “Urban Resilience Infrastructure – Climate Finance Mechanism for Cities, Ghana” (herein often referred to as IDRM project) was jointly implemented by GIZ and Allianz Re in collaboration with three Ghanaian districts, namely Accra Metropolitan Assembly, Ga East Municipal Assembly, Ga West Municipal Assembly, as well as the Ghana Meteorological Agency (GMET). Its overall aim was to prepare the grounds for implementing risk-transfer solutions within an IDRM approach for the said municipalities in GAMA, and thereby better understand what cities can achieve in the field of DRM.

This project complements the World Bank’s “Greater Accra Resilient Integrated Development” (GARID) programme, which is targeted at implementing structural risk-reduction measures that in turn should reduce flood risk in the project area of the three districts (among others). As a further consequence, insurance premiums in connection with a potential public-asset insurance scheme of a district, ought to be lower also given

these proprietary risk-reduction and preparedness measures.

The following activities formed part of the IDRM project, prompting district authorities to consider risk transfer/insurance as a tool in their IDRM strategy for flooding in their constituencies:

- **Flood-risk data collection, measurement and understanding:** Hazard modelling, developing historical loss and asset-registry data repository, risk profiling & analysis (through exposure analysis and the Economics for Climate Adaptation (ECA) approach for a cost-benefit evaluation of various adaptation measures including insurance. The findings are compiled in individual asset risk profiles)<sup>48</sup>
- **Improvement of prevention measures:** Review of DRM strategy of the MMDAs, awareness raising among their administration and citizens, analysis and capacity training on waste management, development of Budget-Analysis tool to review and improve fiscal planning towards DRM to facilitate efficient use of funds; development of urban-resilience training material and capacity building<sup>49</sup> for local stakeholders
- **Identification and implementation of flood-risk preparedness measures within a holistic Disaster Risk Management approach at the local level:** Promoting IDRM activities including the participative<sup>50</sup> design, monitoring and simulations of contingency plans, standard operating processes through capacity building and

48 GIZ and Allianz Re, Developing Risk Profiles for Public Assets, 2021, s.p.

49 Via ToT/train the trainers approach

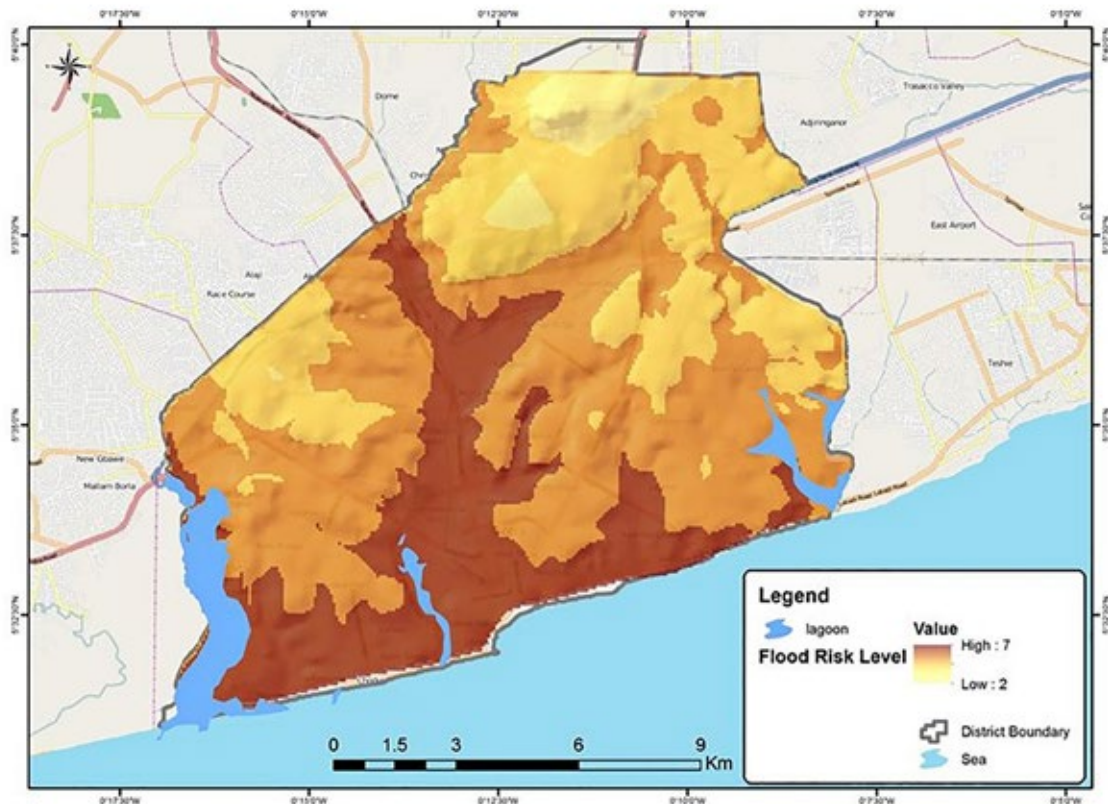
50 Participative as it included a broad range of public infrastructure and services, such as health, police, fire brigades, etc, yet, so far without civil society and the private sector. A further next step would not only include these stakeholders but also consist of city-wide (i.e. cross-district) contingency planning as opposed to only align the individual district contingency plans with the national ones (with the help of NADMO and the University of Ghana)

collaboration; the development of a “flood-risk app” including a rain radar, an early-warning (push messages) and awareness training for citizens and authorities<sup>51</sup>

- **Design of risk-transfer solution based on preferences of the municipality:** Development of a hybrid flood

insurance product for publicly managed assets, with an option for an (index-triggered) early payout and a relief component (20%), which is response oriented, support for regulator to facilitate sandbox approach and exploration of insurance options on the sovereign level.

Figure 3: Flood Risk Map of AMA<sup>52</sup>



In 2015, an exploratory mission concluded with a workshop in co-operation with NADMO, bringing a wide array of interested or already engaged stakeholders (incl. national ones and donors) and city-district authorities together. As a consequence, several municipalities expressed interest in a co-operation on exploring IDRM.

The launch of the GARID project ensued and in 2018 the GIZ and Allianz Re project, which selected three municipalities out of a larger pool that were also supported by GARID and utilised data and maps produced as part of GARID.

51 Allianz Re designed the app “My Flood Risk Accra” for individuals to check flood-risk levels and to learn about precautionary measures

52 A. B. Owusu/M. Akbozo, Application of Geographic Information Systems for Flood Risk Analysis: a Case Study from Accra Metropolitan Area, in: Sciendo, Jan 2019, p. 92

Throughout the project, the following training sessions and workshops were conducted:

PREVENTION – RISK ASSESSMENT & RISK REDUCTION			
Workshops / Trainings	Date	Objectives	Target audience
Global Positioning System (GPS) Training	November 2018	<ul style="list-style-type: none"> <li>- Increase knowledge on GPS and its relevance in data collection and analysis</li> <li>- Provide practical training on relevant device to take coordinates and how to record meta data of public assets</li> <li>- Provide overview on data needs and requirements for exposure modelling and Economic for Climate Adaptation analysis.</li> </ul>	<p>All three piloting districts (AMA, Ga East &amp; Ga West)</p> <p>Districts' NADMO representatives, Works department, Physical-Planning department and Policy-Planning department</p>
Exposure Modelling and ECA Conceptual Results	February 2019	<ul style="list-style-type: none"> <li>- Provide overview on geo-referencing and data collection by the districts</li> <li>- Evaluate impact of public-asset register</li> <li>- Teach Exposure Modelling and Economics for Climate Adaptation Conceptual Results</li> <li>- Deepen understanding of insurance as component of Disaster Risk Management Approaches</li> <li>- Provide overview of insurance offering based on the exposure and vulnerability analysis</li> </ul>	<p>All three piloting districts (AMA, Ga East &amp; Ga West)</p> <ul style="list-style-type: none"> <li>- Allianz Ghana</li> <li>- GARID Project</li> <li>- Ghana Meteorological Agency (GMet)</li> <li>- Hydrological Service Department</li> <li>- Ministry of Environment, Science Technology &amp; Innovation (MESTI)</li> <li>- NADMO</li> <li>- National Insurance Commission (NIC)</li> <li>- Environmental Protection Agency (EPA)</li> </ul>
Cost-benefit Analysis for Eco-friendly Adaptation Measures	June 2020	<ul style="list-style-type: none"> <li>- Discuss proposed adaptation measures and cost, benefit vs. risk reduction and Cost-Benefit Analysis factor for each asset</li> </ul>	<p>All three-piloting districts (AMA, Ga East &amp; Ga West)</p> <p>Each district's:</p> <ul style="list-style-type: none"> <li>- Metropolitan &amp; Municipal Chief Executives</li> <li>- Metropolitan / Municipal Chief Director</li> <li>- Policy-Planning Department</li> <li>- Physical-Planning Department</li> <li>- NADMO</li> <li>- Environmental Health Department (EHD)</li> <li>- Works Department</li> <li>- Waste-Management Department</li> <li>- Public-Health Department</li> <li>- Budget Department</li> </ul>
Waste-Management Training	June 2019	<ul style="list-style-type: none"> <li>- Increase knowledge of inclusive models, economic instruments in solid waste management and application for waste-management collection</li> </ul>	<p>All three piloting districts (AMA, Ga East &amp; Ga West)</p> <p>(all of the above)</p> <ul style="list-style-type: none"> <li>- IT Department</li> </ul>

Training on urban resilience	July & August 2021	<ul style="list-style-type: none"> <li>- Increase knowledge of concepts of IDRM</li> <li>- Provide practical concepts and tools to apply IDRM in their working context</li> <li>- Give outlook on risk- reduction measures and key residual- risk elements, and outline financial instruments (namely insurance) aimed at addressing them</li> <li>- Show case studies of residual disaster-risk management practices</li> </ul>	<ul style="list-style-type: none"> <li>- NADMO</li> <li>- the three districts</li> <li>- Adenta Municipality</li> <li>- Ayawaso Municipality</li> <li>- Ghana Ambulance Service</li> <li>- Ghana Fire Service</li> <li>- Ghana Police Service</li> <li>- GMet</li> <li>- Hydrological Service Department</li> <li>- Ministry of Local Government, Decentralization and Rural Development</li> <li>- National Commission for Civic Education</li> <li>- National Development Planning Commission</li> <li>- Ministry of Water Resource, Works and Housing</li> <li>- MESTI</li> <li>- EPA</li> <li>- NIC</li> <li>- United Nations Development Programme, Ghana (UNDP)</li> </ul>
------------------------------	--------------------	--	--

### RETENTION & TRANSFER

Workshops / Trainings	Date	Objectives	Target audience
Insurance-product Development	February 2020	<ul style="list-style-type: none"> <li>- Provide overview of the insurance-product concept</li> </ul>	All three piloting districts (AMA, Ga East & Ga West).
	June & July 2021	<ul style="list-style-type: none"> <li>- Provide a revised insurance-product concept (finalisation)</li> <li>- Discuss pricing of insurance product &amp; cover for public assets in districts</li> <li>- Discuss future of an insurance product for public assets</li> </ul>	Management: Municipal and Metropolitan Chief Executives & Chief Directors Technical officers in the districts: Planning, Budget, NADMO, Works, Public-Health, EHD, Waste Management

### PREPAREDNESS

Workshops / Trainings	Date	Objectives	Target audience
Contingency Plan Inception Workshop	May 2019	<ul style="list-style-type: none"> <li>- Understand how contingency plans fit into the overall objective of the project</li> <li>- Understand international standards in contingency planning</li> <li>- Provide insight into Ghana National Contingency Plan</li> <li>- Provide overview of status-quo districts' contingency plans</li> <li>- Discuss possible roadmap to standardise and update a contingency plan</li> </ul>	<ul style="list-style-type: none"> <li>- Allianz Ghana</li> <li>- Worldbank – GARID Project</li> <li>- NADMO</li> <li>- Ministry of Finance</li> </ul> The three districts' representatives: <ul style="list-style-type: none"> <li>- Metropolitan / Municipal Chief Executive</li> <li>- Metropolitan / Municipal Chief Director</li> <li>- NADMO Department</li> <li>- Fire Department</li> <li>- Police Commander</li> <li>- Resilience City Advisor at AMA</li> <li>- Budget Officer</li> <li>- Physical-Planning Department</li> <li>- Policy-Planning Department</li> <li>- Public-Relations Officer</li> </ul>

Final Review of the Contingency-Plan Guideline	October 2019	<ul style="list-style-type: none"> <li>- Review and accept draft contingency- plan guideline</li> <li>- Discuss roadmap for the districts' individual contingency-plan write-up</li> </ul>	<ul style="list-style-type: none"> <li>- NADMO</li> <li>- the above-mentioned representatives from Ga East, Ga West and the AMA</li> </ul>
Training on how to Draft Contingency Plans	November 2019	<ul style="list-style-type: none"> <li>- Improve officials' skills in writing their own contingency plans for flood and fire based on the contingency plan guideline</li> </ul>	
Contingency-Plan Monitoring Tool	March 2021	<ul style="list-style-type: none"> <li>- Review &amp; accept Monitoring Tool for contingency plans</li> </ul>	
Simulation-Exercise Guide for Flood and Fire	March 2021	<ul style="list-style-type: none"> <li>- Increase knowledge of simulation exercises for flood and fire</li> <li>- Provide overview of how simulation guide could be applied</li> </ul>	
Training on Flood-Risk App	August 2021	<ul style="list-style-type: none"> <li>- Ensure stakeholders can maneuver easily through App and dashboard interface</li> <li>- Improve stakeholders' capacity to sensitise other stakeholders in the assembly</li> </ul>	<ul style="list-style-type: none"> <li>- GMet</li> <li>- Hydrological Service Department</li> <li>- NADMO</li> <li>- representatives from the three districts</li> </ul>

In parallel to the Accra-focused projects, there is a broader Ghana project called "Participatory Assessment of Flood Disaster Prevention and Development of an Adapted Coping System in Ghana" (PARADeS, 2020-2023). It is led by the University of Bonn and aims to contribute towards enhancing Ghana's flood-risk reduction and management strategy, among others, by also analysing flood risk and disaster management. One out of three case studies will deal with pluvial and coastal flooding in Accra.

Intended outcomes comprise e.g. the provision of hydrologic and hydrodynamic models, the assessment of scenario-based flood-hazard and vulnerability risk as well as the impact on critical infrastructure, prevention and adaptation measures, and recommendations on policy options. Furthermore, it intends to develop a decision-support tool along with knowledge management and awareness raising.<sup>53</sup>

In the following, the project workstreams are being described in terms of process and results on the basis of the three preparatory phases of IDRM: Prevention, Risk Retention & Transfer and Preparedness.

<sup>53</sup> [http://www.parades.info/wp-content/uploads/2021/01/Flyer\\_PARADeS\\_Project\\_compressed.pdf](http://www.parades.info/wp-content/uploads/2021/01/Flyer_PARADeS_Project_compressed.pdf)





# 4

## IDRM for Urban Resilience – Prevention

The Prevention phase of the IDRM is generally split into risk-assessment and risk-reduction activities. Thus, comprehensive risk analysis and assessment is a prerequisite for activities to avoid existing and emerging disaster risks. Evidently, prevention has far lower human, financial and environmental costs than ex-post response and recovery.

## 4.1 RISK ASSESSMENT

Prevention is generally closely aligned with the IDRM phase 'Preparedness', yet also 'Risk Retention and Transfer' heavily relies on the output produced in the Prevention phase: a thorough risk analysis.

The project included a series of studies, among which a detailed risk assessment for flooding events<sup>54</sup> and an analysis of potential adaptation options<sup>55</sup> featured prominently. The latter built on a cost-benefit analysis using the ECA methodology (see 4.2).

It is difficult to determine the effect of flooding on public assets exclusively empirically in the absence of a series of post-disaster loss assessments. Nonetheless, on a modelled basis an exposure analysis provides some indication of likely flood damages. While such quantitative assessments generally rely on a number of assumptions, which make them less scientific than often assumed, qualitative risk assessments, which featured also, tend to be subjective. "The perception of risk is 'real' to each stakeholder and is influenced by factors including previous experience with the hazard or disaster, level of current exposure, level of knowledge and

Prevention also subsumes risk-reduction activities, i.e. lessening adverse effects of disaster events. Given that prevention is absolute and often unrealistic in practice, risk reduction is effectively dominant in risk management and aims at diminishing vulnerability and/or exposure and/or at increasing capacity to contain disaster risk.

understanding, as well as deeper values and beliefs."<sup>56</sup>

The public assets owned and/or managed by the three municipalities span a range of categories in terms of use and physical structure, yet the biggest category consisted of educational facilities.

### 4.1.1 Risk assessment - process

To create a record of public assets and their properties, the three MMDAs conducted an on-site survey of municipal assets<sup>57</sup>, the results of which served as input for the exposure modelling (and were stored in a GIS<sup>58</sup> database). Using inundation maps<sup>59</sup> produced for the GARID programme and/or flood-hazard profiles, along with the location of the public assets, current and future (2050) risk was modelled and the results were validated by field observations, historical data, and the consultation of local experts. In addition, another modelled scenario factored in the situation post-implementation of GARID's pilot investment plan.

To assess the risk of municipal assets in the flood zone, a vulnerability model was developed (using

54 GIZ and Allianz, Exposure Modelling Accra, by HKV Consultants, 2019; HKV were also responsible for flood hazard, vulnerability- and risk assessments, cost-benefit and multi-criteria assessments in the World Bank's GARID programme and thus, both the underlying flood model and the risk assessment built on data provided as part of GARID

55 GIZ and Allianz, Cost-Benefit Analysis, by Ingenieur Bureau Consult, 2020

56 GIZ, IDRM Participant Handbook Urban Resilience, 2020, p. 19

57 The asset register included GPS coordinates, flood history of asset, value of asset, funding agency, building type, construction material, land size, number of floors and photo ID.

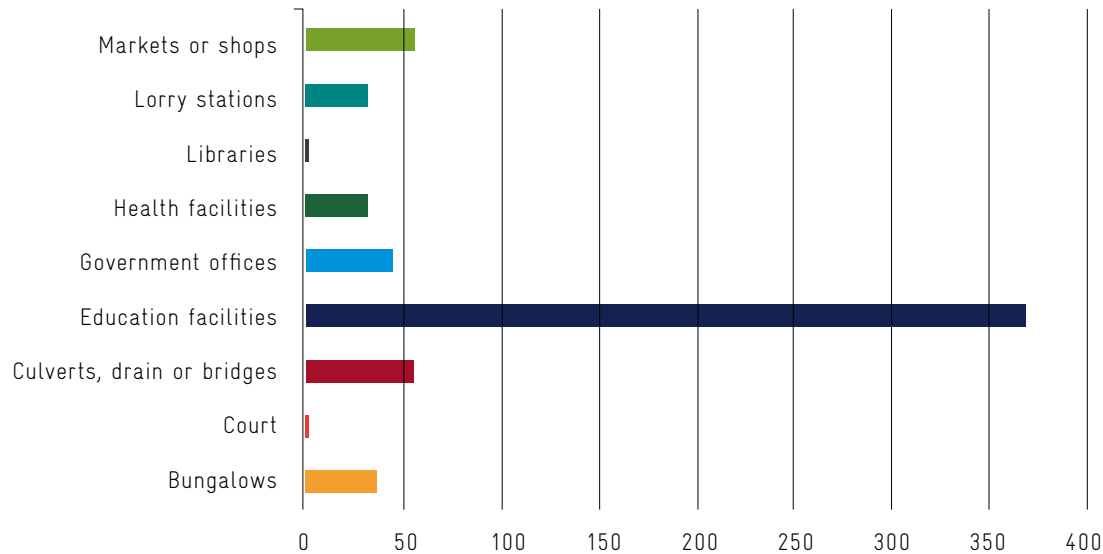
58 Geographic Information System

59 Inundation maps show the spatial extent and depth at specific water-level intervals

standardized exposure modelling) and applied. To gauge vulnerability,<sup>60</sup> vulnerability curves were constructed,<sup>61</sup> which then defined the risk profile of each individual municipality-owned

asset. The vulnerability function describes how flood damage evolves when assets are exposed to rising flood levels.

Figure 4: Number of assets reviewed



#### 4.1.2 Risk assessment – results

A total of 610 assets were surveyed across the three municipalities; 160 buildings/constructions reported flooding in the past already, mostly located in AMA, which represents the most flood-prone downstream section of the river Odaw. A total of 101 assets were located in the flood zone according to the inundation maps.

Vulnerability assessments of the assets also enabled a broader understanding of the potential ripple effects (beyond physical loss or damage) on education, health, trade, etc. due to the disruption of services/activities after a flood incident, e.g. markets, shops/sheds, and transport stations are vital for livelihoods and economic development; health facilities for the well-being and health of local communities. Therefore, along with consequential damage, e.g. in the form of loss of inventory stored at markets, the overall value and thus, loss potential, of certain buildings was markedly higher than their mere (physical) replacement cost.

<sup>60</sup> The on-site conditions (e.g. micro-location, construction type) that make assets susceptible to impacts of perils

<sup>61</sup> Calibrated on the basis of experiences in other geographies and the impact of the 2015 flood incidence

## 4.2 RISK REDUCTION

An asset's (in this case a public asset's) risk profile "is an evaluation of the probability of the asset getting damaged depending on its exposure and vulnerability to a hazard. This determines potential risk reduction measures and the estimation of funds needed to protect the public asset..."<sup>62</sup>

### 4.2.1 Risk reduction - process

With a view to risk reduction, the focus shifted to options available for reducing flood risk in the more exposed areas. The Economics of Climate Adaptation (ECA) methodology was used to understand the effects of flood on the assets, to identify options to protect them and to value and cost these options.<sup>63</sup> On the basis of such a cost-benefit analysis the most beneficial measures were then discussed and selected to achieve an optimal mix of risk-reduction measures.<sup>64</sup>

More specifically, the process consisted of the following steps: after assets had been valued<sup>65</sup> by the district authorities and assigned individual risk weightings, an annual expected damage (AED)<sup>66</sup> estimate was derived.<sup>67</sup> AED turned out to be highest for markets and sheds/shops, followed by transport stations and educational facilities.

### 4.2.2 Risk reduction - results

It was understood that climate change was projected to increase risk (and thus, AED), primarily due to a higher frequency (and not higher severity) of flood events.

In determining the impact of a specific adaptation measure, a cost-benefit analysis or Economics for Climate Adaptation approach helped to compare the cost of a measure with the reduction of future expected damages that the measure was expected to generate, i.e. its benefit. This simple decision-making tool provided the insight that e.g. eco-system based ('green') measures deliver high benefits at relatively low cost. So it turned out that desilting (but ultimately also the widening) of drains, rainwater-harvesting systems and the planting of grass and shrubs on bare ground around assets were very beneficial.

Waste management was also identified as a critical risk driver for the municipalities in respect to flood impact. Reliable waste collection and disposal systems can significantly reduce the risk of floods. Therefore, training was conducted on international best practice incl. waste-management operator models, incentivisation and technology to improve both quality and cost-efficiency.

While a national government has high financial resources available and the ability to implement also significant infrastructural measures, e.g. impacting larger geographic areas, MMDAs are obviously much more limited in their risk-reduction measures, which nevertheless can be very impactful. Therefore, in a workshop, the MMDAs identified the following action points as effective and realistic:<sup>68</sup>

- **Dredging/maintenance/repair of drains:** The dredging or repair of drains is low- cost and is highly effective in preventing flooding. A properly functioning drainage system is in

62 GIZ and Allianz Re, Developing Risk Profiles for Public Assets, 2021, s.p.

63 In on-site visits of assets and interviews of users of these assets (e.g. market sellers at markets) risk capacity was also assessed (qualitatively); risk capacity describes the resources and attributes at hand to manage/reduce disaster risk

64 See footnotes 29 & 30

65 Usually at (construction) cost or replacement value (here however at market value supplemented by a mark-up for content damage)

66 The term, sometimes also called Average Annual Loss (AAL), reflects the total expected cost of flood damage to the structure of a building/construction, averaged over a period of time. The estimate is based on the likelihood and degree of flood damage to a physical asset as well as its construction characteristics, structure value and vulnerability

67 For 86 buildings/constructions used as proxy for risk levels

68 The team also co-ordinated with agencies working across GAMA on specific aspects

fact the backbone of flood prevention. Although drains reduce the local probability of flooding, they can result in faster runoff in upstream areas and subsequently to inundation downstream in the basin.

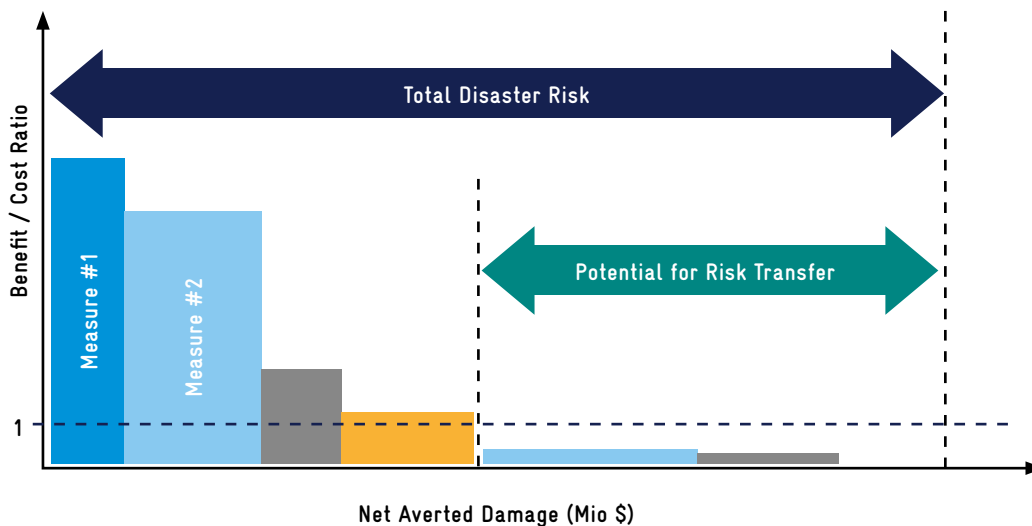
- **Waste-clearing around drains:** Waste clearing put drains to their maximum use of directing water through planned channels to designated locations.
- **Public education, early warning:** Public awareness on flood risk contributes to preventing or reducing flood incidents and is thus, essential, e.g. well-aware inhabitants may reduce the amount of trash in drains Resulting in drains functioning better and requiring less frequent maintenance.
- **Micro retention (through permeable soil) and rainfall harvesting:** Harvesting or retention of rainfall reduces the impact of flooding. Its primary effect is located downstream in the basin. Retention can be implemented on a large scale by retention ponds but also on a smaller scale in the form of Wadis or

vegetation. This makes retention of rainfall a scalable measure.

- **Flood zoning and land-use planning:** Flood zoning, i.e. ensuring that flood prone areas remain free of buildings, is an effective way to reduce flood risk, to maintain the natural capacity of the riverbed and to slow down runoff. Enforcement of the ban on building in flood zones is key for flood zoning and overall risk management. It typically requires institutional capital/investment instead of financial capital/investment.

Costing the above measures supplemented by an effectiveness factor<sup>69</sup> resulted in the already described cost-benefit factor that could both be regarded on its own and be put in relation to the AED estimates of each asset. While all assets were visited and analysed, the ECA conducted for this project focused on 16 of those assets with highest AED. Moreover, it was sensible to concentrate on assets with high AED even when the risk-reduction potential for them was relatively moderate.<sup>70</sup>

Figure 5: Cost-benefit analysis



© MCII / GIZ 2017

69 Measured by its risk-reduction potential (%)

70 GIZ and Allianz, Cost-Benefit Analysis, by Ingenieur Bureau Consult, 2020, p. viii

Finally, it turned out that besides understanding the impact of disasters, developing financial mechanisms were essential to supporting IDRM and resilience activities and to strengthening the capacity for response and recovery. Hence, it is vital to identify and develop options to finance risk reduction, as MMDAs, like most local governments, find it challenging to contribute effectively towards risk-reduction strategies due to inherent funding constraints. Therefore, the project developed a budget-analysis tool to facilitate the identification of funding solutions and the efficient allocation of funds as part of the districts' fiscal planning.<sup>71</sup>

---

71 UNDRR's *How to make Cities more Resilient: A Handbook for Local Government Leaders*, 2017, recommends the following steps: develop an implementation strategy for the plan, organise the structure and define roles & responsibilities, assign a capital and an operational budget, promote the management and mobilisation of (financial) resources and identify innovative strategies to finance risk reduction, p. 96



# 5

## Residual Risk – Retention & Transfer

## 5.1 UNDERSTANDING RESIDUAL RISK

After risk prevention and reduction measures have been deployed, residual risk remains. As it cannot be further reduced, this risk can only be retained or, as a precautionary measure, be transferred to another risk holder such as an insurer.

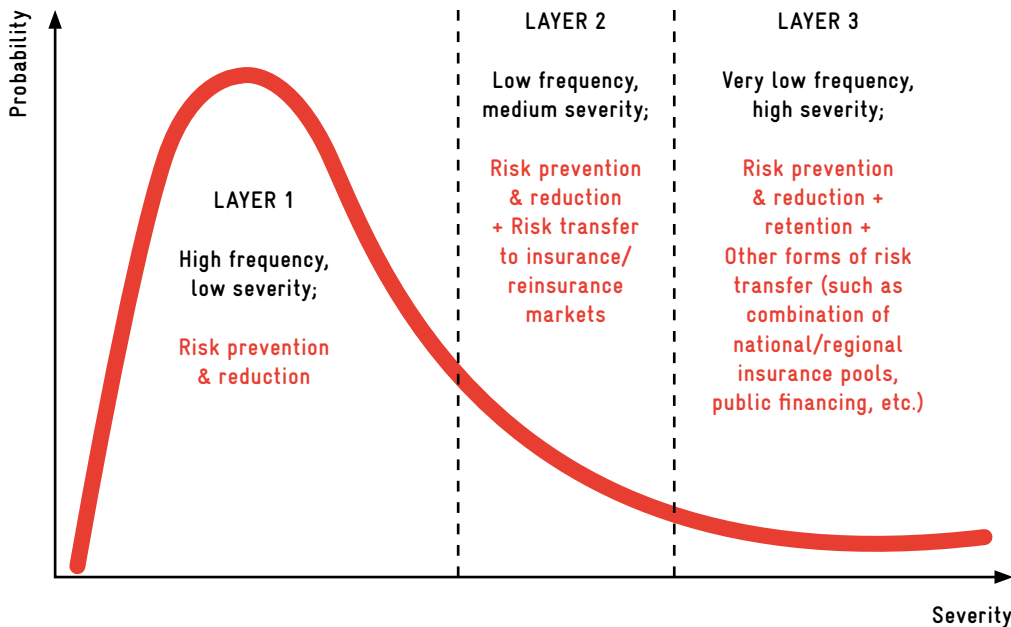
Globally, it is estimated that natural catastrophes in 2020 generated economic losses of some USD 190b, of which only USD 81b were insured (needless to say, mostly in developed countries). The protection gap (uninsured losses) appears to be widening rather than closing.<sup>72</sup>

The nexus between risk prevention/reduction and risk retention/transfer is relatively linear, i.e. the cost of the latter is lower when the former - steps

preventing risk - are more extensive. Therefore, insurance can incentivise risk reduction through prevention activities. The effective risk-retention capacity of developing countries such as Ghana along with its sub-national bodies and MMDAs is very limited; this applies to both, resources set aside in the form of 'rainy-day' funds or resources (e.g. in the form of budget carve-outs) that can be mobilised and dispensed ad-hoc after disasters struck for response and recovery purposes.

Implementing a 'risk layering' approach combining preventive actions with various risk-retention and transfer mechanisms, can significantly reduce both the net risk exposure and post-disaster finance gaps.<sup>73</sup>

Figure 6: Risk layering<sup>74</sup>



© MCII / GIZ 2013

72 Swiss Re Institute, Sigma, Natural Catastrophes in 2020, 2021, p. 2

73 GIZ, Developing Risk Management Approaches for Climate Risk, 2020, p. 2

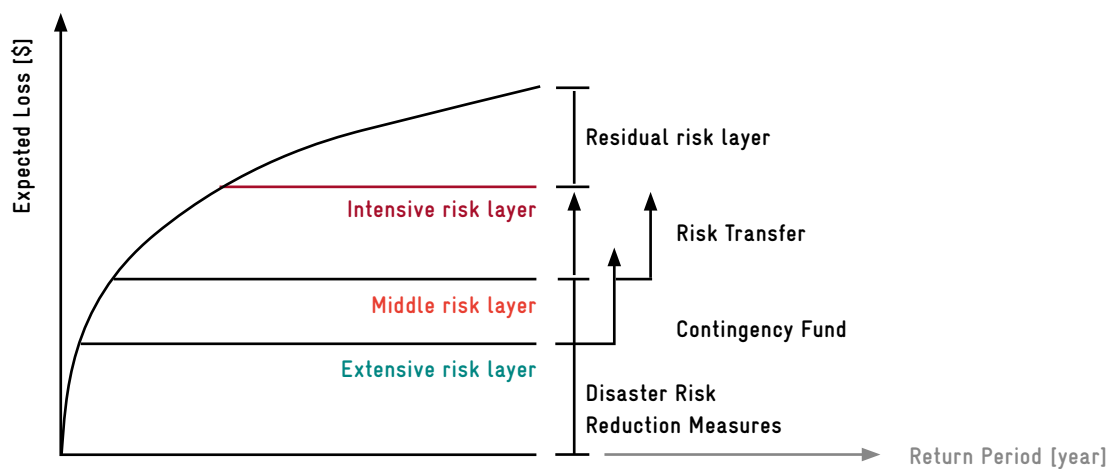
74 MCII and GIZ, 2013



Thus, instead of remaining the risk holder for the bulk of the residual risk, a risk transfer to insurance markets should be considered. Albeit best applied on a higher aggregate level, i.e. e.g. by the government of Ghana or on a regional level in order to benefit from some degree of diversification effects itself, insurance can be a

cost-effective tool to finance residual risk and thereby reduce it in its unmanaged form to a minimum.<sup>75</sup> When post-disaster the insurance payout is being triggered immediately, such schemes have the potential to abate the emergency, add buffering capacity, prevent detrimental knock-on effects and leverage recovery.

Figure 7: Illustrative Loss Curve<sup>76</sup>



## 5.2. RISK RETENTION & TRANSFER - PROCESS

The output of the risk assessment undertaken as part of the aforementioned Prevention phase served as vital input for this phase: inundation maps, asset profiling and registration as well as flood-impact assessments and projections are the key components in insurance design. Allianz analysed the flood and vulnerability risk of the three districts' individual public assets and modelled various loss scenarios. In co-operation with the municipalities' stakeholders, preferences and viable product features were discussed and determined. Besides on-site visits, a number of workshops were held, e.g. on the exposure model, product concept, prevention and adaptation

possibilities. The processes of greenlighting such an insurance solution for MMDAs by the various authorities as well as product approval (in its ultimate format) by the National Insurance Commission (NIC) have not yet started. Nevertheless, given that NIC encouraged MMDAs to launch public-asset insurance schemes,<sup>77</sup> a sandbox application was in the process of being prepared (as this paper was written).

<sup>75</sup> The term 'residual risk' is either defined as risk remaining after prevention/mitigation measures (ICRM perspective) or as unmanaged risk after prevention/mitigation and risk-transfer efforts (insurance perspective), i.e. risk that only emergency response and recovery capacity can eventually counteract.

<sup>76</sup> UNDRR, Disaster Risk Profile Ghana, 2019, p. 19

<sup>77</sup> GIZ, Sovereign Flood Risk Pre-Feasibility Study, 2021, p. 40

## 5.3 RISK RETENTION & TRANSFER - RESULTS

Based on their data analysis, Allianz came to the conclusion that - contrary to general perception - in this case an index solution would be more expensive than traditional indemnity insurance, and hence, proposed the latter, due to the fact that each municipality was to purchase policies individually. The project partnership offered a scheme incorporating three products to the districts:

- Indemnity policy, to finance the reconstruction of the public assets
- Inventory coverage in buildings, to protect inventory stored at insured buildings (such as markets)
- Indemnity 'grant', to implement contingency plans and for post-disaster recovery

### Specification of Allianz Product Offering: Proposed Scope of Policy Coverage<sup>78</sup>

COVERAGE FEATURE	SPECIFICATION
<b>Type of scheme</b>	<ul style="list-style-type: none"> <li>- Rainfall-based flood insurance</li> <li>- Indemnity-based</li> </ul>
<b>Insured entities</b>	<ul style="list-style-type: none"> <li>- Insured assets are the defined premises (incl. inventories) per municipality</li> <li>- Only premises with known geocodes are covered</li> </ul>
<b>Insured risk/peril</b>	<ul style="list-style-type: none"> <li>- Material damage caused by flooding</li> <li>- Excessive rainfall leading to floods</li> </ul>
<b>Policy cover</b>	<ul style="list-style-type: none"> <li>- Policy covers the aggregated losses to all insured assets after a severe single event.</li> </ul>
<b>Benefit</b>	<ul style="list-style-type: none"> <li>- Reimbursement of replacement costs</li> <li>- Unsecured inventories</li> <li>- 20 % additional buffer for emergency relief measures</li> </ul>
<b>Exclusions</b>	<ul style="list-style-type: none"> <li>- Indirect losses (e.g. business interruption)</li> <li>- Culverts and drains</li> <li>- Groundwater (change in level)</li> <li>- Flooding from non-rainfall events</li> <li>- Flooding from below-level rainfall threshold levels</li> <li>- Damaged but unflooded premises</li> </ul>
<b>Clear claims protocol and procedures</b>	<ul style="list-style-type: none"> <li>- Quick preliminary payout based on reported number of assets with total losses, partial losses and undamaged but flooded or based on predefined rainfall-threshold</li> <li>- Professional loss adjusters necessary to ensure fair and immediate claims payment</li> </ul>
<b>Tailored site and event terms per municipality</b>	<ul style="list-style-type: none"> <li>- For each asset type and municipality, site deductibles and site limits are defined to limit the payout per asset.</li> <li>- In addition, payouts per municipality are restricted by tailored event limits and attachment points</li> <li>- Event limits and attachment points are based on modelled portfolio losses for key return periods</li> </ul>

78 Allianz, Presentation, 2020

The proposed insurance scheme was designed after IDRMM capacity building of the MMDAs. It was linked to explicit post-disaster risk-management strategies of the districts with respect to their contingency plans and intended to provide a 20% top-up on indemnity payouts to finance post-disaster response and reconstruction programmes agreed upfront in contingency plans. In addition, it indirectly also provided cover for MSMEs' inventory stored at the premises.<sup>79</sup> Claims would be determined on the basis of individual asset loss/damage estimation by a loss adjuster and confirmation of flooding caused by excessive rainfall in excess of a pre-defined threshold based on on-the-ground rain gauges<sup>80</sup> and remote sensing.

In their budgets, MMDAs set aside a percentage of all inflows for Operation & Maintenance (O&P) of their physical assets. Hence, MMDAs could add insurance premiums to the O&P line, which would thus need to grow accordingly.

---

79 MSMEs rent and utilise assets of the districts. In the case of fire incidents, it appears that MMDAs (through a public fund) pay for or help pay for burnt goods of traders operating in their markets in the aftermath of fire disasters. Thus, given MSME livelihood concerns and the sustainability of MMDA revenue-generating operations, there might be a case for district authorities to consider covering MSMEs in their insurance programme (GIZ, Sovereign Flood Risk Pre-Feasibility Study, 2021, p. 66)

80 Rain gauges and weather stations, whether manual or automatic, are managed by GMet (Ghana Meteorological Authority) and have data quality issues. Moreover, they are few and far between across the three districts



# 6

## IDRM for Urban Resilience – Preparedness

UNDRR defines preparedness as the ability and capacity “to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters”.<sup>81</sup> While preparedness also harks back to the Prevention phase, its main components are early-warning mechanisms, contingency planning, logistics, standard operating procedures for evacuation, search and rescue, emergency relief, and relentless training and field exercises.<sup>82</sup> Ultimately, preparedness activities center around building capacities for emergency response and subsequent recovery.

As such preparedness seeks to limit the impact of disasters and intends to save lives, protect assets and provide for basic needs such as shelter or food. In a next step, it strives to allow resumption of livelihood activities and restoration of basic infrastructure.

The efficacy of early-warning systems is subject to:

- clear messaging containing simple, useful and usable information, that will help those at-risk safeguard lives, assets and livelihoods,
- technically reliable communication channels (multiple ones to amplify reach and to shield against failure), and
- trust (in the reliability of provided information and effectiveness of recommendations)<sup>83</sup>

## 6.1 PREPAREDNESS - PROCESS

The first pillar of this project phase dealt with early warning: the establishment of a ‘platform’, which compiled flood related data points (built out of the risk analysis undertaken), combined them with forecasts (derived from meteorological near-time/real-time data) and set up a

Disaster-preparedness planning involves identifying organisational and financial resources, determining roles & responsibilities, designing policies and contingency plans, containing standard-operating procedures, triggers, etc., and regular training and simulation exercises.<sup>84</sup>

Contingency plans need regular testing, training on and updating; they are only activated when warning signals “reach a pre-defined threshold, implying an emergency to occur.”<sup>85</sup>

Post-disaster, regardless of exact ownership, in Ghana there appear to be implicit public expectations that it will be the MMDAs who are responsible not only for response action, but also for reconstructing assets damaged in flood disasters. Yet, while they first use their internally generated funds, which will not last for long, they would then fall on the national government for additional funds.<sup>86</sup> Quite often, however, ex-post financial resources are simply not available swiftly enough in order to allow for meaningful response activities, nor sufficient to provide for more than the reconstruction of the most basic infrastructure. Hence, preparedness planning also goes hand in hand with risk financing (Retention & Transfer), or, in other words – risk financing, such as insurance, facilitates both risk prevention and impact reduction.

communication & outreach script along with the technical and operational capabilities to reach those at risk in a timely manner.

The second pillar comprised of deliberations and training for the development of a disaster-

81 UNDRR, <https://www.undrr.org/terminology/preparedness>

82 For more information, see e.g. UNDRR, Words into Action: Disaster Preparedness for Effective Response, 2020

83 WMO, Multi-hazard Early Warning Systems: A Checklist, 2017, p. 6

84 For more information, see e.g. GIZ, Guideline for MMDA Contingency Planning in Ghana, 2020, or IFRC, Introduction to Disaster Preparedness, 2020

85 GIZ, Guideline for MMDA Contingency Planning in Ghana, p. 18

86 GIZ, Sovereign Flood Risk Pre-Feasibility Study, 2021, p. 44

preparedness plan at district level for the three MMDAs. In this context a “Guideline for MMDA Contingency Planning in Ghana” had been designed and the three piloting districts were encouraged “to develop [their] own plan based on the guidelines, as well as to perform training and simulations and periodic monitoring activities to ensure the effectiveness and validity of the plan”.<sup>87</sup> NADMO and an expert in University of Ghana assisted in the alignment of these plans with the national contingency plan.

With respect to resource mobilisation, the insurance-product development process incorporated considerations of how to include an effective, swiftly available ‘first-response’ financing element.

Figure 8: Illustration of My Flood Risk Accra App



87 GIZ, IDRM Participant Handbook Urban Resilience, 2020, p. 38

## 6.2 PREPAREDNESS - RESULTS

### 6.2.1 Early-warning system

Almost 10 years ago the first steps in respect to flood-forecasting for the White Volta River were made: Ghana collaborated with the World Bank to put a system in place that was based on river-gauge and meteorological data, along with historical data to identify flood-prone areas. “The hazard assessment covered the genesis of the flooding of the White Volta, the mapping of flood hazards and the effectiveness of structural and non-structural measures to reduce flood impacts. This assessment led to a flood forecasting system launched in 2012 with a three-day lead time.”<sup>88</sup>

Between this Flood Early-Warning System (FEWS-Volta) and one for the Oti basin (2018) the Community Resilience and Early Warning (CREW) project<sup>89</sup> (2016) laid foundations, upon which the GIZ/Allianz Re project built a mechanism sending weather alerts and flood warnings to end-users at all levels. In September 2021, the ‘My Flood Risk Accra’ app was launched.<sup>90</sup> The app has three main functionalities:

- informing authorities about the local (GPS based) consequences of a flood,
- providing infographics (and videos) about measures that could be taken in respect to prevention<sup>91</sup>, preparedness, emergency response and remediation actions, and
- communicating official forecasts (incl. rain radar) from GMet in case of heavy rain (via push messages)

In this app the user can evaluate flood depths at a specific location within the Accra region for three scenarios (low, moderate, high risk), allowing local government and communities in flood-risk areas

to make informed decisions towards flood-risk management, yet it also serves as an awareness tool.

The use of simple and low-cost (incl. low-maintenance) systems is favorable for their long-term sustainability and the adoption of a standardised system for transmitting alerts can be instrumental in improving preparedness.

### 6.2.2 Contingency planning

In respect to contingency planning, extensive capacity building workshops with representatives of the three districts were conducted. To assist the districts in keeping track of the myriad of individual steps and required resources during the contingency-planning process, a detailed ‘monitoring tool’ (which effectively also served as a step-by-step guide) was developed and cast into a logframe format. It contained both planning and implementation guidance, namely:

#### Planning:

- Scenarios and planning assumptions
- Sector response plan

#### Implementation:

- Early warning systems
- Risk identification
- Co-ordination and management arrangements
- Damage assessment procedures
- Human resource capacity development
- Equipment assessment
- Communication network

88 <https://www.worldbank.org/en/news/feature/2013/10/21/state-of-the-art-flood-forecasting-model-launched-for-white-volta-river-in-ghana>

89 See footnote 26

90 <https://www.hkv.nl/en/news/my-flood-risk-accra-app-launched-in-ghana/>

91 E.g. it explains the impact of garbage in the drainage system

## Illustrative examples of monitoring tool indicator matrix:

Component	Indicator	Definitions	Methods/ Sources	Responsible person for indicator development	Monitoring Role	Frequency
<b>Risk Identification</b>	Risk Monitoring Focal Points appointed	Risk Monitoring Focal Points are responsible to acknowledge changes to the environment and monitor specific hazards to the area in question	The focal point can be jointly chosen from a unit or department with crosscutting responsibilities	KWA department	KWA department	Once every other year
	Guidelines for local risk assessment are available	1. Guidelines refer to a compilation of information regarding how the local risk assessments are to be conducted. 2. Risk assessment refers to...	1. Identification and evaluation of activities that increase risks 2. Consultations with community and private actors conducted...			Reviewed and updated every year
	...					
<b>Scenarios and planning assumptions</b>	Problem tree analysis for each potential hazard	Problem tree analysis refers to the study of one or more hazards, identified during the risk assessments, by identifying their causes and negative effects.	1. Previous risk assessment used 2. Consultations with community and private actors conducted ...			Reviewed once every year
	...					

Drilling down further from the contingency-planning matrix, high-level contingency-plan proposals for each of the three districts were developed and discussed; moreover, two exercise guides (for flood and for fire) were prepared for the benefit of district and other authorities involved in preparedness and disaster-response operations. These guides were specifically dedicated towards simulation exercises and to incorporating lessons learnt during such tests in improved standard operating procedures and checklists.<sup>92</sup>

Insurance holds the promise to incentivise policyholders, such as MMDAs, to develop and

implement strategies to reduce risk ex-ante and nudges them towards investing in preparedness efforts as insurance premiums can be reduced as a consequence. A further benefit of contingency planning can be that risk awareness is strengthened and disseminated across MMDAs at large.

The insurance scheme proposed by Allianz Re included 20% of emergency funds that were built into the payout structure and were meant to be dispensed at short-notice, to assist in financing early-response efforts (thereby arguably mitigating damage incurred).

<sup>92</sup> NADMO and GIZ published the contingency-plan guideline, the monitoring tool and the simulation guides for flood and fire respectively for the benefit of other interested MMDAs





# 7

## Roadmap – Future Efforts<sup>1</sup>

<sup>1</sup> See also World Bank, *Enhancing Urban Resilience in the Greater Accra Metropolitan Area*, 2017, pp. 87

The following chapter represents the forward-looking part of this IDRM Roadmap and provides an overview of recommended actions to complement and advance the project's activities.

While GIZ and other, current and future, donors can support these activities, the responsibility for their implementation resides with the MMDAs in co-operation with national authorities.

PREVENTION		
Gap	Action	Timing
Technical training	1. Leverage ToT basis to expand and maintain training on urban planning (incl. building codes) for further staff of relevant local agencies and incorporate disaster-risk training component; Conceive method to ensure enforcement of regulation	Short-term
Co-ordination	2. Establish and improve co-ordination among government authorities both laterally (e.g. GMet and NADMO) and vertically (national and local)	Mid-term
Technical training	3. Introduce training for relevant district staff on risk prevention/mitigation and the importance of maintaining physical assets, in particular drainage and hydraulic infrastructure	Short-term
Municipal services	4. Establish robust system to expand/update asset registry and to manage waste disposal (also involve communities in the latter)	Mid-term
Asset valuation	5. (Periodically) update asset values of districts (and inventory estimates)	Mid-term
Risk assessment	6. With the introduction of a more reliable approach to asset maintenance and waste disposal (along with GARID related effects), update and upgrade inundation maps taking into account drainage network (for reduction of AED/ALL estimates and thus, insurance cost)	Mid-term
Co-ordination	7. GIZ to encourage and facilitate outreach to GARID (e.g. with regards to the impact of engineering work upstream) and PARADeS projects (e.g. vis-à-vis its Accra related activities) to leverage (and sustain) project achievements	Short-term

RETENTION & TRANSFER		
Gap	Action	Timing
<b>Awareness and understanding</b>	1. Continue to increase understanding and awareness of both risk financing and transfer (i.e. insurance) among local and national government authorities	Short-term
	2. Advance deliberations among MMDAs on optimal balance between prevention (investment) on the one side and response/recovery (cost) as well as financing on the other	Short-term
<b>Roles &amp; responsibilities</b>	3. Clarify relative responsibilities of local and central government for post-disaster recovery and inferred from this, risk financing (risk-transfer cost) and larger risk-prevent efforts	Mid-term
<b>Budget</b>	4. Seek financing options for risk retention (e.g. disaster fund, contingent loan) and risk transfer (annual insurance premium)	Mid-term
<b>Needs orientation</b>	5. Align with progress in risk analysis and risk-reduction efforts, review and revise insurance-product specifications in accordance with needs and cost-benefit considerations and submit for NIC sandbox approval	Short-term
<b>Collaboration</b>	6. Consider technical advances (e.g. remote sensing) and economies of scale (e.g. aggregation of several MMDAs in one scheme) for their cost benefits in risk-transfer solutions	Mid-term
<b>Execution</b>	7. Launch insurance tender and take out insurance for pilot under sandbox treatment	Short-term
<b>Needs orientation</b>	8. Consider scheme to also include private assets in future scheme	Long-term

PREPAREDNESS		
Gap	Action	Timing
<b>Use &amp; usability of early-warning app</b>	1. Increase awareness and practicality of early-warning app across communities (and liaise/consider integrating with CREW project's scheme)	Short-term
<b>Eco-system based measures</b>	2. Identify and secure areas to increase water-retention capacity and reduce runoff as well as develop/conservate green areas/even patches with plants/shrubs in flood-prone zones (eco-system based measures)	Short-term
<b>Contingency plans and training</b>	3. Strengthen know-how on contingency planning, regularly update response plans and routinely conduct simulations and field exercises; incorporate lessons learnt in contingency plan	Mid-term
<b>Data quality and management</b>	4. Improve monitoring and data-collection capabilities of GMet enabling quality data feeds towards early-warning systems and insurance schemes	Mid-term

## 8. REFERENCES

- A. Almoradie et al., Current Flood Risk Management Practices in Ghana, in: Journal of Flood Risk Management, Sep 2020
- ADB, Incentives for Reducing Disaster Risk in Urban Areas, 2016
- AMA/100 Resilient Cities, Accra Resilience Strategy, 2019
- C. Amoako/E. Frimpong Boamah, The Three-dimensional Causes of Flooding in Accra, Ghana, in: International Journal of Urban Sustainable Development, Dec 2014
- CDKN/University of Ghana, Ecosystem-based Disaster Risk Reduction: District-level Collaboration for Flood Mitigation in Accra, Ghana, 2020
- CIMA Research Foundation, Project "Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin", 2021
- Ghana Urbanization Think Tank, Cities as a Strategic Resource: Guideline for Ghana's National Urban Policy Revision, 2020
- GIZ, Developing Risk Management Approaches for Climate Risk, 2020
- GIZ, Disaster Risk Finance - A Toolkit, 2019
- GIZ, Guideline for MMDA Contingency Planning in Ghana, 2020, or IFRC, Introduction to Disaster Preparedness, 2020
- GIZ, IDRM – Everything you need to know, s.d.
- GIZ, IDRM Participant Handbook Urban Resilience, 2020
- GIZ, Sovereign Flood-Risk Pre-Feasibility Study, 2021
- GIZ and Allianz, Cost-Benefit Analysis, by Ingenieur Bureau Consult, 2020
- GIZ and Allianz, Exposure Modelling Accra, by HKV Consultants, 2019
- Government of Ghana, National Urban Policy Framework, 2012
- IFRC for the Disaster-Risk Emergency Fund, Final Report Ghana: Floods, 2020
- MCII/GIZ, Innovative insurance solutions for climate change - How to integrate climate risk insurance into a comprehensive risk management approach, 2013
- MCII/GIZ, Integrating Insurance into Climate Risk Management: Conceptual Framework, Tools and Guiding Questions, 2018
- A. B. Owusu/M. Akbozo, Application of Geographic Information Systems for Flood Risk Analysis: a Case Study from Accra Metropolitan Area, in: Sciendo, Jan 2019
- M. Poku-Boansi et al, What the State does but fails: Exploring Smart Options for Urban Flood Risk Management in informal Accra, Ghana, in: City and Environment Interactions, Jun 2020
- Republic of Ghana, Composite Budget, Programme based Budget Estimates for 2020 and for 2019, Accra Metropolitan Area
- SDC, Guidelines on Disaster Risk Reduction, 2018
- Swiss Re Institute, Sigma, Natural Catastrophes in 2020, 2021
- UNDRR, How to make Cities more Resilient: A Handbook for Local Government Leaders, 2017
- UNDRR, Disaster Risk Profile Ghana, 2019
- UNDRR, Ghana Risk-sensitive Budget Review, 2020
- UNDRR, Words into Action: Disaster Preparedness for Effective Response, 2020
- World Bank, Enhancing Urban Resilience in the Greater Accra Metropolitan Area, 2017
- WMO, Multi-hazard Early Warning Systems: A Checklist, 2017
- B. Wullobayi Dekongmen et al., Flood Vulnerability Assessment in the Accra Metropolis, southeastern Ghana, in: Applied Water Science, Jul 2021

**IMPRINT****Published by**

Deutsche Gesellschaft für  
Internationale Zusammenarbeit (GIZ) GmbH

**Registered offices**

Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 40  
53113 Bonn, Germany  
Phone: +49 228 44 60-0  
Fax: +49 228 44 60-17 66

Dag-Hammarskjöld-Weg 1-5  
65760 Eschborn  
Phone: +49 61 96 79-0  
Fax: +49 61 96 79-11 15  
Email: [info@giz.de](mailto:info@giz.de)  
Internet: [www.giz.de](http://www.giz.de)

**Responsible for the content:**

Matthias Range ([matthias.range@giz.de](mailto:matthias.range@giz.de))

**Design:**

[www.kromativ.de](http://www.kromativ.de), Romy Glende

**Programme:**

Developing Risk Management Approaches for Climate Risks

**Picture credits:**

Page 8 – Chapter 1: © Shutterstock / Delali Adogla-Bessa  
Page 12 – Chapter 2: © Nadmo, Ghana  
Page 19 – Chapter 3: © GIZ  
Page 25 – Chapter 4: © GIZ  
Page 31 – Chapter 5: © Nadmo, Ghana  
Page 36 – Chapter 6: © GIZ  
Page 41 – Chapter 7: © GIZ

Articles attributed to named authors do not necessarily reflect the views of  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

## About the project

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), the Strategic Alliance between GIZ and Allianz Re "Developing Risk Management Approaches for Climate Risks" supports municipal, metropolitan & district assemblies to prepare the grounds for implementing risk transfer solutions within an integrated flood risk management approach in Ghana.

## About GIZ

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH offers customized solutions to complex challenges. GIZ is an experienced service provider and assists the German government in achieving its objectives in the field of international cooperation. GIZ offers demand-driven, tailor-made and effective services for sustainable development. For more information, please visit: [www.giz.de/en/](http://www.giz.de/en/).

## About Allianz Reinsurance

Allianz Re is the reinsurance arm of the Allianz Group and tailors reinsurance solutions to the diverse business needs of customers worldwide. Moreover, it serves as Allianz' center of competence in Nat Cat Management, Agricultural Reinsurance, Climate Solutions and Resolution Management. For more information, please visit: [https://www.allianzre.com/en\\_GB/about-us.html](https://www.allianzre.com/en_GB/about-us.html).

On behalf of



Federal Ministry  
for Economic Cooperation  
and Development