ENHANCING COMMUNITY RESILIENCE AND HUMAN SECURITY OF VULNERABLE COMMUNITIES IN URBAN SETTINGS THROUGH THE IMPLEMENTATION OF SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

FINAL PROJECT REPORT

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Executive Summary

This study is commissioned by the United Nations Office for Disaster Risk Reduction (UNDRR) – Regional Office of Arab States (ROAS), to compile project findings and delivering a final project report which will be submitted to the United Nations Trust Fund for Human Security (UNTFHS). The report is to provide an assessment of progress made and challenges encountered taking into consideration the relevant documents available, as well as information gathered from project support consultants and United Nations Development Programme (UNDP) in Tunisia and Mauritania.

The key focus areas of the report are: (i) the added value of the Human Security Approach (HSA) to disaster risk reduction and the implementation of the Sendai Framework for Disaster Risk Reduction (SFDRR); (ii) actions at the local level to enhance the resilience and responses of vulnerable urban communities to climate related threats and natural hazards; (iii) stakeholder engagement in planning on DRR at the local level; (iv) Disaster Risk assessments and Local resilience Action Plans (v) efforts to implement the Resilience action plans in the pilot cities.

The key findings of the report are as: i) the added value of the human security approach to disaster risk reduction and implementation of the SFDRR are significant in a region where several countries are bearing the effects of conflict, broken social contract, refugees and IDPs, ii) while stakeholders were synthesised to the salient features and added value of the Human Security Approach, more effort and support is required to ensure that this will indeed translate into human security approach being used to inform the implementation of the SFDRR, iii) local level stakeholders were engaged in the planning for DRR including local government, civil society and vulnerable groups- which posed challenges due to their varied capacities; iv) Disaster risk assessments and local resilience action plans were developed for the selected cities; however more support is required to ensure that the HAS will inform the further development and implementation of these plans; and v) efforts to implement the local resilience action plans in pilot cities are being followed up by UNDRR ROAS and UNDP Country Offices in Tunisia and Mauritania and national and local stakeholders, where financial and technical gaps are in the process of being identified.

The evaluation recognises the important milestone achieved as a result of this Project, namely to sensitise local authorities and stakeholders on the importance of human security and SFDRR and embark on a process of risk assessment and local resilience building. The evaluation is forward looking in terms of providing recommendations for future efforts to compliment the progress and consolidate the achieved gains.

1 Introduction

1.1 Background

Disasters are a threat to human security, as they cause many deaths and the destruction of livelihoods and assets. Over the decade 2005-2014, over 700 thousand people globally lost their lives, over 1.4 million were injured, and approximately 23 million were made homeless as a result of disasters. Overall, more than 1.7 billion people were affected by disasters in various ways. The total economic loss was more than $1.4 trillion [1]. Women, children, persons with disabilities and the elderly are particularly vulnerable to the negative effects of disasters, particularly those within lower income and wealth brackets. Worse, disaster impacts on human security goes far beyond the immediate effects, as disasters are often linked to health issues and pandemics, social and political unrest, displacement and migration and long term destabilization of economic growth and prosperity, thus affecting threats across the seven identified areas within the human security approach. Especially the most vulnerable lack the ability to recover quickly from disasters, and in many least developed countries development gains are lost for decades, directly impacting the human security of the affected communities.

To this end, the United Nations Trust Fund for Human Security (UNTFHS) awarded the United Nations Office for Disaster Risk Reduction (UNDRR), in collaboration with the United Nations Development Programme (UNDP) in Mauritania and Tunisia, a project that focuses on enhancing community resilience and human security of vulnerable communities in urban settings through the implementation of Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 [2]. The project aims to help protect urban communities living in vulnerable conditions and to develop capacities of the local institutions to overcome disaster, health, food, environmental and economic insecurities, and thus enhance human security of the vulnerable. In particular, the project has the following specific objectives [3]:

1. Support the development of resilience and human security capacities at local levels.
2. Strengthen and promote innovative partnerships for resilience-building and human security.

This project was the first project of its kind to implement the SFDRR through and with integration of the human security concept. As such, the project takes the key aspect

of the SFDRR, namely the recognition, for the first time at international level, of the importance of the involvement, empowerment and focus on communities and community organizations as key for effective disaster resilience and human security. The project utilises the inter-disciplinary human security approach [4], which is integrated in the SFDRR, to promote actions at the local level to enhance the resilience and responses of vulnerable urban communities to climate related threats and natural hazards targeting 10 cities in Mauritania and Tunisia. Beneficiary cities are Nouakchott, Rosso, Boghe, Kaedi and Tintane in Mauritania, and Jendouba, Bizerte, Kasserine, Siliana and Gabes in Tunisia.

The Disaster Risk Management (DRM) terminology [5] used in this report is explained in the Glossary in Annex 1.

1.2 Objectives

The objective of the consultancy are to [6]

1. Compile project findings.
2. Deliver a final project report which will be submitted to the United Nations Trust Fund for Human Security (UNTFHS).

The report is to provide an assessment of

1. Progress made.
2. Challenges encountered taking into consideration the relevant documents available.
3. Information gathered from project support consultants and United Nations Development Programme (UNDP) in Tunisia and Mauritania:

While carrying out the above tasks, reference will be made to the Sustainable Development Goals (SDGs) [7], as deemed necessary, in an effort to strengthen linkages between the Human Security Approach [4], the SDGs [7] and the SFDRR [2].

1.3 Scope and Layout

1.3.1 Scope of Risks

The Hyogo Framework for Action (HFA) [8] and the Sendai Framework for Disaster Risk Reduction (SFDRR) [2] distinguishes between intensive and extensive risks. Definitions of these terms are shown in the Glossary in Annex 1, based on the United Nations International Strategy for Disaster Reduction (UNISDR) terminology [5]. In

accordance with the SFDRR [2], the report also differentiates between existing risk and new risks.

1.3.2 Scope of Sectors and DRM Phases

In accordance of the SFDRR [2], as applicable, the report differentiates between the public and private sectors. The report also explicitly differentiates between response and recovery strategies and plans, as applicable.

1.3.3 Scope of Administrative Level, Resilience and Human Security

The key focus areas of the report are [6]:

(i) The added value of the human security approach to disaster risk reduction and the implementation of the Sendai Framework.
(ii) Actions at the local level to enhance the resilience and responses of vulnerable urban communities to climate related threats and natural hazards.
(iii) Stakeholder engagement in planning on DRR at the local level;
(iv) Disaster Risk assessments and Local resilience Action Plans.
(v) Efforts to implement the Resilience action plans in the pilot cities.

1.3.4 Layout

The remainder of this report is divided into three main sections. Section 2 provides a brief overview of the methodology adopted in this study. Section 3 provides a review of the Human Security and DRM Interaction Framework. Section 4 provide a review of the risk assessment and resilience plans for the five cities in Mauritania; and Section 6 provide a review of the risk assessment and resilience plans for the five cities in Tunisia. Finally, the in-depth risk assessments and the local resilience action plans are summarised in the appendices, while the full set of the plans will be provided separately.

2 Methodology

2.1 Introduction

The methodology adopted in this study is as follows:

- **Step 1:** Review the Human Security Concept (HSC) [4], including those practices and examples of integrating the Human Security approach within the SFDRR. Also review the UNDRR proposal [3], highlighting the main pillars of intervention and their alignment with the HSC [4].
- **Step 2:** Review the reports from the global and national Sendai Indicators pilot study for Tunisia [9], and the draft National Strategies for Tunisia [10] and Mauritania [11].
- **Step 3:** Prepare a draft report summarising progress and challenges in enhancing community resilience and human security of vulnerable communities in urban settings, in the ten selected cities.
- **Step 4:** Revise the draft report, based on the collated feedback from UNDRR ROAS, UNDP Tunisia and UNDP Mauritania Country Offices and the UNTFHS.

2.2 Reference Documents and Guidelines

The analysis of the current situation and the recommendations elaborated in the remainder of this report was informed by various reference documents on human security [12], [13], [14], [15], [16], [17], [18], [19] and [20] in addition to the reference documents listed above. In particular, reference documents, [21] were used to review progress in the implementation of the project. Furthermore, reference documents [22] and [23] were used to review local progress in the implementation of the project, and corresponding municipal workshops, in selected Mauritanian Cities. In addition, reference documents [24] and [25] was used to review the risk assessments for the five Mauritanian cities (Nouakchott, Rosso, Boghe, Kaedi and Tintane) and the proposed local action plans for resilience in the three selected Mauritanian cities of Tevragh Zeina [26], Kaédi [27] and Rosso [28]. Furthermore, reference documents [29] and [30] were used to review local progress in the implementation of the project in selected Tunisian Cities. In addition, reference documents [31], [32], [33] and [34] were used to review the risk assessments and action plans for the two Tunisian cities of Gabes and Mateur. Finally, reference documents [35], [36], [37], [38], [39] and [40] were used to review regional and national trends in sustainable development in Tunisia and Mauritania.

2.3 Main Principles of the Methodology

The assessment methodology of the action plans for DRR aimed to assess the extent to which these plans account for the salient features within the SFDRR, the HSA and Tunisia's and Mauritania's specificities. In particular, the assessment methodology aimed to assess the extent to which the following issues were addressed in the in-depth risk assessments and the ensuing local resilience action plans:

1. Identify and understand linkages between poverty, DRM and HSA.
2. Identify and understand linkages between socio-economic exclusion, DRM and HSA.
3. Identify and understand linkages between drivers of disaster risk and drivers of violent extremism, and ways to mitigate them.

2.4 Similarities and Distinctions between Human Security and Other Strategies

While human security compliments sustainable development, disaster risk reduction, and state security, it is important to highlight how the human security approach is different from the above, as elaborated by the Commission on Human Security [15]:

- State Security: State security concentrates on threats directed against the state, while human security encompasses a wide scope of threats faced by **individuals** and **communities**. It focuses on root causes of insecurities and advances people-centered solutions that are locally driven, comprehensive and sustainable. Therefore, it engages a **broader range of actors** including local communities, international organizations, civil society in addition to the state itself [4].
- Sustainable Development: To sustainable development's objective of 'sustainable growth with equity', human security adds the important dimension of **'downturn with security'** [15]. Human security acknowledges that downturns such as conflicts, economic and financial crises and ill health, impose sudden insecurities and deprivations on people. These not only undo years of development but also generate conditions within which grievances can lead to growing tensions. Therefore, in addition to its emphasis on human well-being, human security is driven by values relating to security, stability and sustainability of development gains and sustainable development efforts.
- Human Rights: Violations of human rights result in conflicts, displacement, and human suffering on a massive scale. Human security makes no distinction

between **different kinds of human rights** – **civil**, **political**, **economic**, **social** and **cultural rights** thereby addressing violations and threats in a multidimensional and comprehensive way. It introduces a practical framework for identifying the specific rights that are at stake in a particular situation of insecurity and for considering the institutional and governance arrangements that are needed to exercise and sustain them [15].

- Resilience and Disaster Risk Management: Human Security, similar to resilience building approaches, adopts a **contextualised**, **people-centred**, **multi-dimensional**, **comprehensive** and **prevention oriented** approach to building security. Furthermore, similar to the comment above regarding sustainable development, it recognises the importance of safeguarding sustainable development efforts and risk reduction gains, against a variety of natural and technological hazards. In this manner, it is similar to the principles of disaster risk reduction as embedded within the SFDRR [2].
- Resilience and Human Security: Like resilience, the human security approaches adopts a **holistic approach** that encompasses the **economic**, **social**, **physical**, **environmental** and **institutional factors** that contribute to shocks and stresses. In this manner, it first identifies and analyses the underlying causes of vulnerability and insecurity in order to then develop effective solutions capable of mitigating the severity of these underlying drivers.

3 Review of Human Security and DRM Interaction Framework

3.1 Introduction

This section reviews the main pillars of the Human Security Approach and how it relates to the SFDRR framework. Next, some of the main interactions between human security and disaster risk are reviewed from a regional perspective. Finally, the main objectives of the project from an HSA and DRR approach are reviewed and highlighted.

3.2 Review of UNDRR Disaster Resilience Scorecard Tool

This section reviews the main pillars of the UNDRR Preliminary Disaster Resilience Scorecard tool (hereafter referred to as the Scorecard) [41], which provides a set of assessments that aims to allow local governments to both monitor and review progress and challenges in the implementation of the Sendai Framework for Disaster Risk Reduction: 2015-2030, and assess their disaster resilience. It measures the ability of the city to withstand and bounce back from both acute shocks (natural and manmade) such as floods, earthquakes, hurricanes, wild-fires, chemical spills, power outages, as well as chronic stresses occurring over longer time scales, such as groundwater depletion or deforestation, or socio-economic issues such as homelessness and unemployment.

3.2.1 Scope of Scorecard

In this manner the Scorecard, covers the ability of a city to 1) understand the disaster risks it may face, 2) mitigate those risks, and 3) respond to disasters that may occur so that immediate and longer term loss of life or damage to livelihoods, property, infrastructure, economic activity and the environment is minimized. **However, this also requires practitioners to consider the chronic stresses can affect the likelihood or severity of an acute shock event, as well as undermine a city's capacity to respond and adapt.** For example, deforestation may increase the potential for flash flooding, or impoverished (and likely uninsured) communities may not be able to rebuild their homes and businesses after a major earthquake. Figure 1 depicts the scope of the Scorecard in relation to the range of shocks and stresses that a city may face [41].

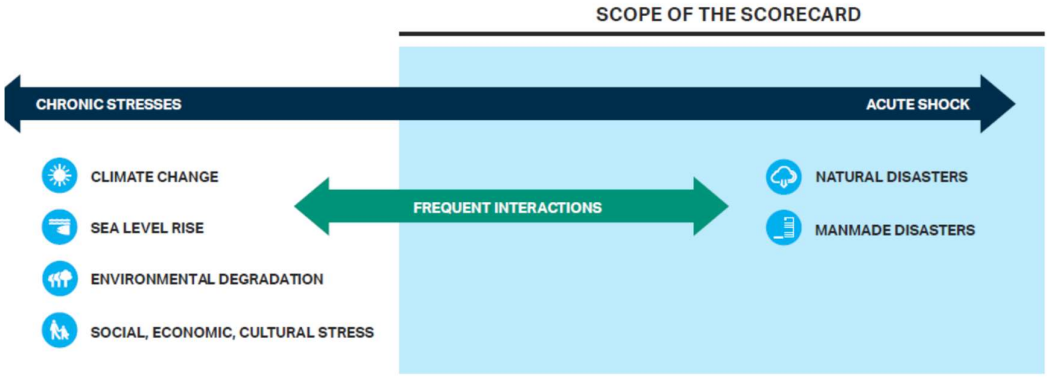


Figure 1 *UNDRR Disaster Resilience Scorecard Tool [41].*

3.2.2 Linkages to The Ten Essential for Making Cities Resilient

The Scorecard is structured around the *Ten Essentials for Making Cities Resilient*, recently updated to support implementation of the SFDRR [2], which aim to cover the many issues cities need to address to become more disaster resilient (see Figure 2):

- Essentials 1-3 cover governance and financial capacity.
- Essentials 4-8 cover the many dimensions of planning and disaster preparation.
- Essentials 9-10 cover the disaster response itself and post-event recovery [41].

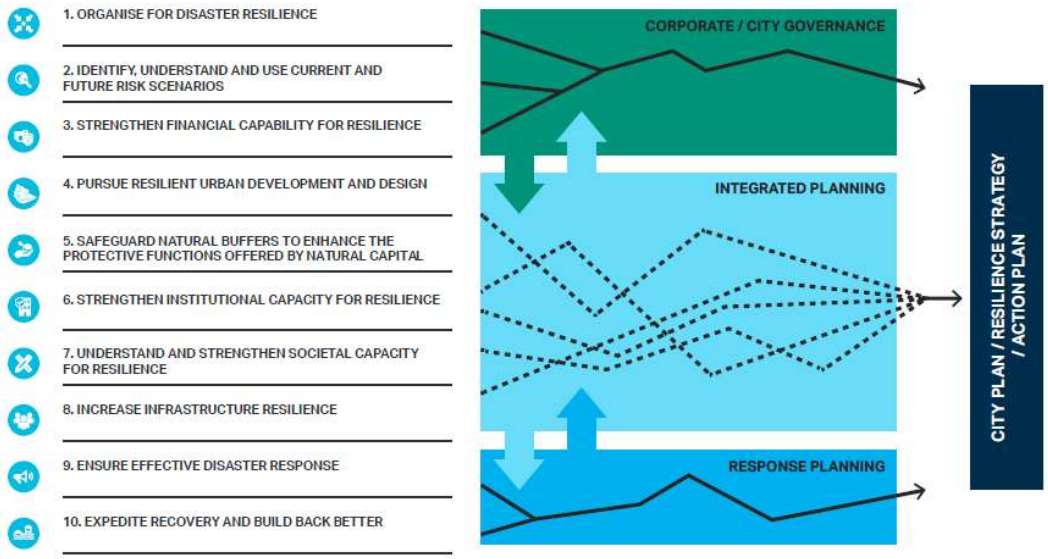


Figure 2 *Ten Essentials for making Cities Resilient [41].*

3.2.3 Stakeholder Engagement

A city is a system of systems (e.g. communications, water, sanitation, energy, healthcare, welfare, law and order, education, businesses, social and neighbourhood

systems) potentially having separate owners, operators and stakeholders. Resilience needs consideration within and across each of these systems as a range of actors including government, private business, community groups, academic institutions, other organizations or individuals have roles to play in maintaining and improving city resilience, particularly in view of emerging systemic risks cutting across all the above these systems [42]. Resilience efforts should be led by local government who usually have the best convening power. A multi-stakeholder dialogue and approach between the above key city stakeholders is deemed necessary to successfully complete the Scorecard, and to effect change towards more resilient cities recovery [41].

3.2.4 Objectives of the Use of the Scorecard

The Scorecard is being used for a range of purposes, as follows [41]:

- Purpose 1: As a high-level ***Preliminary Assessment***, often via a one to two day multi-stakeholder workshop – this can be supported by questionnaires that participants fill out in advance. Sometimes an average or consensus score is applied at the level of each of the "Ten Essentials", rather than for each individual criteria / assessment. In total there are 47 questions, responding to key Sendai Framework targets and indicators, together with some critical sub-questions.
- Purpose 2: As a limited exercise focusing on some individual Essentials, to create an in-depth review of some specific aspects of resilience, e.g. community-level preparedness.
- Purpose 3: As a ***Detailed Assessment*** of the city's entire resilience position, based on a multi-stakeholder exercise that may take 1 - 4 months to complete. This approach **can form a basis for a detailed city resilience action plan.** The detailed assessment includes 117 questions.

3.2.5 Preliminary vs Detailed Scorecard assessment

In the context of this study, the **preliminary scorecard** assessment was used for the following cities:

- Mauritanian Cities: Boghe, Kaedi, Nouakchott, Rosso and Tintane.
- Tunisian Cities: Boussalem, Ghabes, Kasserine, Mateur, Siliana and Tataouine.

The results of the assessments for the Mauritanian and Tunisian cities are summarised in Appendix 2 and Appendix 3 respectively, while a more detailed

discussion on the gaps and findings of these assessments was provided in an earlier report [43]. The achievments and gaps of the Preliminary scorecard assessments in the five Mauritanian and five Tunisian cities, including from an HSA perspective, will be discussed in chapters 4 and 5 respectively.

3.3 Review of UNDRR In-depth QRE Tool

This section reviews the main pillars of the UNDRR Quick Risk Estimation (QRE) tool [44] tool has been designed for the purpose of identifying and understanding current and future risks, stresses and shocks, and exposure threats to both human and physical assets. **The QRE tool is not a full scale risk assessment, rather a multi stakeholder engagement process to establish common understanding**. Taking into account the actions or corrective measures already undertaken, the QRE produces a dashboard – style risk assessment showing 1) the risks and hazards to human and physical assets, 2) impacts of identified main risks and associated hazard events on the specified location and/or particular asset [44].

3.3.1 Linkages to The Ten Essential for Making Cities Resilient

The QRE tool uses the hazards classification outlined by the UNDRR, where the hazard indicators included in the QRE tool are aligned with the 10 essential for Making Cities Resilience Scorecard in the context of the SFDRR and the SDGs.

3.3.2 Stakeholder Engagement

The QRE tool is available for use in cities participating in the 10 Essential Campaign. Potential users include:

- City authorities, including city planners, risk officers, flood managers and emergency response officials.
- Stakeholders in the 10 essentials campaign funded project.

It should be recognised that the QRE tool is only to be used in a workshop environment in a multi-stakeholders approach and not by an individual assessor.

3.3.3 Methodology

The following methodology is adopted for the development of the risk matrix:

- **Task 1** *Provide Location, Region and/or Asset Information*: To begin using the QRE the **'Information'** tab is used to enter the location, region and/or asset specific information that identifies and defines the scope of this risk assessment.

- **Task 2** *Identify hazard families and sub-families*: Identify the hazard families and sub-families relevant to the location being assessed. The hazard families are divided into nine main categories, namely: Geophysical hazards, Hydrological hazards, Meteorological hazards, Climatological hazard, Biological hazards, Extraterrestrial Hazards, Anthropogenic hazards, Others. It should be noted that the hazard families and sub-families are based on the hazard classification adopted by the UNDRR for the Sendai Framework.
- **Task 3** *Identify main hazards*: Within each hazard family / sub-family identified in Step 2, select the main hazards relevant to the location being assessed.
- **Task 4** *Select hazard events*: For each main hazard identified, select associated event relevant to the given location.
- **Task 5** *Assess exposure*: For each selected hazard event, assess and score the exposure of the location being assessed using values from "Unlikely to Inevitable". The users are required to record their justification for each evaluation score in order to enable validation as well as future revisions and tracking progress. Measures of exposure can include the number of people or types of assets in an area [5]. This includes population, building stock, essential facilities and critical infrastructure. Critical facilities are the primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency [44].
- **Task 6** *Assess vulnerability*: For each selected hazard event, assess and score the vulnerability in each of the four categories using values from "Unlikely" to "Inevitable". The four vulnerability categories to assess are:
  - a. Infrastructure (all types - road, transport, rails, ports, bridges, housing, etc.).
  - b. Productive Sectors (specifically livelihood/job market indirectly).
  - c. Essential or Basic Services (health, telecom, water, energy etc.).
  - d. Human and social aspects (displacement, safety, etc.).

  Again it should be recognised that the justification for each evaluation score should be recorded in order to enable validation as well as future revisions and tracking progress. Vulnerability refers to the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging

effects of a hazard. There are many aspects of vulnerability, arising from various physical, social, economic, and environmental factors. Examples may include poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for sound environmental management [5].

- **Step 7** *Assess the level of current actions or measures undertaken* For each selected hazard event, assess and score the level of current actions and measures in place to address and mitigate the hazard event in the location being assessed using values from "No measures in place" to "Complete control of disaster". Again, it should be recognised that the justification for each evaluation score should be recorded in order to enable validation as well as future revisions and tracking progress. Current actions or measures undertaken include activities and measures to avoid and/or address existing and new disaster risks and indicates the current level of disaster-resilience of the specified location.

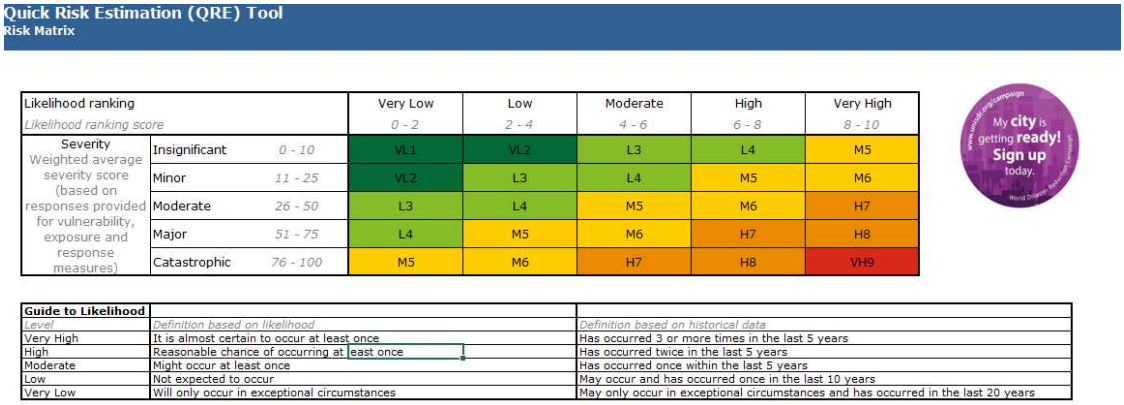
3.3.4 Scoring Guidelines for the Risk Matrix

Based on the assessment across tasks 5 to 7 above, the QRE tool will auto-populate two final numerical values: A Likelihood Ranking Score and Severity Rating; and then identify the Risk Rating for the Hazard based upon the ratings identified in the 'Risk Matrix' tab, as follows:

- **Likelihood ranking score**: refers to the likelihood of the event occurring in comparison to the other assessed events in the specified location, based on the location's exposure and vulnerability to that event, and the current actions and measures undertaken. The lower the ranking score the lower the potential requirement for action. The higher the ranking score the higher potential requirement for action. It should be recognised that this score is not a statistical measure of probability but a ranking score to enable prioritisation of hazards/hazard events across all assessed hazards/hazard events.
- **Severity rating**: refers to the impact and consequence level that a hazard would have on the location under study and its community, ranging from 1 to 100, being 1 the lowest severity and 100 the highest. A (negative) severity rating indicates you are outside the threshold of a material risk to invest in a

response. However, obtaining a severity rating of zero or (negative) may indicate unrealistic scoring of the level of current actions and measures in place to respond to the specific hazard.

- **Risk Rating:** refers to the allocation of a risk rating ranging from Very Low to Catastrophic aligned to the 'Risk Matrix', which is dependent upon the likelihood ranking and severity rating calculated, as shown in Figure 3 .



Quick Risk Estimation (QRE) Tool
Risk Matrix

Likelihood ranking			Very Low	Low	Moderate	High	Very High
Likelihood ranking score			*0 - 2*	*2 - 4*	*4 - 6*	*6 - 8*	*8 - 10*
Severity Weighted average severity score (based on responses provided for vulnerability, exposure and response measures)	Insignificant	*0 - 10*	VL1	VL2	L3	L4	M5
	Minor	*11 - 25*	VL2	L3	L4	M5	M6
	Moderate	*26 - 50*	L3	L4	M5	M6	H7
	Major	*51 - 75*	L4	M5	M6	H7	H8
	Catastrophic	*76 - 100*	M5	M6	H7	H8	VH9

Guide to Likelihood		
Level	*Definition based on likelihood*	*Definition based on historical data*
Very High	It is almost certain to occur at least once	Has occurred 3 or more times in the last 5 years
High	Reasonable chance of occurring at least once	Has occurred twice in the last 5 years
Moderate	Might occur at least once	Has occurred once within the last 5 years
Low	Not expected to occur	May occur and has occurred once in the last 10 years
Very Low	Will only occur in exceptional circumstances	May only occur in exceptional circumstances and has occurred in the last 20 years

Figure 3 *QRE Risk Matrix Tool [44].*

3.3.5 Understanding Risk Matrix Scenarios

The QRE tool assists in developing and understanding current and future risk scenarios based on the results of the self assessment. A risk scenario is a comprehensive assessment of the severity and likelihood of a hazard and its total impact, based on the exposure and vulnerability of the city to loss of life, damage or other adverse impact in the resulting disaster. Identifying scenarios is critical to understanding the risk level of each potential disaster and its impact on the specified location. This will enable cities to establish a baseline measurement of their current level of disaster-resilience, to identify priorities for investment and action, and to track their progress in improving their disaster resilience over time. The QRE tool can be applied to the development of different risk scenarios built upon:

- A single main hazard within a selected hazard family. For example, an earthquake (main hazard within the geophysical hazard family) in a coastal environment causing ground movement followed by a tsunami.
- A compound risk as a result of a combination of two or more main hazards within the same hazard family. For example, a risk scenario resulting from the combination of a drought event (main hazard within the climatological hazard

family) and a wildfire event (main hazard within the climatological hazard family) causing forest and bush fires (hazard event) enhanced by dry conditions.

- A combination of main hazards across different hazard families. For example, a risk scenario in which there is volcanic activity (main hazard within the geophysical hazard family), and landslide (main hazard within the hydrological hazard family), causing ground movement, lava flow and expansive soil (hazard event) that have combined effects in the urban / rural environment of study.

3.3.6 QRE Assessment of Mauritanian and Tunisian Cities

In the context of this study, the **QRE tool** was used for an in-depth assessment for the following cities:

- Mauritanian Cities: Boghe, Kaedi, Nouakchott, Rosso and Tintane.
- Tunisian Cities: Boussalem, Ghabes, Kasserine, Mateur, Siliana and Tataouine.

The achievments and gaps of the QRE assessments in the five Mauritanian and five Tunisian cities will be discussed in Sections 4 and 5 respectively, while also evaluating the extent to which the QRE assessments accounted for the salient features within the HSA, as elaborated below.

3.4 Review of the Human Security Approach

Human security brings together the 'human elements' of security, rights and development. As such, it is an inter-disciplinary concept that displays the following characteristics [4]:

- **People-centered**: human security places the individual at the 'centre of analysis.' Consequently, it considers a broad range of conditions which threaten survival, livelihood and dignity, and identifies the threshold below which human life is intolerably threatened.
- **Multi-sectoral**: Human security is based on a multi-sectoral understanding of insecurities. Therefore, human security entails a broadened understanding of threats and includes causes of insecurity relating to:
  - *Economic*: Persistent poverty, unemployment.
  - *Food*: Hunger, famine.
  - *Health*: Deadly infectious diseases, unsafe food, malnutrition, lack of access to basic health care:

  - *Environmental*: Environmental degradation, resource depletion, natural hazards, pollution.
  - *Personal*: Physical violence, crime, terrorism, domestic violence, child labor.
  - *Community*: Inter-ethnic, religious and other identity based tensions.
  - *Political*: Political repression, human rights abuses.
- **Comprehensive**: human security involves comprehensive approaches that stress the need for cooperative and multi-sectoral responses that bring together the agendas of those dealing with security, development and human rights. This is based on the recognition that threats to human security are mutually reinforcing and interconnected in two main ways. First, they are interlinked in a domino effect in the sense that **each threat feeds on the other** (e.g., climate change can cause violent conflicts which in turn can lead to deprivation and poverty which in turn could lead to resource depletion, infectious diseases, education deficits, etc). Second, **threats** are **geographically linked** as threats within a given country or area can spread into a wider region and have negative externalities for regional and international security. This interdependence should be recognised by decision makers, as it has important implications for policy-making as it implies that human insecurities cannot be tackled in isolation through fragmented stand-alone responses.
- **Context-specific**: the human security approach acknowledges that insecurities vary considerably across different settings and as such advances **contextualized solutions** that are responsive to the particular situations they seek to address.
- **Prevention-oriented**: in addressing risks and root causes of insecurities, human security is prevention-oriented and introduces a dual focus on protection and empowerment. **Protection and empowerment are mutually reinforcing** and cannot be treated in isolation as both are required in to ensure human insecurity, though their form and balance should be contextualised:
  - *Protection*: is defined by the Commission on Human Security (CHS) as *strategies, set up by states, international agencies, NGOs and the private sector, to shield people from menaces* [15]. It refers to the norms, processes and institutions required to protect people from critical and

pervasive threats. Protection implies a **top-down approach**. It recognises that people face threats that are beyond their control (e.g., natural disasters, financial crises and conflicts). Human security therefore requires protecting people in a systematic, comprehensive and preventative way. States have the primary responsibility to implement such a protective structure. However, international and regional organizations; civil society and non-governmental actors; and the private sector also play a pivotal role in shielding people from menaces.

- *Empowerment*: is defined as *strategies that enable people to develop their resilience to difficult situations* [15]. Empowerment implies a **bottom up approach**. It aims at developing the capabilities of individuals and communities to make informed choices and to act on their own behalf. Empowering people not only enables them to develop their full potential but it also allows them to find ways and to participate in solutions to ensure human security for themselves and others.

3.5 Human Security as an Operational Tool Interacting with the SFDRR

Adopting a human security approach to enhance analysis, understanding and programming, within the SFDRR framework, entails accounting for the following main components [4]:

- **Component 1** - *The prevention-related, mutually reinforcing pillars, of protection and empowerment*: which combines top-down norms, processes and institutions (including the establishment of the rule of law, good governance, accountability and social protective instruments); with a bottom-up focus in which democratic processes support the important role of individuals and communities as actors in defining and implementing their essential freedoms. This in turn helps identify gaps in the existing security infrastructure and identifies ways to mitigate the impact of existing security deficits. Furthermore, it ensures the sustainability of programmes and policies as protection and empowerment are introduced in a systematic and preventative manner with a look to long-term stability. It also enhances and reinforces peoples' ability to act on their own behalf. In addition, it also strengthens the resilience of individuals and communities to conditions of insecurity. Finally, it encourages participatory processes. *SFDRR Context:* In this context, the SFDRR promotes

both risk prevention of new risks as well as mitigation of existing risks, both of which can be considered as protection elements. Furthermore, the SFDRR promotes the development of institutional and legislative capacities at the national and local capacities thereby promoting the empowerment of local and national authorities. More importantly, the SFDRR calls for mainstreaming the needs, capacities and vulnerabilities of all people and communities within the DRM process, across age, sex, ability, health condition, ethnicity, religion and socio-economic background; thereby promoting empowerment from the broadest gender perspective.

- **Component 2** – *Comprehensiveness*: which addresses the full scope of human insecurities and attaches equal importance to civil, political, economic, social, and cultural rights. It recognises the multi-dimensional character of security threats as well as their interdependencies both sectorally and geographically; thereby addressing threats both within and across borders, and encouraging regional and multilateral cooperation. It also sets rudimentary thresholds below which no person's livelihood, survival and dignity should be threatened. *SFDRR Context:* The SFDRR recognises the importance of accounting for both intensive and extensive risks. Furthermore, it recognises the importance of accounting for the social, economic, institutional, legislative, and cultural factors that may contribute to vulnerability (or resilience); in addition to the more traditional natural and physical factors contributing to vulnerability. Finally, the SFDRR recognises the interaction (and potential domino effects) between natural, technological, economic and social shocks and stresses; as well as the importance of addressing transboundary risks.
- **Component 3** - *Multi-sectoral*: which allows coherence between different interventions to avoid negative impacts, while ensuring multiplying effects of positive interventions. In this manner, human security develops a true multi-sectoral agenda which 1) captures the ultimate impact of development or relief interventions on human welfare and dignity; 2) provides a practical framework for assessing positive and negative externalities of interventions; 3) enables comprehensive and integrated solutions from the fields of human rights, development, DRM and security in a joint manner; 4) helps to ensure policy coherence and coordination across traditionally separate fields; and 5) allows

for knowledge-sharing and results-oriented learning. *SFDRR Context:* The SFDRR recognises the importance of creating and strengthening linkages with the SDG [7], climate change adaptation and mitigation [45], the new urban agenda [46] and bio-diversity and eco-system protection [47], as evidenced by its promotion of 1) specific national indicators to link to the above frameworks (e.g. [9]), and 2) the importance of output and outcome based indicators (e.g. [9]), in addition to the input based indicators more prevalent in the HFA [8].

- **Component 4** – *Contextualisation*: Human security provides a universally applicable, broad and flexible approach, that: 1) addresses different kinds of insecurity as these manifest themselves in specific contexts; 2) builds on processes that are based on peoples' own perceptions of fear and vulnerability; 3) identifies the concrete needs of populations under stresses and shocks; 4) enables the development of more appropriate solutions that are embedded in local realities; 5) identifies mismatches between domestic and/or international policies and helps identify priority security needs at the local level; 6) examines the impact of global developments on different communities; and 7) captures the rapidly changing international, regional and domestic security environments. *SFDRR Context: The SFDRR encourages the understanding of the existing science policy interface in order to improve it gradually while improving local and national capacities at both the "science" and "policy" level. It also encourages local and national risk assessments thereby encouraging an understanding of intensive and extensive risks at both national and local levels. Finally, by identifying the importance of disaster loss collation, it promotes a contextualised understanding of how disaster risk and associated losses interact with development and climate change at local and national levels.*
- **Component 5** – *Prevention*: In this context, human security: 1) addresses root causes of human insecurities; 2) focuses on early prevention rather than late intervention – thereby, providing more cost-effective solutions; 3) promotes and encourages strategies concerned with the development of mechanisms for prevention, the mitigation of harmful effects when downturns occur and, ultimately, with helping victims to cope. *SFDRR Context:* The SFDRR promotes the prevention of new risk and mitigation of existing risk as opposed to simply focusing on response to disasters. Indeed, it makes the business

case for risk prevention and risk reduction a-priori. Furthermore, the SFDRR promotes, through the adoption for output based indicators, the examination and mitigation of the disaster risk drivers including poverty, weak risk governance environmental degradation and unchecked and rapid urban expansion. Finally, the SFDRR recognised and promotes the importance of the existence of recovery strategies and plans before disasters to ensure recovery is based on Build Back Better (BB) principles.

- **Component 6** – *Partnerships and Collaboration*: By emphasising the interconnectedness nature of threats, human security requires the development of an interconnected network of diverse stakeholders, drawing from the expertise and resources of a wide range of actors from across the UN as well as the private and public sectors at the local, national, regional and international levels. Human security can therefore lead to the establishment of synergies and partnerships that capitalise on the comparative advantages of each implementing organisation and help empower individuals and communities to act on their own behalf. *SFDRR Context:* The SFDRR call for the collaboration of different stakeholders at the executive (national and local), legislative, judiciary, NGO and community levels. Furthermore, it proposes formalizing such a collaboration through a national platform for disaster risk reduction. In addition, the SFDRR calls for regional and international partnerships and exchange of best practices and lessons learnt in different ways, including through the adoption of a global goal specifically for this purpose [2].
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: By providing a holistic and contextual account of peoples' concrete needs and the factors endangering their security, the information obtained through such analyses can be used in assessing existing institutional arrangements and policies as well as a benchmark for impact evaluation of past and current interventions. *SFDRR Context:* The SFDRR promotes the use of global indicators for monitoring the progress achieved in reducing disaster losses (outcome level) and the progress in developing local and national strategies (input level). The SFDRR also promotes the adoption of national and local indicators to look at progress in reducing disaster risk drivers (output level); and it does that in a contextualised manner by encouraging countries to development their own output based indicators.

3.6 Summary of UNDRR / UNDP Project Objectives and Methodology

A detailed discussion of UNDRR/ UNDP Project objectives and methodology is provided in the original proposal [3], while this section provides a summary of the project proposal and objectives. Finally, a discussion will be provided on the main areas of alignment between the project proposal and the HSA approach.

3.6.1 Objectives

The project objectives are to [3]:

- **Objective 1**: Enhance the resilience of communities and authorities to natural disasters through the development and implementation of people-centred and comprehensive local disaster risk reduction strategies and building capacity of local stakeholders to mainstream the human security approach.
- **Objective 2**: Protect people from disasters and minimise loss of life economical and infrastructure, and to support the implementation process by strengthening and promoting innovative new partnerships for human security and resilience.

In particular, it is stated that the project will promote actions at the local level to enhance the resilience and responses of vulnerable urban communities to climate related threats and natural hazards targeting the 10 cities in Mauritania and Tunisia.

3.6.2 Methodology

In order to achieve the above objectives, a series of outputs will be aimed for and a series of activities will be implemented under each, as elaborated in the original project proposal [3], and summarised in Table 1 below.

Table 1 *Main Strategies and Policies for the Implementation of the SFDRR in Tunisia*

Objective	Output	Activity
Objective 1: Enhance the resilience of communities and authorities	**Output 1**: Local knowledge and awareness of governments in 10 cities enhanced on resilience, DRR and HSA and establishment of urban risk and human security learning platform.	**Activity 1.1.1**: Organize City-to-City technical exchange in Mauritania. **Activity 1.1.2**: Organize City-to-City technical exchange in Tunisia. **Activity 1.1.3**: Visit for 10 stakeholders to a city outside the Arab region with experience in urban disaster risk reduction plan and to share experiences on the benefit of the human security approach.
	Output 2: Identify challenges and gaps in capacity for DRR planning and implementation in 10 cities	**Activity 1.2.1**: Local self-assessments in 5 cities in Mauritania to measure resilience, human security and existing resources to identify root causes of vulnerability **Activity 1.2.2**: Local self-assessments in 5 cities in Tunisia to measure resilience, human security and existing resources to identify root causes of vulnerability **Activity 1.2.3**: Regionalize and regularly update the local assessment tool.
	Output 3: Human security approach used to complete in-depth risk assessments for 6 cities	**Activity 1.3.1**: In-depth risk assessments and analysis in 3 cities in Mauritania to develop and implement people-centred, comprehensive local DRR strategies. **Activity 1.3.2**: In-depth risk assessments and analysis in 3 cities in Tunisia to develop and implement people-centred, comprehensive local DRR strategies.
	Output 4: Disaster Risk Reduction Action Plans	**Activity 1.4.1**: Develop / implement local resilience action plans using the HS approach in 3 cities in Mauritania.

	developed / implemented in 6 cities with the HS approach.	**Activity 1.4.2**: Develop / implement local resilience action plans using the HS approach in 3 Tunisia cities.
Objective 2: Protect people from disasters and minimise loss of life economical and infrastructure	**Output 1**: HSA is utilized to implement the SFDRR at national / local levels.	**Activity 2.1.1**: National multi-stakeholder dialogue in Mauritania with private sector to strengthen National Platforms for information exchange and guidance on resilience and mainstreaming the HSA. **Activity 2.1.2**: National multi-stakeholder dialogue in Tunisia as 2.1.1 above.
	Output 2: Road maps for implementation of the SFDRR at regional, national, local levels developed / implemented	**Activity 2.2.1**: Develop plans, priority actions to implement SFDRR and its targets including initiating implementation of the local resilience action plans. **Activity 2.2.2**: Develop and implement a 'Marketplace for Cities Resilience': Collect and promote information and services; consultations and advocacy meetings; adaptation of the tool to national and local specificities.

3.6.3 Discussion on Methodology and Objectives from an HSA approach

The project proposal clearly states that the salient features of the HSA will be incorporated in the development of the local resilience plans. In this context, the subsequent assessment of the project progress, gaps and information, as elaborated in Sections 4 and 5 for Mauritania and Tunisia, will assess the degree to which these plans have incorporated the main pillars of the HSA within the SFDRR as presented in Section 3.2 and Section 3.3.

4 In-Depth Risk Assessment and DRR Action Plans for the Five Mauritanian Cities

4.1 Introduction

This chapter discusses the in-depth risk assessment and DRR action plans for the five Mauritanian cities, as well as the resilience action plans for the three selected cities, from an HSA perspective. A detailed summary of the disaster risk assessments and the resilience local action plans is provided in Appendices 3 and 4 respectively.

4.2 Tavragh Zeina

4.2.1 Risk Assessment Results for Tavragh Zeina

The in-depth risk assessment for the town of Tavragh Zeina [24] has also been summarised within the document elaborating its action plan [26] and [25]. The main hazards that were identified are 1) flash floods, 2) overflow of ocean waters 3) fires, 4) epidemics, 5) sand storms and high winds, 6) desertification, 7) marine pollution and 8) industrial risks. It also identified some important socio economic characteristics of the population including a total population of 46,336 inhabitants, with 58% youth under 25 years with the median age of 20 years. It has a 3.6% poverty rate, well below the Nouakchott average of 16.6% and the national average of 31%, and major livelihoods dependence on public or private administrations and enterprises as it is the place of residence and work of almost all the professional workers in the country (lawyers, experts, consulting firms, doctors, notaries).

On a daily basis, over 60% of the municipality population migrate to the surrounding rural areas seeking employment in public and private institutions, with 162 health facilities, 63 primary and secondary schools whether public or private and 68 Mahdras. On the other hand, one of the main drivers of rural urban migration is the municipality's hosting of high-level of economic and educational establishments, as well as reliable basic services of water and electricity, well above the national average. The city literacy rate is 89% compared to the 61% at the national level.

In this report, we summarise the in depth risk assessment from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific.

4.2.2 HSA Perspective on Risk Assessment Results for Tavragh Zeina

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The impact of the hazards on the survival of people (fatalities, injuries, etc) was considered when assessing the severity of most hazards. The impact and severity of the hazards in terms of loss and damage to property was also assessed. Furthermore the effect of the flash floods on livelihoods and displacement was noted. However the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) was perhaps not sufficiently considered.
- **Multi-Sectoral**. The assessment considered the environmental and health hazards listed above together with the economic impact and in some instances, where relevant their impact on food security. However, food-security, economic and political shocks and stresses were not sufficiently addressed in the assessment and should be considered in future assessments.
- **Comprehensiveness**: geographic comprehensiveness was touched upon by identifying that people from outside the municipality enter it in search of better services and jobs. Furthermore, sand encroachment was considered as a hazard that may have its source outside the municipality (the origin of sand and dust storms). However, the domino-effect of comprehensiveness (in the sense that each threat feeds on the other) was perhaps not sufficiently accounted for and should be addressed in future assessments. This is particularly true for interaction and linkages between different categories of threats (i.e. political, economic, food and environmental) in addition to interlinkages between threats in one sector such as the environmental sector, and health sector, that were addressed in the risk assessment.
- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. However, it may be useful to direct additional efforts in the future to identify and analyse the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. One important issue is the institutional factors, including weak risk governance, leading to ongoing relocation of individuals to a continuously diminishing green-belt around the city.

4.2.3 Local Resilience Action Plan for Tavragh Zeina

The local resilience action plan for Tavragh Zeina identifies six *existing* axes for intervention, namely [24]: i) the rehabilitation of the sanitation system; (ii) the maintenance and consolidation of protective dikes; (iii) the establishment of a green belt protecting the municipality; (iv) the improvement of access routes to the market area and other sensitive sites; (v) the establishment of an adequate system for the treatment of waste and the disposal of stagnant water and (vi) the establishment of a communal system for information and early warning. In addition to the above predefined efforts, the following additional axes were identified as new areas for resilience building [24]: i) the development of a municipal body for disaster prevention and management including the following four units a) information and early warning, b) relief and rescue, c) logistics and procurement, and d) needs, lobbying and external relations; ii) legislative and regulatory framework to institutionalise the municipal body for disaster prevention and management referred to above and to develop and enforce prevention and mitigation legislation including on preventing removal of sand dunes and unauthorised construction along the coast, and safeguarding the green belt.

4.2.4 HSA Perspective on Local Resilience Action Plan for Tavragh Zeina

- **Component 1** - Reviewing the proposed and existing axes of intervention, it is clear that prevention related efforts are focused on a top-down rather than a bottom up approach, which is perhaps needed in early stages of resilience building to set the institutions in place. Notwithstanding the importance of prevention and protection efforts, additional work should also be directed at empowering individuals and local communities in Tavragh Zeina to play a participatory and inclusive role in assessing and improving their own resilience, building on the participatory approach adopted in this study.
- **Component 2** – *Comprehensiveness*: The action plan recognised the interconnectedness of geographical areas for some hazards including flash flooding, sand encroachment and sand and dust storms. Additional effort is required to develop the action plan so it accounts for comprehensiveness in terms of interaction of threats and hazards under the different categories (including food, economic, political, environmental, community and personal). This can perhaps take place at a later stage, as part of further capacity building of the local authority and relevant stakeholders.

- **Component 3** - *Multi-sectoral*: The local resilience action plan accounts for threats under the environmental category. Futrure effort should aim to look at threats under the other categories, as well as to analyse the manner in which they interact (see Component 2 above).
- **Component 4** – *Contextualisation*: As a good first step, the physical and environmental factors contributing to vulnerability to environmental hazards have been identified and are addressed in the resilience local action plan. Future effort should aim to identify and address the social, economic and institutional factors that contribute to vulnerability to environmental hazards and other hazard categories; before also identifying and addressing the factors that may increase the interaction between the different hazards within and between categories.
- **Component 5** – *Prevention*: The local resilience action plans proposed the development of a regulatory and legislative framework to develop and enforce prevention and mitigation laws. Equally important is to direct future effort at the development of strategies to address the root causes and drivers of disaster risk, violent extremism and civil strife - all of which interact to increase vulnerability and reduce human security.
- **Component 6** – *Partnerships and Collaboration*: The local resilience action plan recommends the development of a unit under the municipal body for disaster prevention and management to address needs, lobbying and external relations. The role of this unit may be extended to encompass capacity assessment so that external relations address both capacities and needs of the municipality.
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: a base line of risk has been developed, together with data on poverty and other socio economic indicators. Future effort should aim to augment this database with more data on i) disaster losses, ii) interaction of disaster losses with disaster risk drivers, iii) interaction between threats, shocks, hazards and stresses under different sectors, iv) interaction between threats in different cities. Furthermore, it is also useful to develop targets for reducing such losses and threats, together with targets for reducing the disaster and violent extremism drivers, both of which are drivers for vulnerability that threaten sustainable development.

4.3 In-Depth Risk Assessment for Rosso

4.3.1 Risk Assessment Results for Rosso

The in-depth risk assessment for the city of Rosso [24] has been summarised in other documents [25] and [28]. The main hazards identified in the assessment are: i) flash flood, ii) river flood, iii) fire, iv) epidemic, v) food and/or nutritional crisis, vi) drowning in the river, and vii) industrial risks. It also identified some important socio economic characteristics of the population including a 32% rate of poverty, 46% youth under 24 years and a large dependence on agriculture (peasants working in own fields; agricultural workers in the perimeters of large farms; workers in companies linked to the sector such as perimeter facilities, harvest of crops; and dozens of various service providers) and transportation and trade sectors for livelihoods.

The municipality houses on its territory almost all national societies whose mission is focused on the development of the irrigated agriculture, in addition to the Higher Institute of Technology Education (ISET). There are dozens of private facilities, harvest equipment and dehulling plants. The presence of the Rosso Ferry creates an important commercial hub and services related to trade with Senegal. Furthermore it is envisaged that the upcoming construction of Rosso bridge will greatly enhance this role. Rosso also houses the training centres of the main army and security corps (Guard, Gendarmerie, National Army) and several operational units. Rosso has a hospital, a large Health Centre, a school of health and 8 health posts; and 2 high schools, 6 colleges and dozens of public and private primary schools.

In this section, we summarise the in depth risk assessment from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific.

4.3.2 HSA Perspective on Risk Assessment Results for Rosso

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also identified the scenario where a failure / drop in agriculture production may lead to a food or nutritional crisis. Future assessments should also account for the disproportionate effects of the above disasters on youth, the poor or the different stakeholders within the agriculture sector. It is imperative that future assessmentsalso account for the potential impact of disasters on trade and transportation routes, both important for livelihoods in

Rosso. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in displacements, potential forced relocations, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) was perhaps not sufficiently considered.

- **Multi-Sectoral**. The assessment considered the environmental, personal (drowning) and health hazards listed above together with the impact on food security. However, future assessments should also account for the economic, community and political shocks and stresses.
- **Comprehensiveness**: Geographic comprehensiveness was touched upon by identifying that Rosso may be affected by epidemics originating in other areas. However, the impact of crises in neighbouring countries (e.g. Senegal) on trade and transportation sectors in Rosso was not sufficiently addressed. The domino-effect of comprehensiveness (in the sense that each threat feeds on the other) was identified between drought, food security and nutrition crises. Future efforts should also be directed at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food and environmental).
- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. However, it may be useful to direct additional efforts in the future to identify and analyse the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. For example, it is stated that a new area was developed with functioning infrastructure networks to encourage people in flood plains to resettle. However, the people still refuse to do so and in recent crises used this area solely for shelter while flood waters receded. This clearly shows risk governance deficits, on behalf of the municipality, related to the lack of a two – way communication process (top-down and bottom-up) when developing risk prevention and risk mitigation solutions and resilience building strategies.

4.3.3 Local Resilience Action Plan for Rosso

The local resilience action plan for Rosso identifies six *existing* axes for intervention, namely [28]: (i) the rehabilitation of the sanitation network; (ii) the maintenance and consolidation of the protective dykes; (iii) strengthening the means of Regional Directorate of Civil Protection; (iv) Setting up a stock of emergency kits; (v) the creation at the municipal level of a municipal authority dedicated to the prevention and

management of disasters. In addition to the above predefined efforts, the following additional axes were identified as new areas for resilience building [28]: i) the development of a municipal body for disaster prevention and management including the following four units a) information and early warning, b) rescue and life saving, c) logistics and supply, and d) needs, lobbying and external relations; ii) legislative and regulatory framework to institutionalise the municipal body for disaster prevention and management referred to above and to formalise procedures for declaring crises and emergencies at the municipal level.

4.3.4 HSA Perspective on Local Resilience Action Plan for Rosso

- **Component 1** - Reviewing the proposed and existing axes of intervention, it is clear that prevention related efforts are focused on a top-down rather than a bottom up approach. Notwithstanding the importance of the latter, future effort should also be directed at empowering individual and local communities in Rosso to assess and engage in their own resilience building camapaigns, building on the participatory approach already pioneered in this project.
- **Component 2** – *Comprehensiveness*: The action plan recognised the interconnectedness of geographical areas for some hazards including drought, locust, food and nutrition crises. Future effort should be directed at refining the action plan so it accounts for comprehensiveness in terms of interaction of threats and hazards under the different categories (including food, economic, health, political, environmental, community and personal).
- **Component 3** - *Multi-sectoral*: The local resilience action plan accounts for threats under the environmental, health, food and personal category. Future effort should be directed at accounting for risks and threats under the other categories, as well as to analyse the manner in which they interact (see Component 2 above).
- **Component 4** – *Contextualisation*: The physical and environmental factors contributing to vulnerability to environmental hazards have been identified and are addressed in the resilience local action plan. Future effort should be directed at identifying and addressing the social, economic and institutional factors that contribute to vulnerability to environmental hazards and other hazard categories; before also identifying and addressing the factors that may increase the interaction between the different hazards within and between categories.

- **Component 5** – *Prevention*: The local resilience action plan proposed the development of a regulatory and legislative framework; however, it did not highlight the need for developing and enforcing prevention and mitigation laws and legislations. There is also a need to highlight the importance of developing laws so that some of the prevention interventions suggested in the action plan become enshrined by law and are carried out on a regular basis as needed, including the rehabilitation of the sewage network and the dykes). Equally important is the need to develop strategies to address the root causes and drivers of disaster risk, violent extremism and civil strife all of which interact to increase vulnerability and reduce human security. Finally, the proposed development of a municipal body for disaster prevention and management, and associated units and activities, seems to be more focused on disaster management rather than disaster prevention and risk reduction.
- **Component 6** – *Partnerships and Collaboration*: The local resilience action plan recommends the development of a unit under the municipal body for disaster prevention and management to address needs, lobbying and external relations. The role of this unit may be extended to encompass capacity assessment so that external relations address both capacities and needs of the municipality, communities and individuals.
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: a base line of risk has been developed, together with data on poverty and other socio economic indicators. Future efforts should augment this database with more data on i) disaster losses, ii) interaction of disaster losses with disaster risk drivers, iii) interaction between threats, shocks, hazards and stresses under different sectors, iv) interaction between threats in different cities. Furthermore, it is also useful to direct future efforts at developing targets for reducing such losses and threats, together with targets for reducing the disaster and violent extremism drivers, both of which are drivers for vulnerability that threaten sustainable development. This in turn requires changes in the proposed disaster prevention and management municipal body so that part of its work is related to risk assessment, disaster losses, setting targets for risk reduction, amongst other tasks highlighted above.

4.4 In-Depth Risk Assessment for Kaédi

4.4.1 Risk Assessment Results for Kaédi

The in-depth risk assessment for the city of Kaédi [24] has been summarised in other documents [25] and [27]. The main hazards identified in the assessment are: i) river flood, ii) flash flood, iii) fire, iv) epidemic, v) drought, vi) locust invasion, vii) food and/or nutritional crises, and viii) drowning in the river. It also identified some important socio economic characteristics of the population including a 38% rate of poverty, well above the national average of 32%, 46% youth under 24 years and a large dependence on agriculture (rainfed agriculture - diéri, flood plain agriculture – Oualo, and irrigation-based agriculture), livestock, transportation and trade sectors for livelihoods. The municipality had 49,152 inhabitants in 2013 according to the figures of the General Census of Population and Housing conducted by the Office of National Statistics. The urbanisation of the city of Kaédi is believed to have started around 1859; with small alleys in the districts of Touldé, Gataga, Gourel Saigné that do not allow the access of any type of vehicle.

The municipality has commercial relations with Senegal, and the construction of a wharf as part of the navigation component of the OMVS is likely to increase these exchanges. The municipality houses on its territory several Centers and Directorates in relation to the development of agriculture, as well as the classic regional representations of all the ministries (Health, Education, Agriculture, Livestock, Environment, Social Affairs, CSA and Civil Protection) and regional structures of the different security bodies (Guard, Gendarmeries and Police), in addition to a unit of the national army, the Autonomous Sector of Kaédi SAC. It has a hospital, 2 health centers and 5 health posts; and 1 high school, 2 colleges and dozens of public and private primary schools.

In this section, we summarise the in depth risk assessment from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific.

4.4.2 HSA Perspective on Risk Assessment Results for Kaédi

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also identified the scenario where a failure / drop in agriculture production may lead to a food or nutritional crisis. The

assessment highlighted the disproportionate effects of the above disasters on the poor; however, future efforts should also assess the effects of these disasters on other vulnerable groups including youth and women led households. Future efforts should also assess the potential impact of disasters on trade and transportation routes, both important for livelihoods in Kaédi. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in displacements, potential forced relocations, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) was perhaps not sufficiently considered.

- **Multi-Sectoral**. The assessment considered the environmental, personal (drowning) and health hazards listed above together with the impact on food security. However, economic, community and political shocks and stresses were not sufficiently addressed in the assessment and should form the topics for future assessments.
- **Comprehensiveness**: Geographic comprehensiveness was touched upon by identifying that Kaédi may be affected by epidemics originating in other areas. However, the impact of crises in neighbouring countries (e.g. Senegal) on trade and transportation sectors in Kaédi was not sufficiently addressed. The domino-effect of comprehensiveness (in the sense that each threat feeds on the other) was identified between drought, food security and nutrition crises. It was also identified between flood mitigation measures that may affect flood-plain irrigation zones, which in turn will affect the poorest in the city and the country (Oualo agriculture workers). It may be also useful to direct future effort at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food and environmental). In particular, it will be useful to assess the manner in which climate change may change rainfall and flooding patterns, which in turn will affect associated agriculture types considered the main sustenance for the most vulnerable groups in the city and the country.
- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. It may be useful to direct future efforts to identify and analyse, in a disaggregate manner, the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. For example, the case of flood control

measures affecting flood plain agriculture, and agriculture workers in the districts of in Inity, Tenzah or Wandama was highlighted. It would be useful if future efforts are directed at developing socio-economic (poverty, income, livelihood division) and disaster risk indicators (crop failure, disaster loses, etc) disaggregated at the district, subdistrict and livelihood level (i.e. per type of agriculture)

4.4.3 Local Resilience Action Plan for Kaédi

The local resilience action plan for Kaédi identifies six *existing* axes for intervention, namely [27]: (i) the rehabilitation of the sanitation network; (ii) the maintenance and consolidation of the protective dykes; (iii) strengthening the means of Regional Direction of Civil Protection; (iv) Setting up a stock of emergency kits; (v) providing the municipality with fire fighting equipment, (vi) the creation at the municipal level of a municipal authority dedicated to the prevention and management of disasters. In addition the above predefined efforts, the following additional axes were identified as new areas for resilience building [27]: i) the development of a municipal body for disaster prevention and management including the following four units a) information and early warning, b) rescue and life saving, c) logistics and supply, and d) needs, lobbying and external relations; ii) legislative and regulatory framework to institutionalise the municipal body for disaster prevention and management referred to above and to formalise procedures for declaring crises and emergencies at the municipal level.

4.4.4 HSA Perspective on Local Resilience Action Plan for Kaédi

- **Component 1** - Reviewing the proposed and existing axes of intervention, it is clear that prevention related efforts are focused on a top-down rather than a bottom up approach. Notwithstanding the importance of prevention and [protection efforts at the onset of resilience building by local govenrments, future effort should also be directed at empowering individuals, vulnerable local communities and sectors in Kaédi (e.g. the unemployed youth and various agriculture workers) to participate in their own resilience building efforts, building on the inclusive and participatory approach adopted in this study.
- **Component 2** – *Comprehensiveness*: The action plan recognised the interconnectedness of geographical areas for some hazards including drought, locust, upstream flood control, food and nutrition crises. Future effort should be directed at refining the action plan so it accounts for comprehensiveness in terms

of interaction of threats and hazards under the different categories (including climate change, food, economic, health, political, environmental, community and personal). For example the effect of climate change on agriculture, poverty and unemployment could be assessed, with a view to develop long term economic and livelihood diversification measures.

- **Component 3** - *Multi-sectoral*: The local resilience action plan accounts for threats under the environmental, health, food and personal category. Future effort should consider threats under the other categories, as well as to analyse the manner in which they interact (see Component 2 above).
- **Component 4** – *Contextualisation*: The physical and environmental factors contributing to vulnerability to environmental hazards have been identified and are addressed in the resilience local action plan, while future effort should be directed at understanding the impact of climate change on environmental related hazards. In addition, future effort should be directed at identifying and addressing the social, economic and institutional factors that contribute to vulnerability to environmental hazards and other hazard categories; before also identifying and addressing the factors that may increase the interaction between the different hazards within and between categories.
- **Component 5** – *Prevention*: The local resilience action plans proposed the development of a regulatory and legislative framework; however, it did not sufficiently highlight the need for developing and enforcing prevention and mitigation laws and legislations. There is also a need to highlight the importance of developing laws so that some of the prevention interventions suggested in the action plan become enshrined by law and are carried out on a regular basis as needed, including the rehabilitation of the sewage network and the dykes). Equally important is the need to develop strategies to address the root causes and drivers of disaster risk, violent extremism and civil strife all of which interact to increase vulnerability and reduce human security- including poverty, unemployment, inequality and socio-economic exclusion. Finally, the proposed development of a municipal body for disaster prevention and management, and associated units and activities, seems to be more focused on disaster management rather than disaster prevention and risk reduction.

- **Component 6** – *Partnerships and Collaboration*: The local resilience action plan recommends the development of a unit under the municipal body for disaster prevention and management to address needs, lobbying and external relations. The role of this unit may be extended to include capacity assessment so that external relations address both capacities and needs of the municipality, communities and individuals in order to provide a balanced top-down and bottom-up approach for resilience building, best capable of promoting the duel imperative of protection and empowerment.
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: a base line of risk has been developed, together with data on poverty and certain socio economic indicators. Future effort should be directed at augmenting this database with more data on i) risks and disaster losses, disaggregated along main socio economic parameters including poverty level, age and gender ii) interaction of disaster losses with disaster risk drivers, iii) interaction between threats, shocks, hazards and stresses under different sectors, iv) interaction between threats in different cities. Furthermore, it is also useful to direct future effort at developing targets for reducing such losses and threats, together with targets for reducing the disaster and violent extremism drivers, both of which are drivers for vulnerability that threaten sustainable development. This in turn requires changes in the proposed disaster prevention and management municipal body so that part of its work is related to risk assessment, disaster losses, setting targets for risk reduction, amongst other tasks highlighted above.

4.5 In-Depth Risk Assessment for Boghé

4.5.1 Risk Assessment Results for Boghé

The in-depth risk assessment for the city of Boghé [24] is summarised in this section. The main hazards identified in the assessment are: i) river flood, ii) flash flood, iii) bushfire, iv) epidemic, v) drought, vi) locust invasion, vii) food and/or nutritional crises, and viii) drowning in the river. It also identified some important socio economic characteristics of the population. The municipality had 42,759 inhabitants in 2013, with 46% youth, according to the figures of the General Census of Population and Housing conducted by the Office of National Statistics. The poverty rate is very high at 46%, well above the national average of 31%. Livelihoods exhibit a large

dependence on agriculture (rainfed agriculture - diéri, flood plain agriculture – Oualo, and irrigation-based agriculture), livestock, transportation and trade sectors. Boghé has commercial relations with Senegal and the construction of a wharf as part of the navigation component of OMVS is likely to increase these exchanges. Being the capital of a moughataa, Boghé only has departmental services of some ministries with reduced human and material means and therefore in times of emergencies needs to appeal to the wilaya 70 km away. It has a large health center and a hospital is under construction but is well behind schedule. Boghé has 1 high school, 1 college and dozens of public and private primary schools.

In this section, the in depth risk assessment is summarised from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific.

4.5.2 HSA Perspective on Risk Assessment Results for Boghé

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also identified the scenario where a failure / drop in agriculture production may lead to a food or nutritional crisis. The assessment did not sufficiently highlight the disproportionate effects of the above disasters on the poor; and other vulnerable groups including youth and women led households. Future assessments should account for the potential impact of disasters on trade and transportation routes, both important for livelihoods in Boghé. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in displacements, potential forced relocations, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) should also be the focus of future assessment efforts. This is particularly true for Boghé with a very high poverty rate of 46%.
- **Multi-Sectoral**. The assessment considered the environmental, personal (drowning) and health hazards listed above together with the impact on food security. However, economic, community and political shocks and stresses were not sufficiently addressed in the assessment. The assessment highlighted the connections between weak state presence (as represented in limited presence of rescue services and first responders, and corresponding equipment), weak

infrastructure (non-functional and in some areas non-existent sewerage network) and weak preparedness measures (including limited evacuation routes in some areas). It may be useful to extend this assessment in the future to identify the disproportionate exposure and vulnerability of various vulnerable groups to the above systemic risks.

- **Comprehensiveness**: Geographic comprehensiveness was touched upon by identifying that Boghé may be affected by epidemics originating in other areas. However, the impact of crises in neighbouring countries (e.g. Senegal) on trade and transportation sectors in Boghé was not sufficiently addressed. The domino-effect of comprehensiveness (in the sense that each threat feeds on the other) was identified between drought, locust invasion, food security, nutrition crises, poverty, lack of health infrastructure and epidemics. It was also identified between flood mitigation measures that may affect flood-plain irrigation zones, which in turn will affect the poorest in the city and the country (Oualo agriculture workers). It may be useful to extend this assessment to identify the disproportionate exposure and vulnerability of various vulnerable groups to these interconnected systemic risks. Furthermore, it may be useful to direct future efforts at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food and environmental). In particular, future effort should be directed at assessing the manner in which climate change may change rainfall and flooding patterns, which in turn will affect associated agriculture types considered the main sustenance for the most vulnerable groups in the city and the country.
- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. Future efforts should be directed at identifying and analysing, in a disaggregate manner, the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. For example, the case of flood control measures affecting flood plain agriculture, and agriculture workers was highlighted. Future efforts may also be directed at developing socio-economic (poverty, income, livelihood division) and disaster risk indicators (crop failure, disaster loses, etc) disaggregated at the district, subdistrict and livelihood level (i.e. per type of agriculture). Similarly, future effort should be directed at analysing the interconnected systemic risks of drought, food crises, weak health infrastructure

and epidemics that have disproportionate effects on the most vulnerable groups with the potential for exacerbating abject and multi dimensional poverty and socio-economic exclusion - all of which are drivers of disaster risks and violent extremism.

4.6 In-Depth Risk Assessment for Tintane

4.6.1 Risk Assessment Results for Tintane

The in-depth risk assessment for the city of Tintane [24] is summarised in this section. The main hazards identified in the assessment are: i) flash flood, ii) bushfire, iii) epidemic, iv) drought, v) locust invasion, vi) food and/or nutritional crises, and vii) sand encroachment. It also identified some important socio economic characteristics of the population. The municipality had 21,736 inhabitants in 2013, with 77% youth, according to the figures of the General Census of Population and Housing conducted by the Office of National Statistics. The poverty rate is 26% slightly lower than the national average of 31%. On the other hand, the literacy rate of 58.6% is lower than the average for the country. Livelihoods exhibit a large dependence on agriculture (rainfed agriculture - diéri, and oasis agriculture), livestock, transportation and trade sectors. The urbanisation of the city of Tintane is relatively recent (it was not until the mid-1960s that the first administrative post was opened). Being the chief place of a moughataa, Tintane does not have departmental services of some ministries with reduced human and material means and therefore in case of emergencies needs assistance from the wilaya capital. It has a health centre and a PMI. In terms of teaching of 1 high school, 1 college and several public and private primary schools.
In this section, the in depth risk assessment is summarised from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific.

4.6.2 HSA Perspective on Risk Assessment Results for Tintane

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also identified the scenario where a drought leading to a destruction of livestock or major transhumance may lead to a severe food or nutritional crisis, particularly as the contribution of oasis and

vegetable crops to livelihoods is marginal and other income-generating activities are rare and constitute only a small contribution to household resources. The assessment however did not sufficiently highlight the disproportionate effects of the above disasters on vulnerable groups including youth and women led households. Future efforts should be directed at assessing the potential impact of disasters on trade and transportation routes, both important for livelihoods in Tintane. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in displacements, potential forced relocations, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) was perhaps not sufficiently considered and should therefore form the focus of above assessments. For example, this is particularly true for vulnerable families that were unable to mobilise financial resources to move to build houses on provided land on the new sheltered site. The focus of future efforts should include this vulnerable group, which is unable to move due to poverty, and is expected to be disproportionately affected by future floods envisaged to exacerbate its poverty and socio-economic exclusion.

- **Multi-Sectoral**. The assessment considered the environmental, personal (drowning) and health hazards listed above together with the impact on food security. However, economic, community and political shocks and stresses were not sufficiently addressed in the assessment. The assessment highlighted the connections between weak state presence (as represented in limited presence of rescue services and first responders, and corresponding equipment), weak infrastructure (non-existent sewerage network in old city and weak health infrastructure) and weak preparedness measures (including limited emergency kits and the need to rely on aid 70km away). It may be useful to extend this assessment in the future to identify the disproportionate exposure and vulnerability of various vulnerable groups to the above systemic risks.
- **Comprehensiveness**: Geographic comprehensiveness was touched upon by identifying that Tintane may be affected by epidemics originating in other areas. However, the impact of crises in neighbouring countries (e.g. Mali) on trade and transportation sectors in Tintane was not sufficiently addressed and should form the focus of future assessments. The domino-effect of comprehensiveness (in the

sense that each threat feeds on the other) was identified between drought, food security, nutrition crises, poverty, lack of health infrastructure, weak institutional preparedness and epidemics. It may be useful to direct future efforts at identifying the disproportionate exposure and vulnerability of various vulnerable groups to these interconnected systemic risks. Furthermore, it may be useful to direct additional effort at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food and environmental). In particular, it will be useful to assess the manner in which climate change may change availability of pastures, which in turn will affect associated breeding patterns considered the main sustenance for the most vulnerable groups in the city and the country.

- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. Future efforts should be directed at identifying and analysing, in a disaggregate manner, the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. For example, the case of the selection of the new site to relocate the residents of Tintane deserves additional scrutiny, as the most vulnerable were unable to relocate leaving them in an even more vulnerable position to future flash floods. Furthermore the selection of the new site as a place highly vulnerable to sand encroachment that can threaten future homes and infrastructure especially under prevailing drought conditions and in the absence of any existing policies for the development of a green belt or other protection measures, needs further analysis. The disproportionate exposure and vulnerability of vulnerable groups in both the old and the new site to the various main hazards should be further analysed and disaggregated according to gender, income level, livelihood source and other important socio-economic considerations.

5 HSA Perspective on In-Depth Risk Assessment and Local Resilience Action Plans for Tunisian Cities

5.1 Introduction

This chapter presents and assesses the in-depth risk assessment and action plans for the Tunisian cities of Gabes and Mateur. Annex 2 provides a succinct summary of the results of the preliminary risk assessment for the six Tunisian cities of Gabes, Mateur, Jendouba, Bizerte, Kasserine and Siliana. The results of these assessments have already been analysed from an HSA perspective in an earlier report [43].

5.2 In-Depth Risk Assessment for Greater Gabes Municipalities

5.2.1 Risk Assessment Results for Greater Gabes Municipalities

The in-depth risk assessment for the city of Greater Gabes Municipalities [31] has also been presented in a report on resilience building in Tunisian cities [30]; and is discussed in this section from an HSA perspective while the more details on the assessment itself is provided in Annex 6. The main hazards identified in the assessment are: i) flash floods, ii) seismic hazards (earthquakes and tsunamis), iii) water erosion, iv) drought and silting, v) landslides, vi) oasis destruction, water logging and salinization, vii) chemical pollution, viii) onshore and offshore industrial accidents, ix) climate change and mean sea level rise, x) locust invasion. The risks arising from these hazards were prioritised as i) flooding, ii) water erosion, iii) chemical pollution from industries, iv) industrial accidents, v) accidents in port enclosures and at sea, and vi) destruction of the oasis. This latter risk, if it occurs, will give rise to two other subsidiary risks: water logging and the salinization of the waters of the oasis groundwater. Climate change and rising mean sea levels, landslides, particularly on the banks of wadi, desertification and silting, and locust invasion were also identified as risks that need to be addresed.

It also identified some important socio economic characteristics of the population. The study area covers an area of 48,429.8 hectares comprising the five municipalities of the Greater Gabes (Gabes, Ghannouche, Chénini-Nahal, Bouchamma, and Téboulbou). According to national statistics [31], for the whole of Greater Gabes, the population in 2004 was 159,826 inhabitants. This population increased to reach 180,972 in 2014, and was estimated at 189,623 in 2017; this increase can be translated into a growth rate of nearly 1.36%/year from 2004 to 2014 and 1.51% from

2014 to 2017. The population growth at these municipalities can be estimated at 210,576 inhabitants in 2024 and 244,623 inhabitants in 2034, with the population of the South Gabes delegation being dominant, representing 41.73%. The increase in population in greater Gabes is partly due to is pull factors as a place for work, while at the same time there is a decrease in the number of families living in Gabes city (old city) showing a preference to move to more modern areas with better services and infrastructure networks. Furthermore informal settlements, particularly after 2011 have significantly increased and encroached on the natural oasis.

The industrial boom of the 1980s due to the encouragement of the phosphate industry and the international marketing of fertilisers, modified the regional (sub-national) role of Gabes from a fishery and oasis agriculture city to a phosphate treatment and fertiliser city- also leading to a significant increase in pollution including oasis pollution and degradation of ecosystem. Despite the above developments, unemployment in most municipalities of Greater Gabes remains high well above the national average of 16%. The municipalities with better employment rates (8% in Gnoush) are the ones which have succeeded in protecting and empowering the agriculture sector and industry, construction and services. It should be noted that unemployment for those with high degrees is very high at 31%to36%, while for women with higher degrees it is even higher ranging from 43% to 56%. Women unemployment is twice the national average ranging between 29 to 24%.

5.2.2 HSA Perspective on Risk Assessment Results for Gabes

The risk assessment methodology and results are assessed from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific, v) prevention oriented.

- **People-Centred**: the extent to which threats affecting survival, livelihoods and dignity were considered. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also produced risk maps, spatially disaggregated along the different areas (sectors) of each of the above municipalities. It also identified the detrimental effect of climate change on agriculture production. Future assessment should direct efforts at capturing the disproportionate effects of the above disasters on vulnerable groups including the poor, the unemployed, youth and women led households. It is useful for future assessments to also assess the potential disproportionate impact of pollution and

environmental disasters, and associated health effects, on the poor and the most vulnerable communities including those living in informal settlements adjacent to polluting industries. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. chronic unemployment, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) was perhaps not sufficiently considered and should form the focus of future in-depth assessment efforts.

- **Multi-Sectoral**. The assessment considered the environmental hazards listed above. However, economic, health, personal, community and political shocks and stresses were not sufficiently addressed in the assessment. While this is common for cities embarking on their risk assessment efforts, future efforts should urgently assess the above shocks and stresses.
- **Comprehensiveness**: Geographic comprehensiveness was touched upon by identifying the different sectors in the different municipalities that may be affected by disasters originating from hazards sources in adjacent areas. However, the domino-effect of comprehensiveness (in the sense that each threat feeds on the other) between the different category of threats (e.g. climate change effects on poverty and unemployment which in turn may lead to an increase in informal settlements and environmental degradation, which in turn may disproportionately affect the health of vulnerable groups, and accentuate their vulnerability to other hazards including landslides, floods and pollution) requires further study. Furthermore, it may be useful to extend such an assessment to identify the disproportionate exposure and vulnerability of various vulnerable groups to the various interconnected systemic risks. Furthermore, it may be useful to direct future effort at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food, personal, health, community and environmental). In particular, it will be useful to direct future efforts at assessing the manner in which climate change may affect poverty, unemployment, environment, health and political threats and hazards and the interaction between them.
- **Context Specific**: The hazard and exposure specific context of the municipality was accounted for. It may be useful to direct future efforts to identify and analyse,

in a disaggregate manner (both socio-economic and spatial disaggregation), the full set of economic, social and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental and physical factors. For example, the case of the increase in informal settlements, coupled with a shift from a fishery and agriculture dependency to a more mining-related (phosphate and fertiliser) livelihoods was identified together with the associated increase in rural urban migration and environmental degradation. It would be useful to direct future efforts at understanding the social, economic and institutional factors that led to such a scenario, while aiming to capture any disproportionate effect of exposure and vulnerability arising from such a scenario on the most vulnerable groups in the community.

5.2.3 Local Resilience Action Plan for Gabes

The local resilience action plan for Gabes identifies seven main axes for intervention, namely [30] and [32]: (i) improve the knowledge of hazards, exposure and risks in each spatial sector of the five municipalities comprising Greater Gabes; (ii) reduce the vulnerabilities of the different areas in the five municipalities; (iii) reduce technical and administrative gaps and vulnerabilities (iv) develop a master urbanisation plan and enforce its implementation; (v) improve the resilience of communities and economic sectors and reduce recovery times, (vi) capacity building and education on the importance of resilience building, and (vii) disclosure of verified and comprehensive information on resilience building efforts.

5.2.4 HSA Perspective on Local Resilience Action Plan for Gabes

- **Component 1** - Reviewing the proposed and existing axes of intervention, it is clear that prevention related efforts are biased towards a top-down rather than a bottom up approach, which is common in cities just embarking on their resilience building efforts. Notwithstanding the importance of the capacity building and workshops under axis 6 above, future effort should be directed at empowering individuals, vulnerable local communities and sectors in Gabes (e.g. the unemployed youth, graduates and women, and those living in informal settlements), building on the inclusive and participatory approaches pioneered in this project.
- **Component 2** – *Comprehensiveness*: The action plan recognised the interconnectedness of geographical areas for some hazards. Future effort may be

directed at refining the action plan so it accounts for comprehensiveness in terms of interaction of threats and hazards under the different categories (including climate change, food and nutrition, economic, health, political, environmental, community and personal). For example the effect of climate change on agriculture, poverty and unemployment, health, the environment and pollution could be assessed, with a view to develop long term climate-change-resilient economic and livelihood diversification measures.

- **Component 3** - *Multi-sectoral*: The local resilience action plan accounts for threats under the environmental category, which is common for cities just embarking on their resilience building efforts. Future effort could be directed at accounting for threats under the other categories, as well as to analyse the manner in which they interact (see Component 2 above).
- **Component 4** – *Contextualisation*: The physical and environmental factors contributing to vulnerability to environmental hazards have been identified and are addressed in the resilience local action plan, even though future effort is required to be directed at understanding the impact of climate change on environmental related hazards. In addition, future effort is required to identify and address the social, economic and institutional factors that contribute to vulnerability to environmental hazards and other hazard categories; before also identifying and addressing the factors that may increase the interaction between the different hazards within and between categories.
- **Component 5** – *Prevention*: The local resilience action plans proposed the development of preventative measures against the hazards that were prioritised in the disaster risk assessment. Future efforts should be directed at understanding and addressing the root causes for vulnerability and disaster risk drivers which should also be mitigated as part of the efforts to reduce existing risk and prevent new risk from accumulation.
- **Component 6** – *Partnerships and Collaboration*: The local resilience action plan highlighted the importance of working with the various relevant sectors and with the main economic development and investment stakeholders. Future efforts should ensure further engagement with vulnerable group stakeholders.
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: a base line of risk has been developed, together with data on poverty and certain socio economic

indicators. Furthermore, it is recommended to develop a GIS system to disaggregate hazards, exposure and vulnerabilities within the five municipalities of greater Gabes. Notwithstanding the importance of the above it is useful to durect future efforts at augmenting this database with more data on i) risks and disaster losses, disaggregated along main socio economic parameters including poverty level, age and gender ii) interaction of disaster losses with disaster risk drivers, iii) interaction between threats, shocks, hazards and stresses under different sectors, iv) interaction between threats in different cities. Furthermore, it is also useful to direct future efforts at developing targets for reducing such losses and threats, together with targets for reducing the disaster and violent extremism drivers, both of which are drivers for vulnerability that threaten sustainable development. This in turn requires changes in the proposed disaster prevention and management municipal body so that part of its work is related to risk assessment, disaster losses, setting targets for risk reduction, amongst other tasks highlighted above.

5.3 In-Depth Risk Assessment for Mateur

5.3.1 Risk Assessment Results for Mateur

The in-depth risk assessment for the city of Mateur [30] and [33] is summarised in this section. The main hazards identified in the assessment are: i) flash flood, ii) seismic, iii) water and soil erosion, iv) landslides, v) forest fires, vi) epidemics, and vii) climate change and sea level rise. It also identified some important socio economic characteristics of the population. Mateur occupies an area of 56561 km^2. In 2015 and 2016, the municipal population was estimated at 34,647 and 32,817 respectively; which includes the inhabitants of Mateur city and its suburbs, South Mateur, and the cities Ennasr and Essadaka [33]. The current population is 46,975 inhabitants, and the total number of housing is 25,313. The annual growth rate is negative, of the order of (-0.124%) [33].

Mateur's main source of employment and economic activities are agriculture, industry and services, followed closely by construction and processing. General equipment and infrastructure are insufficient for this large industrial and agricultural pole, as identified and analyzed in the report of the first phase of the study; which also note that cultural and recreational spaces are not available for children and young people who feel neglected. Unemployment severely affects people of working age, especially women [33].

5.3.2 HSA Perspective on Risk Assessment Results for Mateur

The risk assessment methodology and results are assessed from an HSA perspective, using the main HSA pillars, namely i) people-centred, ii) multi-sectoral, iii) comprehensive, iv) context-specific, v) prevention oriented.

- **People-Centred**: threats affecting survival, livelihoods and dignity should form the focus of future efforts, as the current risk assessment focused on the vulnerability of different areas within the municipality. The disaster risk assessment noted the potential impact of the identified hazards on human lives. It also identified the scenario where water and soil erosion may lead to a destruction of agriculture crops (an important source of livelihood in Mateur); however, future effort is required to further examine the link with the effect of crop losses on poverty, inequality, unemployment and loss of livelihoods in order to also identify any disproportionate effects of the above disasters on vulnerable groups including the poor, youth and women led households. Finally, the long term effects of hazards on human dignity and the interaction of hazards losses and impacts with disaster risk drivers and violent extremism risk drivers (e.g. rise in displacements, chronic poverty, multi-dimensional poverty, socio-economic exclusion, inequality) should form the focus of future risk assessment efforts.
- **Multi-Sectoral**. The assessment considered the environmental, and health hazards listed above, while future efforts should account for their impact on food security and any associated nutritional crises. Economic, community, individual and political shocks and stresses should also be addressed in future risk assessments. It may be useful to extend the scope of future assessments to include the above sectors of threats and to identify the disproportionate exposure and vulnerability of various vulnerable groups to the above systemic risks.
- **Comprehensiveness**: Geographic comprehensiveness was not considered in the scope of the assessment, particularly not noting how events in other municipalities or at the national level may exacerbate disaster risk drivers as well as hazard in Mateur; which is common for cities and municipalities just embarking on their risk assessment efforts. The domino-effect of comprehensiveness (in the sense that each threat feeds on the other) between the various environmental (natural) hazards (for example how increased erosion and loss of forests due to forest fires may lead to increased risk of landslides in the wake of earthquakes) should be included in the scope of future assessments that should also the disproportionate

exposure and vulnerability of various vulnerable groups to these interconnected systemic risks. Furthermore, it may be useful to direct future effort at analysing other interactions and linkages between different categories of threats (i.e. political, economic, food, health, personal, community and environmental). Finally, it will be useful to assess the manner in which climate change may affect and interact with all these hazards through assessing its impact on poverty, inequality, unemployment (and therefore socio-economic exclusion) as well as its impact on food security, health, environment and eco systems, health, and security.

- **Context Specific**: The hazard and exposure specific to different geographical (spatial) areas of the municipality was accounted for. Future effort is required to identify and analyse, in a disaggregate manner, the full set of economic, social, physical and institution factors that contribute to vulnerability (or resilience) in addition to the more traditional environmental factors. For example, the case of flood or earthquake risk calculation should account for the vulnerability of populations, livelihoods and infrastructure systems. Indeed it is only in this manner it becomes possible to capture the disproportionate concentration of exposure, vulnerability, and risk on vulnerable communities.

5.3.3 Local Resilience Action Plan for Mateur

The local resilience action plan for Mateur identifies seven main axes for intervention, namely [30] and [34]: (i) improve the knowledge of hazards, exposure and risks in Mateur; (ii) reduce the vulnerabilities of the different areas; (iii) reduce technical and administrative gaps and vulnerabilities (iv) develop a master urbanisation plan and enforce its implementation; (v) improve the resilience of communities and economic sectors and reduce recovery times, (vi) capacity building and education on the importance of resilience building, and (vii) disclosure of verified and comprehensive information on resilience building efforts.

5.3.4 HSA Perspective on Local Resilience Action Plan for Mateur

- **Component 1** - Reviewing the proposed and existing axes of intervention, it is clear that prevention related efforts are focused on a top-down rather than a bottom up approach, which is common for cities and municipalities just embarking on their risk assessment efforts. Notwithstanding the importance of the latter, future effort should also be directed at empowering individuals, vulnerable local communities

and sectors in Mateur (e.g. the unemployed, women led households, youth, informal settlement dwellers, the poor, and agriculture workers).

- **Component 2** – *Comprehensiveness*: Future effort should be directed at refining the action plan so it accounts for comprehensiveness in terms of interaction of threats and hazards under the different categories (including climate change, food security and nutrition crises, economic, health, political, environmental, community and personal). For example the effect of climate change on agriculture and livelihoods, the environment, health, poverty, inequality and unemployment could be assessed, with a view to develop long term economic and livelihood diversification measures and climate change mitigation measures. This would first necessitate addressing all categories (sectors) of threats as discussed in Component 3 below.
- **Component 3** - *Multi-sectoral*: The local resilience action plan accounts for threats under the environmental and health categories, which usually form a priority for cities and municipalities just embarking on their resilience building efforts. Future efforts should be directed at accounting for threats under the other categories, as well as to analyse the manner in which they interact (see Component 2 above).
- **Component 4** – *Contextualisation*: The environmental factors contributing to vulnerability to environmental hazards have been identified and quantified in risk maps, and further addressed in the resilience local action plan. Future efforts should be directed at understanding the impact of climate change on environmental related hazards, and at identifying and addressing the social, economic, physical and institutional factors that contribute to vulnerability to environmental hazards and other hazard categories; before also identifying and addressing the factors that may increase the interaction between the different hazards within and between categories.
- **Component 5** – *Prevention*: The local resilience action plans proposed the development and enforcement of several prevention and mitigation laws and legislations; informed by the results of the disaster risk assessment. Future efforts may be directed at institutionalising risk assessments to ensure they are carried out on a regular basis with the aim of informing the science policy interface, and at instutitionalising efforts for addressing the root causes and drivers of disaster risk, violent extremism and civil strife all of which interact to increase vulnerability and

reduce human security- including poverty, unemployment, inequality and socio-economic exclusion.

- **Component 6** – *Partnerships and Collaboration*: The local resilience action plan highlighted the importance of working with the various relevant sectors and with the main economic development and investment stakeholders. Future efforts should be directed at ensuring engagement with vulnerable group stakeholders.
- **Component 7** - *Benchmarking, Evaluation and Impact Assessment*: a base line of risk has been developed, together with data on poverty and certain socio economic indicators. Furthermore, it is recommended to develop a GIS system to disaggregate hazards, exposure and vulnerabilities within Mateur. Notwithstanding the importance of the above it is useful to direct future efforts at augmenting this database with more data on i) risks and disaster losses, disaggregated along main socio economic parameters including poverty level, age and gender ii) interaction of disaster losses with disaster risk drivers, iii) interaction between threats, shocks, hazards and stresses under different sectors, iv) interaction between threats in different cities. Furthermore, it is also useful to direct future efforts at developing targets for reducing such losses and threats, together with targets for reducing the disaster and violent extremism drivers, both of which are drivers for vulnerability that threaten sustainable development. This in turn requires changes in the proposed disaster prevention and management municipal body so that part of its work is related to risk assessment, disaster losses, setting targets for risk reduction, amongst other tasks highlighted above.

ANNEX 1 – GLOSSARY

Extensive Risk: The widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts. Extensive risk takes a special importance in the development process because it is usually a characteristic of rural areas and urban margins where communities are exposed to, and vulnerable to, recurring highly localised floods, landslides, storms or drought. Extensive risk is often associated with poverty, weak risk governance, unchecked / rapid urbanisation and environment degradation.

Intensive Risk: The risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss. Intensive risk is mainly a characteristic of large cities or densely populated areas that are not only exposed to intense hazards such as strong earthquakes, active volcanoes, heavy floods, tsunamis or major storms but also have high levels of vulnerability to these hazards.

The thresholds that separate extensive and intensive risk are shown in Table 2. Under these criteria, any hazardous event that includes 30 or more people killed ***or*** 600 or more houses destroyed is considered corresponding to an intensive risk.

Table 2 *Extensive versus Intensive Disaster Loss Threshold*

Threshold Type	Threshold Limit
Mortality threshold	30 people killed
Houses Destroyed Threshold	600 houses destroyed

Building code: A set of ordinances or regulations and associated standards intended to control aspects of the design, construction, materials, alteration and occupancy of structures that are necessary to ensure human safety and welfare, including resistance to collapse and damage.

Capacity Development: The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions.

Corrective Disaster Risk Management: Management activities that address and seek to correct or reduce disaster risks which are already present.

Disaster Risk Management: The systematic process of using administrative directives, organizations and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster Risk Reduction: The concept and practice of reducing disaster risk through systematic efforts to analyze and manage the casual factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Exposure: People, property, systems, or other elements present in hazard zones that are thereby subject to potential losses.

Prospective Disaster Risk Management: Management activities that address and seek to avoid the development of new or increased disaster risks.

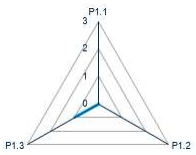
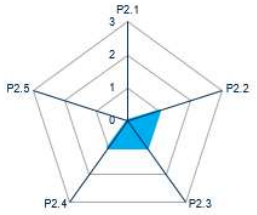
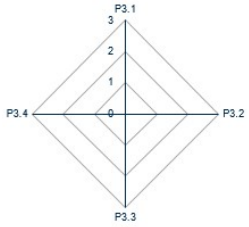
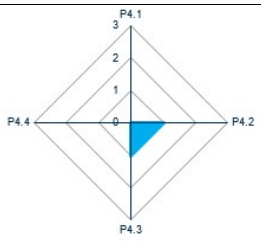
Recovery: The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster affected communities, including efforts to reduce disaster risk factors.

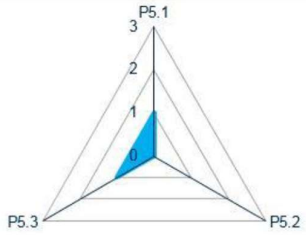
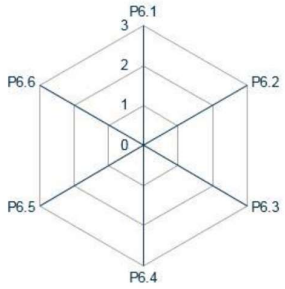
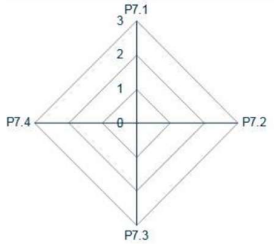
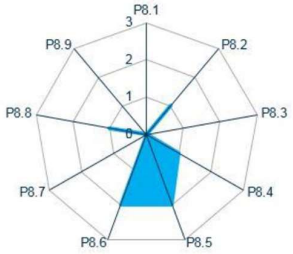
Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

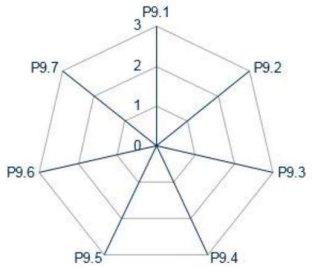
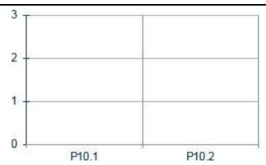
Risk Transfer: The process of formally or informally shifting the financial consequences of particular risks from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

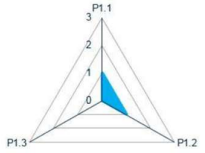
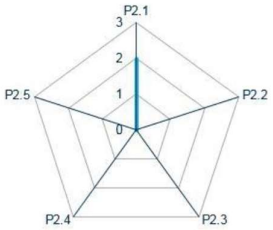
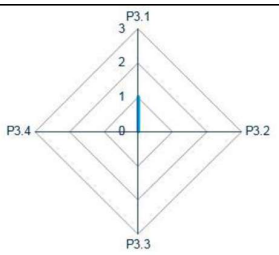
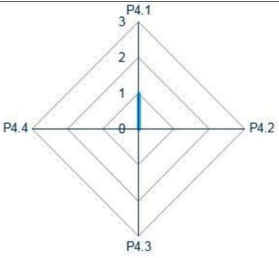
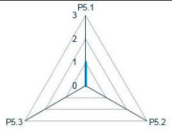
Vulnerability: The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

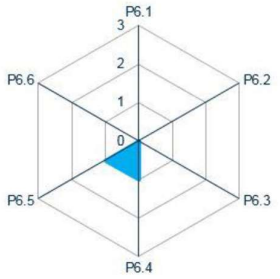
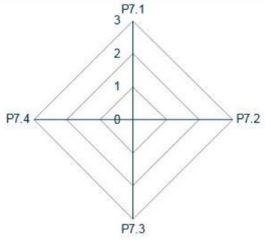
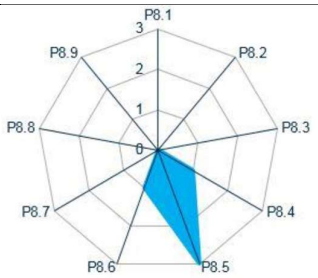
ANNEX 2 – Preliminary Scorecard Assessment Results for the Five Mauritanian Cities

Preliminary Scorecard Assessment for the City of **Boghe**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

Preliminary Scorecard Assessment for the City of **Boghe**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors	

Preliminary Scorecard Assessment for the City of **Boghe**		
Essential No	Questions / Indicators	Results
	remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Kaedi**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city?	

Preliminary Scorecard Assessment for the City of **Kaedi**		
Essential No	Questions / Indicators	Results
	• P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)?	

Preliminary Scorecard Assessment for the City of **Kaedi**		
Essential No	Questions / Indicators	Results
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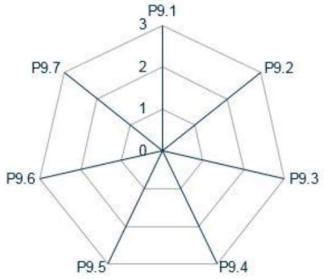
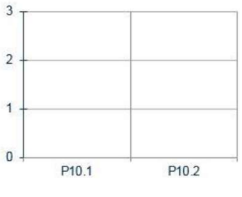
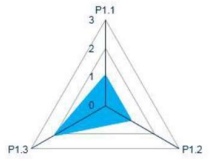
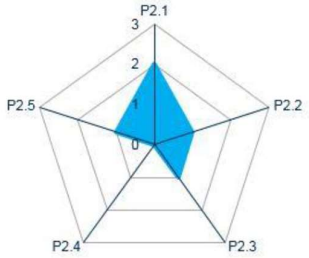
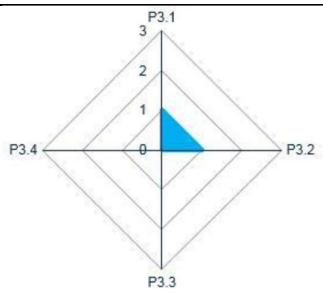
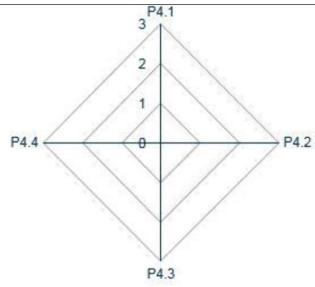
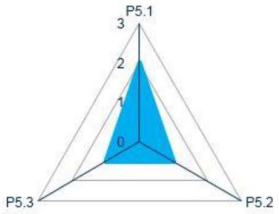
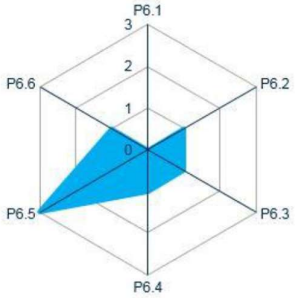
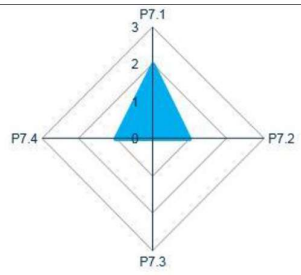
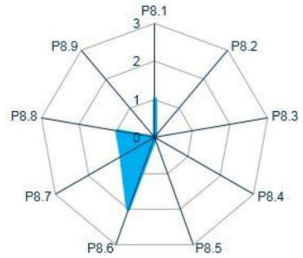
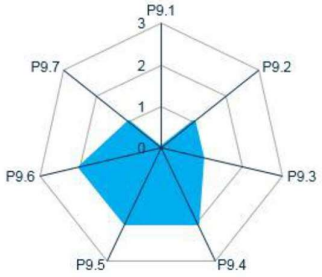
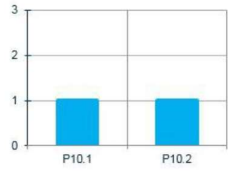
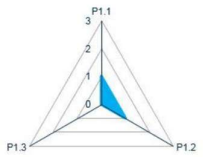
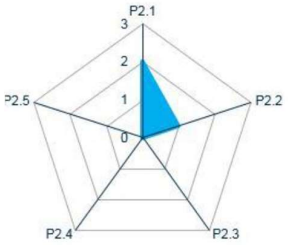
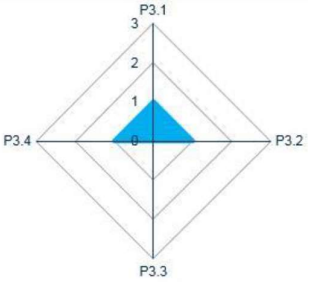
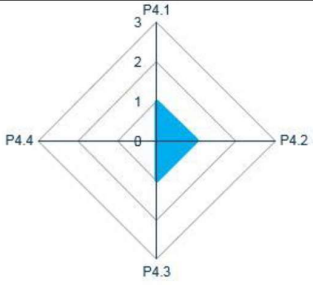
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Nouakchott**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

Preliminary Scorecard Assessment for the City of **Nouakchott**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event	

Preliminary Scorecard Assessment for the City of **Nouakchott**		
Essential No	Questions / Indicators	Results
	of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Rosso**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

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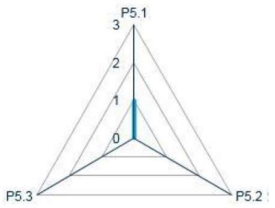
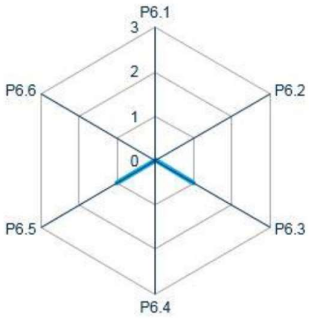
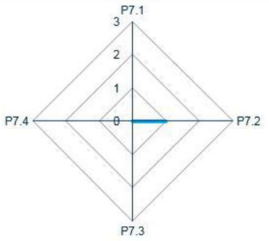
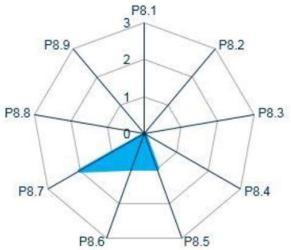
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event	

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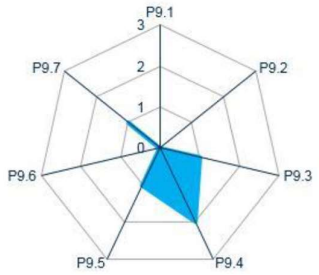
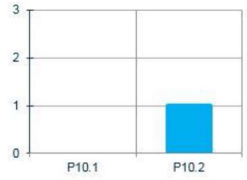
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Tintane**		
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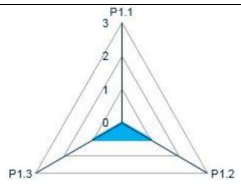
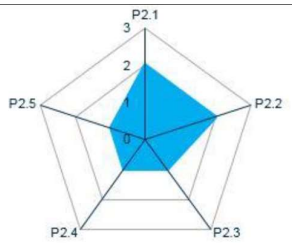
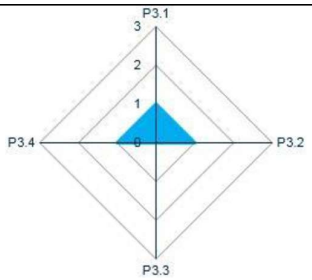
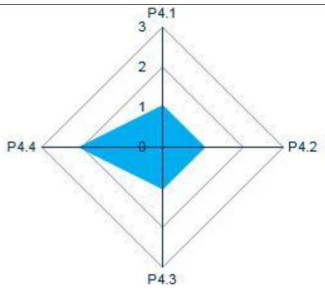
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

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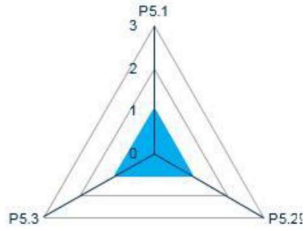
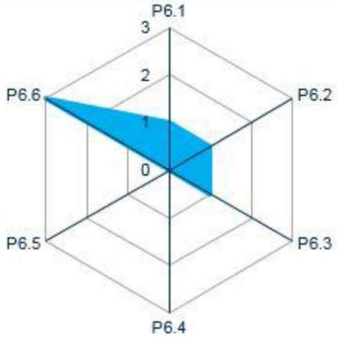
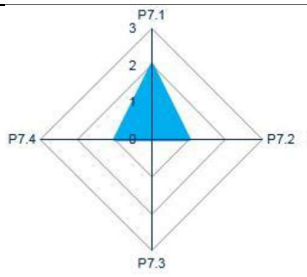
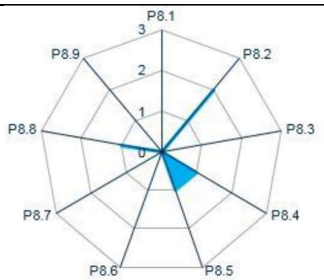
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the	

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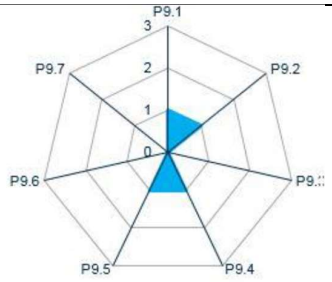
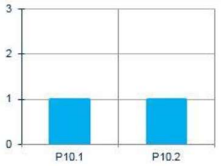
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

ANNEX 3 – In-depth Risk Assessment for Five Mauritanian Cities

A3.1 Tavragh Zeina

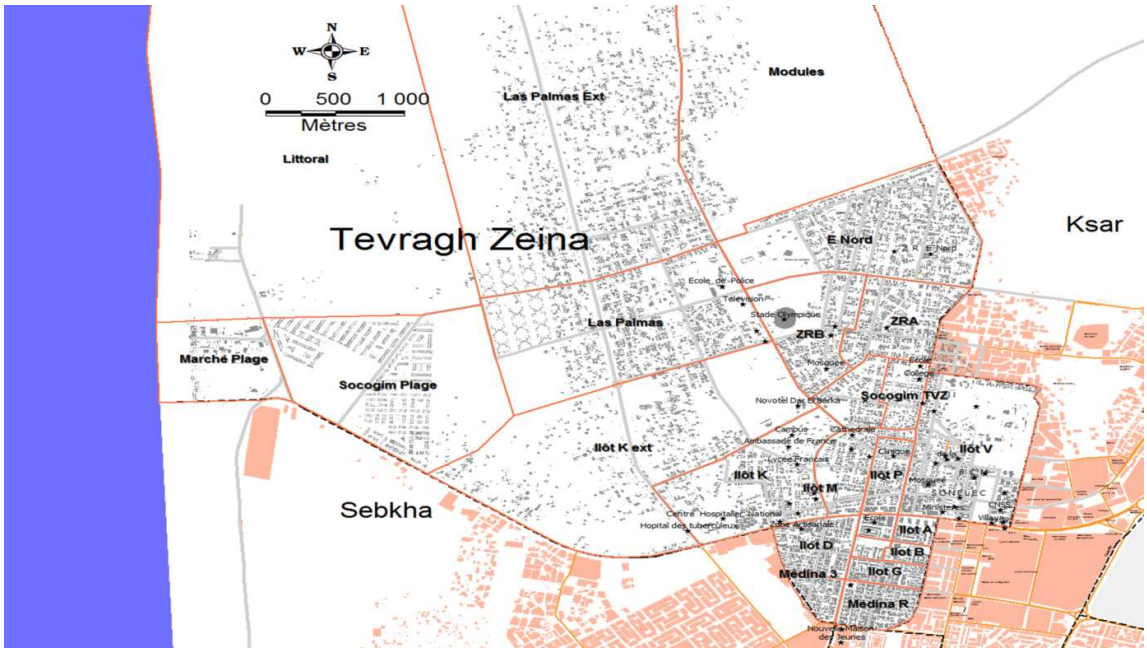
A3.1.1. Brief introduction about the Municipality of Tavragh Zeina

The municipality of Tavragh Zeina is one of three municipalities of the wilaya of Nouakchott West. It is located on the Atlantic Ocean with an area of 83 square km and a sea front of 40 km and the following geographical coordinates: Longitude 15° 59' 57.721" W; Latitude 18° 6' 37.238" N. It is built on a sebkha where the soil is characterized by salinity and impermeability, although some parts of the municipality are covered by layers of sand (and even visible dikes), this is the sand that advances and remains superficial even when a cord is formed; the nature of the ground is being everywhere a sebkha.

Like all the city of Nouakchott, the urbanization of the Tavragh Zeina municipality is relatively recent (early 1960s) but has developed rapidly over the last two decades; despite, its evolution remains slow compared to that of Nouakchott in general.

Tevragh Zeina had a population of 46,336 inhabitants in 2013 according to figures from the ONS General Census of Population and Housing. A relatively young population, the 25 years represent more than 58% of its population and the median age is 20 years with a relatively low poverty rate, 3.6% of the population of the municipality live below the poverty line. The dominant activities of the population are jobs in public or private administrations and enterprises. T. Zeina is the place of residence and work of almost all the professional workers in the country (lawyers, experts, consulting firms, doctors, notaries, etc.).

The municipality houses on its territory almost all the head offices of the central administrations and public authorities (executive and legislative), diplomatic missions and international organizations. It is also home to the headquarters of almost all banks, insurance companies, large service and public utilities companies and the country's largest markets. T. Zeina is also the Latin quarter of the country with the headquarters of the national university, the private universities and almost all the high schools. It has 162 health facilities, 63 primary and secondary schools whether public or private and 68 Mahdras.



Map of the Tavragh Zeina municipality

A3.1.2 Disaster Risk Assessment

The experience of the recent years, the opinion of the various experts and stakeholders, as well as the information gathered during the project's missions and during the Tevragh Zeina's communal workshop held at the Nouakchott Hotel on 25/26 July 2018, revealed the following disaster risks with the frequencies, severities and manifestations that differ from a risk to another. The following table provides a presentation of these disasters before the analysis of each disaster in subsequent developments.

Risks	Cause	Occurrence	Demonstration	Severity
Flooding	Rainwater	Recurring	Sudden. Prediction made on a short time.	May cause severe damage if rain exceeds usual heights
	An overflow of ocean waters	Likely	Slow and predictable and can intervene suddenly	May cause serious damage but prevention measures exist
	A rise in the water table	Possible	Creeping	Medium
Fire	Accidents on household uses of energy	Recurring	Sudden	May cause significant loss of life and property if it occurs in areas of high concentration
	explosion in gas or fuel deposits	Recurring	Sudden	May cause significant loss of life and property if it occurs in areas of high concentration
Epidemic	Proliferation of mosquitoes and other vectors	Recurring	Creeping	Generally medium severity
	Frequent exchanges with countries in the sub-region where epidemics, sometimes serious, occur from time to time	Likely	Sudden	May be of extreme gravity and turn to disaster

Risks	Cause	Occurrence	Demonstration	Severity
Winds / heavy sands storms	Long-term and continuous sand storms	Recurring	Creeping	Medium severity
	Severe and punctual storm	Possible	Sudden	May be of extreme gravity and turn to disaster
Industrial risks	Water or air pollution	Likely	Creeping	Medium severity

Flood risk

As shown in the previous table, flooding in T. Zeina may result from rainwater runoff, an overflow of ocean water through the cord, or an upwelling of the groundwater.

Rainwater runoff

Although rainfall is rare in Nouakchott, with annual totals averaging very low (84 mm per year) over the period 1981-2010, Nouakchott city was subject to several floods resulting from rainwater. In fact, due to the soil nature (salinities and impermeability) and the absence of a sewerage system, a rainfall of more than 40 mm is sufficient to cause damage and create a crisis resulting in traffic jams, cessation of economic activities and displacement of families from certain neighborhoods. This is what happened in September 2013 with a rainfall of 39mm in less than 24 hours. This crisis can turn into disaster as soon as the rainfall reaches 80 to 100 mm. It may cause massive displacement of populations of neighborhoods built in sebkhas, destruction of dozens of dwellings that would remain several days wading in the water and even loss of life in addition to a huge mess for the economic activities and sources of income of the inhabitants. This situation is - it is noteworthy – exceptional in Nouakchott (especially in T. Zeina), a city known for low rainfall; but with the climate change that the world is experiencing, which is translated by drought certainly but also by violent and unexpected rains and thunderstorms, we have to prepare for all the hypotheses.

Overflow of ocean waters

The coast of the Atlantic Ocean at Nouakchott is sandy. It is a low-rise dike cord that serves as the parade between the waters of the ocean and the sebkha that stood between the city and the cordon. This sebkha is practically on the same topographical level as the sea, and the constructions have been spread there with residential neighborhoods, markets and even buildings. At the same time, the dike cordon has become very fragile due to the removal of sand as a building material and the installation of economic and touristic activities on the beach without specific safety features. As a result, the municipality has identified 11 critical points on the dike cordon

where tides higher than normal could overflow the cordon and cause the flooding of part of the municipality.

Unplanned construction on the dike cord

Upgrading of the water table

At the level of Nouakchott city and thus at T. Zeina, the salt water table is too close to the surface and has a tendency to rise on the level of the ground. It is common to see ponds come out of the ground and drag in some neighborhoods of the municipality. Furthermore, it is enough to see that when some buildings are built, the water rises from the water table as soon as we dig and sometimes we have to pump to set up the foundation. To this problem we should add another one, which is the obsolescence of the water distribution system and its inability to absorb the new quantities brought by the Aftout Essahli project. As a result, the inhabitants of certain districts of Nouakchott city (SOCOGIM, BAGDAD, etc.) were forced to move. T. Zeina's municipality is not immune to this risk.

The fire risk

In a municipality like T. Zeina, with hundreds of gas depots, oil distribution stations and an electricity transmission network that is not always up to standard, the fire risk still exists. In addition, the carelessness of users (households and enterprises) who do not always comply with safety measures. However, the most serious case that can cause a real disaster happens when a fire occurs in the complex of the markets of the capital (Capital Market, Lehmoume Market, Charae Errizkh, etc.) in an hour of door crowding.

The area of this complex of markets is inaccessible for most of the day to any kind of vehicle, especially to fire-fighting vehicles, as the population density per square meter is very high. These markets are full of shops and stalls of food and articles of all kinds generally very flammable and have a market value that reaches tens billions of ouguiyas. A large-scale untreated fire can result in loss of life and the destruction of huge fortunes.

The epidemic risk

Floods of dirty water inside the dwellings Module D between NDB road and beach

Nouakchott city (including Tavragh Zeina) experienced several outbreaks of fevers of all kinds where cases of haemorrhagic fever were noted. Doctors attribute these fevers to the proliferation of mosquitoes as vectors. In fact, puddles of dirty water stagnate in several parts of the municipality and constitute a refuge and a breeding ground for these mosquitoes. These fevers have remained, thank God, so far under control; although, at certain times, all hospitals in the city have been overwhelmed and had to intern patients on the ground. But T. Zeina (and Nouakchott in general) is not immune to a more serious outbreak such as the Ebola that had witnessed several West African countries, including Guinea, which is very close to us and with which we maintain innumerable population movements.

Risks of sand storms and high winds

Sand dikes line side 6 T. Zeina

As Nouakchott's position is located in a corridor of winds from the great Sahara, the city is not immune to a sand storm that - if extended for few days - can cause damage

to people, their property or their livelihood. During the 1980s, the sustainable installation of drought and the subsequent advance of sand dikes showed the fragility of the Nouakchott city. In order to limit its effect, the government with the support of several partners (FAO, Dutch, Belgians, others) began the implementation of a green belt protecting Nouakchott, which played an essential role in the fixation of the dikes that were moving threatening T. Zeina and partially breaking the sandy winds. By the extension of the city, the site of this first belt was allocated to individuals, and it is currently subdivided. The protection area has moved to the North, and there are some efforts that are currently deployed in the National Agency of the Green Wall. However, some blocks of this new belt have, in turn, been allocated (university dependencies, professors, magistrates, dual central, etc.).

Industrial risk

The municipality of T. Zeina contains a set of industrial activities (CIPROCHIME, SOBOMA, etc.) and is close to the industrial zone of El Mina and the Autonomous Port of Nouakchott with its various industrial units (cement factories, soap factories, large mills, etc.) and, above all, the deposits in the national security stocks of butane gas and other petroleum products. This situation exposes the municipality of T. Zeina to several types of industrial risks including industrial accidents and water and air pollution. With weak security measures at the collective and individual levels and the absence of the culture of underwriting an insurance policy among individuals and even economic operators, this type of risk can result in loss of life and property.

A3.1.3 Opportunities and Challenges

Due to its status as (being effectively) the country's political capital, the quality of its infrastructure and the economic and educational level of the majority of its inhabitants, T. Zeina has respectful opportunities but also faces challenges.

Opportunities

The municipality of T. Zeina has some opportunities, including a relatively high level of economic and educational attainment of the population, equipment and facilities above the national average; substantial human and material resources and an existing intervention system that is already well developed but can (and should) be improved.

a. Living standards and awareness

With a literacy rate of 89% compared to 61% at the national level, Tavragh Zeina is the municipality where the population is the most educated in the country. The prevalence of poverty is very low; hence, it is the prosperous municipality in the country with a percentage of the population living below the poverty line of 3.6% while this

percentage is 16.6% at Nouakchott level and 32% at national level. In terms of habitat type and water and electricity services, the municipality is also the best in the country. The municipality became aware of the challenge of disasters and appointed an advisor in charge of disaster prevention and management and focal point of the International Resilient Cities Campaign. It has also included in its budget a line to deal with the various hazards.

b. Equipment and facilities

The municipality has a good urban road network covering all neighbourhoods with public lighting that covers a very large part of this network. Furthermore, it has important public and private storage facilities which are constantly well supplied, being the storage place for goods, products and commodities that supply the whole country. Socio-educational facilities (stadiums, schools, hospitals, etc.) exist in dozens and can be used as reception facilities as needed. A sewerage system is in the process of being constructed, its completion and commissioning are eagerly awaited.

c. Human resources and intervention equipment

The municipality benefits from its proximity of the largest Civil Protection emergency centre in the country with the appropriate means of intervention (tankers, multifunctional fire trucks, ambulances, etc.) with organized and well-trained relief and rescue teams. It houses the headquarters of the National Office of Sanitation (NOS), which has a fleet of 30 tanks constituting the Rapid Response Brigade and more than 100 pumps of different flows. It has important health facilities (162 public and private health facilities). In case of an even more serious disaster, the bases of the most important units of the armed and security forces of the country are less than ten kilometres from T. Zeina and can intervene with greater human and material means.

d. Disaster prevention and management system

It will be examined through its two components: the information and early warning system and the crisis or disaster response system.

- Early Warning and Information System: The necessary data and information on the various risks are produced, sometimes very well produced and in real time, by different specialized national structures: (i) the National Meteorological Office; (ii) the COVACC of the CPB; (iii) MIDEC RAC networks; (iv) the SNIS of the Ministry of Health; (v) the MIORF and ONUSPA of the Ministry of Fisheries and Maritime Economy, the OSA of the CSA, etc. All these structures produce regular and useful

information; but they work on the national level, besides they are not intended to deal specifically with the municipality of T. Zeina. Therefore, it is useful for the municipality to be provided with a structure whose mission will be to collect and process in real time the information produced by these various structures in order to give the alert, if necessary.

- The crisis or disaster response system: It is governed by the following texts:
  - Law 71-059 of 25 February 1971
  - Decree 80-087 of 02 May 1980
  - Decree 2002-017 of 31 March 2002
  - By-Law 429
  - By-law 430
  - By-law 431
  - Circular 04 of 21 August 1980

These texts define the modalities of emergency relief, set the gravity thresholds of emergencies, specify the tasks of certain national structures dedicated to crisis or disaster management, but remain very general and do not deal with the municipal level. In addition, the activation of an intervention in case of a crisis or disaster requires a decision at a very high level of the state. During the recent floods that T. Zeina experienced, a device led by a steering committee and comprising 3 commissions (Relief and Rescue, Needs Assessment and Logistics and External Aid) was put in place and worked properly. This approach constitutes a step in the right direction, but needs to be better structured and formalized by statutory instruments.

Challenges

The municipality of Tévragh faces challenges or problems that need to be addressed in order to improve the local resilience. These include: (i) the weakness of the sewerage system; (ii) the destruction of the dike; (iii) the subdivision of the different green belts; (iv) the access to the market in case of disasters; (v) puddles of dirty water and garbage.

- The current sewerage system of Nouakchott city covers only a small part of the municipality; and where it exists, it is not operational.
- The municipality has identified 11 weak points (or breaches) on the dike, which constitute a threat of marine flooding
- The green belt of the 80's is currently allocated and subdivided, and even several blocks of the last belt have been allocated (university dependencies, professors,

magistrates, dual central, etc.), which means that the extension towards the northern part of the city prevents any sustainable installation of a green belt for protection.

- The communication routes around the main markets of the city are narrow and constantly clogged at working hours, making it difficult, if not impossible, for rescue teams to respond to a fire or any other disaster.
- Some areas of the municipality are constantly covered with puddles of dirty and salty water, and sometimes serve as garbage depots, which promote the spreading out of mosquitoes of all kinds and microbes.

A3.2 Rosso

A3.2.1 Brief presentation of the municipality of Rosso

The municipality (city) of Rosso is located in the South-West of Mauritania at 200 kilometers of the capital Nouakchott with the GPS data: Longitude: 15 ° 48' 18" W and Latitude: 16 ° 30' 46" N. It runs along the Senegal River on its right bankand is built (the old city in any case) in a clayey trough between the main river bed and its M'Bleil arm. Being the capital of Trarza, Rosso played a very important role since the colonial era due to several factors: (i) it was the wharf through which all the imported goods pass and those passing-by the port of Dakar and (ii) it was also the obligatory passage for all the tribal chiefs and other local officials and tradesmen going to Saint Louis (N'Dar), then capital of Mauritania. With the independence and the founding of Nouakchott, Rosso has remained the most important economic pole and the obligatory path point for anyone who wants to go from the capital to all directions (Africa, Ax Nema, Axis Tidjikj, Axis Sélibabi, etc.).).It was only at the end of the 70's with the construction of the wharf (then the harbor) and the construction of the road of hope that Rosso went into lethargy. This situation fortunately should not last because in the middle of the 80s, the whole area of the lower valley of the river experienced a great progress with the development of the irrigation and in particular the rice-growing in the country.

The urbanization of the city of Rosso began with the colonization and remained limited to the narrow area alongside the river, relatively secured with protective dykes and a good sanitation network. With the drought and the rural exodus, the city experienced an anarchic urbanization with the construction in submersible and unprotected areas. In addition to the city of Rosso, the municipality has about ten villages some of which are in the valley and others on the sandy plain to the north.

The municipality had51 026 inhabitants in 2013 according to the figures of the General Census of Population and Housing conducted by the ONS.A relatively young population: the 24 years represent more than 46% of its population. The poverty rate is close to the national average, 32.2% of the population of the municipality live below the poverty line.

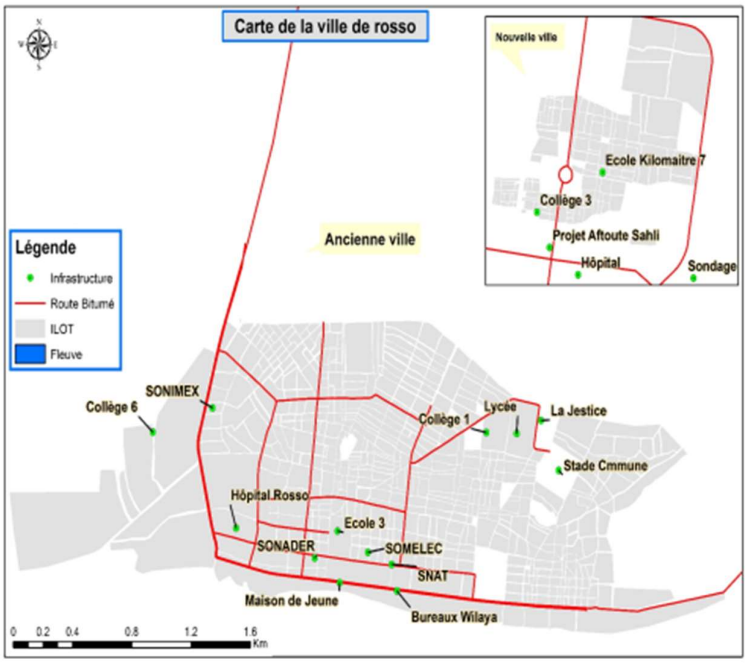
The dominant activities at the level of the commune rely on 2 poles: (i) irrigated agriculture with its various support activities and (ii) exchanges with Senegal and from there to West Africa. The majority of the Rosso population works in agriculture and related activities: farmers, agricultural workers, facilities, harvesting, dehulling, etc.

The municipality houses on its territory almost all national societies whose mission is focused on the development of the irrigated agriculture: SNAT, SONADER, M'Pourrié in addition to the Higher Institute of Technology Education (ISET).There are dozens of private facilities, harvest equipment and dehulling plants.

The presence of the Rosso BAC creates an important commercial hub and services related to trade with Senegal; the upcoming construction of Rosso bridge will greatly enhance this role.

It also houses the training centers of the main army and security corps (Guard, Gendarmerie, National Army) and several operational units.

It has a hospital, a large Health Center, a school of health and 8 health posts; and in the teaching domain, it has 2 high schools, 6 colleges and dozens of public and private primary schools.



A3.2.2 Disaster Risk Assessment

The experience of the last years, the opinion of the different experts and actors as well as the information gathered during the project missions and during the communal workshop of Rosso held in the hall of the town hall on May 13 and 14, 2018 have made appear the following disaster risks with frequencies, severities and manifestations that differ from one risk to another. The following table gives a presentation of these disasters before analyzing each of them in following developments.

Risks	Cause	Occurrence	Demonstration	Severity
Flood	Rainwater	Recurrent	Sudden, and its prediction is done on a short lapse of time	May cause severe damage if the rain exceeds the usual heights
	Overflow of the waters of the river or its arms	Probable	Slow and predictable, and can intervene suddenly	Can cause serious damage but prevention measures exist
Fire	Accidents on household uses of energy	Recurrent	Sudden	Can entail a lot of human and material losses if it occurs in areas of high concentration, especially around the Rosso market
	Bushfires	Recurrent	Creeping	Can entail a lot of losses on the agricultural perimeters and reach the city
Epidemic	Proliferation of mosquitoes and other vectors	Recurrent	Creeping	Average severity in general
	Frequent exchange with the countries of the sub-region whereepidemics crackdown from time to time, sometimes severe	Probable	Sudden	Can be of extreme severity and turn to disaster
Food and/or nutritional crisis	Drought and decrease of the rainfall	Recurrent	Predictable	Can be of extreme severity and turn to disaster
	Locust invasion and other enemies of crops	Recurrent	Predictable	Can be of extreme severity and turn to disaster
Drowning in the river	Accidents caused by recklessness	Recurrent	Sudden	It is not a disaster, strictly speaking, but a regular and serious risk
Industrial risks	Proliferation of paddy by the dehulling plants (water and air pollution)	Probable	Creeping	Medium severity

Flood

As shown in the previous table, flooding at Rosso may result from the rainwater runoff or overflow from the river or one of its arms.

Rainwater runoff

The average annual cumulative rainfall is 262 mm per year over the period 1991-2011. Although rainfall totals are not very high, yet it happens that heavy rains may arrive at high heights over a short period of time. Due to the nature of the soil (very clayey and impervious) and the non-operational sanitation network, the city is completely flooded as soon as a rain of more than 100 mm arrives. This is exactly what happened on August 26th and 27th, 2009, when a 176mm rain fell for 24 hours, killing 3 people and displacing 4,000 families from Satara, El Hilal, Demel and N'Djourbel. It must also be said that because of this situation and the fact that this ancient city is jammed between the river, the plain of M'Pourrié and M'Bleil arms, Rosso cannot know its natural increase. Therefore, the authorities have very well developed PK7 a non-submersible site where all services (water, electricity, etc.) were provided with in fact the proximity of the hospital of the city. In spite of all this, the populations remained on the site (new city) only the time necessary for the waters to withdraw. Indeed, the economic

activities, the value of the land and the psychological effect make the Rosso inhabitants attached to this narrow zone between the river and Sattara.

Gutter clogged and filled with trash on Satara side

Overflow of the waters of the river or one arm

The municipality of Rosso and especially the old city is jammed between the river in the south, the plain of M'Pourrié in the North West and M'Bleil arm in the North East.The city is protected by protective dykes in the South and North East sides against the rising water of the river and the arm M'Bleil. Thesevery old dikes presently have many points of weakness and deterioration, especially in the fishermen's zone and El Hilal district. It must be said that since the construction of the Manantali dam, the floods of the river are considered theoretically controlled but we are not under cover against a strong release that may coincide with a strong flood resulting from watercourses upstream of Manantali and therefore reach a coast that overflows the dykes or make them fail.

Breach in the protective dyke of the river in fishermen area side

Fire

The threat of fire in Rosso may result from either a fire occurring mostly at the market level, or an area of high concentration either from a bushfire blazing in the nearby fields especially after harvest or very woody mats that the winds would lead to the city. The commercial area between the river, landing stage side, and the dispensary (former hospital) is experiencing a daily influx and is itself cramped with clogged

streets and cluttered with merchandise stalls and depositories. Any start of fire due to a domestic accident, an electric mass or any other causes can entail a real disaster because of the difficulty of access of the vehicles of the civil protection in Rosso which has means, insufficient certainly, but still operational. The municipality of Rosso is also surrounded by developed plains and dedicated to irrigated agriculture mainly rice growing. At the time of harvest and after harvest, the remains (straw) of fields are very dry and can fire accidentally or when farmers want to clear their fields; and thanks to unfavorable winds these fire starts can reach the city.

Epidemics

Located on the bank of the river and surrounded by rice fields that must remain flooded in a very large part of the countryside, the municipality of Rosso is the municipality of the country where mosquitoes proliferate the most,and it is also a municipality where malaria is endemic. Today, with garbage cans that are everywhere on stagnant water, and likewise the proliferation of ‘typha’ which is a home for mosquitoes,there is a fear of the multiplication of new varieties still unknown of mosquitoes that would bring diseases other than malaria.

In addition, Rosso remains the country's gateway to Senegal and hence to West Africa in general, and any outbreak in one of these countries will enter Mauritania from Rosso.

Food and/or nutritional crisis

The majority of the population of the municipality live essentially of the agriculture and the breeding in some areas. These are peasants working in their fields, agricultural workers in the perimeters of large farmers, workers in companies linked to the sector (perimeter facilities, harvest of crops, etc.) and dozens of various service providers to that sector.Under these conditions, any sharp drop in production can cause a real crisis in Rosso and even a food and nutritional disaster. Many reasons can lead to this situation: drought and enemies of agriculture.

- Since the beginning of the 70s, the specter of a great drought is hovering over the whole country. The control of the waters of the river has reduced the risk in Rosso and in particular with regard to the irrigated agriculture, but the latter is not everything in Rosso.
- Even without rainfall deficit and with a satisfactory and regulated river level, we are not under cover of a disaster resulting from a locust invasion or other pests of crops.

Drowning in the river

This is not a type of disaster like the classic disasters to which dozens of people are exposed at the same time and for which massive mobilizations of resources are needed but a phenomenon that, according to all local officials met, worries and causes loss of lives. The risk is aggravated by the lack of life-saving equipment: specialized divers and adequate means of diving. It was sometimes necessary to ask for help from the Senegalese side.

Industrial risks

Dozens of paddy dehulling plants and factories have settled in the municipality of Rosso where all the rice production of the river is treated. These plants are of an indisputable economic contribution to the city but they are polluting:

- Release of gas and bad smells polluting the air
- Dumping of used oil polluting the soil and water.

A3.2.3 Assets and Challenges

The municipality of Rosso has a number of means and assets that can serve but it also faces real problems and challenges.

Assets

The municipality of Rosso has: (i) an incomplete sanitation network in poor condition that can be completed and rehabilitated; (ii) CPB antenna; (iii) presence of human and material resources; (iv) a reception site located 7 km away and (v) a disaster experience.

Sanitation network

Although it is currently not operational, the network exists and putting it back into service requires only an intervention for the uncorking of the gutters, and repair of pumps. With a length of 3715 linear meters and gutters of rectangular section 80 cm wide and 70 to 110 in height, this network covers the vast majority of the ancient city and in particular the most exposed part to flood. An ONAS mission has already done some evaluation work on the restoration of the network and submitted a report to its supervisory authority and to the Municipality but nothing has been done since then. It must be said that this network is not managed by ONAS, which is anyway not present at the regional level.

Civil Protection Branch

At Rosso level, there is a Regional Directorate of Civil Protection with a complete and trained response team whose resources are two multifunctional fire trucks with

multiple equipment and one ambulance currently out of order.Even if these means are far from being sufficient, the presence of this unit allows a lot of relief and rescue operations.

Materiel and human resources

In Rosso there are a large hospital, 1 dispensary and 4 health posts. The management of the national companies positioned in Rosso (SNAT, SONADER, M'Pourrié, etc.) as well as the deconcentrated services of the State (Agriculture, Livestock, Environment, Health, Education, CSA, etc.) have material resources (4X4 vehicles, trucks, tanks and even machines) and an important storage infrastructures (CSA, SONIMEX). The private sector with its various economic operators also has vehicles, trucks, tanks and machines that can be mobilized if necessary. Rosso also houses units of the armed and security forces, schools and training centers of all weapons whose mobilization as a last resort would add much greater human and material resources.

A hosting site

Following the latest floods in the city of Rosso, the government has developed in the PK7 an extension of the city in a plain non submersible and allowing the development at will of the city. The plan of parceling was done and the basic services (water, electricity, schools, hospital, etc.) were installed.Although the majority of Rosso residents are still reluctant to settle in this new extension of the city for economic or psychological reasons, yet this site is still an important asset for the city, having a very large hosting capacity for the displaced in case of great disaster.

An experience

The city of Rosso has experienced in recent years and especially during the winter 2009 floods that have entailed the displacement of dozens of families and requested the intervention of all stakeholders, and the mobilization of important resources from the State and partners. The management of this crisis was done under the supervision of the Wali by the Departmental Commission and has involved several local actors. It has thus allowed the local authorities to have practice of large-scale crises, although it would be better to establish a more formalized mechanism for the municipal level, giving the municipal authorities a prominent role in crisis and/or disaster management.

Challenges

The municipality of Rosso faces challenges or problems that need to be solved to improve its local resilience. There are among others: (i) the non-operational nature of the sewerage network and the absence of a technical structure responsible for its management;(ii) the weakness and deterioration of the city's protective dykes; (iii) the

insufficiency of the means of Regional Direction of Civil Protection; (iv) the inexistence of a stock of emergency kits that can be mobilized immediately and (v) the absence of a municipal authority(ies) in charge ofthe disaster prevention and management.

- The sanitation network currently plays no role in protecting the city. The gutters are clogged and heaps of rubbish pile up on them sometimes making them invisible. Pumps are out of order, and this in the absence of a competent and specialized structure present locally and responsible for the management and maintenance of the network.
- The protective dykes of the city have weak points and are strongly eroded in places, which leaves certain parts of the city at the mercy of a rise of the coast of the river and one of its arms.
- The Regional Directorate of Civil Protection is certainly present in Rosso but the means are limited; we note in particular the absence of ambulances and means for rescue in case of drowning.
- The management of the last floods, where dozens of families were affected, showed the difficulty of mobilizing locally and in a short time the rescue needs of displaced populations in tents, mats, blankets, and food kits. These items and other products were not available locally in quantity and in quality, and they had to be imported from Nouakchott and even from abroad when partners sent them by air.
- Although Rosso municipality is one of the five municipalities of the project "Strengthening the Resilience and Human Security of Vulnerable Communities in Urban Settings through the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030",the municipality has not yet designated a focal point and even less has not set up a body to be responsible of the management of the disaster prevention and management.

A3.3 Kaédi

A3.3.1 Brief presentation of the municipality of Kaédi

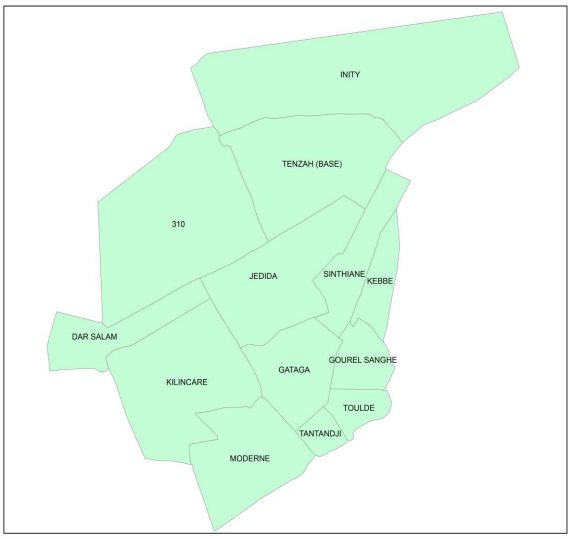
The municipality of Kaédi is located the South of Mauritania at 440 kilometers of the capital Nouakchott with the GPS data: Longitude: 13 ° 30 '20 "W and Latitude: 16 ° 09' 02" N. It is built (the old city in any case) on rocky hills (wilayas, Touldé, Guataga, ENFVA, etc.) overlooking troughs on the right bank of the river valley. With the drought and the rural exodus, the city is spread over large areas in the troughs, and especially the districts of Kebba, Sinthiane, some parts of Tenzah, Jedida, and Dar Salam, etc.) Capital of Gorgol, Kaédi has always been and remains one of the big and active cities of the country. With one of the first high schools in Mauritania that has trained over the years several dozens of cadres who have contributed to the construction of the nation, Kaédi is an educational and cultural pole. Kaédi is also an important economic center (irrigated agriculture, receding, under rain, breeding, trade, etc.).

The urbanization of the city of Kaédi is very old and began well before the colonization, some locals believe that it was founded around 1859; the districts Touldé, Gataga, Gourel Saigné whose alleys do not allow the access of any type of vehicle are the proof that they are old villages. The municipality had 49,152 inhabitants in 2013 according to the figures of the General Census of Population and Housing conducted by the ONS. A relatively young population: the 24 years represent more than 46% of its population. Kaédi is the capital of Gorgol, a region where the poverty rate is one of the highest. 38.2% of the population of the wilaya live below the poverty line against a national average of 31%. The dominant activities at the municipality level are agriculture under its various components (irrigated, flood zones (walo), rain-fed dryland cropping, called dieri diéri), livestock and trade. A good part of the population of Kaedi lives with migrants' transfers to the municipality which has a large and active community of expatriates; the municipality has commercial relations with Senegal, and the construction of a wharf as part of the navigation component of the OMVS is likely to increase these exchanges.

The municipality houses on its territory several Centers and Directorates in relation to the development of agriculture: The National Center for Agronomic Research and Agricultural Development CNRADA, ENFVA and a Regional Directorate of SONADER. There are in Kaédi the classic regional representations of all the ministries (Health, Education, Agriculture, Livestock, Environment, Social Affairs, CSA and Civil Protection) and regional structures of the different security bodies (Guard,

Gendarmeries and Police), in addition to a unit of the national army, the Autonomous Sector of Kaédi SAC. It has a hospital, 2 health centers and 5 health posts; and in the teaching domain, it has 1 high school, 2 colleges and dozens of public and private primary schools.

Map of the city of Kaédi



A3.3.2 Disaster Risk Assessment

The experience of the last years, the opinion of the different experts and actors as well as the information gathered during the project missions and during the communal workshop of Kaédi held in the hall of the town hall on May 17 and 18, 2018 have made appear the following disaster risks with frequencies, gravities and manifestations that differ from one risk to another. The following table gives a presentation of these disasters before analyzing each of them in following developments.

Risks	Cause	Occurrence	Demonstration	Severity
Flood	Rainwater	Recurrent	Sudden, and its prediction is done on a short lapse of time	May cause severe damage if the rain exceeds the usual heights
	Overflow of the river or plain water on the PPGs side	Probable	Slow and predictable, and can intervene suddenly	Can cause serious damage but prevention measures exist
Fire	Accidents on household uses of energy	Recurrent	Sudden	Can entail a lot of human and material losses if it occurs in areas of high concentration, especially around the market
	Bushfires	Recurrent	Creeping	Can entail a lot of losses on the agricultural perimeters and reach the city
Epidemic	Proliferation of mosquitoes and other vectors	Recurrent	Creeping	Average severity in general
	Frequent exchange with the countries of the sub-region where epidemics crackdown from time to time, sometimes severe	Probable	Sudden	Can be of extreme severity and turn to disaster
	Drought and decrease of the rainfall	Recurrent	Predictable	Can be of extreme severity and turn to disaster

Risks	Cause	Occurrence	Demonstration	Severity
Food and/or nutritional crisis	Locust invasion and other enemies of crops	Recurrent	Predictable	Can be of extreme severity and turn to disaster
Drowning in the river	Accidents caused by recklessness	Recurrent	Sudden	It is not a disaster, strictly speaking, but a regular and serious risk

Flood

As shown in the previous table, flooding at Kaédi may result from the rainwater runoff or overflow from the river or the PPG. As shown in the previous table, flooding at Kaédi may result from rainwater runoff or overflow from the river or the PPG when the protective dykes are overflowed or fail.

Rainwater runoff

The average annual cumulative rainfall is 293 mm per year over the period 1991-2011. Although the rainfall totals have been declining in recent years, yet it happens that heavy rains may arrive at high heights over a short period of time. The old districts of Kaédi (Moderne, Touldé, Gataga, Gourel Sangné, Tantandji and a large part of Jedida) are built on rocky elevations whose topography allows the evacuation of rainwater by natural gravitation. Other popular and populous districts born with the drought and rural exodus are built in clay soil troughs and are therefore highly exposed to flooding when rains reach high heights over a short period of time. This is the case of Kebbe, Sinthiane, Dar Salam, etc. The municipality has a network of which a part is realized since the colonization, which was completed by a network carried out by the NGO 'AFRICA 70' in the 90s and which covers the most submersible zone. This network was helping to evacuate the rainwater to two basins with a capacity of several tens of thousands of cubic meters. This network is currently not operational because the gutters are blocked by deposits of alluvium and garbage, and even sometimes by private buildings that have cut the network. An ONAS mission visited Kaédi and made a technical and financial assessment which was handed over to the Ministry of Hydraulics and Sanitation, and to the Municipality.

Basin for receiving the runoff water

Overflowing by destruction or overtaking of dykes

The city of Kaédi is protected by dykes on the south sides of the river, east side of the (Périmètre pilote du Gorgol) PPGs and a confluence coming from Lexeiba which flows into the river opposite the Kebba district, and finally west side of the plain of Rindiaw to the Dar Salam district. These dykes are not high enough and have weak points on several sides. However, in the event of heavy rainfall on the Gorgol downstream of Foum Legleita, and therefore of large quantities of water coming from this confluence at a time when the river's coast is high, the water is pushed back onto the PPGs and overflows the dyke protecting the Kebba district, threatening the entire city. This is what happened in 2007 and created a real crisis that led to a large-scale intervention and displacement of dozens of families. The CSA had to mobilize thousands of empty bags that were filled with soil to reinforce the dykes.

Kebba side protection dyke

Fire

The threat of fire in Kaédi may result from either a fire occurring at the market level, an area of high concentration or a difficult access area, or from a bushfire blazing in areas of strong herbaceous or very woody mats that the winds would lead to the city.

Urban fire

As in any city, the commercial and high-concentration areas in Kaédi are a concern in the event of a fire due to the lack of access during peak hours. Kaédi also experiences additional difficulties due to the existence of several very old districts which have very narrow lanes and which do not allow an access to the vehicles of the civil protection which are dedicated to the fight against the fire. These districts are now connected to electricity, use butane gas and may be therefore subject to serious fires. However, the conservation of the nature of these districts in their state is paramount because of its importance for the historical and cultural heritage of the city.

Bushfire

On each winter, the herbaceous mat develops mainly on the North and North East side (side of the districts Initi, Tenzah and 310) with sometimes very woody areas like the surroundings of EN FVA. When this vegetation dries, fire starts may occur and with adverse winds they can threaten the city.

Epidemic

Located on the bank of the river and surrounded by PPGs that must remain flooded, a very large part of the countryside, the municipality of Kaédi is one of the municipalities of the country where mosquitoes proliferate the most, and it is also a municipality where malaria is endemic. Today, with garbage cans that are everywhere on stagnant water, there is a fear of the multiplication of new varieties still unknown of mosquitoes that would bring diseases other than malaria. In addition, Kaédi is bordering Senegal, which makes it a municipality where the risk of contagion by any epidemic that is triggered in West Africa is present.

Food and/or nutritional crisis

The municpality of Kaédi is an agro-pastoral commune where the populations live essentially of the agriculture (Walo, Diéri and irrigated PPG 1 and 2) and the breeding. Recurring droughts and decreases in rainfall since the beginning of the 1970s, as well as flood control of the river that limits the walo zones, weaken the situation of populations already among the poorest ones in the country, especially in Inity, Tenzah or Wandama districts. A drastic drop in the production in Walo or Diéri, accompanied by an absence of pasture, would have dramatic consequences for a large part of the inhabitants of Kaédi municipality. Moreover, even without a rainfall deficit and with a satisfactory and regulated river level, we are not under a safe cover against a disaster resulting from a locust invasion or other enemies of crops.

Drowning in the river

This is not a type of disaster like the classic disasters to which dozens of people are exposed at the same time and for which massive mobilizations of resources are needed but a phenomenon that, according to all local officials met, worries and causes loss of lives. The risk is aggravated by the lack of life-saving equipment: specialized divers and adequate means of diving. It was sometimes necessary to ask for help from the Senegalese side.

A3.3.3 Assets and challenges

The municipality of Kaédi has a number of means and assets that can serve but also faces real problems and challenges.

Assets

The municipality of Kaédi has: (i) an incomplete sanitation network in poor condition that can be completed and rehabilitated; (ii) CPB antenna; (iii) presence of human and material resources; (iv) a fairly good network of urban roads and (v) a disaster experience.

Sanitation network

Although it is currently not operational, the network exists and putting it back into service requires only an intervention for the uncorking of the gutters, the clearing of the constructions which obstructed it and the maintenance of the water receiving basins. It must be said that the topography of several districts of the city built on elevations allowing the flow facilitates the task, emphasis should be placed on submergible districts to rehabilitate the network and foresee, if necessary, the installation of pumps to clear the runoff. An ONAS mission has already done some evaluation work on the restoration of the network and submitted a report to its supervisory ministry and to the Municipality but nothing has been done since then. It must be said that this network is not managed by ONAS, which is anyway not present at the regional level.

Civil Protection Branch

At Kaédi level, there is a Regional Directorate of Civil Protection with a complete and trained intervention team whose resources are limited to a multifunctional fire truck with its multiple equipment. Even if these means are far from being sufficient, the presence of this unit allows a lot of relief and rescue operations.

Material and human resources

In Kaédi there are a large hospital, 2 dispensaries and 5 health posts. The Directorates of the Ministry of Agriculture (CNRADA, ENVA and Regional Directorate of SONADER) as well as the deconcentrated services of the State (Agriculture, Livestock, Environment, Health, Education, CSA, etc.) have material resources (4X4 vehicles, trucks, tanks, and even machines) and important storage infrastructures (CSA, SONIMEX). The private sector with its various economic operators also has vehicles, trucks, tanks and machines that can be mobilized if necessary. Kaédi also houses units of the armed and security forces whose mobilization as a last resort would add much greater human and material resources.

A good network of urban roads

Apart from some historic areas (Toulté, Gataga and Gourel Sangné), the road network in Kaédi is relatively good and covers most of the city. This situation facilitates rescue

and disaster relief although it would have been better to set up a more formalized system for the municipal level, giving the municipal authorities a prominent role in crisis management and/or disasters.

Experience in disaster management

The city of Kaédi has experienced in recent years and especially during the winter 2007 floods that have entailed the displacement of dozens of families and requested the intervention of all stakeholders, and the mobilization of important resources from the State and partners. The crisis management was done under the supervision of the Wali by the Departmental Commission and has involved several local actors. It has thus allowed the local authorities to practice large-scale crises, municipality

Challenges

The municipality of Kaédi also faces challenges or problems that need to be addressed to improve the local resilience. There are among others: (i) the non-operational nature of the sewerage network and the absence of a technical structure responsible for its management; (ii) the weakness and deterioration of the city's protective dykes; (iii) the insufficiency of the means of Regional Direction of Civil Protection; (iv) the inexistence of a stock of emergency kits that can be mobilized immediately and (v) the absence of a municipal body/bodies responsible for the disaster prevention and management.

- The sanitation network is failing. The gutters are clogged and obstructed by buildings in some places. At Kaédi, there is no competent, specialized, locally-based structure responsible for the management and maintenance of the network.
- The protective dykes of the city need consolidation and development. On the Kebbé side and therefore not far from the place where the waters of the Gorgol coming from Lexeiba flow into the river, the dyke is not strong enough and high to counter a strong rise of water on this critical district. In Dar Salam side, the dyke is not sufficiently extended to the North. In addition, the entrance to the outgoing road from Kaedi to Boghé has created a dam that has made the area containing the CSA stores a pond where the water remains blocked.
- The Regional Directorate of Civil Protection is certainly present in Kaédi but the means are limited; we note in particular the absence of ambulances and means for rescue in case of drowning. Special treatment means for treating fire in areas inaccessible to vehicles are also lacking.
- The management of the last floods, where dozens of families were affected, showed the difficulty of mobilizing locally and in a short time the rescue needs of

displaced populations in tents, mats, blankets, and food kits. These items and other products were not available locally in quantity and in quality, and they had to be imported from Nouakchott and even from abroad when partners sent them by air.

- Although Kaédi municipality is one of the five municipalities of the project "Strengthening the Resilience and Human Security of Vulnerable Communities in Urban Settings through the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030", the municipality has not yet designated a focal point and even less has not set up a body to take charge of the management of the disaster prevention and management.

A3.4 Boghé

A3.4.1 Brief Description of Boghé

Boghé is one of the five moughataas that make up the Brakna wilaya 70 km south of its chief town Aleg. Boghe is one of the oldest and most active cities in the country. Although it is a moughataa capital, Boghé has long played the role of effective capital of Brakna with its oldest college in the country and the presence of certain directorates and regional services. The urbanization of the city of Boghé is very old would have begun well before colonization. According to the oral tradition, Boghé was born with the installation in the villages of Dubaango (present Boghé dow) and Tuldé Dubaango (in the east currently moved).

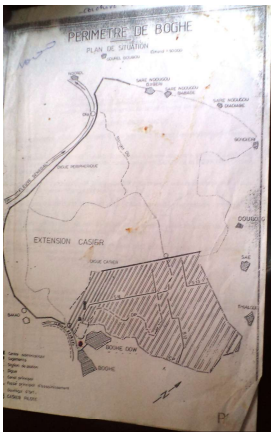
During the colonization, Boghé was an active canton and center of economic activity and a cultural development. With the drought, the city of Boghé which was limited to the former quatiers of Boghé stopover (seat of the administration and wedged between the river and the gap of Djinthou), Boghé Dow on the other side of the gap and the Gnoly district, has spread over large areas along the roads to Aleg or to Kaedi and especially around the Carrefour between these two roads. In addition to the city of Boghé itself the commune also includes dozens of villages on the Rosso road behind the Pilot Locker Boghé CPB (Saye, Douboungué, Sarandouguou, etc.) and other towards Kaédi (Thialgué, Tiédi , Thienel, etc.).

The commune had 42 759 inhabitants in 2013 during the realization of the General Census of Population and Habitat RGPH in 2013 by the ONS, a relatively young population plus 46% of its population. The poverty rate is very high; 46% of the population of the wilaya live below the poverty line against a national average of 31%. The dominant activities at the commune level are agriculture under its various components (irrigated, walo, diéri), livestock and trade.

A large part of the population of Boghé lives from the transfer of immigrants from the municipality which has a large and active community of expatriates and the Commune has commercial relations with Senegal and the construction of a wharf as part of the navigation component of OMVS is likely to increase these exchanges.

The municipality houses on its territory a Regional Directorate of SONADER in charge of the CPB, moreover in extension, and a Training Center of Cooperatives. Being the chief place of a moughataa, Boghé only has departmental services of some ministries with reduced human and material means and therefore needs for intervention important to average to appeal to the wilaya to 70 km. It has a large health center and

a hospital is under construction in Boghé but its finalization is much delayed compared to the deadlines that were planned. In terms of teaching 1 high school, 1 college and dozens of public and private primary schools



A3.4.2 Disaster Risk Assessment in Boghé

Hazard	Cause	Likelihood	Speed of Onset	Severity
Flood	Rainwater	Very likely	Sudden, short forecast time	May cause severe damage if rain exceeds regular levels
	River flooding or Djinthou lagoon flooding	Likely	Slow, predictable, intervene promptly	May cause severe damage but prevention measures exist
Bush Fire	Imprudence of farmers after harvest or in nearby pastures	Very likely	creeping	May cause large losses in pastures and fields, and reach the city
Epidemics	Mosquito / other vectors proliferation	Very likely	Creeping	Moderate
	Regular exchanges with countries in sub-region which sometime suffer from epidemics	likely	Sudden	Major with a potential to become catastrophic
Food / nutritional crisis	Drought / decline in rainfall	Very likely	Predictable	Major with a potential to become catastrophic
	Locust / other hostile agents crop invasion			
River Drowning	Accidents due to recklessness	Very likely	Sudden	Not major, but frequent occurrences

Flooding
Rainwater

The average annual cumulative rainfall is 211 mm per year over the period 1981-2010. Although rainfall totals have been declining in recent years, heavy rains may arrive at high heights over a short period of time. At Boghé Escale (Boghé less) there is an old sanitation network that dates from the colonization is currently defective. The other neighborhoods of the city do not have sanitation network especially those which are built on clay soils and therefore floodable as Boghé Dow and Gnioli. The extension of Boghé on the road to Kaédi is on the other hand built on a sandy ground and is less exposed to the flood by rushing of rainwater. The risk therefore lies especially in a

large amount of rain that falls on a short time at the moment the network of Boghé less does not work in an area surrounded by water on all sides (river to the south, Djinthou lagoon to the north and the plain CPB to the West) and which has only one exit passage through the bridge dike that connects Boghé Escale to Boghé Dow. Other areas are also prone to flooding by water such as the area to the stadium or graveyard on the other side of the lagoon.

Overflow of protective dykes

Several dikes protect the endangered parts of the city including Boghé Escale river side and dikes separating the CPB from the river and the city CPB. Although the current state of these dikes is relatively good, there are still some weaknesses on the protective dike side of the town in the direction of the river and dispensary side towards the lagoon. In addition, the level of elevation of these dikes did not seem high enough to contain an exceptional rise in the waters of the river due to a strong release of Manantali concomitant with exceptional heights of rainfall or the rupture of some dams that flood the entire area the extreme case of a rupture or destruction at the Foum Legleita dam, an unlikely but possible scenario, would put the city of Boghé in a state of catastrophe. It must be said that Boghé Escale has no possibility of rescue or evacuation in case of disaster than by the bridge dike linking it to Boghé Dow and in case of destruction or overflow by the waters of passage this part of Boghé which includes the administrative and municipal authorities most of the state services and the communal market is cut off from the rest of the world.

Epidemics

Like all the cities in the Senegal River Valley, which is also bordered by the Boghé Pilot Locker dedicated to rice-growing, which requires watering for a large part of the countryside, Boghé commune is experiencing a great proliferation of mosquitoes throughout of the year. It is also an area where malaria is endemic and where it is difficult or impossible to sleep without a mosquito net. With a faulty garbage treatment system Boghé is not immune to the appearance of diseases that are still unknown and that could do enormous damage. Indeed, the poverty rate is very high and much of the farming and livestock production is very uncertain because of the uncertainty of

rainfall and the multitude of pests. Any serious disruption of agricultural and livestock inputs would weaken the food and nutritional situation of the populations and expose them to various diseases such as cholera. Added to this is the lack of health infrastructure, which is expected to reduce the completion and implementation of the Boghé hospital under construction.

Food / Nutrition Crisis

The commune of Boghé is an agro-pastoral commune where the populations live essentially of the agriculture (Walo, Diéri and irrigated CPB and extension) and the breeding. Recurring droughts and decreases in rainfall since the beginning of the 1970s as well as flood control of the river that limits the walo zones weaken the situation of populations already among the poorest in the country. A drastic drop in production in Walo or Diéri accompanied by an absence of pasture would have dramatic consequences for a large part of the inhabitants of the commune of Boghé. Moreover, even without rainfall deficit and with a satisfactory and regulated river level, one is not immune to a disaster resulting from a locust invasion or other pests.

River Drowning

This is not a type of disaster like the classic disasters to which dozens of people are exposed at the same time and for which massive mobilizations of means are needed but a phenomenon which, according to all local officials encountered, worries and causes loss of life. The risk is aggravated by the lack of life-saving equipment: specialized divers and adequate means of diving. It was sometimes necessary to ask for help from the Senegalese side.

Bushfires

The start of a bush fire can be triggered from two surrounding areas and potentially exposed to bushfires. This is the area of pastures and rice fields.

- The area bordering on the boghe north and north-east is a band which is covered with good pastures during the winter season and which is also a relatively wooded band. With the end of the rainy season the herbs dry up and can catch fire and threaten a good part of the city and the local services have only traditional means to fight against these fires.

- The rice paddies of the Casier Drivers of Boghé meanwhile rub shoulders with the city of West and North West. After each harvest, the remains (straws) dry up and can catch fire by accident or when farmers burn them to clean their fields. Unfavorable winds can lead them to reach the city over the dikes.

A3.4.3 Strengths and Challenges

Strengths

The municipality of Boghé has: (i) an incomplete and poor sanitation network that can be completed and rehabilitated, (ii) ~~*CPB branch*~~; (iii) protective dikes in relatively good condition; (iv) public and private storage infrastructure in non-flood zones.

Sanitation Network

Boghé Escale district has a very old sanitation network currently not operational that can be rehabilitated and thus solve the problem of runoff on this critical part of the city. It must be said that Boghé Escale is built on an elevation and the water can be evacuated by gravitation either towards the river or towards the Djinthiou lagoon or pond without the need for a pumping system or a special receiving basin. This network must be extended to Boghé Dow.

Civil Protection branch

The city of Boghé has a branch of the DGPC under the Regional Directorate of the DGPC based in Aleg. This branch has an operational multifunctional fire truck, an ambulance currently out of order and a firefighting team. This structure, although poorly equipped, currently provides rescue and rescue operations. Above all, it is a matter of improving its resources and training it for interventions in the river to help in case of drowning, an issue that seems to be of great concern to local populations and authorities.

Protection Dykes

The protective dikes of the city of Boghé are in relatively good condition and have so far managed to protect the city against the different upslopes of the river level but we have low levels including the river side city hall and the Djinthiou lagoon on the dispensary side. More study is needed to see if consolidations and / or elevations are needed to ensure that the city is fully protected as any spillover can have a catastrophic impact on the city.

In addition, Boghé Escale is connected to the outside world only by the bridge dike which is the only way to use a disaster to evacuate people. Any disruption of traffic at this passage will have serious implications for the security of the city and even without breaking the passage in case of disaster in the city the evacuation of dozens of families

would put a lot of pressure on this passage. It is therefore very useful to see if it is technically possible to open other access to this neighborhood.

Storage Facilities

There are several storage facilities owned by the public and also the private sector in the non-flooded part of the city. The CSA holds in this zone a large storage capacity with a trained storekeeper and the management and maintenance of the different types of products. These infrastructures were built precisely for intervention in case of crisis or disaster.

Challenges

Boghé commune also faces challenges or problems that need to be addressed to improve local resilience. These include: (i) the non-operational nature of the sanitation system and the absence of a technical structure to manage it, (ii) the weakness and deterioration of the city's protective dikes; (iii) insufficient means of Regional Directorate of Civil Protection; (iv) the unavailability of a stock of rescue kits that can be mobilized immediately; (v) the weakness of local health structures; and (vi) the lack of armed forces and security units; and (vii) absence of a disaster prevention and management system.

- The sanitation network of the Boghé Escale district is failing. The gutters are clogged and clogged with garbage. Other parts of the city, including the Boghé Dow and Gnoli neighborhoods, need a sanitation network. At the Boghé level, there is no competent, specialized, locally-based structure responsible for the management and maintenance of the network.
- The city's protective dikes need strengthening and development. It is important to study what are the possible technical solutions to allow other access to the neighborhood Boghé Escale, which solution that would limit the pressure, in case of disaster, on the only issue currently available.
- The Regional Directorate of Civil Protection is certainly present in Kaédi but the means are limited, we note in particular the absence of ambulances and means for rescue in case of drowning. Special treatment means for treating fire in areas inaccessible to vehicles are also lacking.
- In case of emergency or disaster, it is difficult to mobilize locally and in a short time the needs of displaced populations in tents, mats, blankets, food kits. These items and other products are not available locally in quantity and quality and must be imported from Nouakchott or even donations from abroad.

- The health structures and staff currently operating in Boghé are insufficient to cope with a disaster situation. In fact, there is only one health center in Boghé for a population of 42,759. It must be said that a hospital is under construction in Boghé. Its finalization and commissioning will help to solve the problem
- Boghé is only a moughataa head office and as such the representations of the ministerial departments are very small and endowed with very few means. There are also no army units in Boghé where the army and the local brigades of the various police forces (guard, gendarmerie and police) are composed mainly of elements of law and order. therefore a large rescue operation would require an intervention of the regional capital Aleg to 70 km.
- Although Boghé commune is one of the five communes of the project "Strengthening the Resilience and Human Security of Vulnerable Communities in Urban Settings through the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030". ", The municipality has not yet designated a focal point and even less set up a body for the management of disaster prevention and management

A3.5 Tintane

A3.5.1 Brief Description of Tintane Municipality

Tintane is one of the four moughataas that constitute the wilaya of Hodh Elgharbi 70 km west of its chief town Aioun. Tintane is one of the most active cities in the country. The urbanization of the city of Tintane is relatively recent well after independence. Indeed, it was not until the mid-1960s that the first administrative post was opened and the construction of the city began with a large influx of people from the Tamchekett department in the north who moved to the north. south for two reasons: (i) the drought generally pushes the populations of the south generally more watered and (ii) the axis Nouakchott-Néma, become very active well before the construction of road of the hope and which passes by Tintane, was also an essential factor.

The city was built in a depression and was quick to experience a rapid demographic and economic development due to its position on the road of hope, the livestock potential of its area and the possibility of exchange with landlocked areas of neighbouring Mali. Thus, during the 1990s and until the mid-2000s, Tintane was considered as the most active, commercial and wealthy cities in the country and land was flourishing (the square meter was was trading in his market area at huge prices). It was in these conditions that the flood of 2007 caused enormous damage, forced the displacement of the city and severely impacted the economic influence of the city.

The municipality had 21,736 inhabitants in 2013 during the realization of the General Census of Population and Habitat RGPH in 2013 by the ONS, a relatively young population more than 77% of its population. The prevalence of y is a little lower than the national average, 26% of the population of the wilaya live below the poverty line. On the other hand, the literacy rate of 58.6% is lower than the average for the country. The dominant activities at the commune level are livestock and trade and rainfed and oasis agriculture. The first village of Tintane even before the installation of the administration and therefore of the city was an oasis. Being the chief place of a moughataa, Tintane does not have departmental services of some ministries with reduced human and material means and therefore needs for intervention important to average to appeal to the wilaya to 70 km. It has a health center and a PMI. In terms of teaching of 1 high school, 1 college and several public and private primary schools.

A3.5.2 Disaster Risk Assessment

Hazard	Cause	Likelihood	Speed of Onset	Severity
Flood	Influx of water from different heights surrounding the city (urban flooding)	Very likely	Sudden	Major to catastrophic
Bush Fire	Abundance of pastures surrounding the new site	Likely	Sudden	May cause large losses in pastures and reach the city
Epidemics	Local disease that spreads or contagion by travellers from elsewhere	Likely	Sudden	Major with a potential to become catastrophic
Food / nutritional crisis	Drought / decline in rainfall	Very likely	Predictable	Major with a potential to become catastrophic
	Locust / other hostile agents crop invasion			
Sand dunes encroachment	Sandy nature of site and wind frequency	Likely	Creeping	Houses abandoned / displacement, motorways / transportation routes disrupted

Flooding

The flood is undoubtedly the most serious risk that threatens the municipality of Tintane. Indeed, the city (the old city) was built in a depression with mountains on the west and north sides and sand dunes on the east and south east sides. The Wadis and Batha that come from the West and the North of the basins of Tinkara, Benmoura and Timbedra carry, in case of good rainfall on the plateau of El Aguer or the mountain of Tinkara, millions of cubic meters of water which are poured into the basin where the city is built and which has no topographical possibility to evacuate.

It was this situation that occurred in 2007 when, as a result of good rainfall, the waters from the aforementioned basins invaded the city at night and led to the disaster that we know. At the time, several scenarios were discussed by the authorities to definitively solve the problem of Tintane including:

- Leave it in the state by providing an evacuation channel and a pumping station, which allows the city to flood each time but allows a rapid evacuation of a part of the water towards the tampron of Dembari to the Este from the city. Precarious solution in that the city is flooded each time.
- Construct a belt of dikes or dams on the entire west and north side and a diversion channel. This solution presents several financial and technical problems: (i) it is expensive; (ii) there are no basins on which the dams will return and the topography does not facilitate the diversion and (iii) in case of rupture of this belt the city is not only flooded but completely scratched from the map.

- The move of the city to the Seif site completely secure, which requires the development of the site, the construction of administrative and social infrastructure but also the membership of the inhabitants. The development of the site was relatively well done, services were installed there with still new road network and public buildings of good quality and a subdivision which allowed the inhabitants to profit from ground. But we did not manage to overcome the reluctance of the people and a good part returned to live in these houses of the old city while waiting for the next flood.

Side of the Tintane market place of Tintane after the flood

Food / Nutrition Crisis

The commune of Tintane is an agropastoral commune where the populations live essentially of the breeding and the trade and incidentally of agriculture under rain and oasis. Any strong and lasting drought, such as that experienced by the area during the 1970s and 1980s, that decimate livestock or lead to transhumance that is remote, expensive and uncertain will have disastrous consequences for the majority of the population. from the community. Indeed, all the measures taken so far to improve the resilience of the Tintane populations, as indeed all the populations in the region, remain insufficient. The contribution of oasis and vegetable crops is marginal and other income-generating activities are rare and make only a small contribution to household resources.

Bush Fires

The Seif area to which Tintane City was transferred after the 2007 flood is located in a sandy plain that is covered with tall, dense grasses as a result of good wintering. These drying herbs become a potential source of bushfires that can be triggered with several types of carelessness such as a smoker, car or home fire. The city has very few means to deal with such dangers and firewalls are not systematically made at the right time. These fire starts can cause serious damage by: i) Destroying pastures over large areas, which translates into a threat to the livelihoods of dozens of families in the

commune; and ii) threatening some parts of the city and even causing fires inside the same city.

Sand Encroachment

The site on which the city was transferred was called, even before the creation of Tintane, Seif, literally the dune of sands, sands that had to be cleared, in many cases, to subdivide the city and realize the public infrastructures that have been executed. The drought has settled permanently in the country and with it the desertification, any zone of the country is threatened of sanding a fortiori a site traditionally a dune of sand. Tintane is therefore threatened by a siltation that could destroy homes, roads and public buildings. Added to this is the absence of any policy to deal with the issue. No greenbelt or reforestation program has so far been implemented at the city level.

Epidemics

Like all cities in the country, Tintane is not immune to a local outbreak or contagion by carriers from other parts of the country or from abroad. Indeed, Tintane is located on one of the most important axes through which dozens of passengers pass daily. It is also a border area in Mali with which the city maintains important commercial exchanges. In addition, health structures at the commune level are limited in terms of staff and resources and can barely meet the needs of patients who come for regular illnesses. In the event of an epidemic, it is necessary to mobilize human and material resources that do not exist in the commune and even in the wilaya.

A3.5.3 Strengths and Challenges

Strengths

The municipality of Tintane has: (i) a facility in the new in a non-submersible site, (ii) relatively good standard of living; (iii) a good road network; (iv) public buildings of good quality and (v) experience of crisis management.

Site not exposed to flooding

As a result of the 2007 flood, the city was transferred to a non-submersible site. This site was well-stocked and plots were allocated to the various landowners in the transferred city. Roads, public services and markets have been developed to allow residents and the various economic actors of the city to settle in a safe area. This situation should have definitively solved the problem of flooding in Tintane but we note that dozens of families still live in the old site and are therefore still exposed to the risk of floods, ie these families can not afford to build in the lands that have been allocated to them either there are economic or psychological factors that prevent them. In any case the security of the city is still not complete.

A relatively good standard of living

Tintane is not a city particularly among the poorest of the country due mainly to its location in a densely stocked area but also the importance of commercial activities in its market. As a result, the standard of living of its populations is considered relatively good with a percentage of people living below the threshold of 26%, which is well below the national average. This situation is however dependent on random factors such as the level of rainfall and the existence of pastures.

Good Road Network

The infrastructure developed as part of the subdivision of the site for the transfer of the city includes a network of new urban roads and runs a large part of the new city, which allows a fluidity of the traffic and a possibility of intervention in all the parts of the city.

Good quality public buildings

The public buildings built as part of the transfer of the city are of good quality, still new and completely safe from floods whatever its origin. These infrastructures can be used in the management of any type of crisis.

Experience in disaster management

The 2007 crisis necessitated rescue and rescue operations for which the administration mobilized all the local means, those of the wilaya and even reinforcements solicited from Nouakchott and the various partners. These operations lasted a few weeks and the restoration activities lasted a few and even continue to this day. The crisis management was done under the supervision of the wali by the Departmental Commission and involved several local actors. It has thus allowed the local authorities to practice large-scale crises, although it would be better to put in place a more formalized system for the municipal level, giving the municipal authorities a prominent role in crisis management. and / or disasters.

Challenges

Tintane commune also faces challenges or problems that need to be solved to improve local resilience. These include: (i) the existence of dozens of families and infrastructure in the flood zone, (ii) the advancing sand dunes; (iii) the absence of a local Civil Protection unit; (iv) the lack of a stock of rescue kits that can be mobilized immediately, (v) the weakness of local health structures; (vi) lack of armed forces and security units and (vii) lack of disaster prevention and management.

- The public authorities have retained the transfer of the site as the only solution to Tintane's flooding problem and therefore have not taken any measures to limit the damage in the old site in the event of a new one. But the transfer of the city was not complete and dozens of families remained on the site exposed to this risk. There is even critical infrastructure for the management of crises and disasters such as the storage depots of the Commissariat for Food Security that have also not been transferred. The relocation of these recalcitrant families requires a lot of pedagogy but also financial aid to these families to enable them to settle.

- The site chosen for the transfer is effectively non-submersible. It is however threatened with advanced sand dunes. Indeed, the area is an area of dunes traditionally called besides Seif. The necessary measures must be taken to secure newly established homes and public infrastructure. There are no coherent and effective programs for building a green belt to protect the city.
- The absence of a Civil Protection antenna at Tintane limits the means of relief at its level. There are no fire trucks in the city or specialized intervention teams. He wait for an intervention from Aioun to 70 km.
- In case of emergency or disaster, it is difficult to mobilize locally and in a short time the needs of displaced populations in tents, mats, blankets, food kits. These items and other products are not available locally in quantity and quality and must be imported from Nouakchott or even donations from abroad.
- The health structures and staff currently operating in Tintane are insufficient to cope with a disaster situation. Indeed, Tintane has only one health center and one PMI for a population of 21,736 inhabitants.
- Tintane is only a moughataa head office and as such the representations of the ministerial departments are very small and have very few means. There are also no army units in Tintane, and the local brigades of the various police forces (guard, gendarmerie and police) are composed mainly of law enforcement elements and

therefore a police operation. large-scale rescue would require an intervention of the regional capital Aioun to 70 km.

- Although the municipality of Tintane is one of the five communes of the project "Strengthening the Resilience and Human Security of Vulnerable Communities in Urban Settings through the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030" ", The municipality has not yet designated a focal point and even less set up a body for the management of disaster prevention and management.

ANNEX 4 – Local Resilience Action Plans for Three Mauritanian Cities

A4.1 Tevragh Zena

The overall objective of this work is to make the municipality of T. Zeina more resilient and able to expect, anticipate and address any type of disaster. It is, in terms of specific objectives, about suggesting to the administrative and municipal authorities, the various stakeholders and the partners:

- The measures that will be taken regarding the improvements which would be made, the equipment, ways and means which would be acquired to make the community more resilient.
- The most appropriate disaster prevention and management system that would be set up for better anticipation and/or addressing disasters;
- The improvements and the additions that would be introduced to the legislative and regulatory framework for emergency and disaster management in order to update it and make more suitable to bear the risks identified above.

A4.1.1 Pre-Action Requirements

The disaster risk analysis carried out in previous developments shows that there are a number of challenges that need to be treated through some achievements limiting the occurrence of disasters or at least helping to address them more successfully when they intervene, Zero risk is not unrealistic. It is about: (i) The rehabilitation of the sanitation system; (ii) The maintenance and consolidation of protective dikes; (iii) The establishment of a green belt protecting the municipality and its safeguard against subdivisions; (iv) The improvement of access routes to the market area and other sensitive sites; (v) The establishment of an adequate system for the treatment of waste and the disposal of stagnant water and (vi) The establishment of a communal system for information and early warning.

Sanitation system

The lack of a good sanitation system is unquestionably the biggest problem facing the municipality and which explodes it most to the risk of disasters. Its realization and its generalization on all neighbourhoods must be a priority. There is a running job with the Chinese, but it seems that:

- It is concerned only with runoff and other surface water, but it is not intended to deal with households to treat wastewater that is a real problem. Indeed, each house

has its own skeptical pit that is not always to the standards; but, with the raising of the ground water, the damage can be serious.

- It does not enter to the neighborhoods; it is limited to go alongside the main traffic lanes, which is very important for traffic flow but leaves many neighborhoods at the mercy of floods.

As an important action to implement this plan, it is necessary to finalize the current sewerage system and complete it so that it can reach all neighborhoods; therefore, it will allow the connection of all households in order to evacuate their domestic waters.

Backup of the dike

Nouakchott city in general and the municipality of T. Zeina in particular cannot be safe without measures to protect it from an overflow of the ocean over the dike. The actions that should be taken under the Resilience Plan include:

- Editing the regulations that prohibit removals from the dike strip as well as the unauthorized constructions on the coastline, and taking actions against offenders.
- Investing in beach stabilization techniques such as StabiPlage or other efficient techniques.

Green Belt and Green City

Protecting the city from sand storms and advancing dikes is essential to its safety and viability over the medium and long term. It is therefore necessary to:

- Strengthen and support the actions carried out by the structures of the Ministry of Environment and Sustainable Development for the planting of millions of trees on the northern part of the municipality.
- The prohibition of allocating areas of the city's green belt for construction purposes and whatever the pretext.
- To create green spaces in all public squares and to encourage individuals to reforest their dwellings, in particular by placing plants at their disposal.

Access to markets and hot spots in case of fire

The commercial areas starting from the market of the capital to the policlinic passing by the so-called Lehmoume market, witness every day a monster influx that makes the passage - for even the pedestrian - extremely difficult. In fact, the markets' surroundings are tight and there are no car parks, whether they would be on open air or underground. In such conditions, if a fire starts, with the impossibility of immediate access to these sites, it will be possible to move towards a real disaster. A gigantic and long-lasting job must be carried out through:

- The development of this area by implementing wider routes and creating car parks, which must be the only places where a car can park.
- The assignment of police forces specifically for this purpose, or even the creation of a municipal police whose powers and tasks will be defined by texts.
- Prohibiting the act of parking outside the car parks and cracking down on offenders.

Stagnant water and garbage

The puddles of stagnant and dirty water observed in different places of T. Zeina on which there are piles of garbage, create a public health problem and give a bad image to a municipality considered as the capital of the Capital, the control center of the country's political and economic power and also the Latin quarter of Mauritania.

It is therefore imperative that the municipality take charge of this situation by:

- Clearing the dirty waters and creating instead of it green spaces and amusement parks that the city lacks.
- Implementing a real and regular system for garbage collection and treatment.

Early Warning and Information System

Although the necessary data and information on the various risks are produced and sometimes very well produced and in real time by different specialised national structures, this information is not specific and especially not centralized and processed in order to be able to give, if necessary, the alert. It is therefore recommended that:

- The Municipality will set up a municipal information and early warning service which will not be able to produce information that is already produced by specialized services of the State, but to collect all the data related to Tavragh Zeina (on weather, health, sea level, etc.) to be able to provide warnings
- The partners and technical services of the State provide technical and financial assistance to this service especially during the period of its establishment and running in.

Design and conduct an information-awareness campaign

No disaster prevention and management strategy can succeed if populations are not involved and involved in the strategy. The municipality should set up an information and awareness program for the Tavragh Zeina population, with the support of the partners. These are the following:

- Developing slogans and messages for the campaign "my city is preparing"

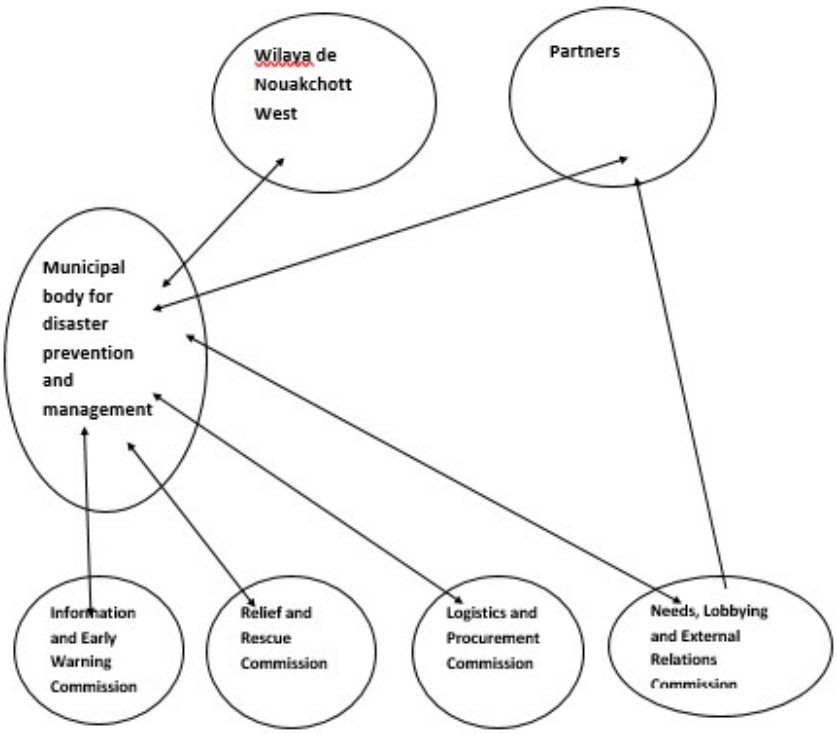
- Identifying the organizations and the associations of the populations that can be used as relays to disseminate messages in neighborhoods and to households (we can depend on mosque imams, women's and youth associations, NGOs, etc.)
- Using information transmission vectors: radio, television, posters, etc.

A4.1.2 Disaster prevention and management arrangements

The current arrangements of the crisis, emergency and disaster management do not deal with local authorities; despite, it set up and organize inter-ministerial committees at the national level, Monitoring and Coordination Units of Emergencies at the regional level and Departmental Commissions (CODEPs) for the moughataas. The scheme proposed here concerns the municipality of Tavragh Zeina specifically and focuses on the following points:

- A central place in the scheme is granted to the municipal authorities.
- Involvement of all actors who can play a role in the implementation of the plan.
- Consideration of all the essential functions in this system to be planned for the prevention and management of disasters i.e. Information and Early Warning; Relief and Rescue Services; Logistics, Procurement and Requirements, Lobbying and External Relations.

The proposed scheme will maintain close relations with the State through the wilaya of Nouakchott West and will be presented schematically as follows.



The Disaster Prevention and Management Authority in T. Zeina is directed by the Hakem of the mougataa, and its secretariat is provided by the Mayor of the Municipality. Besides, it includes four commissions. The composition and the tasks of each of its structures are thus defined.

Management of the DRM

The Disaster Prevention and Management Authority is chaired by the Hakem of the Moughataa of Tavragh Zeina and its secretariat is provided by the Mayor of the municipality. It includes a communications officer and a needs assessment structure. The role of this directorate is to:

- Review and approve the reports of the Information and Early Warning Commission, and therefore declare the crisis, emergency or disaster, if any
- Ensure the coordination and the conduct of the activities of the various Commissions
- Ensure the relations and the exchanges of correspondences with external parties (State, Partners, Populations, etc.) before the crisis, during the intervention period as well as for the post-crisis recovery measures.
- Review, process and validate the reports from various commissions
- Ensure the communication through the press and other means regarding the situation, the measures that should be taken and the safety recommendations.

Information and Early Warning Commission

Led by the municipal information and early warning service, this Commission must involve, like all national services that produce regular and relevant information on the risks of disasters: The RAC of MIDEC, National Weather Office (ONM), Health Information System (SNIS), IMROP of the Ministry of Fisheries and Maritime Economy, Office of the Food Security Commissioner's OSA, LEERG, Other interested Civil Society Organizations.

This committee, which meets at the request of the information service of the municipality, must: i) Process the data collected by the service; ii) Report to the authority's management to request to declare the alert and to define its level (crisis, emergency, disaster); iii) Follow any crisis in Tavragh Zeina through regular meetings and the production of progress reports.

Rescue and Rescue Commission

The Relief and rescue commission is chaired by the administration (Hakem) and include: The Municipality, the armed and security forces, the Civil Protection, the Ministry of Health, the Mauritanian Red Crescent, the ONAS, the CSA, and Other interested Civil Society Organizations.

The mission of this commission is to: i) rescue people in danger from disaster; ii) move and install individuals and families whose residences are affected; iii) provide food and health aids in addition of disaster relief kits; iv) address the causes of the disaster (extinguish fire for fires, pump and clear water for floods, treat patients and vaccinate people for epidemics, etc.).

Logistics and Procurement Commission

This commission is chaired by the municipality. It includes: the Office of the Food Security, the Red Crescent, SNDE-SOMELEC, the Ministry of Equipment and Transports, the Ministry of Health, and other interested Civil Society Organizations.

The mission of this commission is to i) coordinate and organize the use of the means of transportation available to the intervention; ii) receiving, storing and mobilizing food aids, emergency kits and other disaster relief needs; iii) respond to relief and rescue committee calls; and iv) submit reports to the State and partners on the use of the resources mobilized.

Needs, Lobbying and External Relations Commission

This commission is chaired by the municipality. It includes: parliamentarians of the Wilaya of Nouakchott, the President of the Nouakchott Regional Council, the local

elected officials, the representatives of trade and industrial federations in the municipality, the MIDEC, the Ministry of Finance and the opinion leaders.

It has two types of roles: a normal role and a crisis role. Normally the commission must: i) raise the awareness and advocate the problem of disaster risks within the public, the businessmen, the state and the partners; ii) prepare and work towards the adoption of the legislative and regulatory instruments necessary for controlling the disaster prevention and management; and iii) lobbying to engage governments and partners in carrying out the pre-requisites outlined in paragraph 2.1. of this plan

In times of crisis, it must: i) centralize the needs expressed by the various operational commissions; ii) formulate requests for the urgent mobilization of these needs by taking steps with the State, the donors and the other partners; and iii) ensure contact with the various partners and send them the reports they request.

A4.1.3 Legislative and Regulatory Framework

The texts currently in force, which define the arrangements for emergency aid, lay down the gravity thresholds for emergencies, specify the missions of certain national structures dedicated to crisis or disaster management, have a national scope and do not deal with the municipal level. They involve a high-level interdepartmental committee at the national level, a unit chaired by the Wali at the regional level and a departmental committee (CODEP) at the Moughataa level. In addition, the role of the municipal authorities is very small, or even non-existent, and the activation of an intervention in case of crisis or disaster requires a decision at a very high level of the state. This is in addition to the already regulated national system of equipping the Municipality of T. Zeina with its own system, and to legislate on several important issues mentioned above.

Creation of the communal authority

The already regulated national system is not called into question here, but the aim here is to equip the T. Zeina municipality with the system described in paragraph 2.2. of this plan. To do this, there should be:

- A decree of the Prime Minister that establishes at the level of T. Zeina a body of Disaster Prevention and Management, defines its missions, determines its architecture and designates its members. A text is required at least at the level of decree of the Prime Minister because the system involves central services of several departments that are not under the authority of the Wali of Nouakchott West or the Hakem of Tavragh Zeina. This text should define the relationship that

this body must maintain with the Interdepartmental emergency management committee and the regional emergency management unit.

- An order from the Wali or the Hakem specifying the thresholds and procedures for declaring emergencies (emergency, crisis, disasters, etc.).

Resilience texts

Important issues that need to be addressed to make T. Zeina a resilient city include:

- Prohibiting removals from the dune strip as well as the unauthorized construction on the coast
- Safeguarding the Green Belt
- Regulation of parking lots outside car parks in sensitive areas of the municipality

A4.1.4 Matrix of actions of the local resilience plan of Tavragh Zeina

Theme	specified Action	Responsible of the execution	Responsible of lobbying and fundraising	Responsible of monitoring the execution
1. Actions to be taken and work to be done previously	**1.1. Implementation of a comprehensive sewerage system** **1.2. Penetration into all neighbourhoods** **1.3. Connecting houses for sewage disposal**	• The Ministry of Hydraulics and Sanitation for programming, APDs and procurement. • ONAS for management, maintenance and upkeep	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Board is also responsible for getting involved by involving parliamentarians, the President of the Regional Council and other important personalities who are part of it. • Through the project, UNDP must provide technical support to this advocacy and lobbying work	• The municipality is primarily responsible for monitoring the execution of this activity. • A Deputy Mayor must be specifically designated to monitor the execution of this action and must report regularly to the Mayor, Hakem and MIDEC. • The MHA is responsible for the technical monitoring of the execution.

Theme	specified Action	Responsible of the execution	Responsible of lobbying and fundraising	Responsible of monitoring the execution
	2. Backup of Dike **2.1. enact and enforce the laws prohibiting the removal of sand and the establishment on the spot without authorization** **2.2. Investigate and implement a stabilization technique**	• The Ministry of Environment and Sustainable Development for the research of technical solutions and the preparation of studies and regulations. • The municipality and elected officials to mobilizing the funding and monitoring the approval of legislative texts	• The municipality plays the main role. • The Commission Needs, Lobbying and External Relations at the level of the Disaster Prevention and Management Board is also responsible for getting involved by involving parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP through the project must provide technical support to this advocacy and lobbying work	• The municipality in the first place is responsible for monitoring the execution of this activity. • A Deputy Mayor must be specifically designated to monitor the execution of this action and must report regularly to the Mayor, the Hakem and the MIDEC • The MEDD will be asked for compliance with regulations and technical monitoring of stabilization projects
	3. Greenbelt Protection and Green City **3.1. Prohibition of the allocation of areas dedicated to the Green Belt, whatever the purpose thereof** **3.2. Inverting in the Realization of a Large Green Belt**	• The Ministry of the Interior through its representatives (Wali and Hakem) for the prohibition of subdivision on the greenbelt • The Ministry of Environment and Sustainable Development and in particular the National Agency of the Green Wall for the realization of the belt (nurseries, planting, monitoring, etc.) • The municipality and elected officials for mobilizing the funding and monitoring of the approval of legislative texts	• The municipality plays the main role. • The Commission Needs, Lobbying and External Relations at the level of the Disaster Prevention and Management Board is also responsible for getting involved by involving parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP through the project must provide technical support to this advocacy and lobbying work	• The municipality in the first place is responsible for monitoring the execution of this activity. • A Deputy Mayor must be specifically designated to monitor the execution of this action and must report regularly to the Mayor, the Hakem and the MIDEC • The MEDD will be asked for compliance with regulations and technical monitoring of stabilization projects
	4. **Access to markets and sensitive points in case of fire** 4.1. Development of the congested area in terms of space occupancy and parking lots 4.2. 4.2. Compliance with relevant regulations	• The Ministry of Housing, Town Planning and Spatial Planning will be responsible for planning this part of the city • Local authorities (wali and hakem) to comply with regulations on space	• The municipality plays the main role. • The Commission Needs, Lobbying and External Relations at the level of the Disaster Prevention and Management Board is also responsible for getting involved by involving parliamentarians and	• The municipality in the first place is responsible for monitoring the execution of this activity. • A Deputy Mayor must be specifically designated to monitor the execution of this

Theme	specified Action	Responsible of the execution	Responsible of lobbying and fundraising	Responsible of monitoring the execution
		occupancy and parking • The municipality and elected officials for mobilizing the funding and monitoring of the approval of legislative texts	the President of the Regional Council and other important personalities who are part of it. • UNDP through the project must provide technical support to this advocacy and lobbying work	action and must report regularly to the Mayor, the Hakem and the MIDEC • The MHUAT to make the necessary arrangements to facilitate traffic and parking and especially car parks • The MIDEC, through the local authorities, must respect the regulations regarding the occupation of space and parking.
	5. **Clearance of stagnant water and garbage** **5.1. Garbage disposal** **5.2. Arrangement of dirty water retention places**	Actions whose responsibility goes exclusively to the municipality: • Establishing a good garbage treatment mechanism • The development of sites currently left for stangnant water in landscaped spaces with greenery for resting	• The municipality	• The municipality services • The Ministry of Health
	6.1**. Implementation of a municipal system for information and early warning**	• The municipality for the implementation of the system • • All national services producing risk information (ONM, SNIS, OSA, COVAC, IMPOC, etc.) for collaboration and support • UNDP through the technical assistance for the project	• The municipality • The project	• The municipality • The project
2. Dispositif à mettre en place	**2.1. Direction of the Authority**	• The prime time for device approval • The MIDEC and the Wilaya of Nouakchott for the implication of the administrative authorities (Hakem of T. Zeina) • The Municipality for the involvement of the Mayor	• The Mayor of T. Zeina municipality must lobby for approval of his scheme • The UNDP must support the municipality's approaches	• The municipality • The UNDP

Theme	specified Action	Responsible of the execution	Responsible of lobbying and fundraising	Responsible of monitoring the execution
	2.2. Information and Early Warning Commission	• The prime time for device approval • • The municipality is leading this commission • • All national services producing information on risks	• The Mayor of T. Zeina municipality must lobby for approval of his scheme • The UNDP must support the municipality's approaches	• The municipality • The UNDP
	2.3. **Commission de Secours et de Sauvetage**	• The MIDEC and the wilaya of Nouakchott for the implication of the administrative authorities (Hakem of T. Zeina) and the armed forces of security • Other stakeholders (civil protection, health, ONAS, CSA, CRM, etc.)	• The Mayor of T. Zeina municipality must lobby for approval of his scheme • The UNDP must support the municipality's approaches	• The municipality • The UNDP

A4.2 Rosso

The general objective of local resilience action plan is to make the municipality of Rosso more resilient and able to predict, anticipate and cope with any type of disaster. It is, in terms of specific objectives, to propose to the administrative and municipal authorities, to the various stakeholders and to the partners:

- The measures to be taken in terms of improvements to be made and equipment and means to be acquired to make the municipality more resilient.
- The most appropriate disaster prevention and management system to setup to better anticipate and/or respond to disasters
- Improvements and additions to introduce to the legislative and regulatory framework of emergency and disaster management to update it and make it better able to deal with the risks identified above.

A4.2.1 Prior actions to take

The analysis of disaster risk carried out in the previous developments shows that there are a certain number of challenges whose treatment by achievements would limit the occurrence of disasters or in any case would help to confront them more successfully when they intervene, the zero risk being unachievable. These are: (i) the rehabilitation of the sanitation network; (ii) the maintenance and consolidation of the protective dykes; (iii) strengthening the means of Regional Direction of Civil Protection; (iv) Setting up a stock of emergency kits; (v) the creation at the municipal level of a municipal authority dedicated to the prevention and management of disasters.

The rehabilitation of the sewerage network

It is imperative to rehabilitate the sanitation network in Rosso and entrust its maintenance and management to a qualified structure. It is:

- To uncork the gutters on a linear route of 3715 meters
- To clean the reception basins and repair the pumps that expel the water drained by the gutters and collected in the basins in the river or in the plain of M'Bleil arm.
- Entrust the management and the maintenance of the network to a competent structure and why not to the ONAS which, consequently, must open an antenna in Rosso.

Consolidation of protective dykes

Because of its geographical situation jammed between the river, the arm M'Bleil and the plain of M'Pourrié, the municipality of Rosso, at least the ancient city, cannot be safe unless it is surrounded by solid protective dykes and regularly maintained

especially on the South, East and North East sides. These dykes exist but are in a state of degradation that weakens them. It is imperative and very urgent to:

- Make the necessary studies to know the work to be done to consolidate these dykes and to raise them to a height which guarantees the non-crossing by the waters of the river or its arms whatever is the coast reached.
- Entrust this work to a qualified company or companies of civil engineering.

Strengthening the means of Regional Direction of Civil Protection

The Regional Directorate of Protection on which the city counts for various rescue and relief operations (fire, flood, drowning in the river, etc.) has currently only two multifunctional fire trucks and one ambulance broken down. In order to make this structure more capable of fulfilling its mission, it is desirable that it be equipped in addition to this with the following: one multifunctional fire truck, ii) one ambulance, iii) one Zodiac, iv) diving equipment, and v) one liaison vehicle.

Setting up a stock of emergency kits

During the 2009 flood, when a few dozens of families had to be moved/installed and had to be provided with emergency supplies (tents, blankets, mats, cooking utensils and food kits),it has been realized that these needs cannot be mobilized in Rosso. We had to wait for products awarded in Nouakchott or donations in the form of emergency kits sent by some friendly countries by plane.

To avoid these inadmissible delays in the event of disasters and even the additional costs generated by the precipitation, it is requested that the municipality gets, as part of this plan, a batch of 4,000 complete kits and that they be permanently stocked. The CSA has in Rosso a storage capacity in the order of 7,000 tons and a staff specialized in storage, management and maintenance. The municipality may entrust the storage of these kits as part of a contention that states they can be released only by decision of the prevention and management body that we will discuss in the context of this plan.

Municipal Authority for Disaster Prevention and Management

The municipality of Rosso has not yet designated a Focal Point of the International Campaign of Resilient Cities and has not included in its budget a line dedicated to the disaster management. These measures must be taken and still the municipality must designate within it a structure to be in charge of the prevention and the management of disasters, including an information service. Indeed, the mechanism proposed in this resilience plan gives a prominent role to the municipal authorities. It is therefore necessary to have a structure of management type composed of two departments:

- A department responsible for coordinating the action of the municipality in the various committees of the disaster management body where the municipality must be represented by a deputy, and for monitoring the advocacy or lobbying activities to raise awareness and obtain the equipment necessary to improve the resilience of the municipality.
- An information and early warning department that will not be in charge of producing information that are already produced by the specialized services of the State, but to collect all data related to Rosso (on the weather mailing listed by the ONM, health, river coast, OSA food security, bush fires, etc.) in order to be able to give the alert and that the partners and the technical services of the State be called to assist technically and financially, especially during its period of setting up and running-in.

Design and conduct an information-awareness campaign among populations

No disaster prevention and management strategy can succeed if populations are not involved and partners in this strategy. It is:

- Develop slogans and messages to broadcast as part of a "my city is getting ready" campaign
- Identify the organizations and associations of the populations to be used as relays to spread the messages in the districts and within the households (we can rely on the imams of mosques, the associations of women and young people, to the NGOs, etc.)
- Use the vectors of information transmission: radio, television, posters, etc.

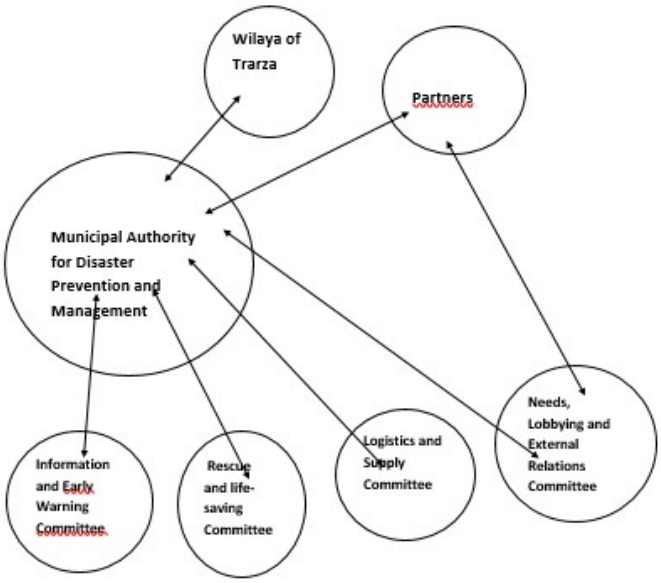
A4.2.2 Disaster prevention and management mechanisms

Current mechanisms of crisis management, emergencies and disasters do not deal with municipal level bodies but create and organize inter-ministerial Committees at the national level, Regional Emergency Monitoring and Coordination Units at the regional level, and also Departmental Committees (CODEPs) for the moughataas. The mechanism proposed here concerns the municipality of Rosso specifically and emphasizes the following points:

- A central place in the mechanism is granted to municipal authorities
- A participation of all actors who can play a role in the implementation of the plan
- Taking into account at this mechanism level all the essential functions to be foreseen for the disaster prevention and management, such as: Information and

Early Warning; Rescue and life-saving; Logistics and Supply and Needs; Lobbying and External Relations.

The proposed mechanism will maintain close relations with the State through the Wilaya of Trarza and will be schematically as shown below.



The Disaster Prevention and Management Authority in Rosso is chaired by the Hakem of the Moughataa and its secretariat is provided by the Mayor of the Municipality and comprises four committees.

The composition and the missions of each of these structures are thus defined.

Management of the authority

The Disaster Prevention and Management authority is chaired by the Hakem of the Rosso moughataa and its secretariat is provided by the Mayor of the municipality. It includes a communications officer and a needs assessment structure. The role of this authority is to:

- Consider and approve the reports of the Information and Early Warning Committee and therefore declare the crisis, urgency or disaster, if any
- Order any taking from the stock of pre-positioned rescue kits
- Coordinate and conduct the activities of the various Committees
- Ensure the relations and exchanges of correspondence with the external parties (State, Partners, Populations, etc.) before the crisis, during the response period and also for post-crisis recovery measures
- Review, process and validate the reports of the various committees

- Ensure the communication through the press and other means on the situation, the measures to be taken and the security recommendations.

Committee of Information and Early Warning

Led by the municipal information and early warning department, this Committee must include, like all national departments producing regular and relevant information on disaster risk: representative of the DRAS (SNIS), representative of the delegation of Agriculture, representative of the SONADER (River coast), representative of SCA (OSA), representative of MHA, press, and interested CSOs representatives.

This committee, which meets at the request of the Information department of the Municipality, must: i) process the data collected by the department; ii) report to the Authority management to request it to declare the alert and define its level (crisis, emergency situation, disaster); iii) go with any crisis in Rosso through regular meetings and the production of progress bulletins.

Rescue and life-saving Committee

The Relief and Life-saving Committee is chaired by the administration (Hakem) and includes: the Municipality, the Civil Protection, Armed and Security corps, the decentralized departments of the State, and interested CSOs.

This Committee's assignment is to: i) ensure the rescue of people in danger situation because of the disaster; ii) move and install individuals and families whose homes are affected; iii) bring along food and sanitation aids and relief kits to the stricken; iv) address the reasons for the disaster (extinguish fires, pump and clear waters for floods, treat the patients and vaccinate people for epidemics, etc.).

Logistics and Supply Committee

This committee is chaired by the Hakem and includes: The Delegate of CSA, the DRPC, Armed and Secrity corps, the ONAS, the DRASS, representatives of local federations of Agriculture, of Transport and Trade, and other interested CSOs.

The assignment of this committee is to coordinate and organize logistics: i) organize the use of the means of transport available for the response and the supply of fuel and lubricants to these means; ii) receive, store and mobilize food aid, relief kits and other needs to be brought to the stricken, brought by the donors (State, partners, sponsors, etc.); iii) answering calls from the Relief and Life-saving Committee; and iv) make reports to the State and partners on the use of the resources mobilized.

Needs, Lobbying and External Relations Committee

This committee is chaired by the Municipality and includes: the parliamentarians of the Moughataa of Rosso, the President of the Regional Council of Trarza, the

representatives of the federations of commerce and industry in the municipality, the representative of MEF, the Mauritanian Red Cross.

It has two types of roles: a role in normal times and a role in times of crisis. In normal times, the committee must: i) raise awareness and advocacy with the public, businessmen, state and partners to realize the disaster risk problem; ii) Prepare and work to adopt the legislative and regulatory texts necessary for the support of disaster prevention and management; iii) lobby in order to engage the public authorities and partners in the implementation of the prior actions outlined in paragraph 2.1. of this plan.

In times of crises it must: i) centralize the needs expressed by the various operational commissions; ii) formulate requests for the urgent mobilization of these needs by undertaking the steps with the State, donors and other partners; iii) ensure contacts with the various partners and submit to them the reports they request.

A4.2.3 Legislative and Regulatory Framework

The texts currently in force and which define the modalities of the emergency relief, set the thresholds of severity of the emergency situations, and specify the charges of certain national structures dedicated to the management of the crises or disasters, have a national scope and do not deal at the municipal level. They involve a high-level inter-ministerial committee at the national level, a cell chaired by the Wali at the regional level and a departmental CODEP commission at the Moughataa level. In addition, the role of the municipal authorities remains very small or non-existent and the activation of a response in case of crisis or disaster requires a decision at a very high level of the State. This is, in addition to the already regulated national system, to provide the municipality of Rosso with its own mechanism.

The national system already regulated is not called into question here, but it is a question here of giving the Municipality of Rosso its mechanism described in paragraph A4.2.2 of this plan. To do this, it needs:

- A decree of the Prime Minister or an order of the Wali that creates at Rosso level a Disaster Management Prevention authority, defines its missions, determines its structure and appoints its members. This text can be limited to a Wali decree since the mechanism only involves regional services or structures being directly under the authority of the Wali of Trarza. This text must define the relationship to be maintained by this authority with the Interdepartmental Emergency Management Committee and the Regional Emergency Management Unit.

- A Wali or a Hakem decree specifying the beginnings and procedures for declaring emergencies (crisis, disasters, etc.).

A4.2.4 Matrix of the actions of the Rosso Local Resilience Plan

Theme	Specific Action	Responsible bodies	Lobbying and fund raising bodies	Implementation monitoring bodies
1. Measures to be taken and work to be done beforehand	1.1. Rehabilitation of the sewerage network 1.1.1 Gutters uncorking 1.1.2. Repair of pumps	1. The Ministry of Hydraulics and Sanitation for the programming, APDs and the procurement. 2. ONAS for the management, follow-up and maintenance	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by involving the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • The MHA is responsible for the technical monitoring of the implementation.
	2. Consolidation of the protective dykes 2.1. Perform the necessary studies 2.2. Entrust the work to a competent PW firm	• The Ministry of Agriculture for the programming, APDs and the procurement. • The SNAT for monitoring the implementation of the works. • The Municipality and the elected officials for the mobilization of financing	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • The MA will be sought for the follow-up of the works
	3. Strengthening the means of Regional Direction of Civil Protection	• The Ministry of the Interior for the preparation of requests for the means of the CPB • The partners and the State for financing • The Municipality and the elected officials for the mobilization of financing.	• The Municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must

Theme	Specific Action	Responsible bodies	Lobbying and fund raising bodies	Implementation monitoring bodies
			implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work.	make regular reports to the Mayor, Hakem and MIDEC • The MIDEC through the DGPC
	4. Setting up of a stock of emergency kits	• Office of the Food Security Commissioner for storage and maintenance • The State and partners for the allocation of resources • The Municipality and the elected officials for the mobilization of financing.	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work.	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • Elected officials and civil society
	5. Establishment of a municipal structure dedicated to the prevention and disaster management: 1. Department for monitoring the implementation of the resilience plan 2. Department "Municipal Information and Early Warning System"	• Actions exclusively under the responsibility of the municipality for these structures • The project and the local administration for the technical support to the setting up of these structures	• The Municipality	• The municipal departments • The local administrations
2. Mechanism to establish	2.1. **Management of the Authority**	• Priority for the mechanism approval • The MIDEC and the wilaya o Trarza for the involvement of administrative authorities (Hakem of Rosso)	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • UNDP must support the municipality initiatives	• The Municipality • UNDP

Theme	Specific Action	Responsible bodies	Lobbying and fund raising bodies	Implementation monitoring bodies
		• The Municipality for the Mayor's involvement		
	2.2. Information and Early Warning Committee	• Priority for the mechanism approval • The Municipality to run this committee • All regional services producing information on risks	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • UNDP must support the municipality initiatives	• The Municipality • UNDP
	2.3. Rescue and Life-saving Committee	• Priority for the mechanism approval • The MIDEC and the wilaya of Trarza for the involvement of administrative authorities (Hakem of Rosso) and the Armed and Security forces • The other stakeholders (civil protection, health, CSA, CRM, OSCs, etc.)	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • UNDP must support the municipality initiatives	• The Municipality • UNDP
	2.4. **Logistics and Supply Committee**	• Priority for the mechanism approval • The MIDEC and the wilaya of Trarza for the involvement of administrative authorities (Hakem of Rosso) • The Municipality to run this committee • The other stakeholders (CSA, CRM, health, Professional oganizations of the carriers, other interested SCOs interesed, etc.)	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • UNDP must support the municipality initiatives	• The Municipality • UNDP
	2.5. Needs, Lobbying and External Relations Committee	• Priority for the mechanism approval • The Municipality to run this committee • The other actors (Rosso Parliamentarians, the President of the Trarza Regional Council, local federations of Trade and Industry, etc.)	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • UNDP must support the municipality initiatives	• The Municipality • UNDP

Theme	Specific Action	Responsible bodies	Lobbying and fund raising bodies	Implementation monitoring bodies
3. Legislative and Regulatory Committee	3.1. Creation of the authority 3.1.1. Decree or Order creating the authority and defining its missions 3.1.2. Order describing the beginnings and procedures for the declaration of emergencies	• The Municipality has the most important role in its creation • The MIDEC and the Wilaya of Trarza for the signature of the decree creating the departments and defining the text for the proposal of its signature by the Prime Minister • The signing of the decree specifying the beginnings and procedures for the declaration of emergencies • UNDP through the project to support the preparation of texts.	• The Mayor of Rosso municipality must lobby for the approval of his mechanism • The Wilaya has to support the mayor's efforts with the MIDEC • UNDP must support the municipality initiatives	• The Municipality • The Wilaya • UNDP

A4.3 Kaédi

The general objective of this work is to make the municipality of Kaédi more resilient and able to predict, anticipate and cope with any type of disaster. It is, in terms of specific objectives, to propose to the administrative and municipal authorities, to the various stakeholders and to the partners:

- The measures to be taken in terms of improvements to be made and equipment and means to be acquired to make the municipality more resilient
- The most appropriate disaster prevention and management system to put in place to better anticipate and/or respond to disasters
- Improvements and additions to introduce to the legislative and regulatory framework of emergency and disaster management to update it and make it better able to deal with the risks identified above.

A4.3.1 Prior actions to take

The analysis of disaster risk carried out in the previous developments shows that there are a certain number of challenges whose treatment by achievements would limit the occurrence of disasters or in any case would help to confront them more successfully when they intervene, the zero risk being unachievable. These are: (i) the rehabilitation of the sanitation network; (ii) enforcing the protection dykes; (iii) Strengthening the abilities of the Civil protection directorate; (iv) securing emergency kits; (v) creation of a body for disaster prevention and management.

The rehabilitation of the sewerage network

It is imperative to rehabilitate the sanitation network in Kaédi and entrust its maintenance and management to a qualified structure. It is:

- Do the uncorking of the gutters.
- To clean the reception basins and to provide pumps especially for the districts which do not benefit from inclination allowing the gravitational discharge.
- To clear all buildings that clog the network regardless of their land status
- Entrust the management and the maintenance of the network to a competent structure and why not to the ONAS which, consequently, must open an antenna at Kaédi.

Consolidation of protective dykes

The protection of the city of Kaédi, in particular some of its districts, depends on the quality of dykes that protect them. Kebba side, the meeting point between the river and its confluence coming from Lexeiba is a critical point that must be secured by having a sufficiently strong and high dyke. Also, the area of Dar Salam where the dyke

coming from the South over the Boghé road must be extended to the North. Finally, we must see how to open the dam formed by the tar at the level of the CSA stores, whether by a bridge or any other technical solution.

It is imperative and very urgent to:

- Make the necessary studies to know the work to be done to consolidate these dykes and to raise them to a height which guarantees the non-crossing by the waters of the river or its arms whatever is the coast reached.
- Entrust this work to a qualified company or companies of civil engineering.

Strengthening the means of Regional Direction of Civil Protection

The Regional Directorate of Protection on which the city counts for various rescue and relief operations (fire, flood, drowning in the river, etc.) has currently only one multifunctional fire truck. In order to make this structure more capable of fulfilling its mission, it is desirable that it be equipped with the following: two multifunctional fire trucks, one ambulance, one zodiac, diving equipment, and a liaison vehicle.

Provide the municipality with special fire equipment

The districts Gataga, Touldé, Gourel Sangné have plans dating back several centuries with narrow lanes not allowing the access of a vehicle. But they are currently connected to electricity and cook with butane gas and, therefore, are subject to the risk of fire as any urban district at the moment when fire trucks cannot access it. And since it is out of the question to change their physiognomy because of their importance for the cultural heritage of the city, it is recommended to:

- Provide the municipality with manual fire-fighting equipment to be positioned in each of the districts
- Train local volunteers on the use of these means
- Establish a close collaboration between the municipality and the Regional Directorate of Protection for the procurement of this material, its storage and use.

Setting up a stock of emergency kits

During the 2007 flood, when a few dozens of families had to be moved/installed and had to be provided with emergency supplies (tents, blankets, mats, cooking utensils and food kits), it has been realized that these needs cannot be mobilized in Kaédi. We had to wait for products awarded in Nouakchott or donations in the form of emergency kits sent by some friendly countries by plane. To avoid these inadmissible delays in the event of disasters and even the additional costs generated by the precipitation, it is requested that the municipality gets, as part of this plan, a batch of 4,000 complete kits and that they be permanently stocked. The CSA has in Kaédi a storage capacity

in the order of 6,000 tons and a staff specialized in storage, management and maintenance. The municipality may entrust the storage of these kits as part of a contention that states they can be released only by decision of the prevention and management body that we will discuss in the context of this plan. It must be said that currently the access to CSA infrastructure in Kaédi is difficult but it is an issue for which recommendations are made elsewhere in the present time.

Municipal Authority for Disaster Prevention and Management

The municipality of Kaédi has not yet designated a Focal Point of the International Campaign of Resilient Cities and has not included in its budget a line dedicated to the disaster management. These measures must be taken and still the municipality must designate within it a structure to be in charge of the prevention and the management of disasters, including an information service. Indeed, the mechanism proposed in this resilience plan gives a prominent role to the municipal authorities. It is therefore necessary to have a structure of management type composed of two services:

- A department responsible for coordinating the action of the municipality in the various committees of the disaster management body where the municipality must be represented by a deputy, and for monitoring the advocacy or lobbying activities to raise awareness and obtain the equipment necessary to improve the resilience of the municipality.
- An information and early warning department that will not be in charge of producing information that are already produced by the specialized services of the State, but to collect all data related to Kaédi (on the weather mailing listed by the ONM, health, river coast, OSA food security, bush fires, etc.) in order to be able to give the alert and that the partners and the technical services of the State be called to assist technically and financially, especially

Design and conduct an information-awareness campaign among populations

No disaster prevention and management strategy can succeed if populations are not involved and partners in this strategy. An information-awareness program for the populations of Kaédi must be set up by the municipality with the support of the partners. It is :

- Develop slogans and messages to broadcast as part of a "my city is getting ready" campaign
- Identify the organizations and associations of the populations to be used as relays to spread the messages in the districts and within the households (we can rely on

the imams of mosques, the associations of women and young people, to the NGOs, etc.)

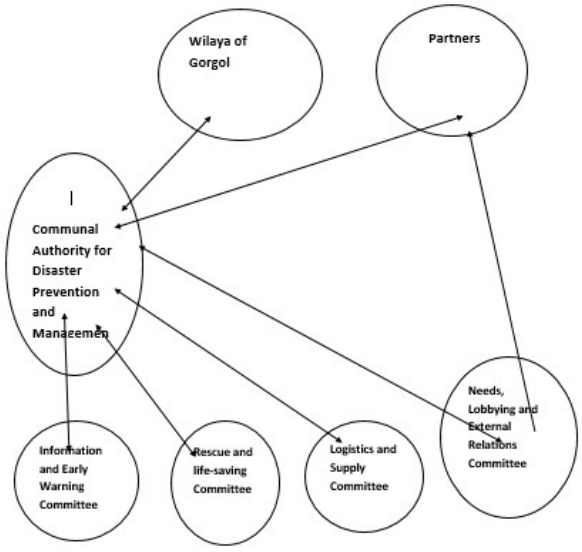
- Use the vectors of information transmission: radio, television, posters, etc.

A4.3.2 Disaster prevention and management mechanisms

Current mechanisms of crisis management, emergencies and disasters do not deal with municipal level bodies but create and organize inter-ministerial Committees at the national level, Regional Emergency Monitoring and Coordination Units at the regional level, and also Departmental Committees (CODEPs) for the moughataas. The mechanism proposed here concerns the municipality of Kaédi specifically and emphasizes the following points:

- A central place in the mechanism is granted to municipal authorities
- A participation of all actors who can play a role in the implementation of the plan
- Taking into account at this mechanism level all the essential functions to be foreseen for the disaster prevention and management, such as: Information and Early Warning; Rescue and life-saving; Logistics and Supply and Needs; Lobbying and External Relations.

The proposed mechanism will maintain close relations with the State through the wilaya of Gorgol and will be schematically as follows.



The Disaster Prevention and Management Authority in Kaédi is chaired by the Hakem of the Mougataa and its secretariat is provided by the Mayor of the Municipality and comprises four committees. The composition and the missions of each of these structures are defined below.

Management of the Authority

The Disaster Prevention and Management Authority is chaired by the Hakem of the Mougataa of Kaédi and its secretariat is provided by the Mayor of the Municipality. It includes a communications officer and a needs assessment structure. The role of this authority is to: i) consider and approve the reports of the Information and Early Warning Committee and therefore declare the crisis, urgency or disaster, if any; order any taking from the stock of pre-positioned rescue kits; iii) coordinate and conduct the activities of the various Committees; iv) ensure the relations and exchanges of correspondence with the external parties (State, Partners, Populations, etc.) before the crisis, during the response period and also for post-crisis recovery measures; v) review, process and validate the reports of the various committees; and vi) ensure the communication through the press and other means on the situation, the measures to be taken and the security recommendations.

Committee of Information and Early Warning

Led by the municipal information and early warning department, this Committee must include, like all national departments producing regular and relevant information on disaster risk: representative of the DRAS (SNIS), representative of the Delegation of Agriculture, representative of the Regional Directorate of SONADER (river coast), RD of the MEDD, RDDDL, RD of Breeding , representative of the Office of the Commissioner for Food Security (OSA), interested OSCs representatives, AMI, and RADIO GORGOL.

This committee, which meets at the request of the Information department of the Municipality, must: i) Process the data collected by the department; ii) Report to the Authority management to request it to declare the alert and define its level (crisis, emergency situation, disaster); and iii) Go with any crisis in Kaédi through regular meetings and the production of progress bulletins.

Relief and Rescue Committee

The Relief and Rescue Committee is chaired by the administration (hakem) and includes: the Municipality, Armed and Security corps, the Civil Protection, the Ministry of Health, the CSA, MHA, SOMELEC, SNDE, CRM, interested CSOs.

This Committee's assignment is to: i) to ensure the rescue of people in danger situation because of the disaster; ii) move and install individuals and families whose homes are affected; iii) bring along food and sanitation aids and relief kits to the stricken; and iv) address the reasons for the disaster (extinguish fires, pump and clear waters for floods, treat the patients and vaccinate people for epidemics, etc.).

Logistics and Procurement Committee

This committee is chaired by the (Hakem) and includes: the Municipality, office of the Commissioner for Food Security, the Ministry of Health, Armed and Security corps, representatives of local federations of Transport and Trade, other interested Civil Society Organizations.

The assignment of this committee is to coordinate and organize logistics: i) organize the use of the means of transport available for the response and the supply of fuel and lubricants to these means; ii) receive, store and mobilize food aid, relief kits and other needs to be brought to the stricken, brought by the donors (State, partners, sponsors, etc.); iii) answering calls from the Relief and Rescue Committee; and iv) report to the State and partners on the use of the resources mobilized.

Needs, Lobbying and External Relations Committee

This committee is chaired by the Municipality and includes: the parliamentarians of the Moughataa of Kaédi, the President of the Regional Council of Gorgol, the representatives of the federations of commerce and industry in the municipality, the MEF Cell, the PRDDL, office of the Commissioner for Food Security, the Ministry of Health, and the Mauritanian Red Cross.

It has two types of roles: a role in normal times and a role in times of crisis. In normal times, the committee must: i) raise awareness and advocacy with the public, businessmen, state and partners to realize the disaster risk problem; ii) prepare and work to adopt the legislative and regulatory texts necessary for the support of disaster prevention and management; and lobby in order to engage the public authorities and partners in the implementation of the prior actions outlined in paragraph A4.3.1. of this plan.

In times of crises it must: i) Centralize the needs expressed by the various operational commissions; ii) formulate requests for the urgent mobilization of these needs by undertaking the steps with the State, donors and other partners; and iii) ensure contacts with the various partners and submit to them the reports they request.

A4.3.3 Legislative and Regulatory Framework

The texts currently in force and which define the modalities of the emergency relief, set the thresholds of severity of the emergency situations, and specify the charges of certain national structures dedicated to the management of the crises or disasters, have a national scope and do not deal at the municipal level. They involve a high-level inter-ministerial committee at the national level, a cell chaired by the Wali at the regional level and a departmental CODEP commission at the Moughataa level. In

addition, the Wali of Gorgol has signed an order dated 07 February 2017 creating a Regional Committee for Disaster Prevention and Management. The role of the municipal authorities remains very small or non-existent and the activation of a response in case of crisis or disaster requires a decision at a very high level of the State. This is, in addition to the already regulated national system, to provide the municipality of Kaédi with its own mechanism. The national system already regulated is not called into question here, but it is a question here of giving the Municipality of Kaédi its mechanism described in paragraph 2.2. of this plan. To do this, it needs:

- A decree of the Prime Minister or an order of the Wali that creates at Kaédi level a Disaster Management Prevention authority, defines its missions, determines its structure and appoints its members. This text can be limited to a Wali decree since the mechanism only involves regional services or structures being directly under the authority of the Wali of Gorgol. This text must define the relationship to be maintained by this authority with the Interdepartmental Emergency Management Committee and the Regional Emergency Management Unit.
- A Wali or a Hakem decree specifying the thresholds and procedures for declaring emergencies (crisis, disasters, etc.).

A4.3.4 Matrix of actions of Kaédi's local resilience plan

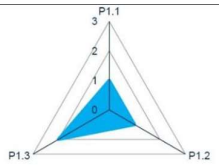
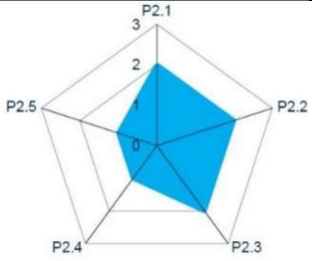
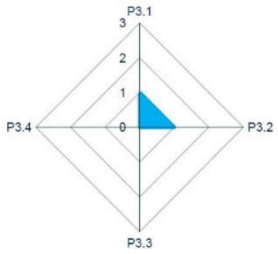
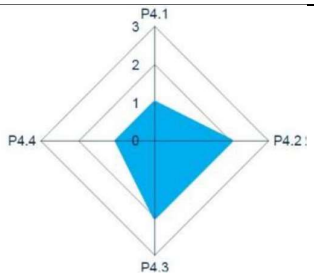
Theme	Specific action	Implementation bodies	Lobbying and fundraising bodies	Monitoring bodies
1. Measures to be taken and work to be done beforehand	1.1. Rehabilitation of the sewerage network 1.1.1. Gutters uncorking 1.1.2. Cleaning the reception basins and forecasting pumps for the low areas	• The Ministry of Hydraulics and Sanitation for the programming, APDs and the procurement. • ONAS for the management, follow-up and maintenance	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work.	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • The MHA is responsible for the technical monitoring of the implementation.

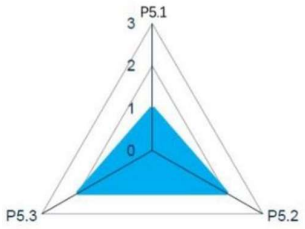
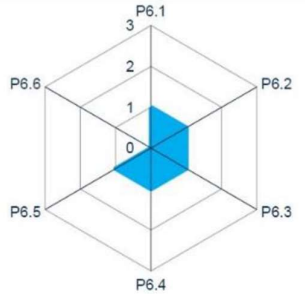
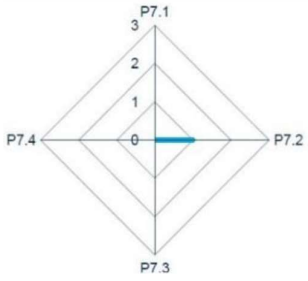
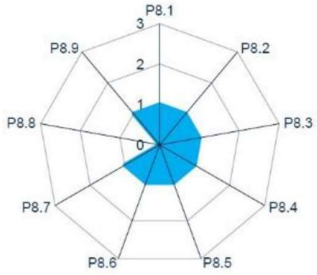
Theme	Specific action	Implementation bodies	Lobbying and fundraising bodies	Monitoring bodies
	2. Consolidation of the protective dykes 2.1. Perform the necessary studies 2.2. Entrust the work to a competent TP firm	• The Ministry of Agriculture for the programming, APDs and the procurement. • The SNAT for monitoring the implementation of the works. • The Municipality and the elected officials for the mobilization of financing.	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • The MA will be sought for the follow-up of the works
	3. Strengthening the means of Regional Direction of Civil Protection	• The Ministry of the Interior for the preparation of requests for the means of the CPB • The partners and the State for financing • The Municipality and the elected officials for the mobilization of financing.	• The Municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work.	
	4. Setting up of a stock of emergency kits	• Office of the Food Security Commissioner for storage and maintenance • The State and partners for the allocation of resources • The Municipality and the elected officials for the mobilization of financing.	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work	• The Municipality in the first place is responsible for monitoring the implementation of this activity. • A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • Elected officials and civil society
	5. Providing the municipality with fire fighting equipment 5.1. Procuration of manual equipment	• The Municipality for the procurement and the possession of the material • DGPC for the training and coaching of	• The municipality plays the main role. • The Committee (Needs, Lobbying and External Relations) at the level of the Disaster Prevention and Management Authority	• The Municipality in the first place is responsible for monitoring the implementation of this activity.

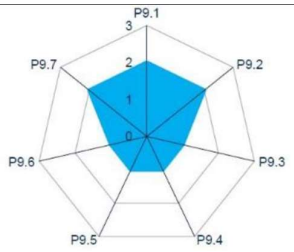
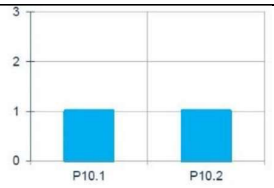
Theme	Specific action	Implementation bodies	Lobbying and fundraising bodies	Monitoring bodies
	5.2. Training of local volunteers on the use of this material	volunteer to use equipment as needed • The State and partners for the allocation of resources for the financing of equipment	is also responsible for getting involved by implicating the parliamentarians and the President of the Regional Council and other important personalities who are part of it. • UNDP, through the project, should provide a technical support to this advocacy and lobbying work.	• A deputy mayor must be appointed specifically to monitor the implementation of this action and must make regular reports to the Mayor, Hakem and MIDEC. • The DGPC
	6. Mise en place d'une structure communale dédiée à la prévention et Gestion des catastrophes 6.1. Service du suivi de la mise en œuvre du plan de résilience 6.2. Service « Système communal d'information et d'alerte précoce »	• Actes exclusivement de la responsabilité de la commune pour de ces structure • Le projet et locale pour l'appui technique à la mise en place de ses structures	• The Municipality	• Municipal services
2. **Dispositif à mettre en place**	2.1. Direction de l'Instance	• La primature pour l'approbation du dispositif • Le MIDEC et la wilaya du Gorgol pour l'implication des autorités administratives (Hakem de Kaédi) • La Commune pour l'implication du Maire	• Le Maire de la commune de Rosso doit faire du lobbying pour faire approuver son dispositif • Le PNUD doit appuyer les démarches de commune	• The Municipality • UNDP
	2.2. Commission d'information et d'alerte précoce	• La primature pour l'approbation du dispositif • La commune dirigeant cette commission • Tous services régionaux producteurs d'information sur les risques.	• Le Maire de la commune de Kaédi doit faire du lobbying pour faire approuver son dispositif • Le PNUD doit appuyer les démarches de commune	• The Municipality • UNDP
	2.3. Commission de Secours et de Sauvetage	• La primature pour l'approbation du dispositif • Le MIDEC et la wilaya de Gorgol pour l'implication des autorités administratives (hakem de Kaédi et les forces armées de Sécurités • Les autres intervenants (protection civile,	• Le Maire de la commune de Rosso doit faire du lobbying pour faire approuver son dispositif • Le PNUD doit appuyer les démarches de commune	• La commune • Le PNUD

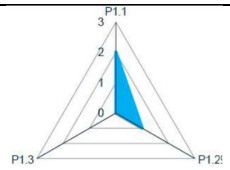
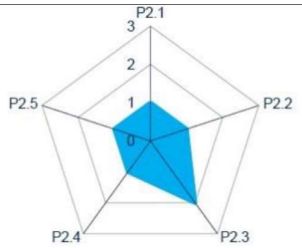
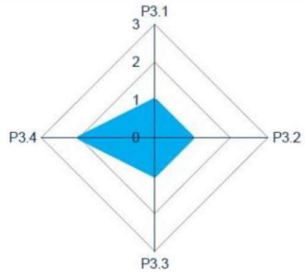
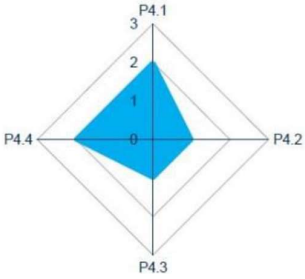
Theme	Specific action	Implementation bodies	Lobbying and fundraising bodies	Monitoring bodies
		santé, , CSA, CRM, OSCs, etc.)		
	2.4. Commission Logistique et Approvisionnement	• La primature pour l'approbation du dispositif • Le MIDEC et la wilaya de Gorgol pour l'implication des autorités administratives (hakem de Kaédi) • La commune dirigeant cette commission • Les autres intervenants (CSA, CRM, Santé, Organisations professionnelles des transporteurs, autres OSCs intéressées, etc.)	• Le Maire de la commune de Kaédi doit faire du lobbying pour faire approuver son dispositif • Le PNUD doit appuyer les démarches de commune	• La commune • Le PNUD
	2.5. Commission Besoins, Lobbying et Relations	• La primature pour l'approbation du dispositif • La commune dirigeant cette commission • Les autres acteurs (Parlementaires de Kaédi, le Président du Conseil régional du Gorgol, les fédérations locales du commerce et l'industrie, etc.)	• Le Maire de la commune de Rosso doit faire du lobbying pour faire approuver son dispositif • Le PNUD doit appuyer les démarches de commune	• La commune • Le PNUD
3. Cadre législatif et réglementaire	3.1. Création de l'Instance 3.1.1. Décret ou arrêté créant l'instance et définissant ses missions 3.1.2. Arrêté précisant les seuils et modalités de déclaration des urgences	• La Commune a le rôle le plus important dans sa création • Le MIDEC et la wilaya de Trarza la signature de l'arrêté créant l'instances et définissant pour la proposition du texte pour la signature du décret par Le Premier Ministre • La signature de l'arrêté précisant les seuils et modalités de déclaration des urgences • Le PNUD à travers le projet pour l'appui a la préparation des textes	• Le Maire de la commune de Rosso doit faire du lobbying pour faire approuver son dispositif • La wilaya pour appuyer les efforts du maire auprès du MIDEC • Le PNUD doit appuyer les démarches de la commune	• La commune • La wilaya • Le PNUD

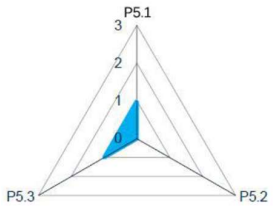
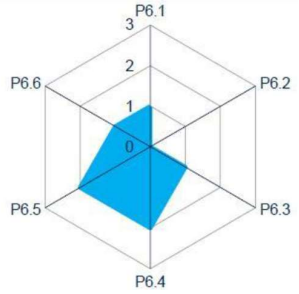
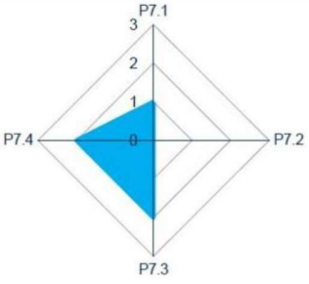
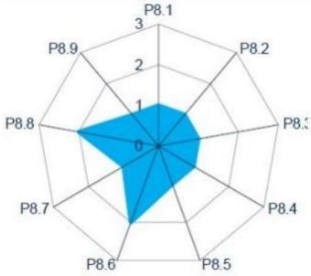
ANNEX 5 – Preliminary Scorecard Assessment Results for the Five Tunisian Cities

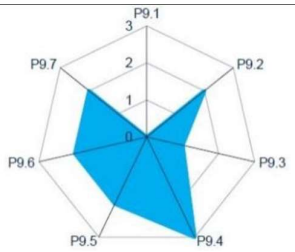
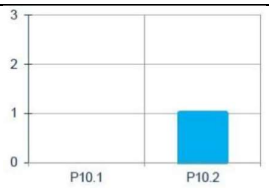
Preliminary Scorecard Assessment for the City of **Bousalem**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

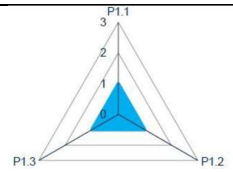
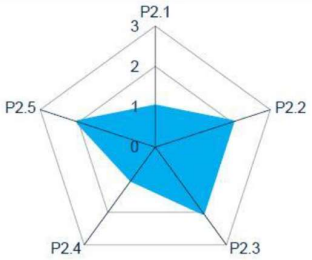
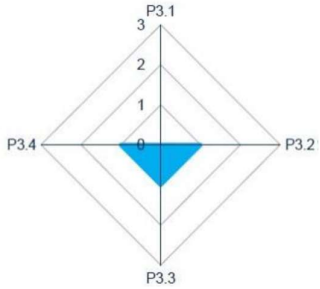
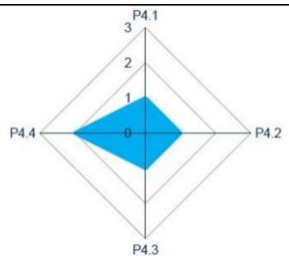
Preliminary Scorecard Assessment for the City of **Bousalem**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors	

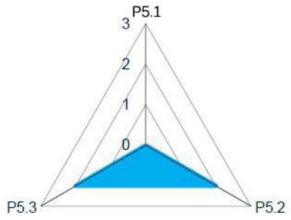
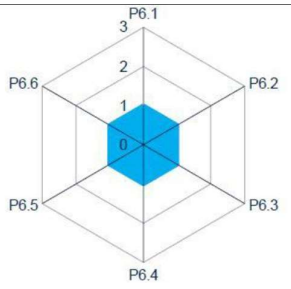
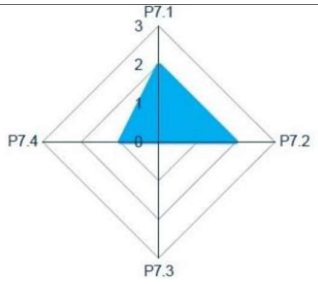
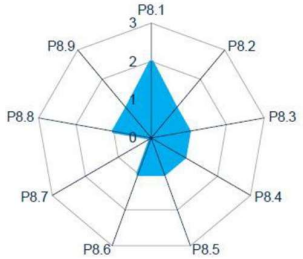
Preliminary Scorecard Assessment for the City of **Bousalem**		
Essential No	Questions / Indicators	Results
	remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

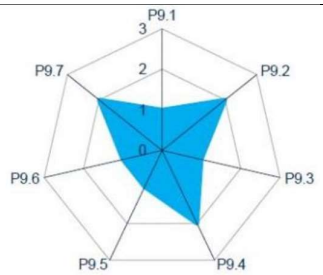
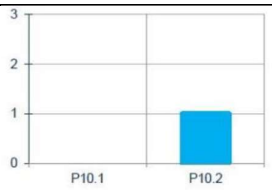
Preliminary Scorecard Assessment for the City of **Gabes**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

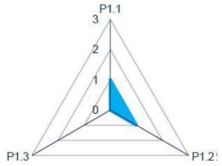
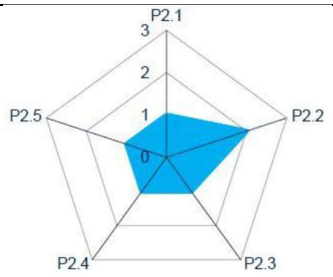
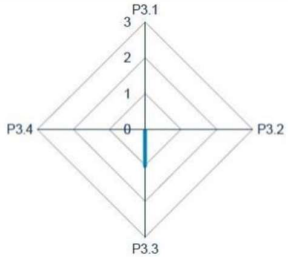
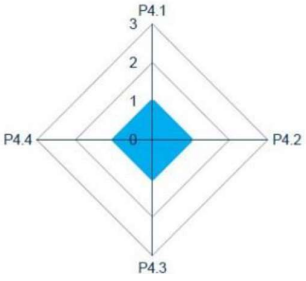
Preliminary Scorecard Assessment for the City of **Gabes**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors	

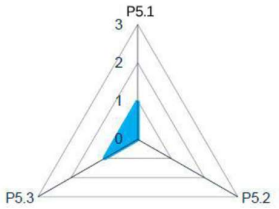
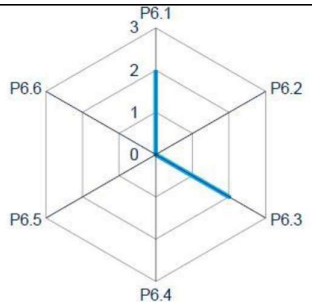
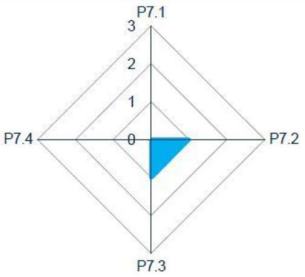
Preliminary Scorecard Assessment for the City of **Gabes**		
Essential No	Questions / Indicators	Results
	remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

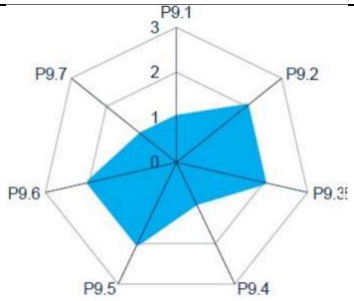
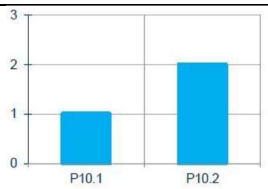
Preliminary Scorecard Assessment for the City of **Kasserine**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

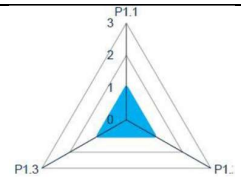
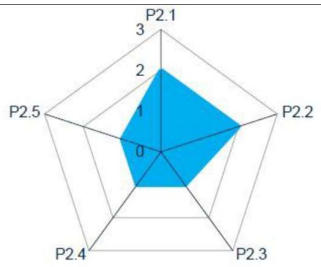
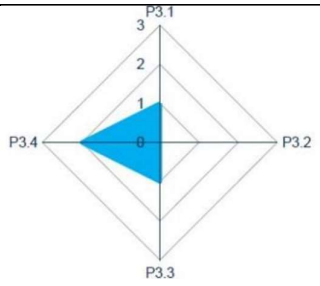
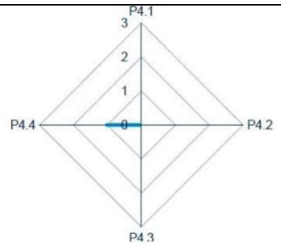
Preliminary Scorecard Assessment for the City of **Kasserine**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors	

Preliminary Scorecard Assessment for the City of **Kasserine**		
Essential No	Questions / Indicators	Results
	remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Mateur**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

Preliminary Scorecard Assessment for the City of **Mateur**		
Essential No	Questions / Indicators	Results
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event	

Preliminary Scorecard Assessment for the City of **Mateur**		
Essential No	Questions / Indicators	Results
	of failure would energy infrastructure corridors remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Preliminary Scorecard Assessment for the City of **Siliana**		
Essential No	Questions / Indicators	Results
1 - Organise for disaster resilience	• P1.1 Does the City master plan (or relevant strategy/plan) adopt the Sendai Framework? • P1.2 Is there a multi-agency/sectoral mechanism with appropriate authority and resources to address disaster risk reduction? • P1.3 Is resilience properly integrated with other key city functions / portfolios?	
2 - Identify, understand, and use current and future risk scenarios	• P2.1 Does the city have knowledge of the key hazards that the city faces, and their likelihood of occurrence? • P2.2 Is there a shared understanding of risks between the city and various utility providers and other regional and national agencies that have a role in managing infrastructure such as power, water, roads and trains, of the points of stress on the system and city scale risks? • P2.3 re their agreed scenarios setting out city-wide exposure and vulnerability from each hazard, or groups of hazards (see above)? • P2.4 Is there a collective understanding of potentially cascading failures between different city and infrastructure systems, under different scenarios? • P2.5 Do clear hazard maps and data on risk exist? Are these regularly updated?	
3 - Strengthen financial capability for resilience	• P3.1 The city / lead agencies understand all sources of funding, and the “resilience dividends”, are well connected, understand all available routes to attract external funding and are actively pursuing funds for major resilience investments. • P3.2 Does the city have in place a specific ‘ring fenced’ (protected) budget, the necessary resources and contingency fund arrangements for local disaster risk reduction (mitigation, prevention, response and recovery)? • P3.3 What level of insurance cover exists in the city, across all sectors – business and community? • P3.4 What incentives exist for different sectors and segments of business and society to support resilience building?	
4 - Pursue resilient urban development and design	• P4.1 Is the city appropriately zoned considering, for example, the impact from key risk scenarios on economic activity, agricultural production, and population centres? • P4.2 Are approaches promoted through the design and development of new urban development to promote resilience? • P4.3 Do building codes or standards exist, and do they address specific known hazards and risks for the city? Are these standards regularly updated? • P4.4 Are zoning rules, building codes and standards widely applied, properly enforced and verified?	

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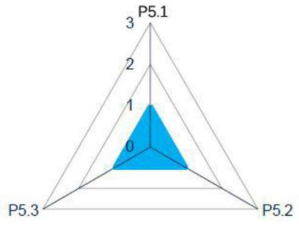
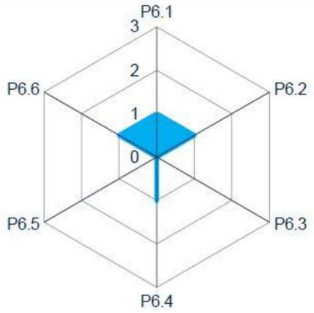
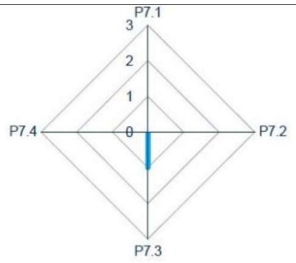
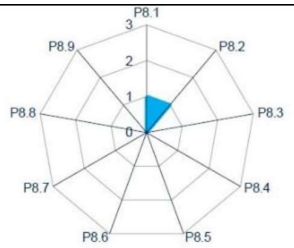
5 - Safeguard natural buffers to enhance the protective functions offered by natural capital	• P5.1 Beyond just an awareness of the natural assets, does the city understand the functions (or services) that this natural capital provides for the city? • P5.2 Is green and blue infrastructure being promoted on major urban development and infrastructure projects through policy? • P5.3 Is the city aware of ecosystem services being provided to the city from natural capital beyond its administrative borders? Are agreements in place with neighbouring administrations to support the protection and management of these assets?	
6 - Strengthen institutional capacity for resilience	• P6.1 Does the city have clear access to all the skills and experience it believes it would need to respond to reduce risks and respond to identified disaster scenarios? • P6.2 Does a co-ordinated public relations and education campaign exist, with structured messaging and channels to ensure hazard, risk and disaster information (that can be understood and used) are properly disseminated to the public? • P6.3 Extent to which data on the city's resilience context is shared with other organizations involved with the city's resilience. • P6.4 Are there training courses covering risk and resilience issues offered to all sectors of the city including government, business, NGOs and community? • P6.5 Are training materials available in the majority of languages in common use in the city? • P6.6 Is the city proactively seeking to exchange knowledge and learn from other cities facing similar challenges?	
7 - Understand and strengthen societal capacity for resilience	• P7.1 Are "grassroots" or community organizations participating in risk reduction and post-event response for each neighbourhood in the city? • P7.2 Are there regular training programmes provided to the most vulnerable populations in the city? • P7.3 What proportion of businesses have a documented business continuity plan that has been reviewed within the last 18 months? • P7.4 How effective is the city at citizen engagement and communications in relation to DRR?	
8 - Increase infrastructure resilience	• P8.1 Is critical infrastructure resilience a city priority, does the city own and implement a critical infrastructure plan or strategy? • P8.2 Is existing protective infrastructure well-designed and well-built based on risk information? • P8.3 Would a significant loss of service for these two essential services be expected for a significant proportion of the city under the agreed disaster scenarios? • P8.4 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would energy infrastructure corridors	

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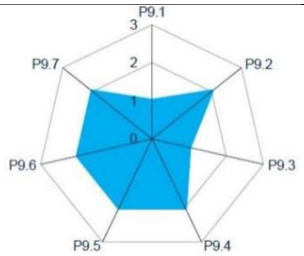
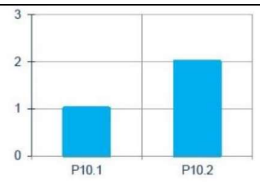
Essential No	Questions / Indicators	Results
	remain safe (i.e. free from risk of leaks, electrocution hazards etc.)? • P8.5 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? In the event of failure would transport infrastructure corridors remain safe (i.e. free from risk of flood, shocks etc) and passable? • P8.6 Would a significant loss of service be expected for a significant proportion of the city in the 'worst case' scenario event? • P8.7 Would there be sufficient acute healthcare capabilities to deal with expected major injuries in 'worst case' scenario? • P8.8 % of education structures at risk of damage from "most probable" and "most severe" scenarios • P8.9 Will there be sufficient first responder equipment, with military or civilian back up as required?	
9 - Ensure effective disaster response	• P9.1 Does the city have a plan or standard operating procedure to act on early warnings and forecasts? What proportion of the population is reachable by early warning system? • P9.2 Is there a disaster management / preparedness / emergency response plan outlining city mitigation, preparedness and response to local emergencies? • P9.3 Does the responsible disaster management authority have sufficient staffing capacity to support first responder duties in surge event scenario? • P9.4 Are equipment and supply needs, as well as the availability of equipment, clearly defined? • P9.5 Would the city be able to continue to feed and shelter its population post-event? • P9.6 Is there an emergency operations centre, with participation from all agencies, automating standard operating procedures specifically designed to deal with "most probable" and "most severe" scenarios? • P9.7 Do practices and drills involve both the public and professionals?	
10 - Expedite recovery and build back better	• P10.1 Is there a strategy or process in place for post-event recovery and reconstruction, including economic reboot, societal aspects etc.? • P10.2 Do post-event assessment processes incorporate failure analyses and the ability to capture lessons learned that then feed into design and delivery of rebuilding projects?	

Annex 6 Summary of the In-depth Risk assessment for Gabes and Mateur

A6.1 Greater Gabes

A6.1.1 General Socio-economic Data

The study area covers an area of 48,429.8 ha of five municipalities of the Greater Gabes (Gabes, Ghannouche, Chénini-Nahal, Bouchamma, and Téboulbou), which belong to four delegations (Gabès Médina, Ghannouche, Gabes West and Gabes South). The delegations and the municipal breakdown are given below.

Table1. Administrative breakdown by delegation, sector and municipality of the study area

DELEGATION	# OF SECTORS	N+	SECTORS	AREA HA	MUNICIPALITIES	AREA (ha)
Gabes Medina	5	**1**	Sector 1	147.2	**Gabes**	3094.8
		2	Sector 2	130.6		
		3	Sector 3	308.3		
		4	Sector 4	293.3		
		5	Chott Sidi	799.7		
Téboulbou	7	**6**	Sector 5	591.6		
		7	Sidi Boulbaba	629.5		
		8	Zrig Eddakhlania	194.6		
		9	Teboulbou	6752.4	**Teboulbou**	27908.2
		10	Limaoua,	5156.8		
		11	El Amazir	4206.4		
		12	El Medou	11792.6		
Gabes West	7	**13**	Bouchemma	5004.6	**Bouchemma**	5004.6
		14	Er-Remathi	7450.6	**Chenini-Nahal**	10423.3
		15	Jaouaoula	161.5		
		16	Nahal	340.4		
		17	Chenini West	1022.3		
		18	Chenini East	85.2		
		19	Chenini North	1363.3		
Ghannouche	4	**20**	Ghannouche East	163.9	**Ghannouche**	1998.9
		21	Ghannouche West	784.8		
		22	Ghannouche South	537.6		
		23	Ghannouche North	512.6		
Total	23	**23**		**48 429.8**		**48 429.8**

The demographic characteristics of the population, the characterization of the biophysical and natural context, the existing resources, and a critique of the infrastructures and equipment of these municipalities, were reported in Deliverable 2 of Phase 1 of this study. For the whole of Greater Gabes, the population in 2004 counts 159,826 inhabitants. This population increased to reach 180,972 in 2014, and was estimated at 189,623 in 2017; this increase can be translated into a growth rate of nearly 1.36%/year from 2004 to 2014 and 1.51% from 2014 to 2017 with an estimated population of 189,623 individuals. The population growth at these municipalities can be estimated at 210,576 inhabitants in 2024 and 244,623 inhabitants in 2034, with the population of the South Gabes delegation being dominant, representing 41.73% [31].

A6.1.2 Methodology for Hazard, Vulnerability and Risk Assessment

The hazard is a two-dimensional entity: the frequency (probability of occurrence) of the hazard and its severity, which defines its class from very low (tolerable) to very high (intolerable).

Vulnerability is conditioned by the contribution of several constraints (variables). For example, vulnerability to flooding involves water flow, slope, drainage density, topography, etc., and the location of an entity and its resistance to the effects of runoff. This vulnerability is classified from very low to very high.

Risk is calculated by combining/multiplying the value of the hazard and the value of the vulnerability in a given risk situation.

Hazard classes			Vulnerability classes		
1	Very low	X	1	Very low	=
2	Low		2	Low	
3	Moderate/Medium		3	Moderate/Medium	
4	High		4	High	
5	Very high		5	Very high	

Hazard classes	Vulnerability classes				
	1	2	3	4	5
1	Very low risk	Very low risk	Low risk	Low risk	Low risk
2	Very low risk	Low risk	Medium Risk	Medium Risk	Medium Risk
3	Low risk	Low risk	Medium Risk	Medium Risk	High Risk
4	Low risk	Medium Risk	Medium Risk	High Risk	High Risk
5	Low risk	Medium Risk	High Risk	High Risk	Very high risk

Calculation and assessment process for risk severity classes

Exploitation of the database allows mapping of hazard and vulnerability. For each type of risk, using geo-referenced files, in raster mode (alphanumeric), zonal variations are characterized at the municipal and sector level through classes of this hazard and corresponding vulnerability classes; By multiplying the attributes of classes 1 to 5 as shown above, the risk classes can be calculated from very low (tolerable) to very high (intolerable).

A6.1.3 Discussion on Risk Assessment

Flood risk

Flood hazard: It is constrained by 24-hour rains, high return periods (50 to 100 years) and land use, in addition to historical events with significant consequences from 1325 to the present day. The following sectors are subject to the highest flood hazard:

- Téboulbou sectors and the Northern East part of the sector of El Medou (municipality of Téboulbou) little occupied and belonging to the vast basin of the Wadi Essourrag 1 and 2;
- Sidi Boulbaba sector (municipality of Gabes) in its Southern West part which is little occupied and crossed from South to North by small tributaries of the Wadi Gabes;

- Chénini-West sector (municipality of Chénini-Nahal) in its Southern East part on the left bank of the Wadi Gabes, partially occupied by the palm grove.

The high hazard affects the majority of the sectors of Téboulbou municipalities, Chénni-Nahal at the palm grove surroundings and Bouchemma. It affects particularly sectors of Gabes municipality, including those of Sidi Boulbaba, Sector 5 and Zrig Eddakhlania in the South, and those on the banks of the course and the canal of Wadi Gabes (Sector 1 to Sector 4). The Chott Sidi Abdessalem sector built at the expense of the palm grove is also exposed to a very dominant hazard. On the other hand, the flood hazard in the municipality of Ghannouche is predominantly low to medium.

Vulnerability: It is constrained by three variables (drainage density x permeability index x road sensitivity index). CES schemes in watersheds, dams and hydraulic thresholds (Rémaga dams on Wadi Gabes; Ras El Wadi hydraulic thresholds) built upstream, diversion of the Wadi Gabes in the urban area, etc., contribute to the reduction of vulnerability to weak and middle classes. The high density of land access and concreting routes, the inadequate drainage network in the city, and the density of the coastal drainage network in low-lying areas aggravate the urban domain's vulnerability to flooding. This is attested by:

- Frequent historical flooding (coastal zone of Mtorrech and Ghannouche, domain of the former bed of Wadi Gabes, Chott Sidi Abdessalem, neighborhoods of Gabes located in the Southern West of the Canal of Wadi Gabes);
- The high vulnerability which is identified for the sectors of Téboulbou in its coastal zone formed by chotts and sebkha, the sectors Sector 5, Zrig Eddakhlania and Sidi Boulbaba and in particular Sector 1 to Sector 4 of Gabes' municipality, in the north of the floodway, which are heavily urbanized, crossed by the former bed of Wadi Gabes and located near the mouth of this Wadi;
- The two sectors of East and South Ghannouche located at the north of the Industrial Zone, in the watershed of Wadi Tine, are also highly vulnerable to flooding.

Flood risk. The areas at high risk of flooding are: the urbanized coastal region, the ancient city in the southern part of the municipality of Gabes and its industrial zone, the city of Chott Sidi Abdessalem, and the area along the former course of Wadi Gabes. The same applies to the central and northern part of the municipality of

Teboulbou, and the sectors Chénini Nord and Chénini Ouest neighbouring the numerous tributaries of Wadi Gabes, draining the region of Ras El Wadi.

The flood risk thus spares no area of the municipalities of Téboulbou, Chénini-Nahal, Bouchemma and especially none of those of the municipality of Gabes from a high vulnerability to the flood. Indeed, in this municipality, Sector 1 to Sector 4, the sectors of Sidi Boulbaba and Zrig Eddakhlania, and especially the sector of Chott Sidi Addessalem are threatened by a high risk.

The two sectors East and South Ghannouche located in the basin of Wadi Tine, are at medium risk with a local tendency to high risk in the low area, with cleared palm grove, and those closest to the left bank of Wadi Tine.

Aggravating factors. The risk of flooding may be aggravated by:

- Constructions, dwellings and plots of arboriculture in the major bed of Wadi Gabes (sectors Chénini West, Chénini Nord and Er-Rémathi);
- The lack of monitoring of the condition of the canals and waterways, the defective fittings of development, the lack of regular cleaning of the main waterway (bypass channel of Wadi Gabes, former bed of this wadi), in addition to discharges of all types of waste obstructing development, watercourses and drainage channels;
- This obstruction of the ways and channels at Gabes is illicit and reflects total unconsciousness. Wadi Tine is obstructed by waste: ordinary/industrial, construction, household, dangerous (plastics, car tires, paint cans, etc.). The canal on the old bed of Wadi Gabes constitutes of black water, garbage bags, TV carcasses and fridge, etc.;
- The unauthorized habitat that developed in a dazzling way in the post-2011 period, without the prior servicing of the land, and without the support for the rainwater drainage;
- The lack of maintenance of the drainage channels of the oasis soils, and the obstruction of these pipes to access the anarchic constructions;
- Inadequate management for wastewater treatment (ONAS) leads to the use of lost wells. The wastewater from these wells (several million m3/year) delivered to the aquifer causes the rise of the piezometric level and the waterlogging of soils (nechaaîa);

- The bacterial load of this untreated sewage from the lost wells is dangerous to health (fecal coliforms, streptococci, etc.) and can be a source of epidemic by stagnation of water during flooding.

Disaster situation. Estimates of centenary floods in the main wadis indicate that, despite existing developments, peak flows can cause flooding in virtually all areas of the studied municipalities.

Challenges. In addition to habitat damage and the risk of loss of life, all bridges in the region may be damaged in the event of 100-year rainfall (or more).

Major Recommendations:

- Urgent need for rehabilitation of the two block valves near the Sidi Boulbaba bridge located at the junction of the former fitted bed of Wadi Gabes and its bypass channel;
- Necessity of regular annual cleaning of waterways and drainage systems;
- Controlling and prohibiting the construction of unauthorized habitat especially in palm groves, which often leads to the dysfunction of drainage channels;
- Urgent need to control and prohibit the dumping of all types of waste into waterways and drainage canals, and to severely penalize offenders;
- Urgent need to control and prohibit the dumping of all types of waste into waterways and drainage canals, and to severely penalize offenders;
- Upgrading of the storm drainage, and regular maintenance and cleaning of the network; institutional and regulatory responsibility for the management of the rainwater drainage network must also be resolved;
- The walled canal built on Wadi Gabes; partially covered in scupper, is too undersized. This development must benefit from a new rehabilitation project so that this canal can ensure its function in the evacuation of rainwater in case of a storm in the city.

Seismic Risk

Hazard. The seismic hazard for the municipalities of the Great Gabes is established based on the instrumental earthquakes recorded during the last three decades in the region, including in the proximal marine domain (intensity, depth).

The seismic hazard varies from low in the south in the municipality of Téboulbou and in the southern part of the municipality of Gabes, to medium in the north, in the northern part of the latter, in the municipality of Chénini-Nahal, in the eastern part of

the municipality of Bouchemma, and in the southeast part of the municipality of Ghannouche. The area with high to very high hazards, with deep earthquakes, is confined to the delegation of El Métouia and extends to the Western sectors of the two municipalities of Ghannouche and Bouchemma.

Vulnerability. Two areas of low to medium vulnerability in the southern part of the municipality of Téboulbou (sectors Limaoua and El Medou), are overlapped on faulty geological structures dating from the Cretaceous-Aptien and the Tertiary.

All areas of the municipality of Gabes, the areas of Ghannouche East and Ghannouche South and the eastern part of the municipality of Bouchemma are weakly vulnerable to earthquakes due to earthquakes of a period of return of the order of 50 years.

Seismic risk. The municipality of Téboulbou is very low risk dominant, but the El Medou sector at this municipality, the municipalities of Gabes and Chénini-Nahal and most of the municipalities of Bouchemma and Ghannouche are at low seismic risk. Sectors of South and West Ghannouche, and the sector of Bouchemma locally present a medium seismic risk in relation to the seismic hazard zone highly centered in Ouedhref and El Métouia municipalities.

Aggravating factors. Poor building foundations, especially unlawful construction, may increase the seismic risk. This risk is also aggravated by the modification of the mechanical properties of foundation soils on waterlogged and saline soils that can cause a high alkali-reactivity of beta. The lack of a seismic code and recommendations for foundations, in addition to the lack of awareness and information about this natural hazard on land and at sea, can aggravate the situation.

Catastrophic situation. Earthquakes with return periods of 500 to 1000 years, although very unlikely, can reach intensities of VII to VIII especially in the marine domain. This fact can lead to tsunamis with serious consequences for the coastal areas of the municipalities of Téboulbou, Gabes and Ghannouche.

Likely challenges. They are the risk of loss of property and possibly of human life, the accidents that can occur in the coastal industrial zone, and the effects of coastal waves.

Major recommendations. The need for the elaboration and application of a seismic code, complying with the Urban Planning Code and the PAU, the fight against unauthorized constructions, and the multiplication of geological and geophysical studies in this field, turn out to be necessary.

Risk of water erosion

Hazard. This hazard is calculated based on constraints: spatial distribution of annual rainfall, land use, and distribution of urban areas.

The bare soils of the southern part of the municipality of Gabes (sectors: Zrig Eddakhlania, Sidi Boulbaba and Sector 5), and the northern and coastal part of the sector of Téboulbou (municipality of Téboulbou), are subject to severe water erosion. Further north, the sectors 1 to 4 and especially the sector Cité Sidi Abdessalem won over the oasis are at high risk of water erosion. The same applies to the East and South Ghannouche sectors, the East part of the Bouchemma sector, and the three East sectors of the municipality of Chénini-Nahal (Jouaoula, Nahal and Chénini East). For the rest of the municipal area, the risk of water erosion is low to very low.

Vulnerability. It is calculated based on the drainage density, the slope, the soils' nature, and the source rock/geology.

Areas of the municipality of Téboulbou, and the sectors Er-Remathi, Chénini Ouest and Chénini North of the municipality of Chénini Nahal, are at medium to low risk. For the remaining areas of these municipalities and those of Bouchemma, Ghannouche and Gabes municipalities, the low vulnerability to water erosion dominates. The averaged high vulnerability is limited to the Southern West, in the high-relief areas of the study.

Risk of water erosion. All the municipalities of the Greater Gabes are exposed to a medium risk of water erosion (sectors of Sidi Boulbaba in the East, Zrig Eddakhlania, and Sector 5 in its South, Sector 2, Sector 3 and Sector 4). The Chott Sidi Abdessalem sector is at high risk due to the total clearing of the palm grove, and the two sectors Ghannouche East and Ghannouche South, of the East part of the Bouchemma sector, and the sectors Chénini East and Chénini North (East part), are similar cases.

In the municipality of Téboulbou, averaged water erosion remains limited to the valleys of the rivers at Wadi Essourrag 1 and 2. For the remaining area of the watersheds and the municipal domain, the risk of water erosion is classified as low to very low.

Aggravating factors. Factors aggravating the risk of water erosion are:

- Lack of watershed management for water and soil conservation;
- The use of poly-disc ploughs that bare the soil especially in areas of arboriculture (especially olive) and facilitate the erosion of the land through runoff;
- Excessive trampling of routes that destroy the plant cover and root layer of soils that favor their erosion;

- Abandonment of the sloping arrangements for the agricultural plots;
- Lack of control, monitoring and maintenance of existing CES facilities;
- Discharges of all types of waste obstructing waterways in the city.

Challenges. The solid annual contribution of the three major watersheds of Wadi Gabes, Wadi Tine and Essourrag 1 and 2 is around 300 000 m3. The scattering of these products contributes to unsanitary conditions; hence, there is a need for a continuous sweeping of the streets under the charge of the municipalities. This discharges the minor beds of the Wadis and the canal of Wadi Gabes, and constitutes a fertile support for the proliferation of wild grasses and reeds that obstruct the drainage network and canals.

Recommendations. The actions to be taken are as follows:

- Sustained effort in watershed development;
- Regular cleaning of drainage canals, Wadi courses and floodway, and development of these wadis in the urban domain;
- The development of rangelands and their rotational use to limit their trampling by livestock;
- The planting of watersheds by drought-resilient trees and shrubs that allow to fix the soil and reduce the aggressiveness of the rains and the noise;
- The construction of grooves along slopes to channel surface water drainage and limit their erosive action.

Risk of Drought and Silting

Major programs to control desertification and silting in independent Tunisia and awareness-raising campaigns were carried out to inform farmers of the dangers of the use of polydisc ploughs, excessive trampling of the paths, and actions to clear the vegetation cover. The municipalities of the study and the surrounding watersheds have inherited these efforts, and remained at low to very low risk of wind erosion and silting.

Landslide Risk

Hazard. It is calculated by taking into account the constraints of precipitation, land use and urban areas.

In the area of the watersheds in the Southern west, the hazard is averaged from medium to very low, but in the municipal domain in the Northern east, on the coast, this hazard is predominantly medium to very high. This is due to higher average annual rainfall in this area, as well as areas of bare, non-occupied or poorly urbanised land.

The sectors Sidi Boulbaba, Zrig Eddakhlania and Sector 5 (Gabes municipality), and the northern part of the Téboulbou sector of the municipality of Téboulbou are very strongly dominant. Sectors 1 to Sector 4, Chott Sidi Abdessalem (Gabes municipality), sectors Chénini-East (Chénini-Nahal municipality), the eastern part of the Bouchemma sector, and sectors East, South and North Ghannouche, are all facing a high hazard of landslide. For the rest of the municipal area, this hazard is low to very low in relation to the dominant vegetation cover.

Vulnerability. It is based on the constraints: drainage density, topography, lineal density, slope, and access road density. The municipal area is very weakly to weakly vulnerable to landslides. However, the west to southern west prairies of the municipalities of Bouchemma, Chénini Nahal and Téboulbou at low vulnerability.

Landslide risk. In the municipal domain, this risk varies from very low to medium in the following areas: the northern part of Téboulbou sector (municipality of Téboulbou), Sidi Boulbaba and Zrig Eddkhlania sectors. Meanwhile, Sector 5, Sectors 1 to 4, and Cité Sidi Abdessalem (municipality of Gabes), East, South and North Ghannouche sectors (municipality of Ghannouche), the Eastern part of Bouchemma sector (municipality of Bouchemma) , and the areas of Jouaoula, Nahal, East and North Chénini (municipalities of Chénini-Nahal) are also low to medium risk.

There is a link between the clearing areas of the palm grove, the banks of Wadis (even Limaoua, El Amazir and El Medou sectors in the municipality of Téboulbou, and sectors East, south and north Ghannouche sectors), bare soils and road density (Cité Sidi Abdessalem sector), and the elevation of the risk class is remarkable.

Aggravating factors. Aggravating factors for this risk include:

- Clearing of palm grove areas;
- Unauthorized constructions and crops on the banks or more simply in major beds of Wadi as in Ras El Wadi (Er Remathi, West and north Chénini sectors of the municipality of Chénini-Nahal), promote risk and amplify its bad consequences;
- Intensification of access roads on unserved land in the event of unauthorized clearing and construction;
- The lack of monitoring, controlling and development, particularly of the banks of the main rivers, is likely to promote landslides in these areas.

Challenges. They can be important especially in case of crops and constructions located at the slopping edge of the river banks, otherwise at the foot of cliffs formed

by the low terraces on the banks as in Ras El Wadi (Er-Remathi, North and West Chénini sectors). The same situation can occur on the edge of the major beds of the tributaries of the Wadi Essourrag 1 and 2 in El Medou, Amazir and Téboulbou sectors in the municipality of this name.

Recommendations:

- CES development and planting of low terraces of the valleys of the wadis, keeping a safety area at the edge of the cliffs;
- Ensure flushing and cleaning especially the minor beds;
- Prohibit the construction and discharge of manure on and below the cliffs of the banks, and severely penalize offenders;
- Prohibit construction (Er-Rmathi sector in Ras El Wadi and Chénini West) and vegetable and arboriculture crops in the major bed of the wadis;
- Raise awareness of the landslides dangers, for respecting protecting the hydraulic public domain.

Oasis Destruction Risk

Hazard. It is linked to the illegal human action, the organized destruction of the palm grove at the Chott Sidi Abdessalem sector, the East of the Bouchemma sector, and the South and East Ghannouche sectors since 1984, as well as the recent destruction of the Shenini Nahal oasis.

Vulnerability. It is very widespread in all the oases in the municipal domain, but difficult to be mapped, at all the municipalities.

The oasis destruction risk. The map is based on remote sensing taking into account alphanumeric data from satellite images from several periods and very recent periods and the Normalized Difference Vegetation Index (NDVI) weighted of the urban area of the Greater Gabes and associated watersheds.

All oases areas and the vestiges of those that have already been destroyed by urbanization are at a dominant risk that vary from very high-to-high. The typical three high-risk areas are the central part of the Téboulbou sector, the Sidi Boulbaba, Zrig Eddakhlania and Sector 5 (in the South), and Sector 1 and Sector 3 in the municipality of Gabes, the Chott Sidi Abdessalem sector, and suburbs of South, West and North Ghannouche. The sectors of Bouchemma on the one hand, and Nahal and Chénini West (municipality of Chénini-Nahal) on the other hand, already begin the period of degradation of the oasis.

Challenges. They are of a particular and extreme type. The urbanization of this oasis, which is unique in every sense, certainly contributes to short-term development and socio-economic prosperity. But it is disproportionate and destructive to heritage. It also generates new risks (waterlogging, water diseases, salinization of water and soil, etc.), including people's exposure to pollution and industrial accidents that remain poorly-controlled and potentially high-impact, especially when considering the return of experience in similar situations.

Recommendations. The recommendations are multiple:

- Studies to be prescribed: i) context of genesis, evolution, conservation and safeguarding of oasis ecosystems in the municipalities of Greater Gabes; ii) urbanization of the oasis of Greater Gabes: mobiles, balance of advantages/disadvantages and environmental and socio-economic consequences; iii) the cost of environmental degradation linked to the urbanization of the oasis areas of the greater Gabes; iv) hydrogeology, hydraulic and sanitation development to prevent the waterlogging into the groundwater and its consequences on the urban area of the Greater Gabes; v) oasis of the Greater Gabes: evolution of the national patrimony and institutional and regulatory requirements of safeguard; vi) studies of the Oasis ecosystem and its biodiversity;
- Total prohibition of urbanization and isolated habitat, in the Oasis area;
- Scrupulously monitoring, controlling and prohibiting any damage to this ecosystem, and prevent any action of its collective or isolated destruction;
- Ensure the respect of multiple vocation of the Oasis area: historical, cultural and environmental natural heritage, but also agricultural and socio-economic (specific biodiversity, tourism, education, etc.);
- Impose the necessary regulations for the cultivation, enhancement and conservation of the oasis ecosystem;
- Maintain and safeguard the remnants of oasis green spaces in already urbanized areas;
- Encourage the use of agricultural waste (dry palms, leaves, crop residues) for the production of composts, livestock feed, for shoemaking, and various products of palm trees and other specific plants of the middle stage, for marketing and handicraft manufacture;

Waterlogging and salinization of aquifer Waters risk

These are two hidden risks, subsidiary to the destruction of the oasis. This destruction, the abandonment of agriculture/drainage, and the use of lost wells contribute to raising the piezometric level, creating waterlogging (necheiaas) and the salinization of soils and waters by evapotranspiration.

Risk. In the most pessimistic case (total destruction of the oasis):

- The whole coastal area to garaât and chotts (municipalities of Gabes and Téboulbou), is very highly to highly threatened by the rise of the tablecloth and its consequences;
- All areas of the municipality of Gabes, Ghannouche, Bouchemma and Chénini-Nahal, the sector of Téboulbou and the northern part of the sector of El Medou in the municipality of Téboulbou, will be threatened by the rise of the piezometric level of the aquifer and its consequences (waterlogging, salinization of the aquifer water, change in the mechanical characteristics of the constructed soils);
- Only the sectors of Limaoua and El Amazir, and the West to South parts of the sectors of Bouchemma, Chénini North , Er-Rémathi and El Medou, with high topography, will be averaged to very low vulnerable to waterlogging and aquifer salinization risk.

Recommendations. The recommendations formulated to the risk of the destruction of the oasis ecosystem will be applied to the scenario of this risk.

Chemical pollution risk

Hazard. It is anthropogenic/technological, caused by the release of smoke, phosphogypsum and heavy metals, as well as the release of radioisotope. The pollution is terrestrial and marine.

Vulnerability. Precise data (levels of toxic metals and radioisotope) on this pollution are lacking to assess and map the vulnerability(s) of water, air, land and sea pollution and that of individuals.

Only the return of experience in similar contexts, as well as some reports, dissertations, theses and publications explain the potential aspects of vulnerability to these three types of pollution concerning the two terrestrial and marine areas of this zone. It has been found strong and widespread.

Air pollution Risk.

- All areas of municipalities of Gabes, Ghannouche, Bouchemma and Chénini - Nahal are subject to a medium to very high risk of pollution, the most important class of this risk is practically limited to the industrial and port area;
- All sectors of Téboulbou municipality are subject to a low to medium risk of air pollution;
- Further, the northern areas of the municipality of New Matmata, and East of the municipality of El Hamma are subject to a low risk of pollution.

Marine pollution Risk. It has been associated with phosphogypsum discharges into the sea for 47 years.

- Excessively high levels of pollution are in the coastal area of the Chott Sidi Abdessalem sector, certainly in connection with the local discharge of phosphogypsum into the sea;
- From the shore of the municipality of El Métouia in the Northeast, to that of Kettana in the South, the marine pollution observed is medium to high.
- The redistribution of pollution in the coastal marine area is closely controlled by the tides, the littoral drift and coastal marine currents.

Aggravating factors.

- Urbanization in the sectors of Chott Sidi Abdessalem, Ghannouche East and Ghannouche South, and the Eastern part of the Bouchemmma sector, all located in an area of very high pollution;
- The destruction of the relics of the oases of Chott Sidi Abdessalem, Bouchemma and Ghannouche, which represent green spaces enabling to protect the urban area and at least partially compose the pollution;
- The maintenance of phosphogypsum discharge into the sea despite the recommendations of numerous studies, and its severity on the environment and biodiversity;
- The delay in the necessary studies in terms of management of industrial fumes, and technological recovery of by-products or toxic metals;
- Lack of sanitary risk studies related to industrial activities in the area.

Challenges. They are heavy, priceless. Any evaluation must reconcile several aspects:

- Positive impact of this first industrial pole which constitutes the South artery of the national economy;
- The cost of degradation of the terrestrial and marine environment, and especially the loss of fisheries resources for 47 years coming;
- The impact on agriculture, particularly in the oasis area;
- The exposure of the population and the urban area to the multiple risks of industrial pollution;
- Urban exposure to industrial risks (see next chapter);

Recommendations.

- Studies to be prescribed: i) soil pollution and metal hazards resulting from the industrial activity of the Great Gabes; ii) assessment of pollution resulting from phosphogypsum discharges at sea; iii) study of the sanitary risk and impregnation of the population by the heavy metals resulting from the industrial activities of the Great Gabes; iv) assessment of radioisotope pollution resulting from industrial activities and the phosphogypsum discharges; v) assessment of the sanitary risk related to the impregnation of the population by radioisotopes in the Greater Gabes region; vi) technical and environmental study for the elimination of dry phosphogypsum in the coastal marine area and development of the landfill area (see below);
- Technological improvements: i) Fume recovery: Gabes industries may use stack gas recovery processes. These are technologies from the first half of the 20th century, including the Cottrel process widely used in America; ii) Metalloid (fluorine, iodine) upgrading: as co-products of phosphoric acid production; iii) Definitive solution for the storage of phosphogypsum: the storage and burial of phosphogypsum in a landfill in the polluted coastal marine area, and the exploitation of the land acquired on the sea, would be a better solution to that of its stacking on the continent

Industrial accident risk

The storage of LPG (Sudgaz, STEG, AGILGAZ) and the production of ammonium nitrate (GCT) in the industrial zone are classified as first category of hazardous industries, according to the classification of hazardous, unsanitary or inconvenient establishments. They represent a risk and can initiate or participate in a technological

disaster. These risks (causes and accident scenarios) can be analysed and assessed by feedback.

Hazard: These hazards are multiple and managed by internal operating plans, and emergency response plans.

LPG storage. Experience has shown that this storage presents some risks:

- Gas phase leak without ignition (30%);
- BLEVE of a capacity (24%);
- Gas or vapor explosion (24%);
- Torch or pool fire (20%);
- Liquid spreading on soil (2%).

The causes of the hazard may be hose break (7%), movable tank member failure (16%) and connecting member failure (20%), non-return valve failure (4%), connected truck departure (5%), human error (9%), or other causes including corrosion (39%). The main initiating events are over-filling (cold BLEVE), a gas leak near the igniting sphere (UVCE then BLEVE), or a fire in the immediate vicinity of the storage sphere (torch effect).

Ammonium Nitrate Plant. Experience has shown that manufacturing can be accompanied by hazardous releases (68.5%), explosions (17.82%), fires (6.9%), domino effects (4.98%), near accidents (2.97%), and other hazards (0.98%). Hazardous releases can be direct (leaks, capacity failures, etc.) or accidental emissions from explosion, fire, etc.

Risks: They may arise from the handling and storage of LPG, the handling and storage of ammonia, and those related to solid ammonium nitrate.

Four scenarios are analyzed and quantified: (1) BLEVE of a LPG sphere; (2) explosion of an ammonia tank; (3) detonation of ammonium nitrate; (4) domino effects, depending on their causes, their probabilities of occurrence, their gravity and their consequences in terms of municipal space, facilities, the environment and human lives.

The distances of thermal, overpressure and toxic effects of one of the probable scenarios in the ammonium nitrate production plant reach the LPG storage tanks, the entire industrial area of Ghannouche, the municipalities of Ghannouche, Bouchamma and downtown of Gabes. A succession of domino effects can occur with the development of a toxic cloud that moves throughout the territory of the Great Gabes.

Preventive security measures are taken in various installations at the industrial zone of Gabes. Other measures are designed in the document to prevent any probable risk.

Recommendations: the measures to be taken in the case of disasters, on-site and evacuation of the population, are discussed for all cases of danger, for the safety of individuals and the mitigation of environmental and health impacts.

Challenges. They are numerous: risk of loss of life, pollution and other environmental impacts, destruction of material and economic losses.

Risk of Accident at Sea

The maritime territory of Gabes is very extensive (more than 150 km). It is also an area of exploitation of hydrocarbon concessions. It is a continental platform that is crossed by an international causeway that poses a problem with regard to accidents at sea, pollution and marine disaster.

Tunisia is a party to international conventions on navigation, safety and environmental protection at sea. The port authorities must therefore have all the human and material means at their disposal in the event of a risk of accident at sea.

Ballast water management of ships can introduce invasive species (Pinctada radiata (pearl oyster), Portunis segnis (blue crab), Brachydentes pharaonis (mussel), Aplysia (sea hare), etc.), which is likely to change marine biodiversity and disrupt the Gulf of Gabes ecosystem.

Tunisia would benefit from enacting regulations to protect its marine domain within its territorial limits, and to guard against accidents involving ships at sea, like the texts and procedures imposed by the Countries of the North Shore of the Mediterranean concerning the rights and obligations of navigation on the high seas.

Risk of climate change and mean sea level rise

The risks associated with climate change, which are multiple and will affect the climate, can lead to desertification and flooding, and lead to an estimated 30% reduction in agricultural production by 2100, relative to the reference period 1961-1996. Another major risk is the rise in mean sea level of nearly 1m during this period. Nevertheless, Gabes has the highest tidal range in Tunisia (2.54 m). The coast of the municipalities is therefore threatened by marine submersion.

Hazard. It is anthropogenic, generated by greenhouse gas emissions related to various sectors of socio-economic life (CO_2, CH_4, NO_2, SO_2, and volatile organic compounds VOC). This is the accelerated rise expected from mean sea level (EANM).

Vulnerability. These are the low areas, the sebkhas and the coastal chotts below a rating of nearly 1m/NGT, the urban fact that is installed, the port facilities, the infrastructure and equipment (drains, rainfalls and wastewater routes, etc.) which are highly vulnerable to this hazard.

Risk. The vulnerability and submersion risk assessment requires a precise side plan by cm near the coastal space. This plan is drawn up from the levelling slopes given on the PAU plans of each sector in each municipality of the greater Gabes.

The coast will undergo the EANM and therefore the submersion from the municipality of Téboulbou, to the municipality of Ghannouche North at North. However, the coasts that will be most affected are those of the Téboulbou sector, sectors 5 & 4 and Chott Sidi Abdessalem in the municipality of Gabes.

Coastal submersion of the Ghannouche East and North sectors will be limited to a few hectares. The following table gives the submergible urban areas in ha, according to the real or virtual EANM.

Area of submersibles by accelerated rise in mean sea level by 2100, calculated for different elevation heights

Cote topographique (m)	total Superficies (ha)	EANM by cm	Risk classification
0 to 0,63	69,0	63	Very high*
0 to 1	109,4	100	Very high**
1 to 2	300,5	-	high
2 to 3	265,9	-	Medium
3 to 4	203,42	-	low

Challenges. There are many:

- Loss of terrestrial (oasis) and marine biodiversity from an already heavily polluted coast;
- Loss of tens or even hundreds of hectares of urban spaces;
- Loss of infrastructure in the submersible area and risk of return of seawater in the pipes;
- Risk of salinization of the coastal groundwater;
- Flooding of port basins, their equipment and infrastructures, and difficulties in accessing ports;
- In addition to these challenges, losses on agricultural crops, drought threats, desertification, increased flood risks.

Recommendations. More detailed studies on the causes and consequences of climate change and the EANM are required. It is necessary to have the most accurate topographical surveys in the coastal urban domain, as well as those of the bathymetry of the nearby marine area. Studies concerning the redistribution of pollution (toxic

metals, radioactivity) of marine sediments by the action of tides and coastal currents in the case of EANM also become necessary.

Locust Invasion Risk

Hazard. This is natural, linked to biodiversity, by the grasshopper gregarization and their invasion.

Vulnerability. All of southern Tunisia is highly vulnerable to locust invasion. In the region, the invasions of 1957, 1987-88, and 2004 are of historical value. In addition, Gabes is on the front line to fight any invasion of locusts.

Risk. Locust invasion occurs in near-ten-year cycles when locust clouds migrate from their sub-Saharan areas of remission to the agricultural areas of the North.

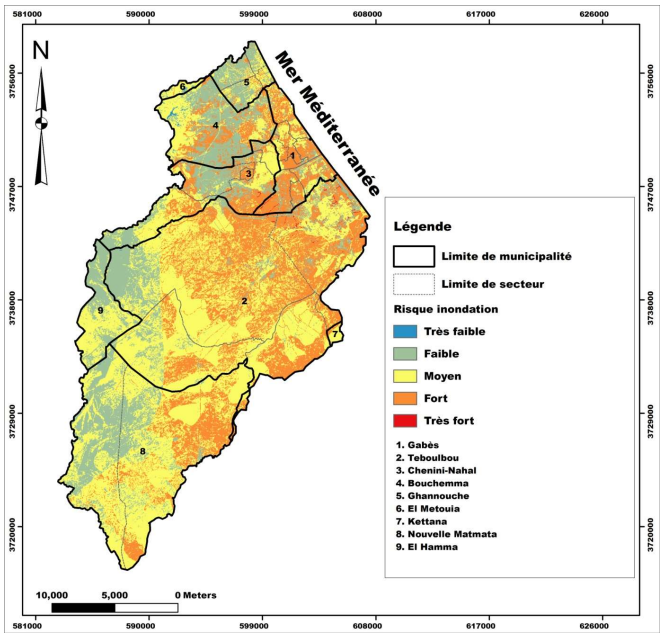
Challenges. These are agricultural, huge and can go back to several million dinars.

Vigilance and locust control. This is governed by Decree no. 2653-2004 of 23 November 2004, correcting Decree no. 1751-1988 of 11 October 1988 on the organization and management of the locust control campaign. This struggle is managed by a Council and two committees:

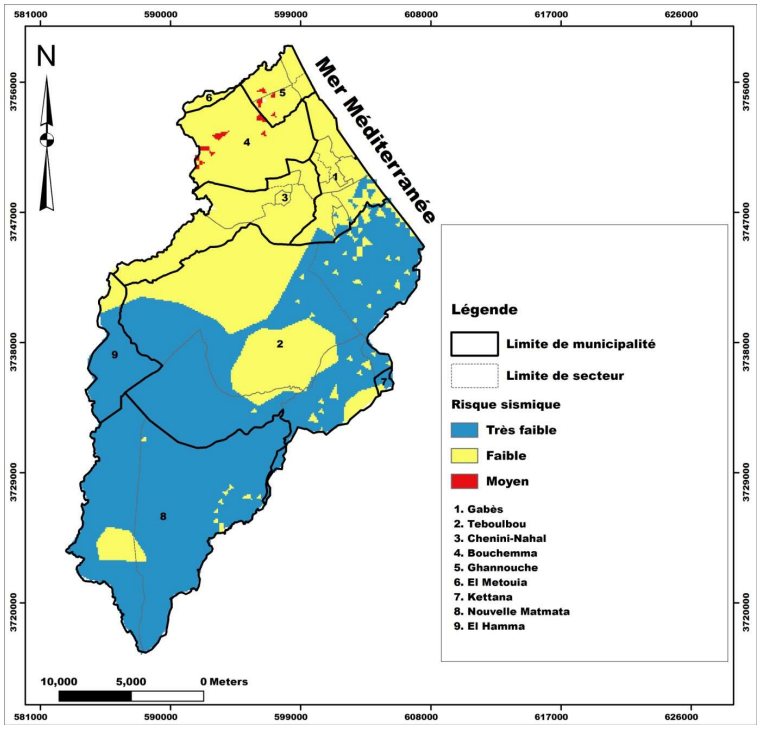
- Superior Council of Antilocust Control chaired by the Prime Minister, in close collaboration with the Minister of Transport, member of this council;
- National Committee of Vigilance and Antilocust Control chaired by the Secretary of State for Agriculture, in close relation with the INM which is a member of this committee;
- Regional Committee of Vigilance and Antilocust Control chaired by the Governor of the region, in close collaboration with the INM which represents the Minister of Transport and which is a member of this committee.

These bodies also include representatives from the Ministries of Defence, Interior, Local Affairs, Environment and Health. The fight against locusts often involves the use of insecticides, which are persistent organic chemicals that are very toxic and very dangerous to the health and the environment.

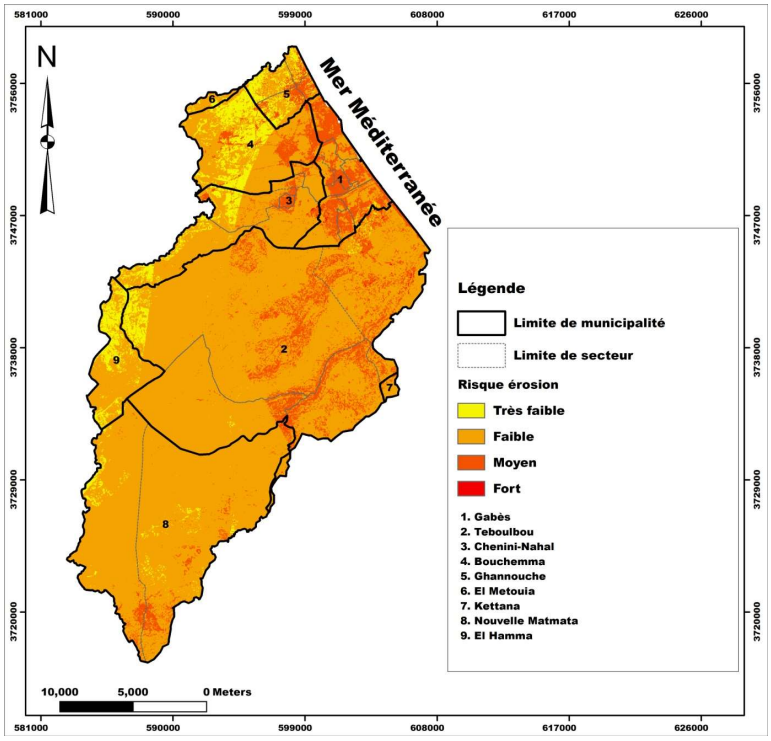
A6.1.4 Risk Maps



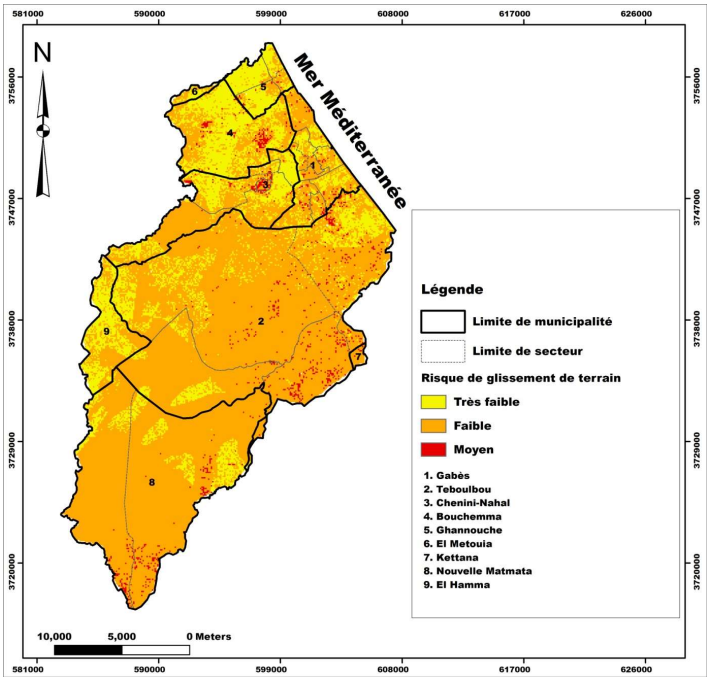
Flooding Risk for Greater Gabes



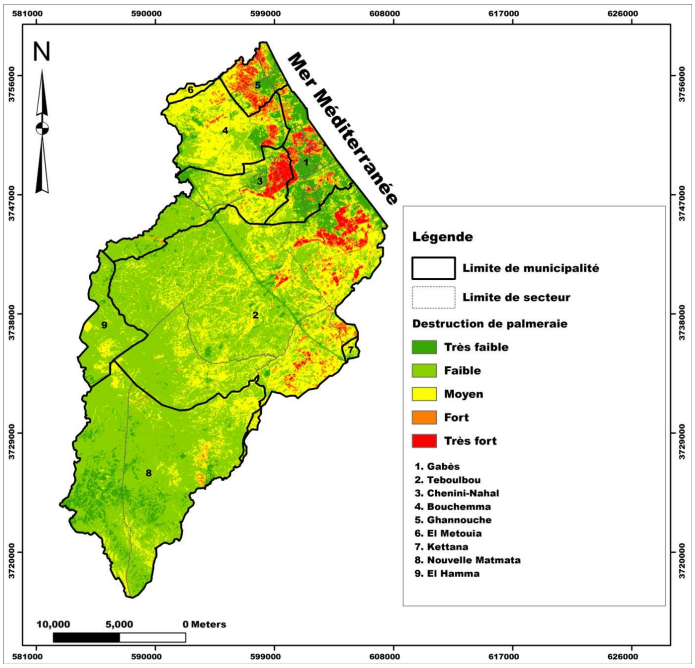
Seismic Risk for Greater Gabes



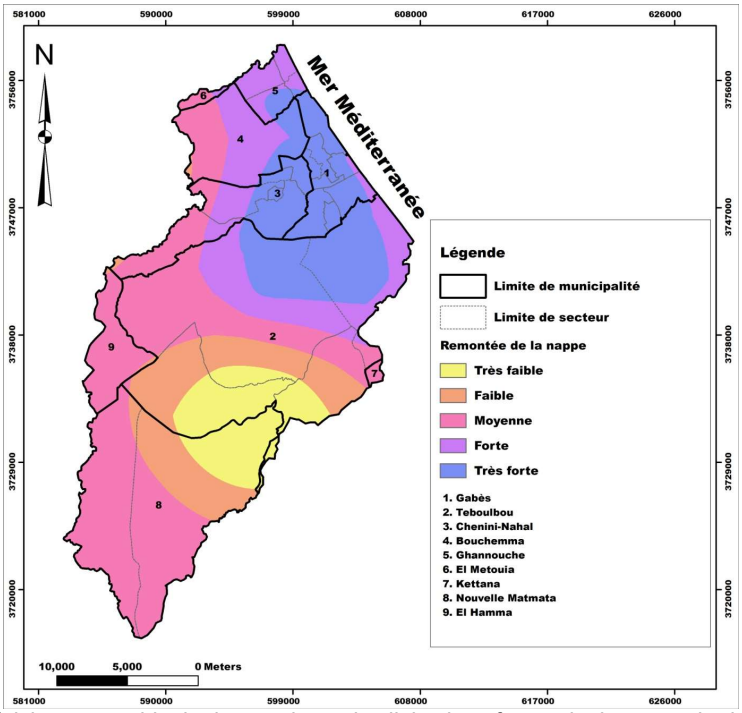
Water erosion risk map established for the watersheds of the communes of Grand Gabes



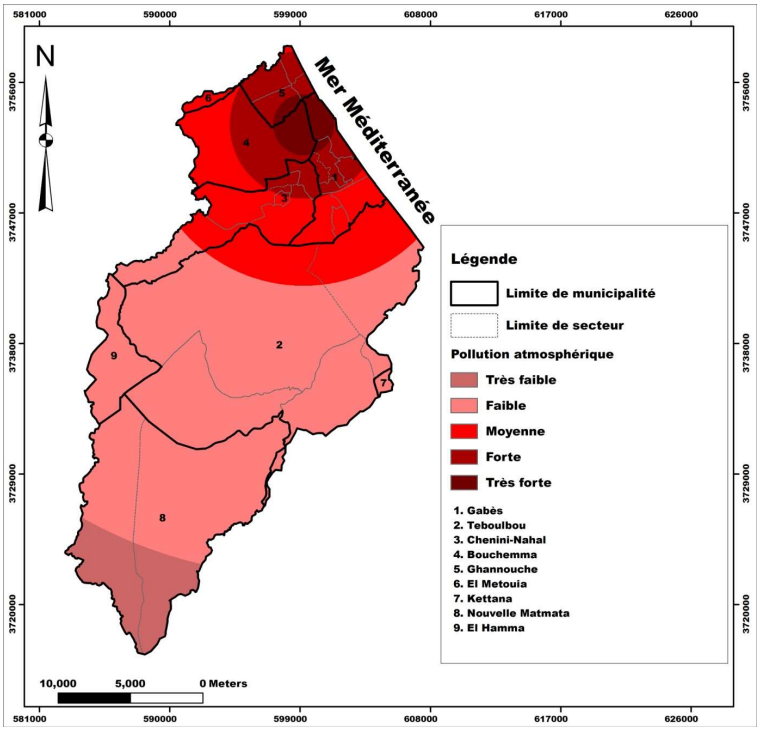
Landslide Risk for Greater Gabes



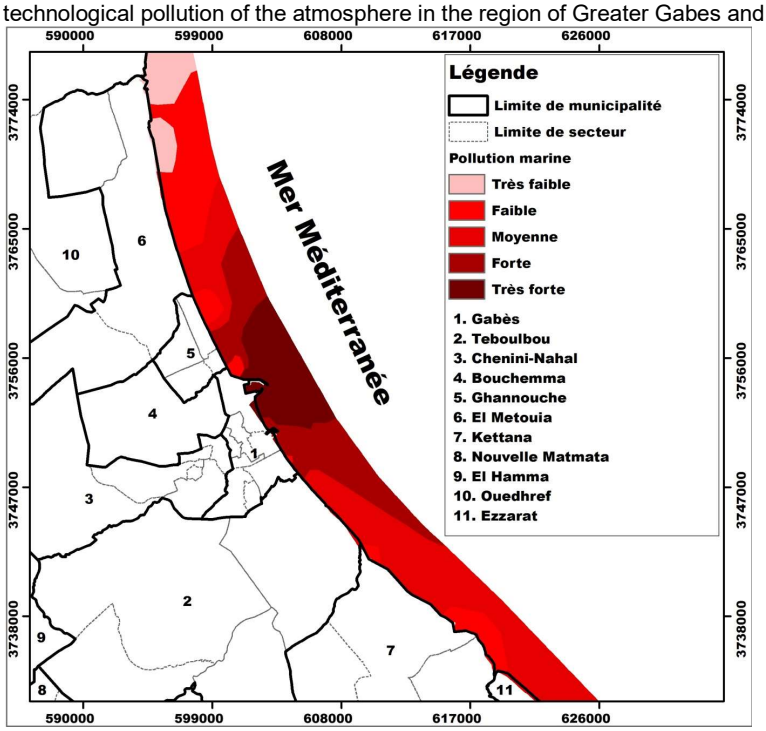
Map of the destruction risk of the oasis established from satellite images (NDVI index).



Map of the risk of rising watertable, hydromorphy and salinization of water in the watersheds of Grand Gabes



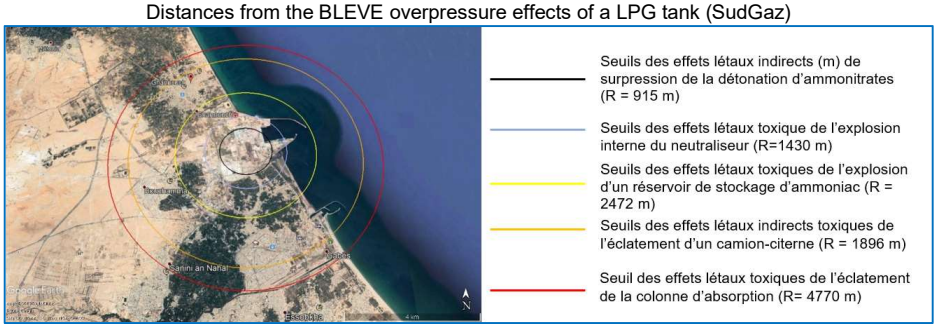
Map of the risk of technological pollution of the atmosphere in the region of Greater Gabes and its surroundings



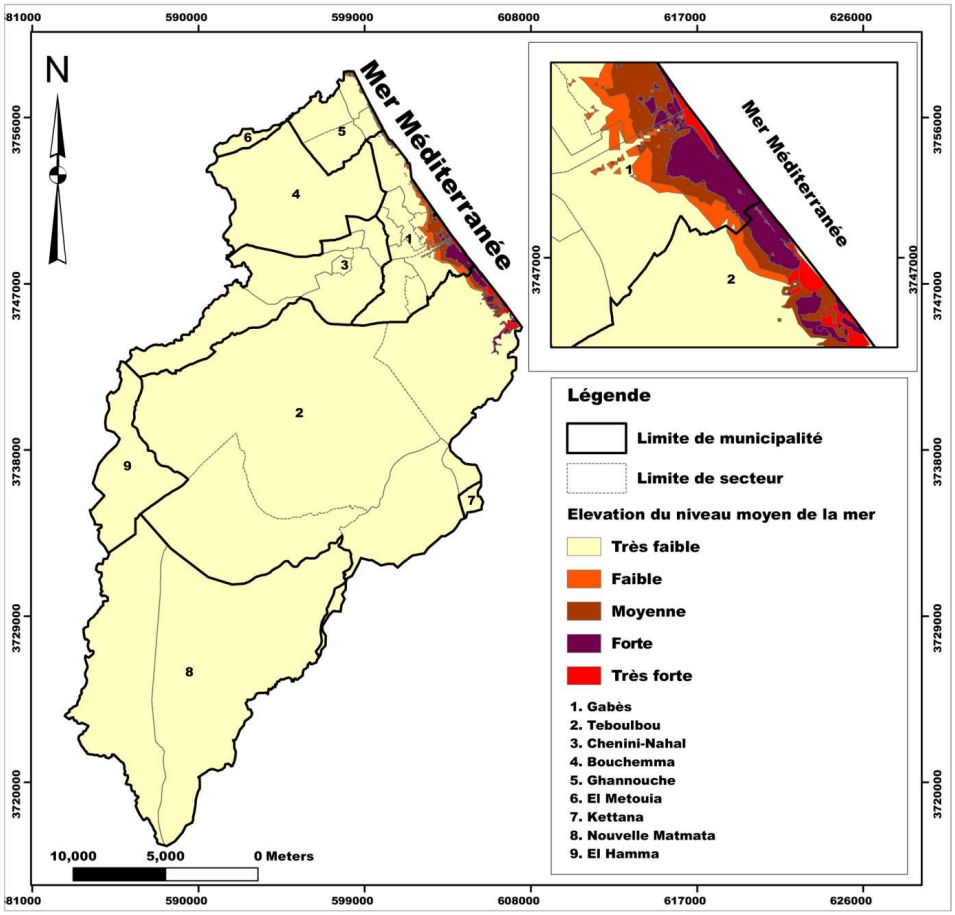
Map of marine pollution risk classes of the coastal proximal zone of the Gulf of Gabes.

Distances of thermal effects in case of BLEVE of a LPG tank (SudGaz)

Distances from the BLEVE overpressure effects of a LPG tank (SudGaz)



Distances from thermal, overpressure and toxic effects of probable ammonitrate plant scenarios



Risk of accelerated rise in mean sea level and submersion of coastal urban land in Greater Gabes

A6.2 Mateur

A6.2.1 General Socio-economic data

La superficie totale de la commune calculée d'après les nouvelles limites légales des secteurs et de la municipalité, est de 56 560,1 ha (565,6 km^2), ce qui représente environ 16,22 % de la superficie du gouvernorat de Bizerte (3486,97 km^2) [33].

Découpage sectoriel et communal de Mateur (2017).

DÉLÉGATION	N°	SECTEURS	SUPERFICIE (HECTAR)	COMMUNE
MATEUR	1	Mateur	826,1	MATEUR
	2	Mateur Sud	33,6	
	3	Banlieue de Mateur	4731,7	
	4	Essadaka	119,6	
	5	Cité Ennasr	2652,2	
	6	Boumkhila	5856,8	
	7	Behaya	12042,1	
	8	Targuellèche	10579,1	
	9	Nefat	7579,7	
	10	Arab Majour	12139,2	
Total			56 560,1	

Pour l'ensemble de la commune de Mateur compte 47 562 habitants en 2004, mais elle a légèrement diminué en 2014 (INS, RGPHs, 2004 et 2014) pour atteindre 46 975 habitants, dont 32 492 hab. vivaient en milieu communal. En 2015 et 2016, la population communale a été estimée à 34 647 et 32 817, respectivement (CGDR). En 2016, la population communale englobe les habitants de Mateur ville et sa banlieue, Mateur Sud, et les Cités Ennasr et Essadaka. La population actuelle devrait atteindre 46 975 habitants, et le nombre de logement total du domaine communal doit approcher 25 313. Le taux de croissance annuel est négatif, de l'ordre de (-0,124%) [33].

A6.2.2 Brief discussion on hazards, vulnerability and risks in Mateur

Risque inondation

Aléa inondation: Il est contraint par des pluies de 24h, de périodes de retour élevées (50 à 100 ans) et par l'occupation des sols, en plus d'événements d'inondations historiques lourds de conséquences ayant affecté la région durant les dernières décennies. Les secteurs suivants sont soumis à l'aléa inondation le plus fort :

- Secteur Taguellache dans sa partie Nord et Nord-Ouest ;
- Secteur Arab-Majour dans sa partie Nord-Est en continuité avec le secteur précédent.
- Les deux secteurs Targuellache et de Arab-Majour sont à dominante d'aléa faible (Targuellache partie Sud et Est, et Arab Majour : parties Sud, Ouest et

centrale) à très fort (Targuellache dans sa partie Nord et Nord-Ouest, et Arab Majour dans sa partie Nord-Est) ;

- Les secteurs Banlieue de Mateur, Cité Ennasr, Boumkhila, Behaya et Nefat sont à aléa faible à fort dominant, avec une tendance locale à l'aléa très faible en aval du barrage de Joumine dans le Nord-Est du secteur de Behaya ;
- Dans la ville de Mateur, les secteurs Mateur, Mateur Sud et Essadaka sont sujet à un aléa moyen à fort.

Vulnérabilité: La forte densité des voies d'accès et de bétonnage des terrains dans Mateur, le réseau insuffisant de drainage dans la ville, et la densité du réseau hydrographique côtier occupant des zones basses aggravent la vulnérabilité du domaine urbain à l'inondation. Ceci est attesté par :

- Des aménagements CES et les barrages (Joumine et Tine) construits en amont de certains villages et de la ville de Mateur, contribuent au rabattement de vulnérabilité à leur aval aux classes très faible à moyenne (Nord-Est du secteur Behaya, Sud des secteurs Arab-Majour et Behaya).
- Les deux secteurs Targuellache et Arab-Majour sont à vulnérabilité forte à très forte dominante.
- Les secteurs Cité Ennasr, Boumkhila, Behaya et Banlieue de Mateur sont à vulnérabilité faible à forte face à l'inondation, avec un espace à vulnérabilité très faible, à relief élevé, à l'aval du barrage de Joumine et au Nord-Est de Behaya.
- La ville de Mateur (secteurs Mateur, Mateur Sud et Esasdaka) se caractérisent par une vulnérabilité forte à l'inondation.

Risque inondation. Les zones qui encourent un risque moyen à fort sont les deux secteurs de Targuellache et de Nefat à l'Est de la commune, les secteurs à risque fort dominant sont les secteurs Banlieue de Mateur, Cité Ennasr, Boumkhila, Behaya et Arab-Majour.

La ville de Mateur avec ses secteurs Mateur, Mateur Sud, Cité Ennasr (partie Est) et Banlieue de Mateur (partie Sud) sont à risque fort face à l'inondation. Ceci s'explique comme invoqué précédemment par la situation de la ville dans la dépression de Mateur, mais aussi par la densité du réseau hydrographique local.

Ce sont les zones en relief et les zones à faible densité de réseau hydrographique (platiers hydromorphes au Sud du Lac Ichkeul, qui présentent un risque moyen à

l'inondation. Ce sont ces dernières zones qui souffrent cependant de l'hydromorphie fréquente dans le temps et dans l'espace comme nous le verrons.

Facteurs aggravants. Le risque d'inondation peut être aggravé par :

- Des constructions sur les berges des lits d'oued, comme c'est le cas dans la ville (zone industrielle à l'Est et quartiers la jouxtant sur l'autre berge du canal de confluence des oueds Joumine et Tine) et les deux berges des deux oueds Joumine longeant la ville au Sud, et El Khalij, la traversant dans sa partie Ouest.
- La partie Sud de la Cité Zarrouk (Jebbanet Ennasara, Lycée Zarrouk, et habitations voisines) dans la partie Sud du secteur Mateur avoisinant le cours de l'oued Joumine orienté en Est-Ouest et son extension future peuvent aggraver le risque d'inondation.
- Des agglomérations au Nord-Ouest et habitat isolé à proximité de la retenue du barrage Joumine, et d'autres près de la vallée de cet oued en aval du barrage, aggravent le risque d'inondation ;
- L'habitat non-autorisé qui s'est développé d'une manière grave dans l'après 2011, sans viabilisation préalable des terrains, et sans prise en charge pour l'évacuation d'eau pluviale, mais aussi les rejets de déchets de tous type peuvent conduire à obstruer les cours d'eau et à aggraver l'inondation ;
- Les difficultés d'entretien (manque de moyens, investissement lourd) et de curage des principaux canaux et lits mineurs des oueds qui sont largement envasés et bourrés de roseaux et herbes sauvages amplifient le risque d'inondation et de catastrophes ;

Situation de catastrophe. Les estimations de crues centenaires des principaux oueds indiquent que malgré les aménagements existants, les débits de pointe peuvent provoquer l'inondation de pratiquement tous les secteurs, notamment ceux de la ville de Mateur. Cette inondation peut être provoquée par les deux grands oueds Joumine et Tine, mais aussi par l'oued El Khalij qui traverse la ville de Mateur dans sa partie Ouest.

Enjeux. Compte tenu des périodes de retour retenues pour les aménagements (<50 ans) et des conditions de pluies centennales ou plus :

- Les ponts de Mateur situés sur les routes RN-7 et RR-56 (en cours de réaménagement) peuvent subir des dégâts importants.

- La station ferroviaire, les deux zones industrielles, mais aussi l'ISSAT-Mateur et les zones voisines d'habitat peuvent subir des dégâts dont des pertes de vie comme ce fût le cas au cours de l'inondation de février 2012.
- Les aménagements de barrages (voir livrable 2 de cette étude) souffrent également de certaines difficultés de stabilité qui nécessitent un suivi continu.
- Les dégâts peuvent également toucher les biens et les vies humaines, comme c'est le cas de l'inondation en 2012.

Recommandations majeures :

- Il est nécessaire de doter la commune de tous les moyens humains et matériels pour assurer le curage annuel et régulier des voies d'eau et des réseaux de drainage ;
- Il est nécessaire de contrôler et d'interdire la construction d'habitat non-autorisé notamment sur les berges de l'oued et à proximité des retenues de barrages ;
- Il y a nécessité urgente de contrôler et interdire le déversement de tous types de déchets dans les cours d'eau et dans les canaux de drainage ;
- Nécessité de l'amélioration du réseau d'assainissement des eaux pluviales, et de l'entretien régulier et le curage de ce réseau ;
- La responsabilité institutionnelle et réglementaire de la gestion du réseau d'eau pluviale doit aussi être résolue ;
- Imposer l'étude d'inondation comme préalable à toute autorisation à bâtir ;
- Des études sont aussi à prescrire en ce qui concerne la stabilité des aménagements de barrage, de l'hydrologie des bassins versants et des risques d'inondation dans toute la commune de Mateur.

Risque sismique

Aléa. Les données sismiques instrumentales des dernières décennies indiquent que des séismes d'une courte période de retour (50 ans), d'intensité VII, peuvent survenir dans la région. Ce type de séismes rappelle les séismes de forte intensité (IX) dans la région d'Utique en l'an 412 et 852 A.J.C (période de retour 975 ans au moins).

Vulnérabilité. Deux zones de vulnérabilité sont identifiées : l'une à vulnérabilité moyenne qui caractérise les secteurs de Mateur, Mateur Sud, Cité Essadaka, Banlieue de Mateur, Cité Ennasr, les parties Nord-Ouest de Neffat et Arab-Majour, et le Nord Est de Behaya et de Boumkhila. L'autre à vulnérabilité forte, couvre l'espace Sud-Ouest des secteurs de Boumkhila, Behaya, Arab-Majour et Est Neffat. Le secteur

de Targuellèche proche de la zone à accidents majeurs orientés en NE-SW (Jebel Lanserine-El Alia) se site dans une zone à vulnérabilité forte.

Risque sismique. La carte calculée montre deux zones. Les secteurs Est et Sud, de Targuellache, Neffat, Arab-Majour et Behaya se caractérisent par un risque sismique fort. Au contraire, les secteurs à l'Ouest et au Nord (Mateur, Mateur Sud, Cité Essabaka, Cité Ennasr, Banlieue de Mateur, Behaya et Boumkhila) sont à risque faible à moyen. Cependant, la plupart des secteurs présentent localement des petites zones à risque fort (zones industrielles, lieux fortement fréquentés comme la gare de chemins de fer).

Facteurs aggravants.

- L'habitat illicite qui peut conduire à un mauvais ancrage des bâtiments d'où provient leur fragilité face aux risques de secousses telluriques. La construction dans des zones inondables et à hydromorphie saisonnière (Cité Zarrouk dans la partie Sud du secteur Mateur) peut aussi s'accompagner par une fragilisation des bâtis ;
- Les études relatives à la séismicité et ses conséquences sur le domaine urbain, équipements, infrastructures, et sur la sécurité des personnes sont très en retard comparativement à la situation internationale globale.
- Il n'existe pas de code parasismique qui doit être imposé à la qualité des fondations et charpentes des constructions partout dans le pays, notamment lors d'octroi de permis à construire.

Situation catastrophique. Des séismes d'une forte intensité (VI à IX IMM) sont probables notamment pour de périodes de retour de l'ordre de 475 à 975 ans. Compte tenu des données de séismicité instrumentale durant les trois dernières décennies, et des séismes historiques d'Utique-Tunis, ce type de séismes d'une forte intensité peuvent provoquer des dégâts matériels touchant aux constructions, mais aussi aux aménagements de barrages.

Enjeux probables.

- Blessures, pertes de biens, d'habitat, et dans le cas extrême de vies humaines ;
- Les dommages qui viendraient à être occasionnées aux équipements collectifs (fondations et armatures précaires et non bien étudiées), aux infrastructures insuffisantes et mal entretenues, et aux zones industrielles, etc.

Recommandations majeures.

- La Tunisie en général et la commune d'étude localement gagneraient à adopter un Code parasismique national dont les recommandations doivent être respectées pour chaque permis à bâtir ;
- Imposer le respect du Code d'urbanisme et des PAU locaux, et contrôler, suivre et interdire les constructions non autorisées ;
- Multiplier les études géologiques de surface et de subsurface, les études géodynamiques et les études sismiques à l'échelle nationale et dans la zone ;
- Informer, éduquer et sensibiliser la population aux risques sismiques

Risque érosion hydrique

Aléa. L'aléa érosion hydrique est calculé sur la base de trois contraintes : répartition spatiale des précipitations annuelles, occupation des sols, et répartition des zones urbaines.

les sols de Mateur sont faiblement à moyennent attaqués par l'aléa érosion hydrique, avec une prédominance nette de la classe moyenne dans les secteurs de la ville de Mateur (Mateur, Mateur 2, Cité Essadaka, Cité Ennasr) et dans les secteurs au Sud (Boumkhila, Behaya, Arab-Majour, et surtout Targuellèche. Les deux secteurs Neffat et Banlieue de Mateur sont par contre à aléa érosion hydrique faible dominant. Localement, les terrains situés à la transition entre les deux secteurs Targuellèche et Arab-Majour, sont à aléa érosion hydrique très fort.

Vulnérabilité. Elle est calculée à partir de la densité de drainage, de la pente, de la nature des sols, et celle de la roche mère/géologie. La carte obtenue pour la commune, les deux bassins versants majeurs, et leurs environs, aboutit aux résultats suivants :

- Les deux secteurs Neffat et Banlieue de Mateur sont à vulnérabilité de classe moyenne à forte, avec une prédominance de la classe moyenne ;
- Pour tous les autres secteurs de la commune la vulnérabilité est de classe moyenne à forte, avec une prédominance spatiale de la classe forte, notamment dans les zones à fort reliefs (Béjaoua-Hédil), au Sud (secteurs de Targuellache, Arab-Majour, Behaya, Boumkhila). Dans ces régions, les reliques de forêts peuvent maintenir les sols et les protéger contre cette érosion ;
- La zone découverte traversée par le lit de l'oued Tine, à forte densité du réseau hydrographique, à la transition des deux secteurs Targuiellèche et Arab-Majour,

est nettement vulnérable à l'érosion hydrique de classe très forte, bien que relativement limitée dans l'espace,

Risque érosion hydrique. La carte des classes de risque érosion hydrique établie pour la commune, ses secteurs et ses environs montre que le risque de classe moyenne à forte domine dans la plupart des secteurs. Les deux secteurs Neffat et Banlieue de Mateur sont à classe dominante de risque à l'érosion hydrique. Des espaces dénudés sur les berges de l'oued Tine suivant en Sud-Nord la limite entre les secteurs Taguellèche et Arab-Majour sont à classe d'érosion très forte.

Facteurs aggravants.

- Le manque d'aménagement des bassins versants pour la conservation des eaux et des sols ;
- L'usage des charrues polydisques qui mettent à nu les sols notamment dans les espaces d'arboriculture et facilitent l'érosion des terres en accentuant l'agressivité des précipitations en cours d'orages ;
- Le défrichement des espaces de forêt, de garrigues et de maquis qui détruit la couche racinaire des sols et leur protection contre la mobilisation et l'érosion ;
- Le piétinement excessif des parcours qui détruisent le couvert végétal et la couche racinaire des sols favorisant leur érosion ;
- L'abandon des aménagements des parcelles agricoles en pente et leur plantation par des plantes résilientes à la sècheresse ;
- L'absence du contrôle, du suivi et de l'entretien des aménagements CES existants.

Enjeux. Le phénomène d'érosion s'effectue à 1mm/an de tranche de sol érodée. Il peut paraitre insignifiant. Pourtant, à l'échelle de siècle et de millénaires, ce facteur peut contribuer à la formation de deltas entiers comme celui en soubassement de la ville de Mateur.

Dans la vallée de l'oued Tine, les sols souvent nus sur marnes du Crétacé, servant à la céréaliculture, sont sujettes à une forte érosion. Ceci peut contribuer à une dégradation de sols et des récoltes au fil des années, ce qui conduit à l'abandon des terres.

L'oued Joumine charrie des galets et des sables calcaires provenant du glissement et de l'érosion des falaises calcaires formant les reliefs des Hédil-Béjaoua. Ces falaises calcaires souvent nues, sans sols sont délaissées, et les sols environnants peuvent

être sujet à du glissement et à de l'érosion en hauteur ; l) encore, les sols en pâtissent et les récoltes peuvent se dégrader à longueur d'années.

La quantité d'apport solide moyen annuel à la latitude de Mateur, est de l'ordre de 400.000 m3/an/ Cet apporte qui envase les oueds Joumine et Tine nécessite un curage annuel des lits d'oueds en milieu urbain. Pour seulement 50.000 m3/an à désenvaser, les dépenses sont évaluées à 1000.000 DTN, ce qui n'est pas du budget de la commune de Mateur dans la situation actuelle.

Recommandations. Les actions à conduire sont les suivantes :

- L'effort soutenu des aménagements de bassins versants dans toute la région ;
- Le curage régulier des canaux de drainage et des cours d'oueds notamment dans le domaine urbain ;
- L'action de sensibilisation pour interdire le labour profond (trisoc) qui aggrave ; l'érosion hydrique ;
- La plantation des bassins versants par des arbres et arbustes résilients à la sècheresse qui permettent de maintenir le sol en place et réduisent l'agressivité des pluies et du ruissèlement ;
- La construction de rigoles le long des pentes pour canaliser le drainage des eaux de surface et limiter leur action érosive.
- La veille continue concernant le défrichement de la forêt, des maquis et des garrigues qui protègent les sols, tout en sanctionnant sévèrement les contrevenants ;
- Conduire les études nécessaires sur le rôle de l'érosion hydrique et ses conséquences sur l'activité agricole et le développement urbain ;
- Résoudre le problème de la responsabilité institutionnelle et réglementaire des communes dans la lutte contre l'érosion hydrique et ses conséquences.

Risque glissement de terrain

Aléa. Pour le calcul et la cartographie de l'aléa glissement de terrain, les contraintes : précipitations, occupation des sols, pentes et zones urbaines ont été prises en considération. L'analyse montre :

- Dans l'espace des bassins versants au Sud-Ouest (secteurs de Boumkhila, Nehaya, Arab-Majour, Taguellèche, Neffat), l'aléa est de classe moyenne dominante ;
- A la limite des deux secteurs Targuellèche et Arab-Majour, les berges dénudées présentant des falaises fortes en direction Sud Nord qui sont causes d'un aléa glissement de classe forte ;

- Dans le domaine communal au Nord-Est, aux alentours de la ville de Mateur (Mateur, Mateur Sud, Cité Essadaka et Cité Ennasr), cet aléa est à dominante faible à moyenne. La zone de glissement moyen suit les cours (berges) de l'oued Tine et de l'oued Joumine.
- Dans la Banlieue de Mateur à terrain faiblement chahutés, l'aléa est de classe dominante faible.

Vulnérabilité. La carte établie révèle que l'espace communal d'étude est très faiblement à faiblement vulnérable au glissement de terrain. Cependant, à l'approche des reliefs au Sud (secteurs Targuellèche, Arab-Majour, Behaya, Boumkhila) mais aussi à l'Est (secteurs Neffat et Targuellèche) la classe de vulnérabilité moyenne prédomine.

Les reliefs dénudés, dirigés en Sud Nord à l'Est du barrage Joumine, suivant la limite entre les secteurs de Behaya et Arab-Majour, présentent une forte vulnérabilité aux glissements de terrain.

Les secteurs de la ville de Mateur (Mateur, Mateur 2, Cité Essadaka, Cité Ennasr) sont à vulnérabilité faible, alors que le secteur Banlieue de Mateur aux terrains plats, est à vulnérabilité de classe faible à très faible à ce type d'érosion.

Risque glissement de terrain. Le risque de glissement de terrain dans le domaine communal est à dominante forte pour la plupart des secteurs. Ceci peut s'expliquer par la pente des terrains, leur nature argileuse sur les pentes (marnes crétacées et tertiaires) notamment dans la vallée de l'oued Tine, mais aussi calcaire dans les reliefs où les départs de falaises sont fréquents, liés à la texture conglomératique de calcaires de l'Eocène. Seuls les secteurs Neffat et Banlieue de Mateur sont à risque de glissement moyen dominant.

Le glissement apparait également orienté par les cours d'eau, où il se trouve lié à l'effondrement des falaises des berges depuis les reliefs jusqu'à l'embouchure dans le Lac Ichkeul.

Facteurs aggravants. Les facteurs aggravant ce risque sont :

- Le défrichement des espaces forestiers, des maquis et des garrigues augmente le risque de glissement de terrain ;
- Les constructions non-autorisées et cultures sur les berges des oueds favorisent le risque et amplifient ses mauvaises conséquences ;
- La densification des voies d'accès sur des terrains non viabilisés en cas de défrichement et de construction non autorisée ;
- L'absence de suivi, de contrôle et d'aménagement notamment des berges des cours d'eau principaux est à même de favoriser le glissement de terrain en ces lieux ;
- Le manque de stabilisation des terrains en pente par la plantation d'arbre et arbustes résilients à la sècheresse, et la pratique de rigoles d'évacuation des eaux de ruissèlement

dans le sens de la pente pour diminuer le rôle de l'eau en ruissèlement dans l'imbibition des sols et leur tendance au glissement.

Enjeux. Les enjeux liés au risque de glissement de terrain peuvent être importants notamment dans des conditions de forte pluie, sans exclure la perte en biens et potentiellement en vies humaines. Les pertes peuvent survenir en cas de cultures et de constructions en bordure de talus sur les berges des cours d'eau et près des ouvrages et plans de mobilisation d'eau de ruissèlement.

Recommandations: Pour surveiller, prévenir et réduire les conséquences des risques glissements de terrain, il importe :

- D'aménager (travaux CES) et de planter les basses terrasses des vallées des oueds, en gardant une zone de sécurité par rapport à la bordure des falaises ;
- De veiller au curage et nettoyage notamment des lits mineurs dans les vallées ;
- D'interdire les constructions et les rejets de fumiers sur les falaises des berges et sur les terrains en pente (nécessité de terrassement et de viabilisation), et sanctionner sévèrement les contrevenants ;
- De construire des rigoles de drainage des eaux de ruissèlement dans le sens de la pente pour limiter l'infiltration des eaux et diminuer l'intensité de l'érosion hydrique ;
- De sensibiliser les concernés aux dangers de glissements de terrain, au respect et à la sauvegarde du domaine public hydraulique.

Risque de feu de forêt

Aléa. Il peut être naturel (foudre essentiellement), ou dû à la pyromanie dans des situations diverses, par erreur ou volontaire.

Vulnérabilité. Dans les limites des secteurs de la commune, seuls persistent des lambeaux forestiers sur les reliefs dans les espaces Sud-Ouest des secteurs de Behaya et de Boumkhila. Le secteur de Targuellèche est aussi riche en reliques forestières (région de Sidi Abdelbasset-Eddkhila), notamment à l'approche des reliefs de Tébourba au Jebel Messeftine, à El Alia. Tous ces espaces forestiers sont à vulnérabilité très forte au risque de feu de forêt. Le secteur Cité Ennasr possède aussi un petit espace forestier au Sud-Ouest assez riche en Eucalyptus et qui peut être observé sur la route de Mateur à Ghezala. Ce lambeau de forêt demeure fortement vulnérable au feu.

Risque de feu de forêt : La carte établie pour les classes de ce risque prend en considération les contraintes suivantes : type de forêt, occupation du sol, indice de pente, et zones urbaines.

- Tous les espaces à reliques forestières issues de l'action défrichement depuis l'antiquité, sont limitées aux reliefs des secteurs Sud de la commune : Targuellèche, Behaya et Boumkhila, et à la partie Sud du secteur Cité Ennasr. La forêt couvrant le Jebel Ichkeul bien que limitrophe au secteur Banlieue de Mateur, avec sa richesse en faune avicole, joue un rôle important dans l'équilibre environnemental et de la biodiversité dans la commune.
- Les classes de risque d'incendie varie de très faible au très fort. Les forêts à résineux avec des espaces de maquis, de garrigues, de parcours et localement des champs d'arboriculture sont à risque très fort d'incendie. Le risque moyen à fort caractérise les garrigues, reliques forestières limitées, brises vents aux alentours de champs d'arboriculture, situés sur les pentes et dans les plaines.
- Les champs d'arboriculture ont aussi été intégrés dans la carte, et sont caractérisés par un risque de classe faible à forte, surtout dans et aux alentours des secteurs Mateur, Mateur Sud, Banlieue de Mateur, dans la partie Nord des secteurs de Targuellèche et Arab-Majour, et aux confins Nord des limites du secteur de Neffat.

Facteurs aggravants

- Le défrichement non-autorisé des maquis et garrigues pour le gain d'espaces de culture
- L'absence de contrôle, de suivi régulier et de surveillance de l'intégrité des espaces forestiers, et d'entretien des tranchées pare-feu ;
- L'abandon du métier de garde forestier dans l'après 2011 ;
- L'absence de pancartes de signalisation et de sensibilisation des voyageurs, des chasseurs, des habitants, etc., aux risques involontaires de mise à feu de l'espace forestier (barbecue en cours de randonnée par exemple).

Enjeux : Les enjeux sont nombreux.

- Perte définitive d'espace forestier, notamment lorsqu'il s'agit d'associations phyto-sociologiques non-naturellement régénérables ;
- Perte d'espaces de parcours, de culture de loisirs (campement, chasse, randonnées, etc.);
- Pertes potentielles d'habitat, de biens, de bétail, de biodiversité et surtout de vies humaines;

- Retombées environnementales désastreuses, la forêt jouent un rôle capital dans le rabattement de l'érosion hydrique et des glissements de terrain;
- Pertes de gains socio-économiques liés à l'exploitation des espaces forestiers (pâturage, chasse, loisirs, tourisme ; industrie artisanale en particulier du bois, fruits exotiques, menthol extrait du romarin, pin d'Alep, essences végétales et médicinales, etc.);
- Déséquilibre climatique contrôlé entre autres par la présence de couverture forestière jouant à l'encontre de l'évapotranspiration et donc la sècheresse, la séquestration du carbone, la productivité biologique, etc.;
- Perte en termes de biodiversité animale et végétale.

Recommandations.

- Etudes nécessaires: i) contexte de genèse, évolution, conservation et sauvegarde des écosystèmes forestiers dans la commune de Mateur et ses environs ; ii) réforme administrative, institutionnelle et réglementaire relative au patrimoine forestier (révision du Code forestier notamment en ce qui concerne l'exploitation et la sauvegarde de ce patrimoine ; le rôle de la commune dans la prévention du risque de catastrophe lié au feu de forêt ; iii) enjeux socioéconomiques des incendies de forêt ; iv) le coût de dégradation de l'environnement lié aux incendies de forêts ; v) incendies de forêt et déséquilibre de la biodiversité et de son habitat;
- Interdiction de l'urbanisation et de l'habitat isolé, de l'espace forestier et ses environs immédiats ;
- Interdiction des actions de défrichement de forêts, de maquis et de garrigues ;
- Réglementation de l'exploitation des espaces de parcours forestiers ;
- Signalisation et sensibilisation des passagers et des visiteurs (camping, chasse, randonnée) aux risques de départ de feu de forêt ;
- Réhabilitation du métier de garde forestier ;
- Renforcement du contrôle, de suivi, et des moyens matériels et humains pour la surveillance de l'espace forestier ;

Risque épidémiologique (Aedes)

Aléa : Cet aléa est lié aux sols hydromorphes salins au Sud de l'Ichkeul (secteur Banlieue de Mateur) propices au développement de biotopes à moustique Aedes. En cas d'épidémie, tous les secteurs de la commune peuvent être soumis à un aléa très fort d'épidémie.

Vulnérabilité : Tous les secteurs de la commune sont très fortement vulnérables à l'épidémie potentielle liée à ce moustique, voyant les résultats de l'épidémie de 1927-1928.

Risque. Les secteurs Banlieue de Mateur, Mateur Sud, Mateur, Cité Essadaka, et les parties Nord à Nord Est des secteurs Targuellèche et Arab-Majour sont à risque fort à très fort d'épidémie lié au genre de moustique Aedes. Le secteur Neffat dans sa partie Ouest est sujet à une classe forte face à ce risque.

Enjeux : En dépit des efforts de suivi, de contrôle et de prévention du risque épidémiologique lié au moustique Aedes, toute survenue d'épidémie liée à cette espèce peut provoquer des pertes lourdes en vie humaines.

Recommandations. Les recommandations sont les suivantes :

- Conduire les études nécessaires pour la caractérisation des biotopes favorables au développement des gîtes larvaires d'Aedes ;
- Améliorer le traitement des eaux usées de la STEP et conduire les études nécessaires quant à l'aménagement des facilités et des zones de rejet des eaux usées traitées ;
- Informer et sensibiliser la population communale à la gestion rationnelle et rigoureuse des déchets et des rejets d'eaux usées, et aux risques épidémiologiques liés à divers vecteurs dont en particulier le moustique Aedes.

Risque changement climatiques et élévation du niveau moyen de la mer

Les risques associés aux changements climatiques qui sont multiples et affecteront le climat, peuvent engendrer la sècheresse et les inondations, et provoquer une réduction estimée de la production agricole à l'horizon 2100, par rapport à la période de référence 1961-1990. Un autre risque majeur concerne l'élévation du niveau moyen de la mer de près de 1m durant cette période. Or la majeure partie du secteur Banlieue de Mateur est situé à des côtes très basses, souvent inférieures à 1m/NGT, en relation avec l'évolution géomorphologique du Lac Ichkeul.

Aléa. Il est anthropique, engendré par des émissions de gaz à effet de serre liés aux divers secteurs de la vie socio-économique (CO_2, CH_4, NO_2, SO_2, et composés organiques volatiles COV). Il s'agit de la conséquence de l'élévation accélérée, attendue du niveau moyen de la mer (EANM).

Vulnérabilité. Ce sont les zones basses hydromorphes et à sols salins en dessous d'une cote de près de 1m/NGT qui sont à vulnérabilité forte à très forte à la submersion marine. La salinisation de l'aquifère phréatique dans ces zones est également

possible. Les sols à biotope de moustiques Aedes, peuvent se rapprocher encore plus des secteurs de la ville de Mateur.

Risque. L'évaluation de la vulnérabilité et du risque de submersion nécessite un plan côté précis au cm près de l'espace côtier. Ce plan est établi à partir des données satellitaires les plus récentes.

La carte montre que le secteur de Banlieue de Mateur est exposé à un risque très fort par cette submersion marine liée à l'EANM.

Les marais et sols hydromorphes des alentours Sud du Lac Ichkeul et les zones à cote basse, en dessous de 1m/NGT, subiront l'EANM et donc la submersion notamment dans les espaces Nord du secteur Banlieue de Mateur. Les pertes en terrains de cultures gagnées sur le Lac Ichkeul depuis des millénaires, seront importantes. De plus, cette submersion provoquera la salinisation de l'aquifère de surface et aidera à l'extension des sols hydromorphes à végétation halophile vers les zones habitées. Ces sols formant un biotope favorable aux moustiques, notamment l'espèce Aedes, peuvent aussi engendrer un risque épidémiologique à l'avenir.

Le Tableau suivant donne les surfaces urbaines submersibles en ha, en fonction de l'EANM réelle ou virtuelle.

Cote topographique (m)	Superficie totale (ha)	EANM en cm	Classe de risque
0 à 0,63	470	63	Très forte*
0 à 1	587	100	Forte **
1 à 2	1294	-	Faible

** : Scénario pessimiste envisagé dans l'étude d'IHE 2008 (MAL&E).*
*** : EANM révisée à la hausse dans les études mondiales récentes.*

Enjeux. Ils sont nombreux :

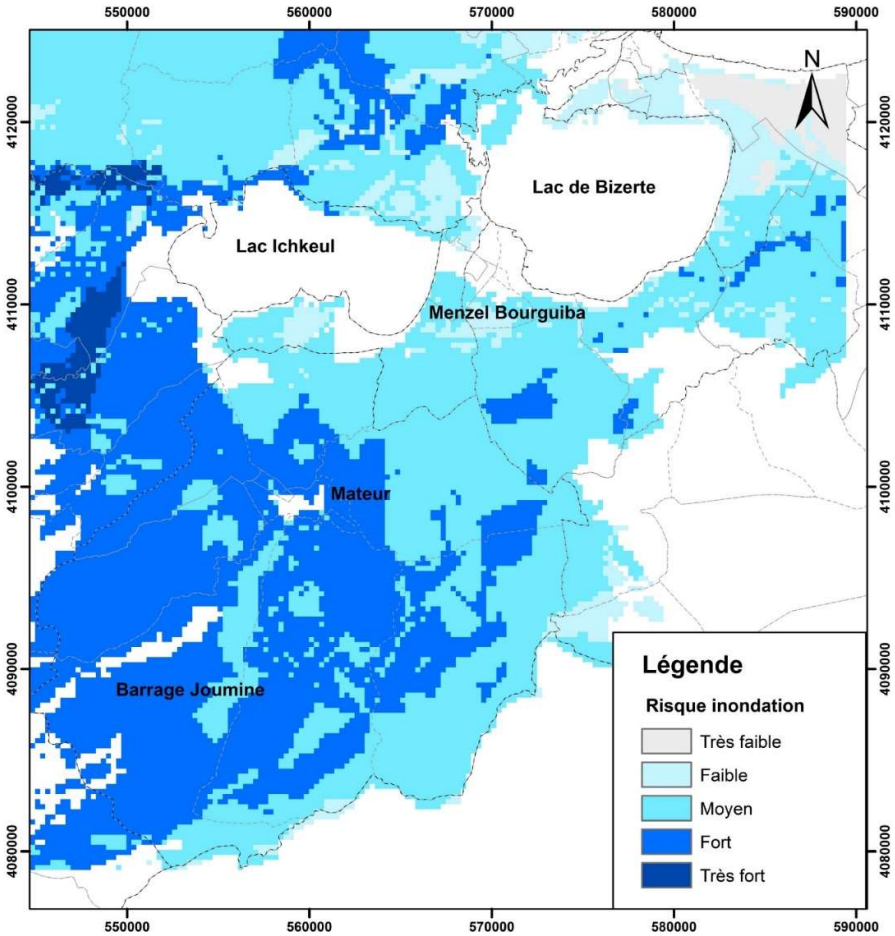
- Les conséquences de cette EANM prévue continuelle, seront graves sur la biodiversité et l'équilibre écologique du Lac Ichkeul ;
- La pêche dans le Lac Ichkeul peut bénéficier de la submersion attendue et par conséquent l'enrichissement éventuel des ressources poissonnières ;
- Les terrains agricoles actuels et parcours du Nord du secteur Banlieue de Mateur seront submergés, ce qui représente une perte considérable de ressources agricoles ;
- La formation de nouveaux espaces de sols hydromorphes à végétation halophile, plus proches des concentrations urbaines, peut comporter un risque épidémiologique plus affirmé, véhiculé par des vecteurs dont les moustiques Aedes.

- La salinisation des aquifères de surface représente une perte considérable de ressources hydriques vitales.

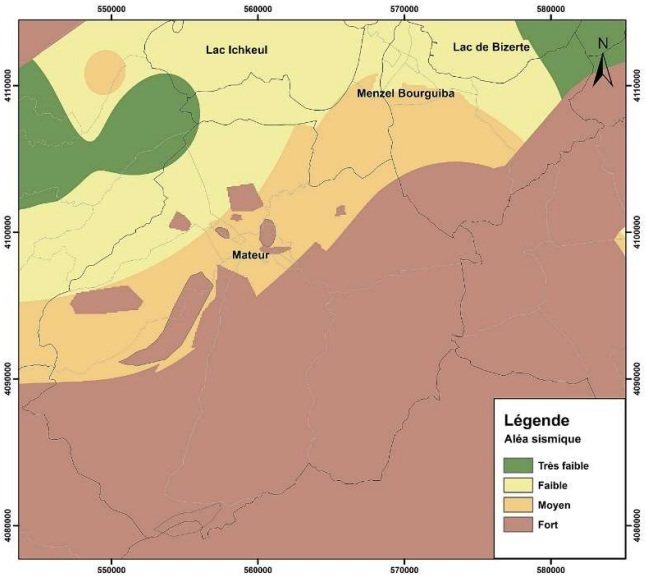
A ces enjeux, il faudra ajouter les pertes sur les récoltes agricoles, les menaces de sècheresse, l'aggravation des risques d'inondation, etc.

Recommandations. Il est recommandé de conduire des études plus détaillées sur les causes et les conséquences des changements climatiques et sur l'EANM. Dans ce dernier cas, il est nécessaire de disposer des levés topographiques les plus précis dans le domaine urbain et la dépression du Lac Ichkeul. Des levés bathymétriques de ce lac et de l'évolution de la profondeur d'eau en relation avec l'envasement progressif, sont également nécessaires. L'étude stratégique d'adaptation de l'agriculture de la région aux changements climatiques et à l'EANM doit aussi être approfondie.

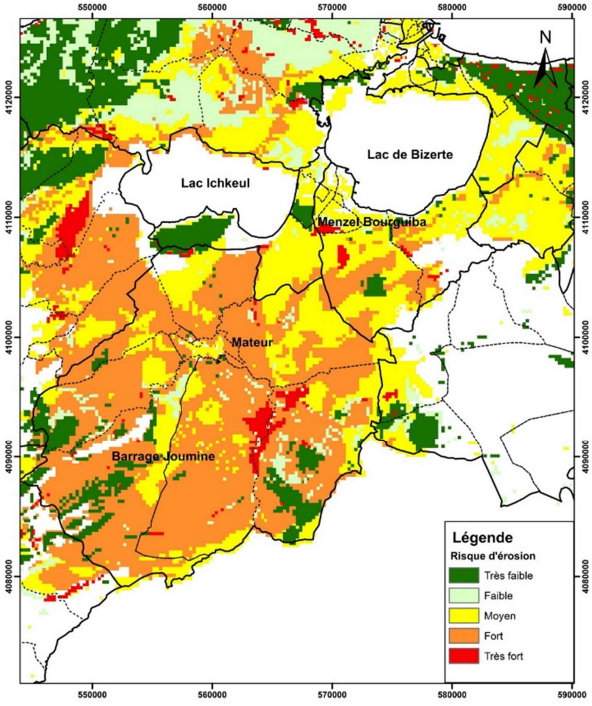
A6.2.3 Risk Maps



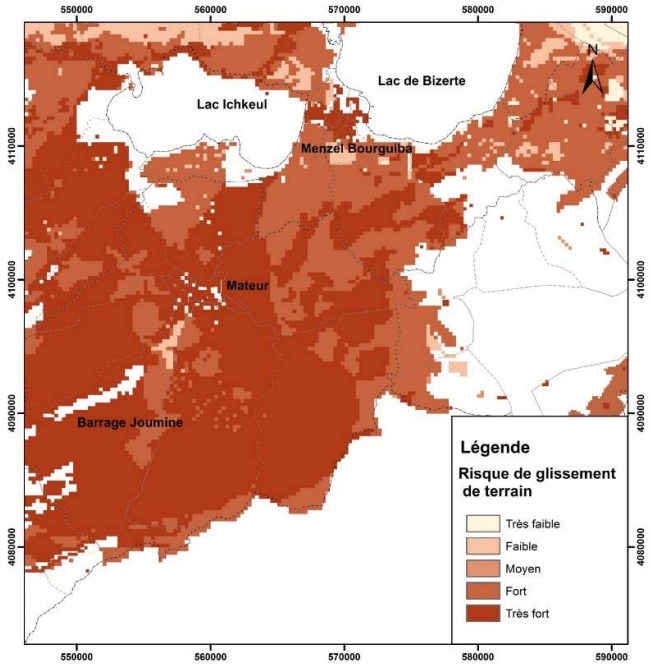
Flash flood risk map



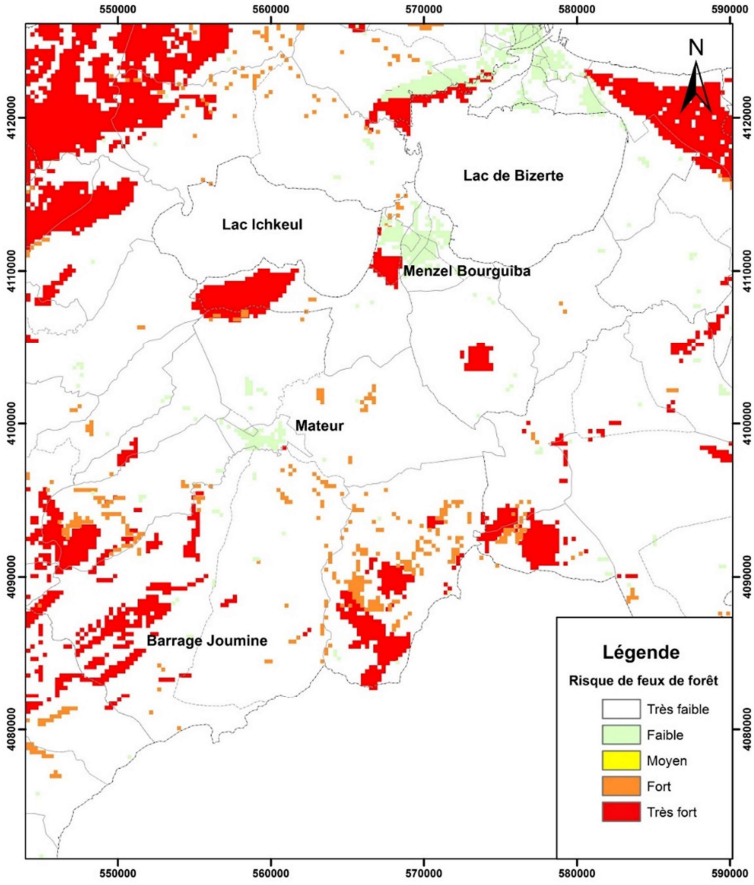
Seismic Risk Map



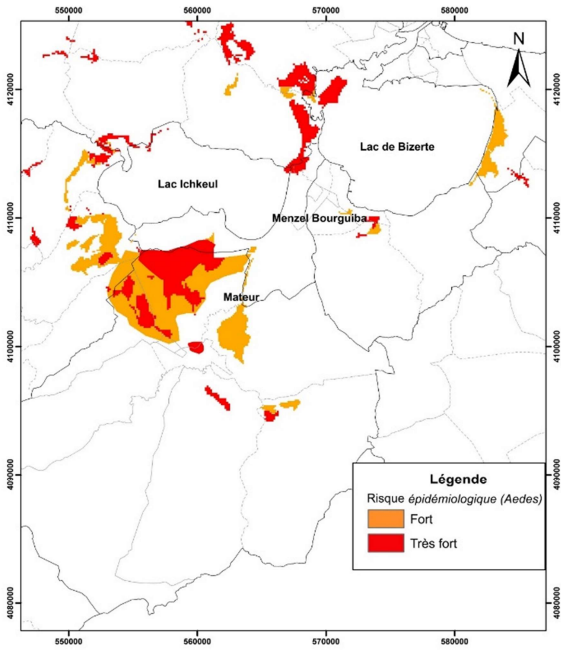
Water and soil erosion risk map



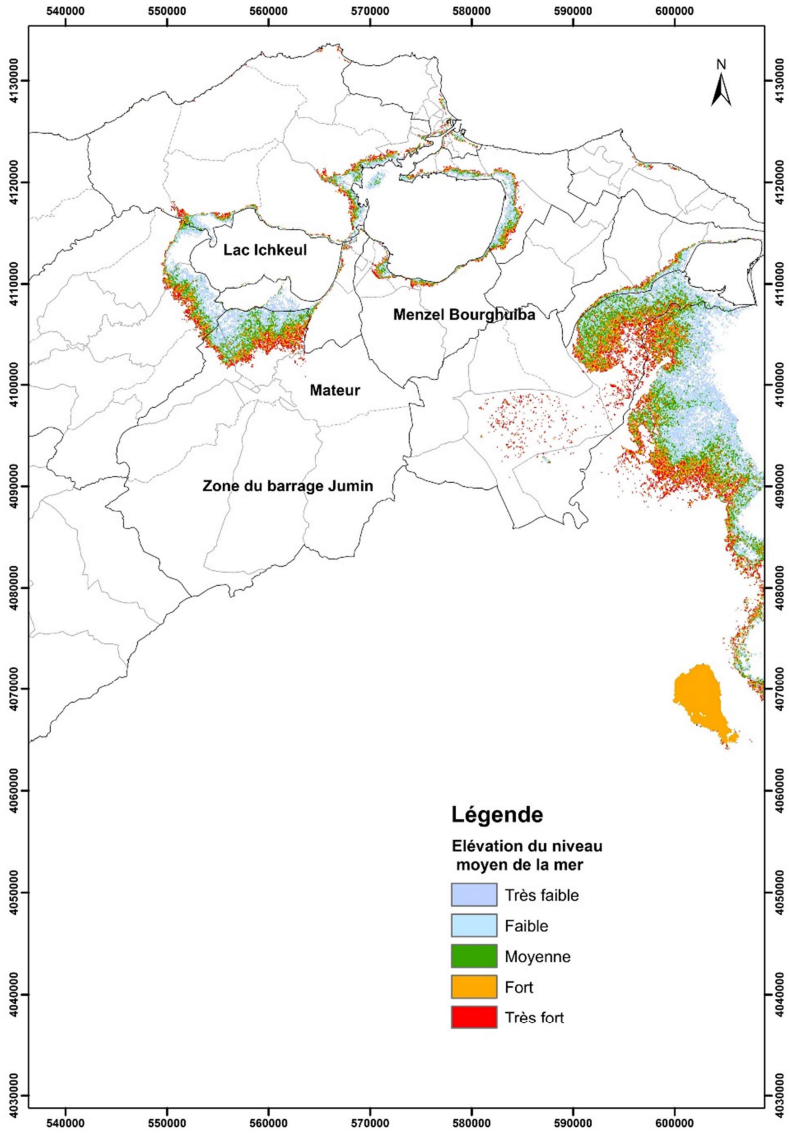
Landslide risk map



Forest fire risk map



Epidemic Risk Map



Sea-level rise Risk Map

Annex 7 Summary of Resilience Local Action Plans for Gabes and Mateur

A7.1 Gabes

It should be noted that this local strategy can not be separated in its essence and objectives, from the strategy to be adopted at the national level. In this respect, some strategic areas of the study, are part of the expected national strategy rather than a simple local strategy

A7.1.1 Main Axes for Local Strategy for Resilience

The analysis of the disaster risk in this work and the results obtained at the scale of the Greater Gabes, highlight the axes of multisectoral intervention, the strategic priorities and the priority actions, and the fields of intervention. Seven strategic axes can be listed:

1. Update and implementation of institutional and regulatory mechanisms for DRR;
2. The development of long-term financial mechanisms;
3. The overall reduction of the effects of hazards and vulnerability;
4. Organization and strengthening of information, training and awareness systems for disaster risk;
5. long-term capacity building at the national, regional and municipal levels;
6. Strengthening transversal coordination and international cooperation.

Strategic axes 1, 2, 3 are part of the sectoral national strategy and the national action plan to be adopted in this field, whereas axes 3, 4, 5 and 6 are the main priorities for the local strategy at the Greater Gabes level.

A7.1.2 Local Action Plan

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience des communes du grand Gabes face aux risques et aux situations de catastrophe						
ACTVITES		**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Objectif spécifique 1 : Améliorer la connaissance des aléas, des facteurs de vulnérabilité et des risques en découlant dans le contexte spécifique à chaque secteur communal.						
Résultats : Connaissance satisfaisante de l'agressivité des aléas, des degrés de vulnérabilité et de la gravité des risques.						
Activités	Construction, mise à jour et gestion d'une base de données géo-référencées SIG permettant de restituer et d'évaluer le zonage spatio-temporel de l'aléa, de la vulnérabilité et du risque.	Mise en place, gestion et mise à jour de la base de données. Base de données fonctionnelle.	Contrôle et suivi mis en place.	Exploitation effective de la BD, production de cartes d'aléa, de vulnérabilité et du risque à l'échelle des secteurs et des communes.	Commune ; structure de gestion de la base de données (géomaticien).	Court terme
	Recruter le personnel nécessaire à la mise à jour, à la gestion et à l'exploitation de cette base de données	Géomaticien recruté ?	Géomaticien/spécialiste identifié.	Gestion de la BD opérationnelle, production de jeux de cartes.	Commune, Unité de Géomatique et urbanisation,	Court terme
	Conduire des études nécessaires pour améliorer la connaissance de l'exposition des secteurs aux risques potentiels (risque de destruction de la palmeraie, salinisation des sols, pollution, etc.).	Identification des thèmes d'étude, préparation des TdRs et des cahiers d'Appel d'Offres	Appels d'offres publiés	Appels d'offre dépouillés et marché attribué aux adjudicataires	Commune	Court terme
	Exploiter les résultats de cette vulnérabilité pour orienter les schémas de développement communaux et sectoriels, et les plans d'aménagement urbain y afférents.	Production de plans de sauvegarde des communes, Plan d'aménagement remis à jour	Plans de sauvegarde et mesures y afférentes finalisés	Plans de sauvegarde et mesures y afférentes approuvés et communiqués.	Département d'urbanisme ; Unité Géomatique	Court à moyen terme
	Exploiter les résultats de cette vulnérabilité pour orienter les schémas de développement communaux et sectoriels, et les plans d'aménagement urbain y afférents.	Etude spécialisée sur Appel d'Offres	Appels d'offres publiés	Appels d'offre dépouillés et marché attribué aux adjudicataires	Commune (Service des Achats	Court terme

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience des communes du grand Gabes face aux risques et aux situations de catastrophe						
ACTVITES		**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Objectif spécifique 2 : Agir pour réduire la vulnérabilité des secteurs des communes et l'agressivité des aléas.						
Résultats : Les programmes et les mesures de la vulnérabilité des secteurs sont mis en place						
Activités	Instaurer un programme de veille et de contrôle pour éradiquer les rejets anarchiques de déchets, la destruction des canaux de drainage, et combattre sévèrement l'occupation et la construction illicite dans l'espace urbain	Programme d'action conçu et mis en œuvre	Réduction des rejets de déchets et constructions illicites.	Nombre de contrevenants sanctionnés	Police municipale Police de l'Environnement	Court et moyen termes
	Conduire les études nécessaires pour une meilleure connaissance de l'étendue de la pollution terrestre et marine provenant de la zone industrielle.	Études réalisées (pollution atmosphériques, métaux lourds, radioactivité)	Études approuvées.	Production des rapports définitifs d'étude	Commune - Service des Achats	Moyen terme
	Préparer un programme de consultation des industriels pour l'adoption de SME et des meilleures techniques disponibles pour la gestion des émissions atmosphériques (traitement des fumées), des effluents et des décharges solides (enterrement du phosphogypse) dans l'environnement marin proximal déjà pollué ; engager des pourparlers pour l'instauration d'une taxe verte permettant de mobiliser des fonds pour des projets de compensation de la pollution (murailles vertes protectrices, pépinières forestières, etc.) ;	Programme de consultation établi et consultations accomplies	PV de réunions, rapports et comptes rendus	Accords conclus avec les industriels et échéances d'exécution Taxe verte réglementée et textes publiés	Commune	Court et moyen terme
	Organisation et renforcement des capacités des acteurs	Guide de formation préparé	Formation des concernés assurée par des spécialistes du métier	Taux personnes bénéficiaires de la formation	Commune	Court et moyen termes
	Encourager les investisseurs dans les projets industriels amis de l'environnement	Conception des projets ; Schémas d'investissement, sources de financement	Projets mis en place	Nombre de projet	Commune/Autorités régionales	Moyen et long termes

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience des communes du grand Gabes face aux risques et aux situations de catastrophe						
ACTVITES		**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Objectif spécifique 3 : Etudes réalisées, accords conclus, et mise en place des administrations DHU et ARRU						
Résultats : Réduire la vulnérabilité technique et organisationnelle des réseaux structurants						
Activités	Conduire les études nécessaires pour un projet d'aménagement de lutte contre les inondations : refonte du réseau d'évacuation d'eau pluviale, réaménagement du canal installé sur le domaine public hydraulique de l'ancien lit d'oued Gabes, aménagement d'autres canaux radiaires de drainage sur les affluents intra-urbains de cet oued situés dans des quartiers inondables	Etudes réalisées (inondation, aménagement)	Etudes approuvées ;	Production des rapports définitifs d'étude et DAO des aménagements à pourvoir	Commune/DHU	Moyen et long termes
	Engager des discussions avec le ministère de l'agriculture, des ressources hydrauliques et de la pêche, et le ministère de l'équipement, de l'équipement de l'habitat et de l'aménagement du territoire pour un projet de protection du grand Gabes contre les inondations, et pour résoudre le problème des charges annuelles de curage et d'entretien du réseau public hydraulique dans les communes.	Programme de consultation établi et consultations accomplies	Accord de projet, rapports de consultations accord négocié.	Accords conclus et PV de réunions.	Commune/DHU//MARHP	Court et moyens termes
	Conduire les études nécessaires (hydrologie, hydrogéologie, Hydraulique, APD/DAO) pour un projet de drainage des zones urbaines hydromorphes (secteur de Chott Sidi Abdessalem).	Etudes réalisées (hydromorphie, salinisation).	Etudes approuvées.	Rapports définitif d'étude	Commune	Court et moyen termes
	Exiger la création d'administrations de la direction de l'hydraulique urbaine, et de l'Agence de Réhabilitation et de Rénovation Urbaine au profit du Gouvernorat de Gabes.	Préparation du dossier, justification, structure à mettre en place	Accord conclu avec la tutelle	Administrations locales DHU et ARRU mises en place	Communes/Autorités de la Région	Court et moyen termes

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience des communes du grand Gabes face aux risques et aux situations de catastrophe						
ACTVITES		**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Objectif spécifique 4 : Maitriser l'urbanisation et concevoir des secteurs résilients						
Résultats : Périmètres de sécurité mis en place, arrêt des constructions illicite de l'oasis, et réserves foncières évaluées et créées						
Activités	Interdire l'urbanisation dans une zone de sécurité de 1200 m autour de la zone industrielle et user de la loi (expropriation pour utilité publique ; loi 2017-53) pour le dédommagement des concernés	Réglementation mise en place. Délimitation de la zone de sécurité recherchée, évaluation budgétaire, consultations avec les concernés.	Accords et ententes conclues avec les concernés.	Textes réglementaires publiés. Taux de couverture de la zone de sécurité créée autour de la zone industrielle.	Communes/ Administration Régionale	Moyen et long terme
	Mettre en défens l'espace oasien contre toute urbanisation, préserver ses reliques dans les zones urbaines et combattre sévèrement son urbanisation qui conduit au risque d'hydromorhie et de salinisation des sols et des eaux de nappe ; User de la loi d'expropriation pour utilité publique pour préserver ce patrimoine qui constitue en priorité, un patrimoine historique et culturel.	Réglementation mise en place. Délimitation de la zone de sécurité recherchée, évaluation budgétaire, consultations avec les concernés	Accords et ententes conclues avec les concernés	Textes réglementaires publiés. Taux de couverture de la zone de sécurité créée autour de la zone industrielle.	Communes/ Administration Régionale	court et Moyen termes
	Œuvrer à l'acquisition de réserves foncières et leur viabilisation telle que par expropriation pour utilité publique pour décongestionner les centres urbains et éviter l'urbanisation des zones à risques (inondation, pollution), plus particulièrement les zones basses et les oasis.	Textes réglementaires conçus Définition des besoins en terres sur la base de schémas d'orientation du développement urbain.	Accords et ententes conclus avec les concernés	Textes réglementaires publiés ; superficie de terrains acquis.	Communes/Autorités régionales.	Moyen et long termes
	Intégrer l'évaluation du risque dans les schémas directeurs de développement urbain.	Recommandations publiées et accords administratifs transversaux (Communes, DGAT)	Accords et ententes conclus concernant le modèle type des TdRs d'études	PVs de réunions, information publiée et communiquée.	Communes/Autorités Régionales	Court et moyen termes

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience des communes du grand Gabes face aux risques et aux situations de catastrophe						
ACTVITES		**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Objectif spécifique 5 : Prévenir la gravité des enjeux et se préparer à la gestion de la situation de catastrophe						
Résultats : Plans préventif du risque et plans communaux de sauvegarde établis et mesures de soutien bien définies						
Activités	Préparation des plans préventifs du risque, et des plans communaux de sauvegarde.	Plans préventifs et de sauvegarde produits par l'Unité Géomatique et le Département de l'Urbanisation	Plans approuvés	Plans de prévention et de sauvegarde publiés et communiqués.	Communes : Unité de Géomatique et Département de l'Urbanisation.	Court et moyen termes
	Instauration des mesures et des plans d'action de soutien pour un retour rapide à la normale.	Mesures et plans d'action arrêtés.	Mesures et plans d'action approuvés.	Mesures et plans d'action publiés, et communiqués.	Communes Département de l'Urbanisation.	Court et moyen Termes
	Action de sensibilisation à la gestion des catastrophes.	Préparation des programmes de séminaires, ateliers, etc.	Tenue des séminaires, réunions, etc.	Nombre d'association de la société civile impliqués, nombre de séminaires, ateliers, nombre de participants.	Communes	Court et moyen termes
	Formation d'un corps de personnes dans le domaine de prévention, d'intervention et de gestion en cas de catastrophes.	Préparation des programmes de formation	Approbation du programme de formation et des procédures d'intégration des personnes.	Nombre de volontaires formés et actifs dans le domaine.	Commences/Autorités Régionales/DR de l'ONPC	Court, moyen et long termes
Objectif spécifique 6 : Information et éducation préventives du public et développement de la résilience						
Résultats : Ateliers, workshops et séminaires réalisés, et supports d'information communiqués au public.						
Activités	Financer des ateliers, des workshops, des journées scientifiques ou de formation des jeunes écoliers, collégiens, lycéens et étudiants (compétition avec distribution de prix, de logos, de casquettes, de tee-shirts, de brochures, etc.)	Conception des ateliers, workshops, brochures, logos et autres supports	Ateliers et workshops réalisés, Support communiqués, rendus publics, médias informés	Nombre d'ateliers, de workshops, nombre de participants.	Communes	Court, moyen et long termes
	Impliquer les organisations de la société civile dans l'organisation et la conduite des manifestations précédentes.	Accords entre communes et ONGs préparés et communiqués, Réunions de consultation.	Contrats signés avec les ONGs	Nombre de contrats, nombre d'Ateliers dirigés par les ONGs et nombre de participants, comptes rendus.	Communes	Court, moyen et long termes
Objectif spécifique 7 : Divulgation de l'information auprès des administrations, de la société civile, des médias et de la population (écoles, collèges, lycées, établissements universitaires) est un atout primordial pour le renforcement de la résilience de la population face aux RC						
Résultats : Divulgation de l'information accomplie et vérifiée						
Activités	Œuvrer pour la meilleure diffusion de l'information sur les risques multiples et les dangers de catastrophes dans les communes du grand Gabes	Textes d'information avec justificatifs et études et plans de prévention et de sauvegarde préparés.	PVs de réunions, courriers d'échange d'information, spots publicitaires, nombre de séances de médias.	Taux de couverture de l'information auprès du public communal.	Communes	Court, moyen et long termes

A7.2 Mateur

It should be noted that this local strategy can not be separated in its essence and objectives, from the strategy to be adopted at the national level. In this respect, some strategic areas of the study, are part of the expected national strategy rather than a simple local strategy.

A7.2.1 Main Axes for Local Strategy for Resilience

The disaster risk analysis in this work and the results achieved have identified the areas of multisectoral intervention, strategic priorities and priority actions, and areas of intervention. Six strategic axes can be listed:

1. Update and implementation of institutional and regulatory mechanisms for DRR;
2. The development of long-term financial mechanisms;
3. The overall reduction of the effects of hazards and vulnerability;
4. The organization and strengthening of information, training and disaster risk awareness systems;
5. Long-term capacity building at the national, regional and municipal levels;
6. Strengthening transversal coordination, and international cooperation.

Strategic axes 1, 2, 3 are part of the sectoral national strategy and the national action plan to be adopted in the field, whereas axes 3, 4, 5 and 6 have been identified as priority axes at the local level.

A7.2.2 Local Action Plan

	ACTVITES	INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES	INDICATEURS DE SUIVI	SOURCES ET MOYENS DE VERIFICATION	RESPONSABILITE	Echéance
Objectif global : Mise en place d'un plan d'action pour améliorer la résilience dans la commune de Mateur face aux risques et aux situations de catastrophe						
Objectif spécifique 1 : Améliorer la connaissance des aléas, des facteurs de vulnérabilité et des risques en découlant dans le contexte spécifique à chaque secteur communal						
Résultats : Connaissance satisfaisante de l'agressivité des aléas, des degrés de vulnérabilité et de la gravité des risques						
Activités	Construction, mise à jour et gestion d'une base de données géo-référencées SIG permettant de restituer et d'évaluer le zonage spatio-temporel de l'aléa, de la vulnérabilité et du risque.	Mise en place, gestion et mise à jour de la base de données. Base de données fonctionnelle.	Contrôle et suivi mis en place.	Exploitation effective de la BD, production de cartes d'aléa, de vulnérabilité et du risque à l'échelle des secteurs et de la commune.	Commune; structure de gestion de la base de données	Court terme
	Recruter le personnel nécessaire à la mise à jour, à la gestion et à l'exploitation de cette base de données	Géomaticien recruté ?	Géomaticien/spécialiste identifié.	Gestion de la BD opérationnelle, production de jeux de cartes.	Commune, Unité de Géomatique et urbanisation	Court terme
	Conduire des études nécessaires pour améliorer la connaissance de l'exposition des secteurs aux risques potentiels (inondation, glissements de terrain, hydromorphie, épidémiologie, etc.).	Identification des thèmes d'étude, préparation des TdRs et des Dossiers d'Appel d'Offres	Appels d'offres publiés	Appels d'offre dépouillés et marché attribué aux adjudicataires	Commune	Court terme
	Exploiter les résultats de cette vulnérabilité pour orienter les schémas de développement communal et sectoriels, et les plans d'aménagement urbain y afférents.	Production de plans de sauvegarde la commune, Plan d'aménagement remis à jour	Plans de sauvegarde et mesures y afférentes finalisés	Plans de sauvegarde et mesures y afférentes approuvés et communiqués	Département d'urbanisme ; Unité Géomatique	Court à moyen terme
	Exploiter les résultats de cette vulnérabilité pour orienter les schémas de développement communal et sectoriels, et les plans d'aménagement urbain y afférents.	Etude spécialisée sur Appel d'Offres	Appels d'offres publiés	Appels d'offre dépouillés et marché attribué aux adjudicataires	Commune (Service des Achats)	Court terme
Objectif spécifique 2 : Agir pour réduire la vulnérabilité des secteurs de la commune et l'agressivité des aléas.						
Résultats : Les programmes et les mesures de la vulnérabilité des secteurs sont mis en place						
Activités	Instaurer un programme de veille et de contrôle pour éradiquer les rejets anarchiques de déchets, la destruction des canaux de drainage, et combattre sévèrement l'occupation et la construction illicite dans l'espace urbain	Programme d'action conçu et mis en œuvre	Réduction des rejets de déchets et constructions illicites	Nombre de contrevenants sanctionnés	Police municipale Police de l'Environnement	Court et moyen termes
	Préparer un programme de consultation des industriels existants ou nouvellement installés pour l'adoption de SME et des meilleures techniques disponibles pour le traitement des nuisances, des effluents et des déchets solides. Engager des pourparlers pour l'instauration d'une taxe verte permettant de mobiliser des fonds pour des projets de compensation de la pollution (murailles vertes protectrices, pépinières forestières, etc.) ;	Programme de consultation établi et consultations accomplies	PV de réunions, rapports et comptes rendus	Accords conclus avec les industriels et échéances d'exécution. Taxe verte réglementée et textes publiés	Commune	Court et moyen terme
	Organisation et renforcement des capacités des acteurs ;	Guide de formation préparé	Formation des concernés assurée par des spécialistes	Taux personnes bénéficiaires de la formation.	Commune	Court et moyen termes

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience dans la commune de Mateur face aux risques et aux situations de catastrophe						
	ACTVITES	**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
	Encourager les investisseurs dans les projets industriels amis de l'environnement	Conception des projets ; Schémas d'investissement, sources de financement	Projets mis en place	Nombre de projet	Commune/Autorités régionales	Moyen et long termes
Objectif spécifique 3 : Réduire la vulnérabilité technique et organisationnelle des réseaux structurants						
Résultats : Préparation des études et solutions à apporter aux problèmes de nuisances environnementales						
	Conduire les études nécessaires pour un projet d'aménagement de lutte contre les inondations : refonte du réseau d'évacuation d'eau pluviale, réaménagement des cours d'eau dans la ville.	Etudes réalisées (inondation, aménagement)	Etudes approuvées	Production des rapports définitifs d'étude et DAO des aménagements à pourvoir	Commune/DHU	Moyen et long termes
Activités	Engager des discussions avec le ministère de l'agriculture, des ressources hydraulique et de la pêche, et le ministère de l'équipement, de l'habitat et de l'aménagement du territoire pour un projet de protection de Mateur contre les inondations, et pour résoudre le problème des charges annuelles de curage et d'entretien du réseau public hydraulique dans la commune	Programme de consultation établi et consultations accomplies	Accord de projet, rapports de consultations accord négocié	Accords conclus et PV de réunions	Commune/DHU/ MARHP	Court et moyens termes
	Conduire les études nécessaires (hydrologie, hydrogéologie, Hydraulique, APD/DAO) pour un projet de drainage des zones urbaines hydromorphes (secteurs Mateur et Banlieue de Mateur).	Etudes réalisées (hydromorphie, salinisation).	Etudes approuvées	Rapports définitif d'étude	Commune	Court et moyen termes
	Engager des discussions avec l'ONAS pour trouver une solution d'épandage d'eaux usées traitées dans les terrains hydromorphes.	Préparation du dossier, justifications, structure à mettre en place	Accord conclu avec l'ONAS et la tutelle	Aménagements apportant la solution réalisés	Commune/Autorités de la Région/ONAS	Court et moyen termes
Objectif spécifique 4 : Maitriser l'urbanisation et concevoir des secteurs résilients						
Résultats : Périmètres de sécurité mis en place, arrêt des constructions illicites, et réserves foncières évaluées et créées						
	Interdire l'urbanisation dans les zones hydromorphes qui doivent être mises en défens	Réglementation mise en place, Délimitation de la zone à mettre en défens, évaluation budgétaire, consultations avec les concernés	Accords et ententes conclues avec les concernés	Textes réglementaires publiés	Commune/ Administration Régionale	Moyen et long terme
Activités	Œuvrer à l'acquisition de réserves foncières et leur viabilisation dans les zones à moindres risques pour orienter l'urbanisation future et assurer le développement durable de la commune	Réglementation mise en place, Délimitation des terrains à acquérir et demande de déclassement	Accords et ententes conclues avec l'administration de l'Etat	Textes réglementaires de déclassement des terrains publiés	Commune/ Administration Régionale	Court et moyen termes
	Intégrer l'évaluation du risque dans les schémas directeurs de développement urbain.	Recommandation publiés et accords administratifs transversaux (Commune, DGAT)	Accords et ententes conclus concernant le modèle type des TdRs d'études	PVs de réunions, information publiée et communiquée	Commune/Autorités Régionales	Court et moyen termes
Objectif spécifique 5 : Prévenir la gravité des enjeux et se préparer à la gestion de la situation de catastrophe						
Résultats : Plans préventifs du risque et plans communaux de sauvegarde établis et mesures de soutien bien définies						

Objectif global : Mise en place d'un plan d'action pour améliorer la résilience dans la commune de Mateur face aux risques et aux situations de catastrophe						
	ACTVITES	**INDICATEURS D'IMPACT OBJECTIVEMENT VERIFIABLES**	**INDICATEURS DE SUIVI**	**SOURCES ET MOYENS DE VERIFICATION**	**RESPONSABILITE**	**Echéance**
Activités	Préparation des plans préventifs du risque, et des plans communaux de sauvegarde	Plans préventifs et de sauvegarde produits par l'Unité Géomatique et le Département de l'Urbanisation	Plans approuvés	Plans de prévention et de sauvegarde publiés et communiqués.	Commune: Unité de Géomatique et Département de l'Urbanisation	Court et moyen termes
	Instauration des mesures et des plans d'action de soutien pour un retour rapide à la normale	Mesures et plans d'action arrêtés	Mesures et plans d'action approuvés	Mesures et plans d'action publiés et communiqués	Commune Département de l'Urbanisation	
	Action de sensibilisation à la gestion des catastrophes	Préparation des programmes de séminaires, ateliers, etc.	Tenue des séminaires, réunions	Nombre d'association de la société civile impliqués, nombre de séminaires, ateliers, nombre de participants	Commune	
	Formation d'un corps de personnes dans le domaine de prévention, d'intervention et de gestion en cas de catastrophes.	Préparation des programmes de formation	Approbation du programme de formation et des procédures d'intégration des personnes	Nombre de volontaires formés et actifs dans le domaine	Commence/Autorités Régionales/DR.ONPC	Court, moyen et long termes
Objectif spécifique 6 : Information et éducation préventives du public et développement de la résilience						
Résultats : Ateliers, workshops et séminaires réalisés, et supports d'information communiqués au public						
Activités	Financer des ateliers, des workshops, des journées scientifiques ou de formation de jeunes écoliers, de collégiens, de lycéens et d'étudiants (compétition avec distribution de prix, de logos, de casquettes, de tee-shirts, de brochures, etc.)	Conception des ateliers, workshops, brochures, logos et autres supports	Ateliers et workshops réalisés, Support communiqués, rendus publics, médias informés	Nombre d'ateliers, de workshops, nombre de participants	Commune	Court, moyen et long termes
	Impliquer les organisations de la société civile dans l'organisation et la conduite des manifestations précédentes	Accords entre commune et ONGs préparés et communiqués, Réunions de consultation	Contrats signés avec les ONGs	Nombre de contrats, nombre d'Ateliers dirigés par les ONGs et nombre de participants, comptes rendus	Commune	
Objectif spécifique 7 : Divulgation de l'information auprès des administrations, de la société civile, des médias et de la population (écoles, collèges, lycées) est un atout primordial pour le renforcement de la résilience de la population face aux risques ; c'est un exercice de formation, de prévention et de gestion des catastrophes.						
Résultats : Divulgation de l'information accomplie et vérifiée						
Activité	Œuvrer pour la meilleure diffusion de l'information sur les risques multiples et les dangers de catastrophes dans la commune et à l'échelle du Gouvernorat	Textes d'information avec justificatifs et études et plans de prévention et de sauvegarde préparés	PVs de réunions, courriers d'échange d'information, spots publicitaires, nombre de séances de médias.	Taux de couverture de l'information auprès du public communal.	Commune	Court, moyen et long terme

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