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Amman
Disaster Risk Management Master Plan

Support to Building National Capacities for Earthquake Risk Reduction in Amman

Final Report

31 March 2009

A project undertaken under contract no. 00051485 awarded by UNDP-Jordan

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List of Tables and Figures

List of Acronyms

AMA	Amman Metropolitan Area
AS/NZS 4360	Standards Australia and Standards New Zealand
BCPR	Bureau of Crisis Prevention and Recovery
BRC	Building Research Council
DRM	disaster risk management
DRMCSO	Disaster Risk Management and Citizens' Safety
DRMMP	Disaster Risk Management Master Plan
DRMSC	Disaster Risk Management Standing Committee
DRR	disaster risk reduction
DSFS	Dead Sea Fault System
DST	Dead Sea Transform earthquake fault system
FEMA	Federal Emergency Management Agency
GAM	Greater Amman Municipality
GDCD	General Directorate for Civil Defense
GIS	Geographic Information Systems
HDMU	High-Density Mixed-Use
HFA	Hyogo Framework for Action
IAEM	International Association of Emergency Managers
IBC	International Building Code
ICS	Incident Command System
IWO	Implementation Work Outputs
JEA	Jordanian Engineering Association
JNCC	Jordanian National Construction Council
MDGs	Millennium Development Goals
MENA	Middle East – North Africa region
MGP	Metropolitan Growth Plan
MIS	Management Information System
Mw	moment magnitude
NEMA	National Emergency Management Association
PGA	Peak Ground Acceleration
PIT	Project Implementation Team
PSHA	probabilistic seismic hazard analysis
RSS	Royal Scientific Society
SA	Response Spectral Acceleration
UNDP	United Nations Development Program
UN/ISDR	United Nations International Strategy for Disaster Reduction
UNRWA	United Nations Relief and Works Agency

AMMAN
DISASTER RISK MANAGEMENT MASTER PLAN FRAMEWORK

Support to Building National Capacities for Earthquake Risk Reduction in Amman

EXECUTIVE SUMMARY

The 2005 *Hyogo Framework for Action (HFA)* is the main international framework guiding all work on disaster risk reduction (DRR) and the most widely accepted strategy around the world. The HFA specifically identifies the integration of risk factors in urban development and the mainstreaming of disaster risk reduction in development programs and planning as two valid approaches. In recent decades, uncontrolled urbanization, migration influx, and environmental degradation have caused the increase of disaster risks in many rapidly developing cities including Amman. The proximity of Amman to the Dead Sea Transform earthquake fault system (DST), with a documented history of destructive earthquakes going back four thousand years, constitutes a significant threat to the city of Amman. This threat makes it imperative that certain emergency preparedness and disaster risk reduction-planning procedures be taken in the event of and prior to an earthquake disaster.

With a major effort from many national, local institutions, and international organizations, the Earthquakes and Megacities Initiative (EMI) undertook this project to develop a ***Disaster Risk Management Master Plan*** **(DRMMP)** ***Framework*** for the Greater Amman Municipality (GAM). The framework provides a road map for GAM and other national institutions to attain the international standards of practice for disaster risk management (DRM). The project was developed under contract with the United Nations Development Program (UNDP) offices in Jordan and in Geneva through the Bureau of Crisis Prevention and Recovery (UNDP/BCPR) and undertaken in partnership with several governmental institutions of the Kingdom of Jordan, including the General Directorate for Civil Defense (GDCD) and GAM. A multi-disciplinary team of national experts (the "Project Research Collaborative") under the leadership of Yarmouk University and supported by EMI experts also took part in the project and completed an assessment of the seismic risk of Greater Amman.

A DRMMP Framework of Amman has been developed by the EMI Project Implementation Team and is presented in this report. The DRMMP Framework provides a set goals, policies and recommendations intended to eventually equip GAM and other relevant national institutions with a disaster risk management practice that conforms to the international standards in the field. The DRMMP Framework was developed on the basis of a process of analysis, consultation, planning and validation of the DRM practice, in Amman and in the country. In particular, this includes analysis of aspects of the country's emergency management system, building construction and building code adoption, implementation and enforcement, land use and environmental management, the evaluation of the legal and institutional arrangements related to disaster management as these elements relate to the governance and operations of GAM. The DRMMP Framework was also grounded in the outputs of the earthquake risk assessment study undertaken for Greater Amman by the Project Research Collaborative. This study constitutes a major output of the diagnosis and analysis phase of the project

as it provides an understanding of the geographical distribution of the potential social and physical losses to the Greater Amman through a scientific quantification of the earthquake hazards, social and physical vulnerabilities and exposed assets at risk for each neighborhood. The risk assessment is undertaken on a 500mx500m grid and aggregated to the neighborhood level throughout the administrative territory of GAM. In particular, the study estimates potential losses to buildings, lifelines and critical facilities of the city for several considered large earthquake scenarios as well as for probabilistic considerations that provide long term averages. The other important output of the DRMMP process was the development of the **Amman Risk Management Profile**, which documents the current legal, institutional, and organizational arrangements for DRM in the country and several other related elements.

The development of the DRMMP Framework included a series of participatory planning workshops and meetings with a broad spectrum of stakeholders including representatives of city departments and agencies, relevant national agencies, private sector, academia, professional organizations, among others. This participatory process is an integral part of the DRMMP methodology. It is intended to accomplish several goals, including collecting and sharing knowledge among all stakeholders, stimulating discussion and debate, building ownership, clarifying the roles and responsibilities, and improving the inter-institutional coordination. In this process the elements and recommendations provided in the DRMMP Framework are driven by the input and contribution of all stakeholders and validated by them. These DRMMP elements are summarized in the form of recommendations that address hazard and vulnerability reduction, preparedness, emergency response and recovery planning, and research and development. The DRMMP Framework includes 47 recommendations grouped into the following elements:

1. Legal, Institutional and Organizational Aspects
2. Emergency Management and Social Mobilization
3. Construction Standards and Practice
4. Building Earthquake Resiliency
5. Land-Use Planning and Environmental Management
6. Training and Capacity Building
7. Research and Development, Knowledge Management, ICT and Human Resources
8. Project Management

These recommendations are reproduced in **Exhibit A: DRMMP Framework Matrix**.

The output of this phase of the project set forth only a “framework.” In order to proceed with the last phase of the development of a full-scale DRMMP, the framework has to be turned into a strategic plan with specific and well-defined Implementation Work Outputs (IWOs). These IWOs are a finite list of priority items that determine the immediate level of capital investment in DRR and are considered to be the most pertinent and the most feasible recommendations to undertake in the immediate term. The IWOs are also developed through a participatory strategic planning effort involving the city

agencies and other relevant institutions to define the investments that will improve the City's resiliency to earthquakes and other hazards and protect its physical and socio-economic environment for its citizens. The Project Implementation Team (PIT) strongly recommends completing this last phase of the DRMMP process.

The success of the recommendations set forth in this project requires that GAM take ownership of the findings and recommendations of the DRMMP, under the support and coordination of the relevant national agencies. In particular the DRMMP recommends that GAM puts in place a new Focal Organization for Disaster Risk Management composed of

a) A new office for Disaster Risk Management and Citizen's Safety (DRMCS)

b) A Local Disaster Risk Management Coordinating Committee

The recommendations to build GAM competency in disaster risk management are intended to complement and support the existing competencies of the national institutions, principally within the GDCD. While undoubtedly there is some overlap in functions, this overlap enables better inter-institutional coordination and facilitates communication and mutual support. It is now recognized that an effective disaster risk management system for a country should include a component specific to local authorities in order to capacitate the local agencies in disaster management, mobilize local resources, protect human and physical assets, and reduce disaster risk in the long term.

1.0 SCOPE, INTRODUCTION AND BACKGROUND

1.1 Scope of the Project

The main objective of the project is to develop a ***Disaster Risk Management Master Plan*** **(DRMMP)** ***Framework*** for the Greater Amman Municipality (GAM) which will build a competent DRM practice and will improve the City's resilience to earthquakes and other hazards and protects its physical and socio-economic assets and investments. The project's main goal is to develop a disaster risk management framework that would enable GAM and other relevant national institutions to accomplish the following:

- Establish a competent emergency management[1] system within GAM
- Establish a disaster risk management (DRM) practice in GAM
- Identify a set of objectives and recommendations to reduce disaster risk in Greater Amman and consequently in the country
- Build the experience and expertise within the country so that the DRMMP model for Greater Amman can be duplicated to reduce risk to other major cities in Jordan

Due to budget limitations and other parameters, it was agreed that this project will be limited to the first three phases of the DRMMP model (refer to the explanation of the DRMMP model in Section 2.4 below), with the development of a framework DRMMP as the key deliverable (i.e. Phase 3 of the DRMMP Chart). It is recommended that GAM completes the DRMMP Process (i.e. Phase 4) in a future project in order to operationalize the proposed framework and turn it into an efficient disaster risk reduction planning document. Consequently, in this project, the following three phases of the DRMMP were developed:

Phase 1: **Analysis and Diagnosis**

- Development of a City Profile
- Legal and Institutional Analysis
- Assessment of Current Practice
- Identification of Gaps and Needs

Phase 2: **Risk Analysis**

- Risk Assessment (high resolution)
- Narrative Scenario and Initial Indicators
- Risk Analysis

Phase 3: **Planning and Framework Development**

[1] In this study, the function of Emergency Management is assumed to include broad responsibilities such as crisis management, emergency response, post-event rehabilitation and recovery, pre-event planning, capacity building, and awareness and preparedness activities. It also includes inter-sectoral and inter-institutional coordination pre-event, post-event and during an event. In today's practice the term Disaster Risk Management is replacing the terminology of Emergency Management to indicate that the management of disaster risk should go beyond the traditional function of managing response.

- Legal, Institutional and Organizational Aspects
- Emergency Management and Social Mobilization
- Construction Standards and Practice
- Building Earthquake Resiliency
- Land-Use Planning and Environmental Management
- Training and Capacity Building
- Research and Development, Knowledge Management, ICT and Human Resources
- Project Management

The Project Implementation Team (**PIT**) was composed of the following individuals and expertise:

Name	Position	Expertise
1. **Dr. Eng. Fouad Bendimerad**	Project Director Earthquake Engineer	Risk Assessment and Analysis; Construction Standards and Practice; Earthquake Resiliency; Disaster Risk Management
2. **Ms. Shirley Mattingly**	Senior Program Advisor, Emergency Management Expert	Emergency Management, Disaster Risk Management Institutional Arrangements
3. **Atty. Violeta Seva**	Legal and Institutional Expert	Legislative and Policy Framework; Disaster risk Management
4. **Dr. Onder Kustu**	Structural Engineer; Seismic Risk Analyst	Structural Engineering; Seismic Loss Evaluation
5. **Dr. Bijan Khazai**	Geotechnical and Spatial Analyst	Geotechnical Engineering; Seismic Risk Analysis; Disaster Risk Indicators; Decision Making
6. **Dr. Marqueza Reyes**	Project Manager; Urban Land Use Planning Expert	Land Use Planning; Disaster Risk Reduction
7. **Mr. Kristoffer Berse**	Knowledge Management	Knowledge Management
8. **Col. Waleed S. Al-soub, Lt. Col. Marwan Bader**[2]	GDCD, Disaster Department Director(s)	Overall Project Supervision and Guidance
9. **Eng. Anwar Shunnaq**	GAM Special Projects Director	GAM Representative and Coordinator
10. **Mr. Soud Quran**	GDCD Project Manager	Overall Local Project

[2] Col. Waleed replaced Lt. Col. Bader, who went on study leave starting June 2008.

		Management and Coordination
11. Ms. Ghada Al-Sous	GDCD Project Assistant	Project Support and Coordination
12. Mr. Hossein Khalali	UNDP-BCPR	UNDP/BCPR Project Representative
13. Ms. Amal Dababseh	UNDP-Jordan	UNDP-Jordan Project Representative

The members of the Project Research Collaborative housed under the Queen Rania Center for Jordanian Studies and Community Services of Yarmouk University who undertook the comprehensive seismic risk assessment of Greater Amman were:

1. Dr. Rasheed Jaradat
2. Dr. Yasin Fahjan
3. Dr. Osama Nusier
4. Dr. Muheeb Awawdeh
5. Dr. Mahmoud Al-Qaryouti
6. Dr. Abdullah Diabat
7. Mr. Abdullah Al-Rrawabdeh

The PIT likewise benefited from the insight and collaboration of Brigadier Ahmad al Moumani, General Director Assistant for Planning of the General Directorate for Civil Defense (GDCD). The focal persons at GDCD were Col. Waleed Al-Soud and Lt. Col Marwan Bader. Project management support was provided by Mr. Soud Quran and Ms. Ghada Al-sous, who were also based at GDCD.

The PIT likewise worked in cooperation with GAM through the assistance of Eng. Anwar Shunnaq who facilitated the collection of information from and coordination with GAM. The PIT benefited as well from the technical and administrative guidance of Ms. Amal Dababseh of UNDP Jordan and from the project support of Mr. Hossein Khalali, UNDP-BCPR. The risk assessment and risk analysis were undertaken by the Project Research Collaborative who also provided valuable scientific support and inputs to the project.

1.2 The Disaster Risk Management Practice

Disaster risk management (DRM) is a set of processes, planning actions, policies and legal and institutional arrangements aimed at managing, and eventually reducing the effects of hazardous events (natural or man-made) on the human and physical assets of a community and minimizing the impacts of these hazards on the delivery of essential services to the population. These policies and actions typically start at the community level (e.g., neighborhoods, associations) and escalate through

the different levels of government (district, municipal, provincial, and central). They can be formal or informal, public or private; however, ***their effectiveness is highly correlated to the level of inter-institutional coordination*** that actually takes place during the course of their implementation.

DRM should be recognized as a professional practice, requiring its own processes, trained professionals, experience and culture. In developing countries, DRM can be considered as an emerging practice, often in need of experience, investment and maturity, which will take time to be operational and effective. ***The protection of assets (human, institutional and material) as well as the protection of services is core to the direct correlation between DRM and development***. When a community takes more and more measures to make its built environment and its processes for management of resources and delivery of services (i.e., transportation, sanitation, energy, health, education, etc) resilient to external damaging hazard events, it is accomplishing DRR. The ensemble of policy and actions adopted by that community and its governing institutions (public or private) defines its DRM practice. Thus, in concept, DRM practice is pro-active (i.e., *ex-ante*) as opposed to disaster response and rehabilitation/reconstruction, which are post-event activities (i.e., *post-ante*).

The current approach to DRM gives an important role to local authorities because it recognizes that they intervene in providing key services to the population such as land use and city planning, urban development, building construction and licensing, water, sanitation, organization and delivery of trade and services, parks and recreations and others. Making these services resilient to disasters is core to DRM. Also, local authorities are in touch with the heritage and the cultural fabric of their cities, the needs and potential of communities and can thus harness these resources and protect them from disasters. Further, local authorities are the implementing agencies of the central government policies and program, and have a key role in implementation. Hence, any national program for disaster risk reduction needs to enable local governments to develop a DRM practice by providing them with the necessary competencies and resources.

1.3 Disaster Risk Reduction and Development

Disasters caused by vulnerability to natural hazards exert an enormous toll on development. In so doing they pose significant threats to poverty alleviation and the achievement of the Millennium Development Goals (MDGs). This challenge is likely to be exacerbated by the impacts of climate change[3].

There is an increasing evidence of a correlation between disasters and development, and the important role of development in contributing to either decreasing or increasing disaster risks. Inappropriate development can increase levels of vulnerability to disasters and in turn, disasters negatively impact a country's development[4]. Furthermore the costs of recovering from large-scale disasters divert investments in key development sectors, such as health and education, to recovery

[3] The UN Under-Secretary General for Humanitarian Affairs

[4] Reducing Disaster Risk: A Challenge for Development, United Nations Development Programme (UNDP), (2004),

and reconstruction efforts or undermine previous development efforts[5]. While the process of urban development is quite complex and sometimes resorts to ad-hoc action, the link of DRM to development cannot be incidental. Independently of where it takes place (community, local, provincial or national,) DRM practices are more sustainable and more efficient in the long term when they are explicitly integrated with formal development processes.

1.4 The Concept of Mainstreaming

The aim of reaching the integration of DRM in institutional planning, development, functional and operational processes is referred to as "mainstreaming". Advances in DRR are directly linked to the ability of institution to accomplish mainstreaming. Development processes and programs of government typically get implemented at the local level. One must thus recognize the key role of local government and local institutions in accomplishing the mainstreaming process. ***A country cannot reach an effective level of disaster risk reduction if its local processes and capacities for integrating DRM within its development processes are weak or uncoordinated[6].*** Decentralization of development processes, decision-making processes and resources are strong indicators of the potential for mainstreaming.

EMI has developed a mainstreaming model which has been followed in the undertaking of this project. It is funded on three elements: ***Local Implementation, Central Coordination,*** and ***Participation***. This model recognizes that local government typically has the authority over a number of key services and functions that need to be made resilient to disturbing external hazard events. These services include transportation, water and sanitation, waste management, engineering and public works, housing and building construction, land use and urban development, and social services. These are the base functions where ***mainstreaming needs to take place locally***.

However, local implementation cannot be done in isolation from the central agencies of the government, which have legal and institutional mandates and are in charge of oversight and resources. It is the fundamental role of the national government to provide the legal and institutional basis for DRM as well as the resources to ensure compliance.

[5] World Bank's Evaluation of Hazards of Nature, Risk to Development.
[6] Bendimerad F., State-the-Practice in Urban Disaster Risk Management, EMI (2009)

Figure 1.1 EMI Mainstreaming Model for Local-Level DRM

(Local Implementation – Central Coordination – Participation)

Source: ***www.emi-megacities.org***

Lastly, the mainstreaming model calls for a participatory process in order to build knowledge, ownership and sustainability. Government must mobilize the social, human and institutional resources of the communities though the participation of the stakeholders including the academia, private sector, trade and workers unions, professional organizations, media, community leaders and representatives, volunteers, networks and alliances, and various other representatives of civil society.

1.5 Participation in Mainstreaming DRR

The participatory approach is at the core of mainstreaming DRM practice. By nature, it facilitates the communication of risk, the development of local ownership, and the inter-sectoral coordination among stakeholders. It also enables consensus building and social mobilization when conflicts and disagreements arise. It must be emphasized though that mainstreaming will not create new elaborate governmental structures that duplicate expertise and functions done elsewhere within the city structure. It will rather enable existing institutions in understanding and integrating DRR within their operations and functions. However, a core coordinating agency with competency in disaster risk management must exist in order to support the process of building a DRM practice and take particular responsibility over DRM functions that are lacking in the overall functional structure of the city. Thus, all key departments and functions of a city must be part of the development of a local DRM practice and its related strategic planning, and action planning processes. These organizations do not operate in a vacuum as they are related up to their governing institutions and down to the citizens and the communities they serve. Thus, a participatory process calls for the constructive collaboration of all the relevant stakeholders in order to reach a workable consensus and in order for each actor to play its role and take its responsibilities into the endeavor of reducing risk and building a culture of safety. Difficult local issues such as informal housing cannot be effectively resolved without the participation of the affected populations, the local policy makers, city planners, and community advocates. Adopting a structured participatory process is essential in mainstreaming DRM at various levels.

2.0 RELEVANT DRM STANDARDS OF PRACTICE

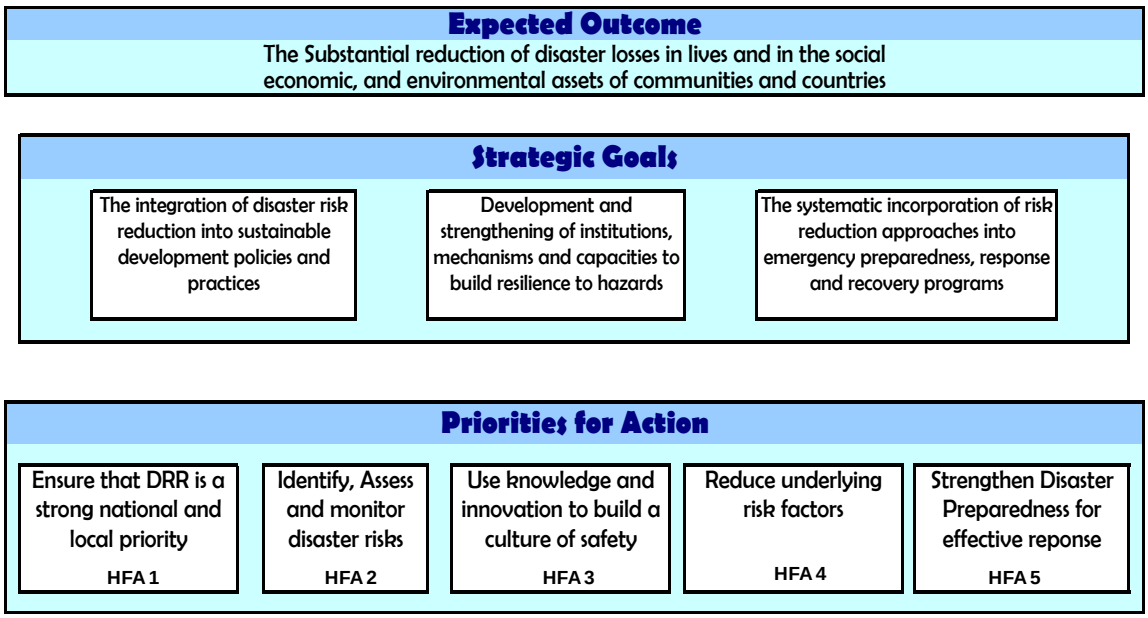
2.1 The Hyogo Framework for Action

The 2005 Hyogo Framework for Action (HFA) is the main international framework guiding all work on DRR and the most widely accepted strategy around the world. It was endorsed by 168 countries,the United Nations system, and a multitude of inter-governmental agencies and civil society representatives. The HFA provides a road map of the main elements required for meaningful DRR at all levels.

Disaster risk reduction is defined by the United Nations International Strategy for Disaster Reduction (UN/ISDR) as "*action taken to reduce the risk of disasters and the adverse impacts of natural hazards, through systematic efforts to analyze and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events*."

The HFA standard is embodied in Table 2.1 below. It identifies five priorities for action (HFA 1-HFA 5) that countries must integrate in their DRR programs.

Figure 2.1: HFA Outcome, Strategic Goals and Priorities for Action



The UN Millennium Development Goals adopted (A/RES/55/2) at the United Nations General Assembly as well as the Road Map Towards the Implementation of the United Nations Millennium Declaration (Secretary-General Report to GA A/56/326) emphasized the need to "intensify our collective efforts to reduce the number and effects of natural and man-made disasters".

Although not identified as a separate target for action, disaster risk reduction cuts across each one of the eight MDGs. In 2005, progress towards meeting the MDGs was reviewed by the independent UN Millennium Project [7]. The resulting report recognizes that disasters are a serious impediment to meeting the MDGs. It calls for mainstreaming risk reduction strategies within the MDGs and recommends four pathways for achieving better integration:

1. Investment in disaster-proof infrastructure, including the application of disaster standards in new building and retrofitting existing buildings and infrastructure.
2. The protection of livelihoods.
3. Government's investment in building and strengthening national and local early warning systems to monitor conditions and provide advance warning of potential disasters.
4. Emergency preparedness and contingency plans to minimize loss and maximize efficiency and equity in post-disaster relief and reconstruction.

International support for the integration of DRR into sustainable development frameworks is also visible in a number of other international agreements including:

- The Fifty-Ninth Session (2004) of the General Assembly [Resolution 59/233] prioritized the mainstreaming of DRR into country programs and action plans.
- The Johannesburg Programme of Implementation of the 2002 World Summit on Sustainable Development identified the importance of integrating DRR into development.
- The Bali Action Plan 2008 explicitly links climate change adaptation, disaster risk reduction and development, providing an important platform for disaster risk reduction as the international community moves to address weather extremes attributed to the changing climate.

2.2 Emergency Management Standards

Standards for emergency management exist within the broader framework provided by the Hyogo Framework for Action described above. The ***Emergency Management Standard and Accreditation Program***, offering program standards for agencies, and the ***Certified Emergency Manager Program***, which offers professional standards for emergency managers, are two highly regarded and widely accepted sets of standards in the field.

Emergency Management Standard and Accreditation (EMAP)[8]

The Emergency Management Accreditation Program (EMAP), initiated in 1997 by emergency management stakeholders and professionals in the United States, provides a set of standards of excellence for government emergency management programs at all levels. EMAP has structured a standard-based assessment and accreditation process for state and local government emergency management programs based on the program's Emergency Management Standard. Founded by the

[7] www.unmillenniumproject.org/reports/fullreport.htm

[8] See www.emaponline.org. The *Emergency Management Standard* can be downloaded from this site.

Federal Emergency Management Agency (FEMA), the International Association of Emergency Managers (IAEM), and the National Emergency Management Association (NEMA), EMAP is now an independent non-profit organization which fosters excellence and accountability in emergency management programs.

As defined by the Emergency Management Accreditation Program, emergency management program means a jurisdiction-wide (state/territory, county, city) system for management and coordination of prevention, mitigation, preparedness, response and recovery activities for all hazards. The system encompasses all organizations, agencies, departments, entities and individuals responsible for emergency management and homeland security functions.[9]

The Emergency Management Standard provides a set of standards that define a quality emergency management program. Thus, the Standard can serve as a tool for strategic planning and program improvement through benchmarking against recognized standards. The Standard is reviewed and updated on a three-year cycle as improved practices and solutions for prevention, preparedness, mitigation, response and recovery emerge.

The Emergency Management Standard covers 16 elements which are considered necessary components of a viable emergency management program:

1. Program Management
2. Administration and Finance
3. Laws and Authorities
4. Hazard Identification, Risk Assessment and Consequence Analysis
5. Hazard Mitigation
6. Prevention and Security
7. Planning
8. Incident Management
9. Resource Management and Logistics
10. Mutual Aid
11. Communications and Warning
12. Operations and Procedures
13. Facilities
14. Training
15. Exercises, Evaluations and Corrective Action
16. Crisis Communications, Public Education and Information

Within these 16 essential program elements, there are 63 individual standards on which programs that apply for EMAP accreditation are evaluated. For purposes of illustration, the standards for the "Exercises, Evaluations and Corrective Action" program element are quoted as follow:

[9] Emergency Management Accreditation Program (EMAP), *Emergency Management Standard,* September 2007, www.emaponline.org.

Overview: *A program of regularly scheduled drills, exercises and appropriate follow-through activities, designed for assessment and evaluation of emergency plans and capabilities, is critical to a state, territorial or local emergency management program.*

> *4.14.1 A documented exercise program is established that regularly tests the skills, abilities, and experience of emergency personnel as well as the plans, policies, procedures, equipment and facilities of the jurisdiction. The exercise program is tailored to the range of hazards that confronts the jurisdiction.*
>
> *4.14.2 The program shall evaluate program plans, procedures, and capabilities through periodic reviews, testing, post-incident reports, lessons learned, performance evaluations and exercises. The products of these reviews are documented and disseminated within the program and to key stakeholders and selected partners.4.14.3 A process for corrective actions shall be established to prioritize and track the resolution of deficiencies in real world and exercise events and to revise the relevant program plan.*[10]

Certified Emergency Manager Program (CEM)[11]

While EMAP provides standards and credentialing for agencies, the Certified Emergency Manager designation is a certification for individual emergency managers. The Certified Emergency Manager Program was developed by the International Association of Emergency Managers (IAEM) in the early 1990s in order to raise and maintain professional standards for emergency managers. IAEM is a non-profit educational organization based in the United States with members in 58 countries. It promotes the goals of saving lives and protecting property during emergencies and disasters. The organization's mission is to provide information, networking and professional opportunities in order to advance the emergency management profession. Consistent with this, its certification process is rigorous, and the CEM credential is difficult to attain. Moreover, an emergency manager must renew his/her certification every five years to retain the designation.

In the United States, some employers now list the CEM credential as a job requirement when posting positions for emergency managers. Governments and companies can be assured that a CEM possesses certain working knowledge, skills and abilities based on their certification, diminishing the need for additional training once they are hired. For the emergency manager, certification offers recognition, membership in an established accredited network of professionals, career counseling and enhanced career opportunities.

For further information, see the CEM/AEM Brochure and CEM/AEM Examination Study Guide and the IAEM website at www.iaem.com.

2.3 Disaster Risk Management Standards

One of the internationally recognized risk management standards is the Standards Australia and Standards New Zealand: AS/NZS 4360: Risk Management[12] first developed in 1995. This Standard

[10] Emergency Management Accreditation Program (EMAP), *Emergency Management Standard,* September 2007, www.emaponline.org.
[11] See www.iaem.com/certification.

specifies elements of the risk management process and emphasizes the management of risk rather than the management of hazards.

Focusing on reducing risk by modifying aspects of the source of risk, it encourages the development of strategies relating to prevention and mitigation of disasters and emergencies rather than being solely concerned with enhancing response capabilityand the associated need to increase and/or divert resources and budgets. In this model, local government is a key stakeholder in the DRM process based on the rationale provided in the earlier discussion related to mainstreaming.

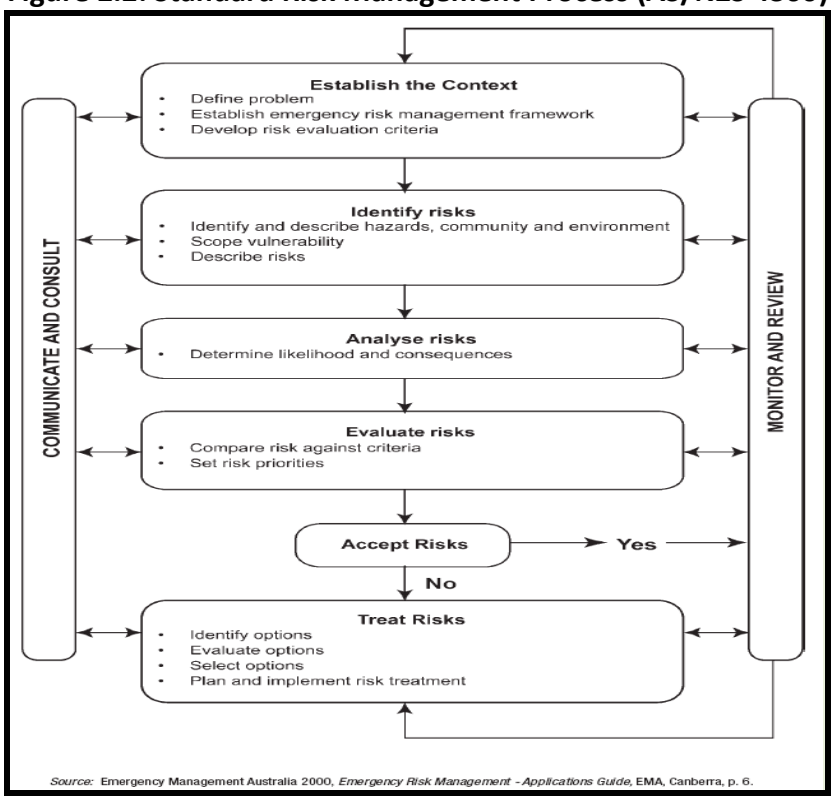
This Standard is complemented by a systematic method consisting of five major activities (see Figure 2.2):

1. Establishing context
2. Identifying risks
3. Analyzing risks
4. Evaluating risks
5. Treating risks

Risk treatments include mitigation, prevention and preparedness as well as provision for response and recovery should an emergency or disaster event occur. This process is further supported by two enabling activities: Communicating and consulting and Monitoring and reviewing. These support activities apply to each of the major activities of the process, ensuring relevance of outcomes and decisions. Documentation occurs throughout the process.

[12] *AS/NZS 4360: Risk Management*, Third edition, 2004.

Figure 2.2: Standard Risk Management Process (AS/NZS 4360)



2.4 The Concept of Disaster Risk Management Master Plan (DRMMP)

The DRMMP is the analytical model developed by EMI to guide local authorities (cities, local government units, metropolitan governments, and provincial governments) in a participatory planning process by which they can understand their vulnerabilities to hazards, evaluate the physical and socio-economic impacts of these hazards, develop a coherent approach to manage their overall risk, and determine a series of options to reduce the risk given their priorities and implementation processes. Essentially, the DRMMP is a disaster risk management planning tool and an analytical model to develop the "master plan" and the "processes" for mainstreaming disaster risk reduction at the local level. The DRMMP model is inspired from Standards Australia and Standards New Zealand: AS/NZS 4360

This model has been used with success in cities such as Istanbul, Metro Manila, and Kathmandu and has been accepted by many international development agencies such as the United Nations Development Program (UNDP/BCPR) which is sponsoring and managing this particular project.

The DRMMP process is structured into four phases as indicated in the attached flowchart (Figure 2.3):

- **Preparatory Phase:** Consist of securing agreements with the local partners (e.g., city administration), identifying stakeholders, preparing an initial work plan, collecting the key vital information, and initiating the development of a DRMMP Project Implementation Team (PIT).

This phase essentially defines the "rules of engagement" of the project, objectives, stakeholders, expected tasks and deliverables and the level of resources.

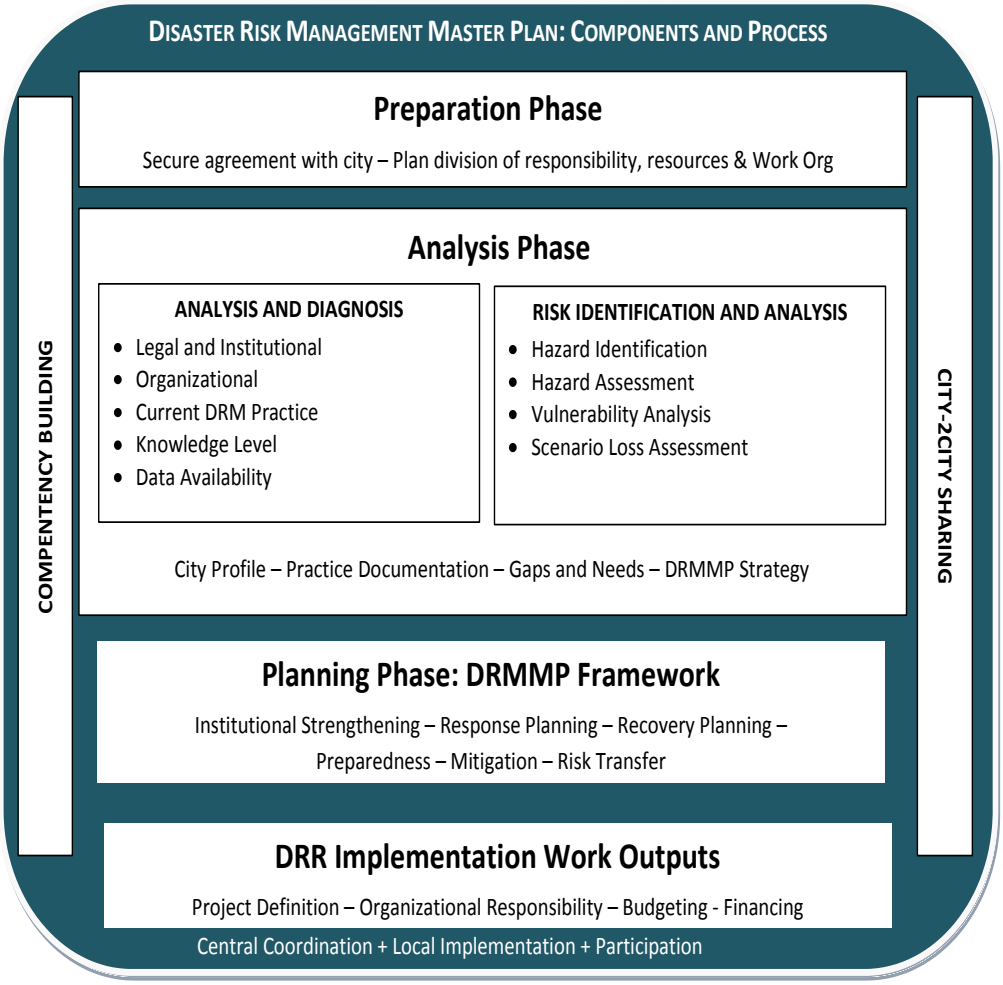
- ***Analysis Phase***: Consist of two essential elements: a) an understanding and documenting of the current legal, institutional, and organizational arrangements for DRM in the country and city; the current state-of-the-practice of DRM; current institutional competencies, and the sources of vital data and statistics and other key relevant information; and b) an understanding of the hazard, vulnerability and risk through a scientific risk assessment and risk analysis.

- ***Planning Phase***: Consist of structured planning workshops and meetings with the participation of a broad spectrum of stakeholders including key city departments, relevant national agencies, private sector, academia, professional organizations, among others to define and structure the elements of the DRMMP. These elements are in the form of recommendations around hazard and vulnerability reduction, preparedness, emergency response and recovery planning, risk transfer, and research and development which are validated by relevant implementation agencies. It also includes the determination of institutional ownership and inter-institutional arrangements for implementation and evaluation of resources.

- ***Implementation Work Outputs (IWOs)***: The last phase consists of the identification of the Implementation Work Outputs (IWOs), which are a finite list of priority items that are considered to be the most pertinent and the most feasible to undertake in the immediate term. These IWOs determine the immediate level of capital investment in DRR to be undertaken by the City. They represent the outcome of a comprehensive, strategic planning effort by the city agencies and other relevant institutions to define the investments that will improve the City's livability and strengthen its physical and socio-economic environment for its citizens.

Simultaneously with these phases, the DRMMP process includes competency building activities in terms of specialized training, workshops, and city-to-city sharing activities. They are aimed at ensuring that local institutions build the necessary technical knowledge and experience to take ownership over the DRMMP implementation process, as explained in the next pages. The city-to-city sharing activities, on the other hand, enable sharing of sound practices between the cities. This is a strong motivator to facilitate an efficient learning process. It forms a class of informed and competent professionals who can take leadership in their own cities and be the agents for change and advocates for progress.

Figure 2.3 Disaster Risk Management Master Plan (DRMMP) Model



The DRMMP analytical model follows EMI's conceptual model for mainstreaming DRR which is based on the integration of three principles: *Local Implementation + Central Coordination + Participation*. This model recognizes that implementation is local but requires the support of and the coordination with the central agencies of government: further it needs to harness the engagement and contribution of the active agents of society through a participatory process.

3.0 PROCESS FOR DEVELOPING THE DRMMP FRAMEWORK OF GREATER AMMAN MUNICIPALITY

3.1 DRMMP Process in GAM

The Disaster Risk Management Master Plan process in GAM started with a diagnostic of GAM's current disaster risk reduction and management status which allowed defining the baseline for the project. The output of this component is the Amman City Disaster Risk Profile. The City Profile enabled an initial understanding of current practice gaps and needs both at the national and city level. This was followed by two landmark studies for GAM and Jordan:

1. **The seismic risk assessment of GAM led by the Project Research Collaborative and validated by EMI.** The results of this scientific study are very significant in terms of determining not only the seismic hazards that GAM is exposed to and the probable scenario earthquakes, but also in determining the physical, social and economic vulnerabilities of Greater Amman (see the executive summary of this study in Annex 3, Volume 2). These risk parameters are critical inputs to identifying disaster risk management elements that could form the framework of the Amman Disaster Risk Management Master Plan (DRMMP).

2. **The Analytical Study on Legislations Effective in the Hashemite Kingdom of Jordan Related to Disasters and Disaster Management** by the Legal Affairs Department of the Civil Defense, 19 September 2007.

3.2 Seismic Risk Assessment

During the course of the seismic risk assessment conducted by the Project Research Collaborative composed of experts from Yarmouk University, Natural Resources Authority, Al al-Bayt University, Jordan University of Science and Technology and Gebze Institute of Technology (Turkey), EMI provided technical support and expert guidance to the in-country experts by providing the following assistance through written communication:

- Expert review of seismicity investigation, scenario development and soil classification, finalization of hazard parameters.
- Expert review of inventory classification and the development of capacity and fragility functions, finalization of vulnerability parameters.
- Support for risk assessment including model preparation, model integration and model testing, model entry data check.
- Development of risk assessment and review and validation of risk assessment results.
- Assist national experts in analysis of loss assessment results and interpretation of risk parameters.
- Evaluation of the accuracy and possible inconsistencies in the results of loss assessment.

- Expert guidance in the development of sensitivity and validation tests.
- Review and validation of final outputs.

The provision of the technical guidance was initiated with the submission of an Inception Report (undated) and the first Progress Report by the risk assessment team on 6 December 2007. EMI submitted its first written recommendations on 4 January 2007 and subsequently through several written expert reviews with a final report submitted to UNDP and the risk assessment team 10 June 2008. The first field investigation discussed further below was thereafter scheduled in order to provide in-country support in the finalization of the risk assessment study.

3.3. First Field Investigation *(May 5-9, 2008)*

The first field investigation or in-country technical support was carried out by the EMI Project Implementation Team from 5-9 May 2008. It focused on two important aspects of disaster risk management within the context of GAM: seismic risk assessment and legal and institutional frameworks for disaster risk management.

A one-day workshop where the results of their study were reviewed and discussed was conducted together with the seismic risk assessment team , composed of Dr. Mohamed Tamene, Dr. Rasheed Jaradat, Mr. Abdullah Rawabdeh, Dr. Yasin Fahjan, Dr. Mamoud Al-Qaryouti, Dr. Osama Nusier, Dr. Abdullah Diabat, Prof. Nabil Seifeddin. Other key institutions participated in the technical workshop including UNDP represented by Ms. Amal Dababseh and Mr. Hossein Kalali; Civil Defense; Col. Marwan Bader, Lt. Talal Al-Daaja, Mr. Soud Quran, and VIANOVA Group represented by Mr. Qusai Ahmed.

The technical discussion included the review of seismicity and geomorphology investigations, inventory classification, development of capacity and fragility functions, and development of scenario earthquakes as well as guidance in the finalization of the hazard and vulnerability parameters. Guidance was provided by the EMI experts on considerations to improve the scientific basis of the study and to resolve outstanding issues. The forum concluded with a discussion on the process of risk management, including the appropriate methods in communicating risk with various audiences.

A one-day Multi- Stakeholders' Workshop on the Development of the DRMMP Framework was likewise held on 7 May 2008 at the Le Vendome Hotel in Amman. About 40 participants represented various government organizations (e.g. Greater Amman Municipality; General Directorate for Civil Defense; Ministries of Environment, Agriculture, Interior, Energy and Mineral Resources, and Planning and International Cooperation; Crisis Management Center; National Security and Crisis Management Center; High Council for Civil Defense; Jordanian Armed Forces; Natural Resources Authority; Department of Statistics); non-government organizations (e.g. Royal Scientific Society; Swiss Agency for Cooperation; Jordan Red Crescent Society, Jordan Hashemite Charity Organization); academe (e.g. Jordan University, Yarmouk University); and the United Nations Development Program.

The participants were introduced to the concept and methodology of the DRMMP and shown examples from other cities. They also started their own consultations and discussions on the relevance of disaster risk to Amman from the point of view of various national agencies. Discussion also took place around the key considerations of the seismic risk assessment study and its initial

outputs. One important output of this workshop was the consensus-based revised vision for Amman: ***"A safe, sustainable and prosperous city with a soul."*** More inputs were derived from consultations with key government organizations that would also serve as part of the basis for structuring the Amman DRMMP and in developing its elements.

Understanding the legal, policy and institutional environment of Jordan vis-à-vis GAM's governance mandate and its implication on disaster risk management was the topic of several consultation meetings and interviews conducted with key government agencies and officials. These consultation meetings yielded fundamental inputs and feedback from the local stakeholders themselves. A consultation meeting and briefing with the Civil Defense on 5 May 2008 was held at the headquarters of the General Directorate for Civil Defense in Amman. It was organized by the Assistant Directors of Civil Defense and the head of Disasters Department, Lt. Col. Marwan Bader, who gave a briefing on the legal basis of the disaster management system of Jordan as well as its current institutional framework and related policies.

Lastly, questionnaires on the disaster response, training on disaster risk management, building code implementation and enforcement, and land use planning were likewise prepared by the EMI PIT in order to clarify issues and gather more information to fill in existing gaps in knowledge after the field investigation. These questionnaires were then distributed to certain key informants in GAM, Civil Defense, and Royal Scientific Society.

3.4 Second Field Investigation *(August 18-22, 2008)*

A second field Investigation, which was undertaken on 18-22 August 2008, continued the process of developing the framework and elements of the Amman DRMMP through a participatory approach that further engaged various sectors and stakeholders in reducing disaster risks in Greater Amman. The second Field Investigation aimed at:

1. Further engaging the local stakeholders in an inclusive and participatory process of developing the framework and elements of the Amman DRMMP;
2. Harnessing the results of the seismic risk assessment of Amman to serve as basis for the determination of elements that will be included in the Amman DRMMP;
3. Gathering additional inputs and relevant information from various sectors and local stakeholders through participatory workshop, consultations, stakeholder survey questionnaires and individual interviews towards the drafting of the Amman DRMMP; and
4. Determining the elements that will provide structure to the DRMMP framework of Amman. These elements may include those related to legal, policy and institutional framework for DRM; disaster mitigation and prevention (including construction and building code enforcement and land use planning); emergency management and disaster response; recovery; and capacity building for DRM.

This in-country investigation further engaged key stakeholders and sectors of GAM and other key national agencies in synthesizing and providing additional key inputs towards the development of the Amman DRMMP. Results of the seismic risk assessment study as well as the goals and process of the

development of the DRMMP were presented to several high-level officials of GAM. The EMI Team explained the importance of the participation of the GAM leadership in the development of the DRMMP Framework and to start evaluating its potential implications on GAM's functions and operations. In attendance were the Deputy City Manager of Public Works, Eng. Mustafa Fawzi and the Deputy City Manager of Public Services, Eng. Mustafa Allouzi as well as the directors and officials of various departments in GAM such as Engineering, Roads, and Amman Plan, among others.

A Second Multi-Stakeholders Workshop on the Development of the DRMMP Framework of Amman was conducted on 20 August 2008 at the Al-Fanar Palace Hotel in Amman. The Workshop employed the ***Future Search*** methodology in which the past, present, and future of GAM were analyzed by the participants within the framework of disaster risk reduction. To focus the analysis of the participants and make their recommendations pertinent to the current and future state of disaster risk management in GAM, six groups were organized according to the following themes:

1. Policy and Governance
2. Research and Development
3. Emergency Management
4. Land Use Planning and Building Regulations
5. Preparedness, Communication, and Training

These DRM-related themes became the backbone of the Amman DRMMP Framework.

3.4 Third Field Investigation *(January 10-14, 2009)*

The process of developing the framework and elements of the Amman Disaster Risk Management Master Plan (DRMMP) entered its final stage with this third and last field investigation, which was conducted from 10-14 January 2009 by the EMI team. This field investigation sought to validate the draft DRMMP Framework of Amman and to consolidate the sense of ownership of the disaster risk management agenda to relevant local stakeholders and key government organizations including the Greater Amman Municipality, which is the primary recipient of this work.

The objectives of this investigation were to:

1. Engage key government agencies such as the GAM and Civil Defense in a focused consultation process to discuss and validate the draft DRMMP Framework of Amman;
2. Collect feedback and comments on the Draft Amman DRMMP from various sectors and stakeholders of GAM;
3. Consolidate recommendations based on inputs from stakeholders and integrate these in the final draft of the Amman DRMMP Framework; and
4. Conduct consultations on the scope of the follow-up activities in order to complete the DRMMP process.

Prior to the upcoming field investigation, the first draft of this document was submitted to UNDP-Jordan. Hence, the draft DRMMP Framework was circulated by the GDCD Project Manager, Mr. Soud

Quran, to various stakeholder organizations for their review and evaluation before the third field investigation.

The Multi-Stakeholder Validation Workshop of the Amman DRMMP Framework was held on 12 January 2009 at the Al-Hussein Cultural Center of GAM. More than 30 participants representing key organizations in GAM and Jordan actively participated in the discussion of the DRMMP elements and sets of recommendations. Comments and suggestions were expressed in the plenary, while written feedback was also submitted by the participants during the workshop. A period of 10 working days was given to all stakeholders to submit their official comments on the Draft DRMMP Framework to Mr. Quran.

Focused discussions were likewise held in individual meetings with various key departments at GAM on 13 January 2009. These included the Director of the Amman Master Plan Project and Advisor to the Mayor, Mr. Samir Subhi Al-mousa, and the Senior Advisor to the Amman Master Planning initiative and Vice-President of the Amman Institute for Urban Development, Ms. Hania Maraqa. Another meeting was held with Engineer Reshad Shahin. The discussion focused on clarifying the role of GAM in the review and implementation of the Building Code. A brief discussion with Eng. Mohamed Khair Khatibeh, Director of Study and Design Department, was likewise done.

On 14 January 2009, the EMI team conducted an ocular inspection of the Emergency Operations Center (EOC) of GAM in Tla'-Ali. The EOC was established about a year ago, according to Ms. Miryan Mami who is the head of the Command Center Control. She was also interviewed by the EMI team regarding the emergency management and operations in GAM. Further briefings and discussions took place with the GDCD on the same day.

The Amman DRMMP Framework builds on the results of the seismic risk assessment study, initial risk analysis contributed by EMI, and the Amman disaster risk management profile (see Volume 2). The DRMMP Framework also synthesizes inputs obtained during several multi-stakeholder participatory workshops facilitated by EMI as well as individual interviews, meetings, and dialogues held with key government agencies as described above. Its recommendations reflect the collective contribution from such consultative processes.

The complete lists of workshop participants are exhibited as Annex 1 of Volume 2 in this report.

4.0 EARTHQUAKE RISK ASSESSMENT AND ANALYSIS OF AMMAN

4.1 Understanding Hazards, Vulnerability and Risk

4.1.1 Hazards

Earthquakes are typically characterized by the magnitude level and location. Magnitude is a measure of the energy released at the focus of the earthquake, and not a measure of the actual severity of the earthquake at a given site. The latter is related to other conditions such as distance from the site to the rupture plane of the earthquake, soil conditions, depth of the earthquake hypocenter and type of earthquake rupture. Thus, it must be understood that even moderate earthquakes can cause high earthquake severity depending on the site conditions. For example, a site where the soil condition consists of deep alluvial and consolidated soil will have the tendency to amplify the earthquake shaking; whereas a site where the surficial geological conditions are composed of rock will have the tendency to dampen the earthquake shaking. Secondary damaging effects can also take place such as liquefaction (a process by which unconsolidated water-saturated soil can lose their bearing capacity and become like quick sand) or soil failures such as landslide. Understanding the geographical distribution of the potential and severity of these hazards constitutes the first component in assessing risk.

4.1.2 Vulnerability

Vulnerability, on the other hand, represents the potential damage of buildings and other structures under the impact of earthquake loads. Different types of structures have different vulnerability patterns. For example, an old brick and masonry building is likely to sustain more damage than a modern building designed and built with good earthquake standards. Earthquake engineers characterize structural vulnerability in terms of the type of construction (e.g. masonry, concrete, wood, steel), type of structural system intended to resist earthquake loads (e.g., frame versus walls), number of stories, age, quality of construction and the physical condition of the structure (e.g., previous damage, deteriorated maintenance conditions).

4.1.3 Risk

Risk is the convolution of the severity of the hazard at a site and the vulnerability of the built environment. It is defined as the likelihood of damage or loss. In a city such as Amman, risk varies geographically depending on the distribution of severity of the earthquake hazards and the vulnerability of buildings. The expression of risk can be determined in a deterministic way, where the damages and losses are computed assuming a particular “scenario” earthquake to take place or probabilistically by looking at the long term average of several simulated earthquake that could take place with their particular rate of occurrence. The deterministic approach has traditionally been used in disaster management planning such as pre-event response planning or contingency planning; whereas the probabilistic approach has been used for engineering purposes such as developing building code regulation.

4.2 The Hazard Landscape

4.2.1 Regional Hazard Environment

The Middle East is tectonically and seismically active. In general, the eastern Mediterranean region is dominated by the interaction of the Arabian and African plates with Eurasian plate and within this tectonic framework is the Dead Sea Fault System (DSFS). This fault system defines the western edge of the Arabic plate and forms a 1000 km long continental transform fault extending from the Red Sea northwards through Lebanon, Syria and Jordan towards the collision zone in southern Turkey. This part of the fault, which passes through Jordan, is known as the Dead Sea Rift.

The Dead Sea Rift Valley, which extends across the length of the country and defines its western border, is the single most important geological feature of seismic significance within Jordan. The rift valley is a continuation of the East African Rift Valley and the Red Sea.

It owes its existence to a deep-seated transform fault, which marks the boundary between the Arabian and African plates. Earthquakes are reasonably common along the Rift Valley but become progressively rarer towards the interior deserts. Over 50 major earthquakes have affected the area in the past 2500 years, which have been responsible for the destruction of many historically known cultural centers. Historical earthquakes have also caused tsunamis in the Dead Sea and landslides in adjacent areas. The major seismic activity of the Dead Sea area is confined to its eastern shore. Some of the most recent earthquakes occurred on 11 July 1927 in which 342 people died (epicenter in Damiya), 31 March 1969 (Northern Red Sea) and on 22 November 1995 with a magnitude 7.1 in the Gulf of Aqaba.

The epicenter of the 11 February 2004 earthquake was 45 km from the Amman capital. It occurred at a shallow depth of 25.8 km and was strongly felt in Amman and the northern area of Jordan. Although no death was recorded from this earthquake, it triggered general panic and confusion among the public. Further description of the earthquake fault system that impacts Amman is provided in the next section of this report.

In terms of flood, incidents of flash flooding have claimed the lives of a few hundred in Jordan over the years and affected the lives and livelihoods of thousands. The most recent incident in 2006 occurred in the Jordan Valley. In the past half century, floods have caused the death of 345 people and affected 24,321 lives.

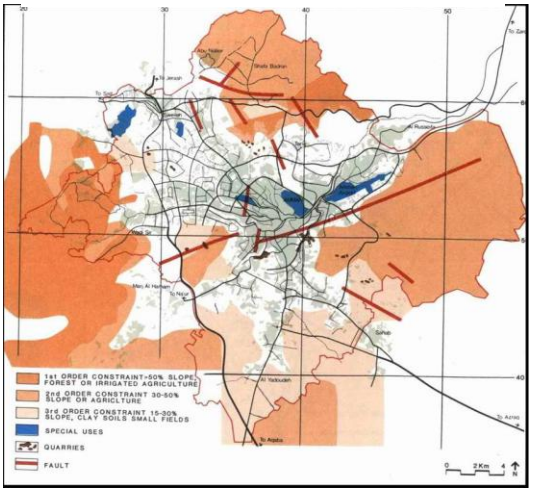
Also, Jordan is one of the world's most water scarce countries with 75 percent of the country classified as desert or semi-desert. Drought has been a prevalent feature of the Jordanian landscape during the latter part of the 1990s, producing serious socioe-conomic and environmental consequences. In 2001, Jordan suffered eight successive years of drought, which led to international assistance by FAO, WFP, USAID, the European Union, GTZ and others. In 1999, severe drought cut rainfall by up to 70 percent with declining rainfall levels and increased demand on water resources. During that period, drought affected over 200,000 persons including small holders who lost their harvest and inputs, small-scale herders, and landless rural households.

Water shortage in Jordan has been compounded by recent droughts, over-exploitation of water resources and a high population growth and is another area of concern. The water use for household and municipal purposes per capita is 160 cubic meter. Despite plans for additional water resources and the upgrading of the water supply infrastructure, the race between supply and demand will continue.

4.2.2 Fault Systems near Jordan and Amman

Jordan is situated along a major earthquake fault system which dramatically increases the vulnerability of the country to earthquakes and related natural disasters. The Dead Sea fault zone is a major left-lateral strike-slip fault. South of the Dead Sea basin, the Wadi Araba fault extends over 160km to the Gulf of Aqaba.

Figure 4.1 Fault map of Amman



The Dead Sea fault zone is known to have produced several relatively large historical earthquakes. The fault systems near Jordan and Amman include the Dead Sea and part of the Jordan Valley.

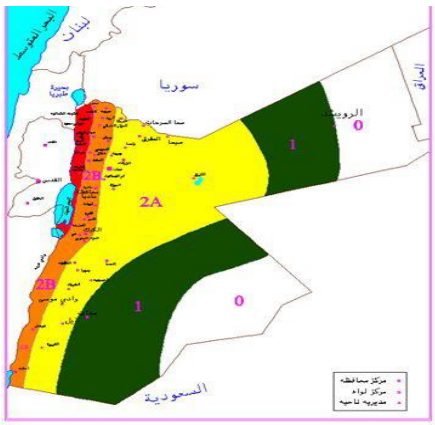
Secondly, this sheet where a radial pattern of faults branches off eastern shoulder of the Dead Sea in various directions. These faults are:

- Zerqa - Mai'n and Siwaqa Strike - slip faults systems, which are the most important strike - slip faults in Jordan having an E-W direction from the central part of the Eastern Shore of the Dead Sea.
- Karak Fayha and Hasa fault Systems with a NW-SE trend from the central part and the southeastern corner of the eastern shore of the Dead Sea.
- Amman - Hallabat structure having NE-SW trend branching from the northeast corner of the Dead Sea.

4.2.3 Seismic Zones of Jordan

Today's city of Amman covers an area of 1,680 km^2 and is populated by 2.25 million people (38 percent of Jordan's total population) as estimated by the Department of Statistics.

Figure 4.2 Jordan seismic hazard map



Amman is built on seven hills, or jabals, each of which defines a neighborhood. The layout is described as eight circles that form the "spine of the city," with the downtown area as the first circle and from there extending to the west. There are no major rivers in or near Amman.

The Jordanian National Building Code divides the country into four seismic zones: 1, 2A, 2B and 3 with increasing hazard towards the Dead Sea Transform

Fault as indicated in Figure 4.1. Amman is currently located in zone 2A.

4.3 Seismic Risk Analysis of Greater Amman

This study included the undertaking of both a probabilistic risk analysis as well as deterministic risk analyses considering three separate plausible earthquake scenarios[13]. This study is the first of its kind for the Greater Amman area. It provides a wealth of information of hazards, vulnerability and risk that are extremely pertinent to the management of risk and the reduction of physical vulnerability to Amman and the protection of its physical and human assets.

Amman, Jordan's capital city, was last damaged by a destructive earthquake on the 11 July 1927, at 15:04. The epicenter of the (M_L = 6.3) earthquake which startled the residents of the Jordan-Palestine area was estimated to be in Jordan Valley, in the vicinity of the present Damya bridge. While that earthquake resulted in 342 deaths, damages and casualties in Amman itself were minor. This is the strongest earthquake in Amman in recent history.

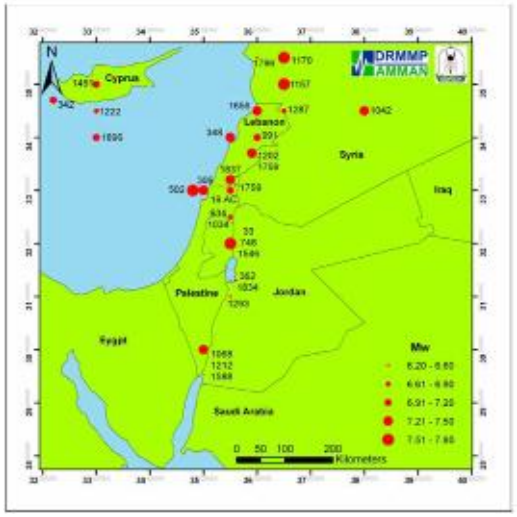


Figure 4.3 Historical earthquake activities within the DST region.

Amman has rapidly grown into a city with a population estimated at 2.2 million inhabiting an area of around 1,662 km^2. The population of the Greater Amman Municipality (GAM) is now 1000 times the population it used to be in 1909 when the first municipal council in Amman was established. Because of these recent and dramatic changes, past disasters cannot be used to assess the impact of the next destructive earthquake on modern Amman. A large earthquake today will affect not only a much larger urban population, but also completely different urban construction, (e.g., mid- and high-rise buildings) and complex infrastructure system that enables every-day life.

[13] Refer to reports by Queen Rania Center for Jordanian Studies on Community Service, Yarmouk University on the study of earthquake risk of Greater Amman produced as part of this project.

4.3.1 Future Earthquakes and their Effects on Amman

A multi-disciplinary team of scientists of seismologists, geophysicists, geologists, structural and geotechnical engineers from various research and higher learning institutions and led by Yarmouk University developed an earthquake risk assessment of Greater Amman in a study funded by the United Nations Development Program (UNDP) and supervised by EMI. This is the first comprehensive study of its kind for Amman in estimating the magnitude and locations of future earthquakes likely to affect Amman; the level of ground shaking that these earthquakes would create; and the damage to Amman's buildings, lifelines and critical infrastructure, and potential life and monetary losses.

Determining the Earthquake Threat

The amount of shaking, or "ground shaking intensity," that Amman will experience during an earthquake depends primarily on three factors: the strength of the earthquake (magnitude), its distance from Amman, and Amman's ground/soil conditions. The seismic risk assessment study team attempted to determine the magnitude and location of earthquakes that would likely damage Amman in the future. They analyzed the region's faults and earthquake records dating back to several thousand years B.C.

Probabilistic Seismic Hazard Assessment

The goal of probabilistic seismic hazard analysis (PSHA) is to quantify the rate (or probability) of exceeding various ground-motion levels at a site (or a map of sites) given all possible earthquakes. The Probabilistic Seismic Hazard Assessment in Amman has been conducted for return periods of 475 and 2,475 years, corresponding to 10 percent and 2 percent probability of exceedance in 50 years, respectively, on a grid size of 0.5 km × 0.5 km and represented in Figure 4.4. Traditionally, peak ground acceleration (PGA) has been used to quantify ground motion in PSHA. The Response Spectral Acceleration (SA) is also used as a ground motion parameters, which gives the maximum acceleration experienced by a building. Both PGA and SA at periods of 0.2, 0.3, and 1.0 seconds were selected as ground motion parameters in the analysis for GAM. The PGA maps in the probabilistic analysis below show relatively uniform levels of hazard throughout the GAM area, with nearly all locations affected by values in the range of 0.09-0.22g, for 10 percent probability of exceedance in 50 years. Meanwhile, for 2 percent probability of exceedance in 50 years, PGA values vary between 0.15-0.47g. In general, the maps for the 2 percent probability of exceedance in 50 years show an increasing influence of the infrequent but larger magnitude events associated with the Dead Sea Transform (DST) fault area zones of the region.

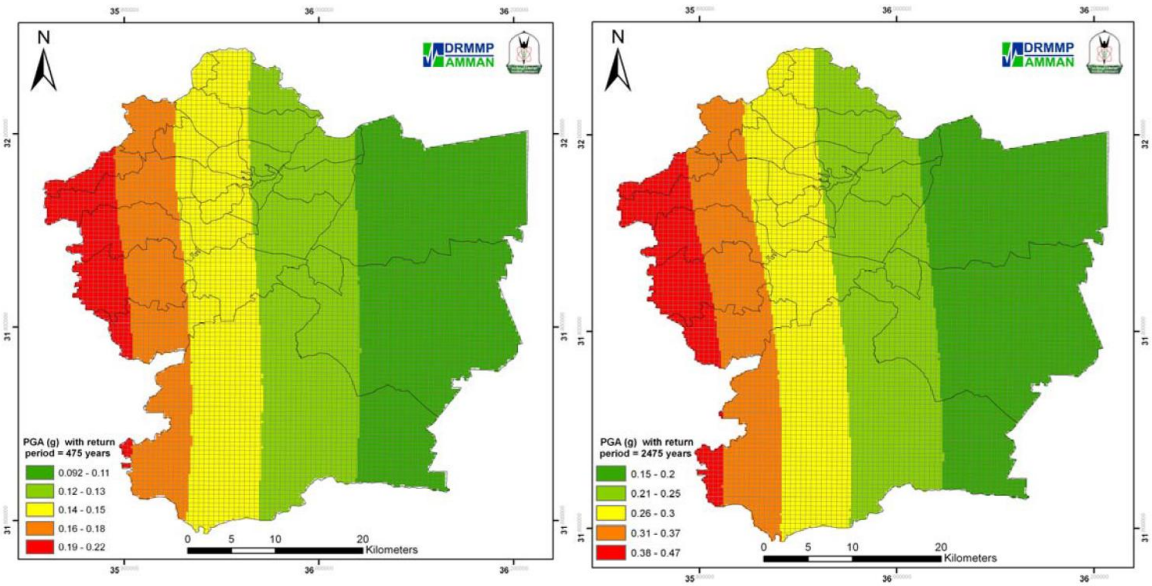


Figure 4.4 PGA contour map for 10% probability of exceedance in 50 years (left), and for 2% probability of exceedance in 50 years (right) assuming rock site conditions (NEHRP B site class)

Deterministic Seismic Hazard Assessment

Deterministic seismic hazard assessment methods characterize the spatial distribution of the earthquake ground motion that would result from a given earthquake (scenario earthquake). Scenario earthquakes realistically describe the earthquake risk and potential impacts, giving clear reasons for individuals, businesses, and policy makers to act to prevent eventual losses. A successful scenario tells the story of a defined earthquake and its specific impacts using the geological and seismological information. The selection of scenario earthquakes is based on the disaggregation of a Probabilistic Seismic Hazard Analysis to show which events have the highest likelihood of occurrence in the source region. In the case of Amman, this procedure suggests that an earthquake with a moment magnitude (Mw) of 7.5 (similar to historical earthquake which affected the Roman-Nabatean reservoir of Aasir el Telah south of the Dead Sea) is selected as the "Credible Worst Case" scenario event. This is assumed to take place on the three main faults of the DST. Accordingly, to represent the range of the hazard for the "Credible Worst Case" earthquake, three scenario events assumed to take place on the three main faults of the DST were selected for detailed assessment (Figure 4.5):

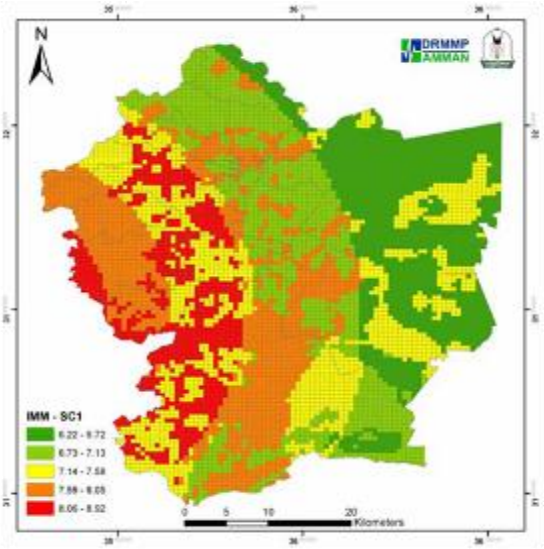
- Dead Sea Fault **(Scenario I)**
- Jordan Valley (Jericho) Fault **(Scenario II)**
- Wadi Araba Fault **(Scenario III)**

Figure 4.5 Earthquake Scenarios proposed by the seismic risk assessment study team

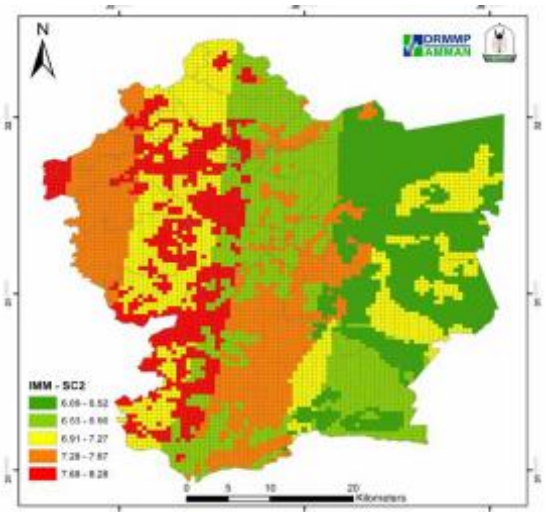
(The red and blue lines represent the potential fault ruptures of each of the three scenarios)

The scenario earthquakes are assumptions used to describe the earthquake risk and potential impacts based on the seismological and geological information and provide government authorities, emergency managers and policy makers with information to take action and prevent devastating losses.

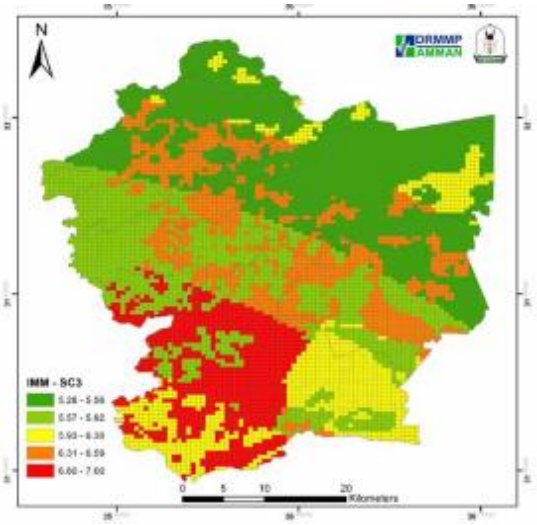
The effect of magnitude, location and local ground conditions on ground shaking intensity is apparent in Figure 4.6. The ground shaking intensity maps show relatively similar levels of hazard for the different scenarios throughout GAM area, with western and southern locations showing the highest intensities. It can also be seen that the earthquake associated with the most expected rupture potential lies along the 90 km long segment of the Jordan Valley Fault (Scenario II) and a 30 km long section of the eastern segment of the Dead Sea Fault (Scenario I). Both of these scenario earthquakes would release over 30 times more energy than the earthquake on the Wadi Arabia fault (Scenario III).



Scenario I



Scenario II



Scenario III

Figure 4.6 Ground shaking intensities for the three proposed scenarios including effects of soil amplification (unit used is g=1cm/s2)

An earthquake on the Dead Sea Fault under Scenario I would produce the strongest ground shaking in Amman. Its proximity to the downtown Amman and the characteristics of the soft soils in the west of Amman may result in severe, "MMI 8" shaking in the west of the city and the densely populated center. The Modified Mercalli Intensity (MMI) scale is one of many intensity scales used by earth scientists and engineers to relate ground shaking to the effects it has on people, buildings and nature. During MMI 8- ground shaking, slight damage

occurs in specially designed structures; considerable damage in ordinary buildings and great damage in poorly built structures. Assessing Earthquake Damage

The behavior of structures during earthquakes depends not only on the amount of ground shaking, but also on the age, material, design, construction, quality and dimensions of the structure. For example, the behavior of a multi-story building made of concrete reinforced with steel bars ("reinforced concrete") is very different than that of a one-story building made out of masonry. For this reason, the earthquake engineering experts involved in the study determined the prevalent categories of buildings in Amman and classified them according to construction type, number of stories and date of construction (prior to 1985 or after 1985). In 1980s, the engineering construction techniques were greatly changed by the introduction of a seismic code. This change, combined with the enforcement of engineering supervision for the buildings, influenced a better practice.

Damage to buildings in Amman, based on the ground shaking from each of the three scenarios, was estimated using "fragility curves" for each of the different building types. The fragility or damage curves relate the mean damage potential of a particular class of building to the hazard intensity. Damage states for each building class were obtained as: None, Slight, Moderate, Extensive and Complete. Damage to lifelines, including water, sewers and transportation systems in Amman were also estimated in this study. Additionally, estimates of potential damage to critical facilities, such as hospitals, schools, emergency centers, civil defense departments, educational institutes, police stations, governmental buildings etc., were also incorporated in the earthquake risk assessment of GAM. Selected results are provided in Figure 4.7.

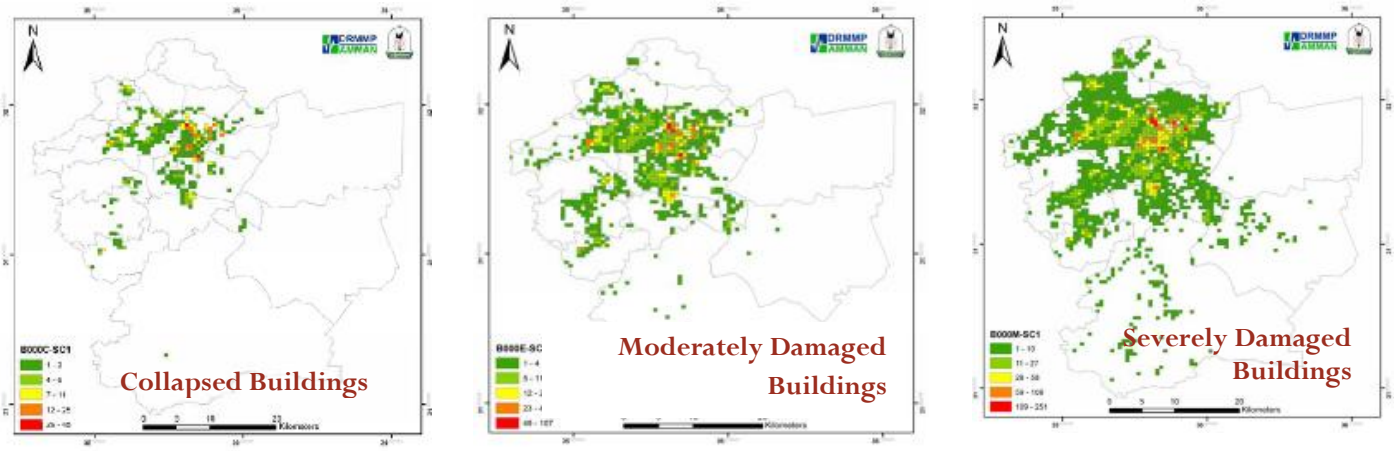


Figure 4.7 Distribution of damage states for all building types for Scenario 1

4.4 Narrative Scenario

Detailed estimates and technical descriptions of damage from potential earthquakes do not always effectively communicate the impact of such disasters to the non-expert. For this purpose, EMI developed a narrative scenario (see Annex 4, Volume 2) to describe life in Amman in the short- and long- term recovery periods following one of the scenario earthquakes proposed in the risk

assessment study of Greater Amman Municipality. The Amman Earthquake Risk Narrative Scenario also provides guidance to government officials, business leaders, and the general public in reducing damage and injury in the next major earthquake. The narrative scenario is based on the technical assessment of earthquake risk of GAM described in the previous chapter, but it is written in non-technical terms as a story line of the impact on life in Amman during the short-term and long-term recovery process.

4.5 Building Institutional Competency in Risk Analysis and Risk Management

The knowledge of risk and competency of technical governmental institutions in Jordan and in particular in GAM is low due to the inexistence of such studies in the past and the low-level of understanding of their relevance to physical planning and construction standards in the city. As an evidence, the currently drafted general physical plan for GAM does not explicitly consider parameters of earthquake hazards, vulnerability, or risk in the study. This is an inherent weakness considering the high exposure of the city to earthquake risks. That is not to say that the competency does not exist in the country. In fact, the risk analysis performed in the context of this study demonstrated that the country has solid expertise in the subject within its research institutions, universities and specialized technical agencies. This calls for a stronger cooperation and consultation between the technical administrative structure of GAM and other government agencies and the national experts.

The detailed seismic risk assessment and analysis in GAM was the first study of its kind in Jordan. It was successful in evaluating potential earthquake hazards, risks and losses and the geographic distribution of potential human and material losses. Rather than a finished product, this ground-breaking study by Jordanian scientists should be viewed as the beginning of an organized process for research and development in the disaster risk reduction of Amman. The understanding of the outputs of the study should go beyond the conceptual level. GAM technical institutions as well as policy makers and managers should become familiar with the outputs of the risk assessment study undertaken by the seismic risk assessment study team. Department Heads and Managers should apply the outcomes of the risk study on their particular mandates, functions and operations and develop strategies for “mainstreaming” risk reduction within these functional processes. The stakeholder workshops on the development of the DRMMP have clearly demonstrated that there is great scientific interest and knowledge available on this area which has yet to be tapped. Research and Development should be a concerted effort of an active community of practice working towards seismic safety in Amman. The results of the GAM risk assessment study have the potential of building a valuable basis for the development of research in earthquake science and engineering.

5.0 ANALYSIS AND DIAGNOSIS OF THE CURRENT DRM PRACTICE AT THE GREATER AMMAN MUNICIPALITY

In this section the various aspects of the DRM practice in the Kingdom of Jordan as they relate to the Greater Municipality of Amman are developed and analyzed.

5.1 City Profile and Relevant Data

The final version of the Disaster Risk Management Profile of Amman, Jordan has been published by the Disaster Management Department of the General Directorate for Civil Defense with support from UNDP Jordan following a draft that was prepared earlier by EMI and template and examples from other cities provided by EMI. Relevant excerpts are presented here, while the profile is provided as an exhibit with this document in a separate volume (see Annex 2 in Volume 2). All maps and illustrations were likewise lifted from this document.

5.1.1 Physical and Socio-Economic Characteristics of Jordan

Jordan is a relatively small country in the northern part of the Arabian Peninsula. The area of Jordan is 89,213 sq. km; of which 88, 884 sq. km are land and 329 sq. km are water. Jordan is bordered by Syria in the north, Iraq in the north east, Saudi Arabia in the south and Palestine and Israel in the west. It has a southern access to the Red Sea, Aqaba, which is its only sea port. Jordan is mainly a desert, with some mountain areas in the west and north-west. The nation of Jordan contains a diversity of landscapes and environments, a rich history containing many significant archeological sites, and is bounded to the west by a major fault/plate boundary. Jordan can be divided into four ecological areas: the Jordan Valley, Highlands, Steppe and Badia (Arid) region.

Figure 5.1 Political map of Jordan.

Politically, the country is divided into 3 regions made up of 12 governorates: Irbid, Jarash, Ajloun and Mafraq are in the Northern region; Amman, Zarqa, Balqa and Madaba in the Central Region; and Karak, Taffileh, Ma'an and Aqaba in the southern region. The majority of Jordan's population of 5.92 million lives in urban areas, mainly in Amman, Zarqa, and Irbid.

The capital Amman is located in the central west part of the country of Jordan and has gained its importance through history. The population of Jordan is growing at a rate of 2.3 percent, with a life expectancy of 71.5 years. Sudden population increases occurred in the past decades when refugees came to settle down in the country, such as in 1948 when an estimated 700,000 refugees came from Palestine. Another wave of refugees of about 300,000 arrived from Palestine in 1967 during the war between Israel and Egypt, Syria and Iraq. Another population spurt came after the Gulf War in 1990 when over one million refugees came through Jordan and about 300,000 of them became residents in the country. Further conflicts and wars in different years resulted to more influxes of refugees to Amman.

Jordan's economy has changed from an agricultural based to a diversified economy, which includes services and industry. The Amman Metropolitan Area (AMA), which covers the cities of Amman, Zarqa, Ruseifa including its surrounding areas, hosts more than 50 percent of Jordan's total population, accounts for about 80 percent of the country's industrial sector and provides employment for about 55 percent of the country's .

5.1.2 History of Amman

Amman is an ancient home of civilization dating back to 8,000 BC. Different civilizations from the Heksus, Bani Ammon, Assyrians, Babylonians, Greeks, Romans, Ghassanids, Umayyads, and Abbasids left their imprints on the city in the form of caves, buildings, churches, amphitheaters and mosques. With the changes in civilizations and the occurrences of natural disasters such as earthquakes, some have become ruins and some are still standing.

With the increasing importance of Amman for its location and the influx of refugees and immigrants, the city had several spurts of growth that affected its structure. Of the first immigrating groups was the Circassian tribe of Shabsough in 1887. At that time, Jordan (it had not obtained that name yet) was still under the Ottoman rule which continued until the end of First World War when the British mandate over Transjordan started.

In May 1923 the British recognized Transjordan to be an Emirate under the leadership of Emir Abdullah with the British mandate controlling foreign affairs, armed forces, communication, and state finance. In 1946 Transjordan gained its independence from the British mandate and Emir Abdullah became King Abdulha of the Hashemite Kingdom of Jordan. With the Israeli-Palestinian conflict remaining as deadly as ever, the spill-over effect from the conflict makes Jordan vulnerable to 'man-made' disasters and their consequences. According to the UNRWA, there are 234,749 refugee camps for Palestinians in Amman. In the last five years, there has been a large influx of Iraqi refugees after the coalition's invasion of Iraq.

The sudden influx of immigrants/refugees and returnees in the past years has had a series of social and economic effects related to shortages of food and housing ,strains on the education system, limited water resources and urban infrastructures, and increased unemployment by 30 percent. Like many countries, Jordan faces the challenge of rapid urbanization with an annual rate of urban growth of approximately four to five percent. In 1943, Amman had only 30,000 inhabitants. Over the subsequent decades, Amman grew to a booming, overcrowded metropolitan center with a population of over two million.

Figure 5.2 Present-Day Amman

5.2 Legal and Institutional Analysis of Disaster Risk Management Practice

5.2.1 Existing Legal Basis

A number of laws related to disaster management in Jordan have been enacted indicating that regulations aimed at protecting people and properties are in place. These laws, however, are implemented by many authorities working in an loosely coordinated manner. Several of these laws have been enacted almost two decades ago when threats to lives and economic assets were not as severe as today. Risks to security, safety, health, among others, are getting more complicated and have challenged the capacities of cities like GAM. Table 5.1 shows some of the most relevant legislations related to disaster risk management in chronological order.

Table 5.1 Legislation related to managing risks in Jordan in chronological order

The Jordanian Constitution for 1952 and its Amendments
The Municipalities Law No. (29) for 1955 and its Amendments
Public Security Law no. (38) for 1965 and its Amendments
Jordan National Red Crescent Society Law no. (3) for 1969
Building and Planning Regulation in the City of Amman and its amendments No. (67) for 1979
Organization and Management Regulation for the Ministry of Energy and Mineral Resources no (26) for 1985 and its amendments
Defense Law No. (13) for 1992
The Jordanian National Construction Law No. (7) for 1993 and its Amendments
Labor Law No. (8) for 1996
Industry and Trade law no. (18) for 1998 and its amendments
Civil Defense Law No. 18 1999 (amended in 2003) established the Higher Council of Civil Defense (HCCD) at the national level.
The Jordanian Armed Forces Temporary Law No. (64) for 2001
Nuclear Energy and Radiation Protection Law No. (29) for 2001
Temporary Traffic Law No (47) for 2001 and its amendments
Temporary Agricultural Law No. (44) for 2002
Environment Conservation Law No. (52) for 2006
The Municipalities Law No. 14 of 2007 vests the Amman city level certain powers and responsibilities related to disaster response

These laws have created a web of organizations with responsibilities related to risks management and requiring a vast amount of resources. GAM has a networking system of government bodies but coordination within this system is weak. Overall, the efforts on disaster management are highly centralized where inter-agency coordination remains unclear. There are no systematic programs for information, education and communications on hazards, vulnerability and risks and modern disaster risk management (DRM) practice has yet to be introduced at many key national institutions. A comprehensive system and strategy to institutionalize DRM practice within the governmental agencies

need to be put in place. Such strategy should recognize the important role of local governments in disaster risk management. The strategy should be based on a pro-active approach where risks are identified and integrated into the development plans at various levels.

5.2.2 National Level

At the national level, the Higher Council of Civil Defense (HCCD) is granted with the authority to deal with disasters through the Civil Defense Law No. 18 of 1999 which was amended in 2003. The HCCD is intended to be the policy and coordinating agency for emergency management in the country. However, it seems to lack the commensurate financial and administrative support in order for the Council to work more effectively. The implementation of this law is centralized, thus reducing the effectiveness in dealing with disaster risk management issues at the local level.

5.2.3 Municipality Level

The Municipalities Law No. 29 of 1955 and its Amendments, on the other hand, authorized the Greater Amman Municipal Council to undertake responsibilities related to DRM such as licensing for building construction, taking precautions to prevent damages caused by floods, relieving victims of fires, floods, earthquakes and other general disasters, city and street planning, and risk prevention from natural and man-made hazards.

The Municipalities Law No. 14 of 2007 also provides several responsibilities to the Municipality. It addresses several issues and concerns that include city plans and buildings, sanitation and health, fires, flooding, aid to victims, risk prevention, and financial requirements. Several issues addressed by the law are shown in Table 5.2 below:

Table 5.2 Issues addressed by the Municipalities Law No. 14 of 2007

	Issues	Responsibilities/mandates
City Plans, Buildings	City and Street Planning	Constructing new roads, canceling or changing the routes of others; determining and constructing their sidewalks, width, route; paving, maintaining, cleaning, and lighting them; numbering the buildings along them; preventing encroachment upon them; conduct landscaping and planting alongside; and monitoring what may fall on them from open lands, and ordering owners of said lands to erect walls.
	Building Licenses	Monitoring the construction and demolition of buildings; ordering changes in the design; installation of elevators; granting of licenses for such works; determining the form, shape, and area size of a building vis a vis the geophysical conditions of its locations; and ensuring adequate sanitation

	Destruction of Dilapidated Buildings	Demolition of dilapidated buildings that pose risks of collapsing or constitute a public health hazard.
	Right-of-Way	Sale and use of right-of-way lands and what is acquired for public projects.
Sanitation and Health	Water	Providing residents with water; determining the specifications for its supply, such as water meters, pipes; regulate its distribution; determine its prices and the cost of subscription to the service; preventing pollution of springs, water channels, tanks and wells.
	Sanitation	Collect, transport and get rid of street trash and garbage from homes and public places.
	Public Health	Take all measures and necessary precautions to maintain public health and prevent the spread of diseases.
Fires	Fire Stations and Fire Prevention	Taking precautions to prevent fires; monitoring and regulating the sale and storage of fuels and flammables, and determine their prices; maintaining fire stations.
Flooding	Precautions against Flooding	Taking precautions to prevent damage caused by floods and overflowing stream.
Aid to Victims	Helping Victims of Disasters	Providing aid to victims of fires, floods, earthquakes, and other disasters; and collecting donations for them and distributing these among them.
Risk Prevention	Risk Prevention	Take all necessary precautions to protect individuals and properties; prevent damages and harms caused by any acts mentioned in this article.
Finances	Budget	Approve the annual budget, final account statement and personnel salaries prior to referral to responsible authorities.
	Disbursement of Municipality Funds	Managing Municipality properties and funds, and constructing, leasing, selling and purchasing needed buildings on such property, in accordance with the provisions of this Law; receiving grants, donations and endowments.

5.3 Organizational Structure for DRM

As previously mentioned, the country's disaster relief operations are highly centralized by virtue of Civil Defense Law No. 18, 1999 (amended in 2003) which established the Higher Council of Civil Defense (HCCD). The HCCD is chaired by the Minister of Interior with the Director General of Civil Defense as vice-chair. The Government's National Disaster Risk Management Program (NDRMP 2004) has been created to deal with disasters and major accidents as part of the Civil Defense Law no. 18, 1999. It is an adjustment to Law No. 57, 2002. The plan has procedures and actions to be carried out by the civil defense.

Members of HCCD

Members of HCCD and its committees in the administrative divisions perform the plan's actions. The HCCD includes the Minister of Interior who acts as the Chairman and the Director General of Civil Defense as the Vice-Chairman.

It also includes the following officials as members of the Council:

1. Secretariat-General of Prime Ministry
2. Secretary general of all ministries
3. Secretary general of the higher council of youth
4. Jordanian armed forces deputy assigned by the chairman of Jordanian Armed forces
5. Public security deputy assigned by the public security general director
6. Public intelligence deputies assigned by the director of public intelligence directorate
7. Amman municipality deputy
8. The chairman of the Jordanian red crescent society
9. The chairman of the trade chambers union
10. A chairman for one of the industrial chambers assigned by the Ministry of industry and trade.

The duties of the HCCD are comprehensive. These range from response planning at the national level, entering into international agreements on disaster relief and similar state duties to operations like forming civilian volunteers at the local level, training of citizens and others. The HCCD duties are summarized in Table 5.3 below:

Table 5.3 Duties of the Higher Council of Civil Defense (HCCD)

Functions	Duties
Planning and Risk reduction	Setting public plans and procedures to encounter emergencies and disasters, and specifying duties of private and public parties. Setting necessary plans to provide protection against chemical, radioactive, bacterial contamination, and toxic gases in cooperation with specialized concerned parties.

Coordination within the Council, governorates and agencies	Issuing directives to organize the council's duties, and managing its operation rooms and the operation rooms of the parties represented within as well as the operation rooms of civil defense committees in the governorates and provinces. Specifying duties and tasks of civil defense committees formed in governorates in accordance with the rules of this law.
Mobilizing support from Armed Forces and civilians	Setting the duties of Armed Forces and Public Security at emergencies and disasters to support civil defense actions. Forming voluntary teams of civilians with ages ranging from 18 to 50 years old to support civil defense actions
Emergency support	Establishing and equipping public shelters
Training	Demonstrating techniques of warning citizens against emergencies and disasters, and specifying required methods.
Administration	Setting financial estimation required in case of emergencies and disasters, and submitting it to the Cabinet for possible inclusion within the public budget.
Policy direction	Recommending the Cabinet to obligate concerned local departments, organizations and authorities in allocating funds from their annual budgets to carry out duties and tasks determined by the council.

The HCCD established three subcommittees: media, relief, and earthquake technical committees. Many responsibilities of the committees are oriented to disaster responses. HCCD focuses on response preparedness, disaster relief and coordination. Little is explicitly indicated over disaster risk reduction. The following sections discuss the duties and functions of HCCD's subcommittees (except for media committee) in detail.

The Relief Committee

The Relief Committee, on the other hand, is composed of: Ministry of Industry and Commerce as the director, Ministry of Health, Ministry of Social Welfare, Foreign Ministry, Ministry of Public Works and Housing, Ministry of Communication, Ministry of Transportation, Ministry of Agriculture, Civil Defense, Military, Police Force, Jordan Red Crescent Society. The committee's duties are:

1. Conduct disaster rapid damage and needs assessments.
2. Request relief materials for the vulnerable people
3. Provide logistics services (receive, store, distribute and deploy) for the relief material in adequate time

4. Supervise the relief subcommittees operation in the field and monitor relief operation in the field
5. Coordinate with the HCCD and the civil defense committees in the governorates during relief operations and emerging situations.
6. Supervise international relief operations.
7. Follow up international appeal and external support
8. Reporting to HCCD on the relief operations

Earthquake Technical Committee

The earthquake technical committee consists of: Ministry of Public Works and Housing, Civil Defense, The Royal Scientific Society, Natural Resources Authority, Engineer's union, Ministry of Municipalities, Ministry of Water and Irrigation, and GAM. The Committee's duties are:

1. Training civil engineers, Ministry representative, and emergency teams in earthquake resistant building design.
2. Implementing the Jordan building code for earthquake-resistant buildings.
3. Monitoring the implementation of the Jordan building code in coordination with GAM and the Engineer's union.
4. Identifying buildings at risk.
5. Creating and updating a database of engineering offices and institutions that have the necessary skills to conduct building evaluation and rehabilitation for earthquake resistance.
6. Establishing an engineering emergency team in each governorate to assess and classify the buildings affected by the earthquake in terms of their safety and resistance based on the approved rating system.

Likewise, there are other agencies and units working on disaster management in Jordan. These include the office of the Interior Minister, National Security and Crisis Management Center (NSCMC), the General Directorate of Civil Defense, and the Local Civil Defense Committees.

Operational Management through the Interior Minister

In case of emergencies and disasters, the Interior Minister, who sits as the Chair of HCCD, is authorized by the Prime Minister under Civil Defense Law No. 18, 1999 (amended in 2003) in accordance with Article No. 8 to give orders and undertake the following procedures during the time required by these situations.

1. Laying hands on all means of transportation, restricting their moves and moves of drivers, laying hands on their spare parts, and restricting sale.
2. Laying hands on required immovable properties and buildings for establishing public shelters, hospitals, and necessary centers for the purpose of ambulance services, nursing and other civil defense affairs.
3. Taking hold of various types of flammable materials, restricting use and the way of storing
4. Organizing, specifying, distributing foods and all required materials in order to encounter emergencies and disasters for the stability of people's living
5. Organizing the use of electricity and water resources in coordination with concerned parties.

6. Maintaining the work of radio and wired communications
7. Preventing general staff, doctors, pharmacists, male and female nurses, the staff at any institution or utility of public services, the staff of food trading manufacturing field, and transportation laborers from leaving their jobs without permission signed by the minister or his representative. Besides, the minister has the right to impose prevention upon any other parties, if their works were necessary for the stability of living.
8. Charging any person- of those whom has the required ability- with contributing in civil defense comprehensive services. If this person works in free business field, he has to put the equipment he has under the disposal of civil defense.
9. Charging any public employee with running civil defense services all the required time.
10. Charging any of the public/private organizations with delegating one of their senior officials for working as liaison officer between the organization and civil defense committees in order to coordinate with them as soon as possible.
11. Issuing any directions, orders, and other decisions necessary for comprehensive civil defense requirements.
12. Establishing coordination and cooperation through signing agreements with neighboring countries, Arab states, European countries and international organizations.

As described above, the central body through the Interior Minister is vested with a broad span of control in dealing with emergency situations. Authority to act has not been delegated to the local level where action should be taken more efficiently.

The HCCD signed agreements with Algeria, Lebanon, Egypt, Syria, Sudan, Saudi Arabia, Yemen, Switzerland and Austria, regarding civil defense, search and rescue, training, and support during response operations.

The National Security and Crisis Management Center

The King announced the creation of the National Security and Crisis Management Center (NSCMC) in April 2008. The NSCMC is to be composed of senior officials from various government agencies to address the need to integrate the efforts on disaster management in the country. To date, the scope and functions of NSCMC have not been made clear and a budget to run the committee has not been allocated. In the meantime, the relationship of the NSCMC with the existing government entities related to DRM, in particular the HCCD, has yet to be defined.

GENERAL DIRECTORATE OF CIVIL DEFENSE

The General Directorate of Civil Defense (GDCD) reports to the Ministry of Interior. It is organized as a para-military organization with mandate over response planning and relief operations in the case of disasters. The GDCD has a small department of Disaster Management. Based on the Civil Defense Law no. 18, 1999, the GDCD is the formal body authorized to protect the lives and properties of the citizens against potential dangers through self prevention and protection procedures. Figure 5.3 below is the organizational chart of the GDCD.

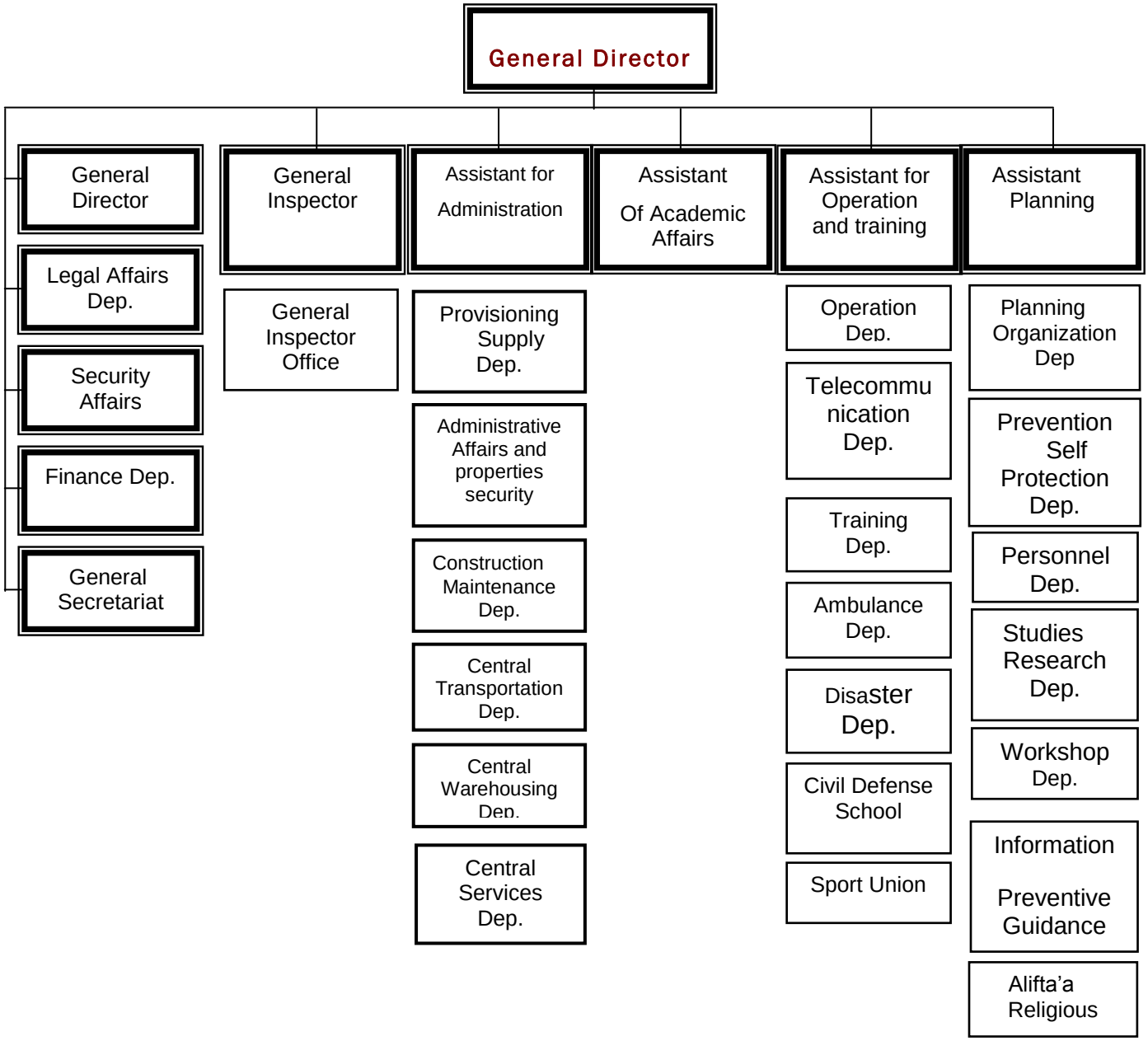


Figure 5.3 Organizational Structure of the GDCD

Local Civil Defense Committees

At each of the 12 governorates, a committee called Local Civil Defense Committee is formed. It is headed by the governor and each of the general managers or managers of formal departments, director of civil defense, police director, head of the municipality, head of industry and commerce chambers, representative of armed forces appointed by the chief of staff, and head of Red Crescent branch in the governorate are members of the committee. Disaster response is the main task of the GDCD carried out through various directorates, divisions and centers at 115 locations (Figure 5.4).

- 12 Civil Defense Directorates
- 2 Specialized Civil Defense Directorates
- 3 Rescue and Support Region North, Middle and South.
- 134 Civil Defense Stations

Figure 5.4 Civil Defense Directorates in Jordan

Assigned to the Disaster Department of GDCD which was established in 1991 are the following responsibilities:

1. Gathering and storing strategic information related to the disaster management;
2. Coordinating with international bodies and NGOs concerned with disaster related matters;
3. Coordinating with universities and scientific institutes concerned with disaster management. As a result, coordination with Cranfield University of Britain took place recently for holding qualification courses for civil defense officers and members of the HCCD in the field of disaster management.
4. Writing and publishing books and leaflets related to disaster management;
5. Updating disaster response plan;
6. Conducting awareness campaigns and training in the form of workshops, lectures, and field visits;
7. Providing technical and professional counseling through the media during disasters;
8. Supervising the establishment of the civil defense academy which will focus on disaster management, fire fighting engineers, specialized emergency medical services in addition to

organizing specialized training programs in civil defense science (fire fighting, first aid, search and rescue)

As part of the public awareness campaign, the Civil Defense, in coordination with Hashemite Charity, carries out public awareness campaigns through the production and dissemination of communication materials as well as the conduct of trainings upon request of government institutions and local NGOs.

In general, the Civil Defense is working on developing a framework to guide and monitor disaster risk reduction in Jordan. The framework will concentrate on political commitment, institutional aspects, risk assessment, impact assessment, forecasting and early warning systems, and knowledge management.

5.3.2 Municipality Level

GAM is a financially independent public corporation. It is divided into 27 administrative districts, each district with its own set of employees.

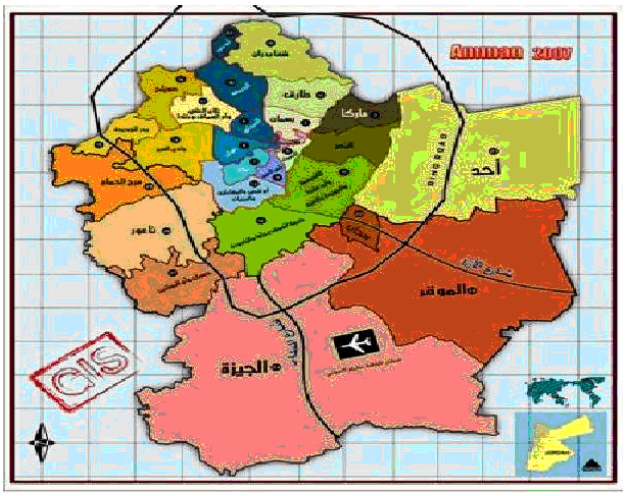


Figure 5.5 Map showing GAM's 27 districts.

The functions are administered by the GAM Council, the Municipality's highest governing body, which is headed by the Mayor of Amman as Council President. The Council Ministers vote to select the Mayor and Deputy Mayor within the 68 members of the GAM Council. The Mayor is assisted in his duties by the Deputy Mayor. The Council is assisted by several Council-delegated committees, where each committee deals with a specific task. The Council's term in office is four years.

The Council of Ministers consists of 34 Amman residents elected and 34 appointed to represent official, commercial, and economic bodies as well as other services departments within the city of Amman. The GAM city council has 68 members and are distributed into 14 committees:

Table 5.4 GAM City Council 14 Committees

Zoning and building district committee	Local committee of sub-districts
Employees affairs committee	Supplies and work committee
Land laying hand committee	Green area committee
Finance planning committee	Finance committee
Health committee	Legal committee
Street naming and numbering committee	Social and cultural committee
Development committee	Traffic safety and awareness committee

Greater Amman Municipality has several service departments including research and development department, GIS, quality control, information development, legal, culture, communication center, public relation, external relations, Zaha center for children, internal monitoring unit, workshops and fleet, sports and international relations, environmental health, finance, planning, engineering, security and protection, and management .

Existing Institutional Arrangement for Emergency Management at GAM

The GAM is a member of HCCD, and has its own emergency centers, which provide direct response for day-to-day needs. The two emergency centers are located in Tla'- Ali and in Ras el-Ain. They report directly to the enforcement operational unit of GCCD. These emergency centers are vested with functions such as opening access and emergency routes (e.g. streets), provide water drainage, build supporting walls, maintain the valleys and streams in the Amman area, and manage the response operations from the central operation room. In addition, GAM has responsibility to build up a database of the water drainage lines and pipes.

The emergency team has developed a contingency plan for natural and human-induced disasters. The main duties in this contingency plan are as follows:

- Prepare and equip the operation room linked to the High Council of Civil Defense;
- Support the 27 sub operation rooms in the different areas of Amman;
- Mobilize all GAM departments to respond;
- Support the relief operations through their operation teams;
- Support debris removal and sustain the cleanliness and maintenance of affected areas; and
- Prepare burial places for the victims, and provide sterilization material to prevent epidemics, insects and rodents.

Greater Amman Municipality has provided a map of alternative roads and routes for 89 bridges, tunnels, grand intersections, water tunnels, and major traffic roundabouts that may be affected in

case of disasters. The two major emergency centers in Tla'- Ali and in Ras el-Ain are also keeping a list of officials to contact in case of disasters.

In terms of addressing health-related concerns during disasters, GAM has prepared guidelines for health sectors in the municipality. These guidelines include laws and regulation to deal with epidemics, but oftentimes lack standard operating procedures to mobilize the health teams or contingency plans to implement in case of disasters. For example, the plan assumes that hospitals and health centers would be operational after a disaster and the staff would also be available or be mobilized quickly.

In the past, much of the work on disaster management in Amman led by the central bodies has focused on disaster preparedness and relief operations work. It is interesting to note though that risk prevention and mitigation measures are now gradually being developed. For instance, GAM is working with the National Building Council on raising awareness among contractors about implementing the building laws and codes.

5.4 Emergency Management

For the purpose of this section, the UNISDR's definition for Emergency Management (EM) will be used. It is defined as:

> "*The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation. Emergency management involves plans, structures and arrangements established to engage the normal endeavors of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.*"[14]

Current arrangements and practices for EM in the city of Amman are analyzed under that context. Basic information gathered in the document Disaster Risk Management Profile[15] is used as basis for the analysis along with a survey and other information gathered during the second field investigation of August 2008.

The responsibilities of GAM are dictated in the Municipalities Law No. 14 of 2007 and its amendments. Listed are three roles and responsibilities related to emergency and/or disaster management:

- Fire Stations and Fire Prevention: taking precautions to prevent fires; monitoring and regulating the sale and storage of fuels and flammables, and determine their prices; maintaining fire stations.
- Precautions against Flooding: taking precautions to prevent damage caused by floods and overflowing streams.
- Helping Victims of Disasters: providing aid to victims of fires, floods, earthquakes, and other disasters; and collecting donations for them and distributing these among them."

[14] www.unisdr.org

[15] AbdelQader Abu Awad, Disaster Risk Management Profile, final edition, a report to the UNDP-Jordan Office, July 15, 2007.

GAM established an emergency center in Amman in order to coordinate its emergency management actions and mobilize its resources during hazard events. The mandate is oriented towards direct response to large or small scale disasters by mobilizing up to 1300 employees from different departments. The Center's operations room operates on 24h/7day. In regular times, the staff is working in two shifts and, in case of emergency, they work in three shifts. The emergency center is equipped with emergency telecommunication systems and has a hotline with the civil defense operation room, governor's office, as well as the general security to coordinate its emergency response at all levels.

A disaster response plan was developed for the Emergency Center. Although not based on specific disaster scenarios, this disaster response plan is being updated every six months. Specifically, the plan shows the roles and responsibilities of different departments and officials in GAM.

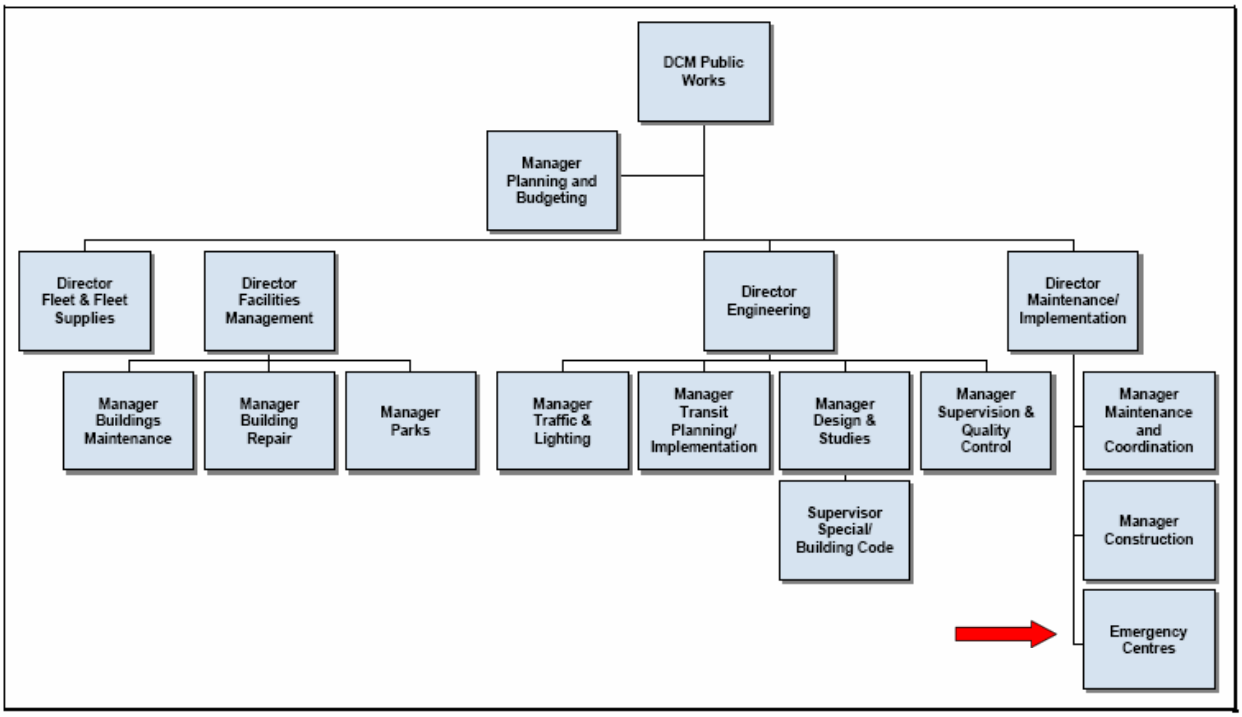


Figure 5.6 Current Structure of Emergency Center

The present situation is that all elements needed for disaster response (equipment, human resources, telecommunications, emergency plan, and finances) are available, but there is no disaster response plan based on clear scenarios and no emergency Standard Operating Procedures (SOPs) for the operation rooms. Moreover, there is no clear disaster management structure that defines the line of command, as well as field assessment team to evaluate conditions and coordinate their response operations. The Emergency Management system operates in a top down fashion that assumes that

staff and officers are available and conditions are adequate for mobilizing human and material resources. The exceptional conditions of a major disaster, such as a major earthquake are not explicitly planned for.

Responders to the risk perception survey questionnaire administered in August 2008 (see Annex 5, Volume 2) provided mixed answers:

- Some thought that local disaster management units and/or voluntary organizations in Amman are not very well organized and operational in different areas of emergency management and response.
- More of the emergency managers and policy makers thought that the levels of inter-institutional organization and coordination for response are good between various institutions in Amman such as civil society organizations, local authorities, public services and operational organizations.
- Not enough financial and non-monetary resources exist for Emergency or Disaster Management in Amman.
- Interestingly the participants ranked the lack of management and internal coordination and lack of technical capacity as the greatest obstacles to improved EM and DRR.
- Lack of financial resources was ranked the same as lack of political will or awareness and lack of national or local policy.

On the preparedness side, the respondents to the survey were uncertain if local authorities and decision makers in Amman have attended enough training workshops or held meetings and conferences to improve Amman's disaster risk reduction and emergency preparedness. They also are not clear if schools and hospitals in Amman have disaster preparedness training and education programs administered to them. Participants were generally in agreement, however, that not enough protocols, operational procedures and contingency plans for post-disaster response have been put in place.

Finally, the DRM Profile for Amman (Annex 2 in Volume 2) , when referring to the major issues and concerns, makes very explicit the need for a improved coordination mechanism between the different stakeholders in order to have improved preparedness for emergency response. The need to count on a networking system to facilitate such coordination was also highlighted.

5.5 Construction Standards and Practice

5.5.1 General Considerations

Physical infrastructure such as buildings, transportation systems, and vital lifelines such as water distribution systems, sanitation and drainage systems, power and communication systems as well as critical facilities such as schools, hospitals and emergency centers can be effectively protected against damage from earthquakes and other extreme natural hazards through the adoption, implementation and enforcement of competent building codes and construction standards. In fact, experience has shown that in areas where building codes reflect the latest knowledge in hazard analysis and

earthquake engineering and are adequately implemented and enforced, the loss of life and extent of material damage has been much less widespread than in other instances where construction standards are poor or when building code provisions are ignored or poorly enforced. Thus, reviewing the current understanding of hazard, vulnerability and risk and their incorporation in building and construction standards as well as the process for adoption, implementation and enforcement of the building code is an integral part of a strategy to reduce social and physical vulnerability in Amman. This part of the DRMMP reviews the current practice and makes recommendations for improving processes related to risk integration in building codes and construction standards.

5.5.2 Process of Code Development

The Jordanian National Construction Law No.7 of 1993 and its subsequent revisions and amendments provides for the creation of the Jordanian National Construction Council (JNCC) headed by the Minister of Public Works and Housing and provides it, in Article 5, with the broad authority to organize and supervise the development of the various building codes, to publish and circulate the codes and to issue instructions related to applying the codes in design, execution, monitoring, maintenance and operation stages. The Earthquake Prevention Code is one of the codes under the jurisdiction of the JNCC. The code is adopted by the Cabinet.

JNCC relies on the technical knowledge of the Building Research Council (BRC) at the Royal Scientific Society (RSS) to prepare drafts of the various Building Codes. It then consults various interested parties, and collects relevant feedback and inputs before finalizing the code provisions. These parties include in particular the Ministry of Public Work, and the Jordanian Engineering Association (JEA), The Jordan Construction Contractors Association, and the Commission of Engineering Offices and Companies. The provisions of the codes are updated from time to time as warranted by advances in knowledge or in practice; although, there is no set time limit that forces a mandatory update of the provisions of the Codes.

5.5.3 Chronology of Code Development

There were no National Codes available between mid-seventies until the end of 80s. Instead, there were some limited technical specifications directed towards contractors or other specifications addressing highway design and construction published in the English language. The first such specifications were issues to the building industry in 1971. The armed forces also had their own specifications around the same time. Note however that foreign building codes were available, especially in Egypt where the code was supposed to apply to Arab States in the region. In particular, the Arab code for reinforced concrete was issued by the Arab Engineering Union in Damascus in 1977. Certain professionals and construction institutions relied on these codes, which were considered to be more representative than codes from elsewhere such as Europe or USA.

During these earlier times, under its mandate for technical research in building design and construction standards, the BRC led both the research and national consultations on establishing building codes. Formal building code committees representing concerned public and private agencies were also constituted to discuss and elaborate the code provisions. This process led to the preparation of several drafts and provisions of various building codes.

In particular, this process led to the BRC issuing technical specifications related to the definition of the loads and forces pertaining to reinforced concrete and steel structure construction as well as similar separate provisions for load-bearing walls. These provisions were inspired by building codes from countries such as the United States, Great Britain, Australia, Canada and South Africa. In 1980, the topic was discussed with his Majesty late King Hussein, when he asked if there are laws to ensure the safety of buildings. As a result, King Hussein gave orders for the preparation of building codes and related regulation.. The Earthquake provisions of the building code were first completed and issued by JNCC in 1987. Since then, these provisions have gone through several revisions with the last version issued in December 2005.

5.5.4 Process for Official Code Adoption

The Technical Committee of the JNCC is charged with the preparation of a draft form of the Code. This draft is first submitted for review by relevant public and private agencies and organizations. JNCC then issues an updated version of the Draft Code that incorporates the inputs and comments received from this review. The updated Draft Code is distributed to different libraries in the country and an announcement is sent to experts in various fields (e.g., seismology, engineering, material, etc.) to review and provide comments during a 60 day "hearing" period. The JNBC once more incorporates and integrates the inputs received from these experts, and a final draft is sent to the Prime Minister for a final review. The final version of the Code is then adopted by the Cabinet through legislative action introduced by the Ministry of Public Works and Housing. This results in the adoption of a National Building Code. The National Building Code applies uniformly to the whole country and to all levels of government (i.e., national, provincial and local).

5.5.5 Process of Implementation of the Code

Legal Requirements

The Jordanian National Construction Law of 1993 specifies the process of implementation of the various construction codes.

- First, in its Article 11.b, the law makes it mandatory to have completed code-complying drawings prepared and issued by a duly authorized body for design or an engineering office that is registered and approved by the JEA before the start of any construction.
- In its subsequent Article 11.c, it indicates that the approving institutions (i.e., JEA) shall provide its seal on the drawing to indicate their conformance with the code provisions, specifying that such action does not release the design office from its liability.
- In its Article 11.d, the law specifies a number of requirements for institutions that provide construction licenses (i.e., regulatory agencies). They include:
    a) Art. 11.d.1: Construction licenses shall not be issued and construction shall not be approved unless their blueprints are authenticated by competent bodies (i.e., JEA)
    b) Art. 11.d.2: Follow-up projects from inception to completion to ensure that the codes requirements, provisions and conditions in the construction license are met, and

c) Art. 11.d.3: Work permission shall not be granted without the "*Conformity Certificate*" issued by an authorized *work implementation supervising body* and stamped by the JEA.

Considering that GAM is the license issuing institution within its territorial jurisdiction, these articles put three regulatory responsibilities on GAM. In two of these responsibilities (i.e., a and c above) GAM defers to the approval of JEA for compliance. However, in Art. 11.d.2 (b) above, the law seems to provide GAM with the responsibility of ***ensuring from inception to completion that the code requirements and conditions in the construction license are met***.

At the same time Municipality Law No. 29 of 1955 and its subsequent revisions and amendments authorizes the Greater Amman Municipality Council several powers including among others monitoring the construction of buildings, granting building licenses, and taking all necessary precautions to protect citizens against hazards. In terms of building licensing, the Municipality Law indicates the following authorities: "*Monitoring of construction and destruction of buildings, changes in their design and the installation of elevators; granting licenses of such works; determining the location and shape of the building and its area relative to the building lot, and ensuring the existence of sanitary conditions in them*."

Actual Practice

The EMI Project Implementation Team (PIT) attempted to understand how the law is actually implemented in practice and was able to learn the following[16]:

a) In general, Articles 11.b and 11.c are routinely assumed by JEA. There is no specific reason to question the competence of the JEA and it is reasonable to conclude that the drawings are adequately checked for compliance with the code by JEA.

b) In relation to Article 11.d, GAM is in charge of issuing construction licenses within its territorial jurisdiction. The construction licensing responsibility falls under the Public Works and Construction Division of GAM. The process of issuing a building license entails checking for compliance with site and architectural condition as indicated in the Municipality Law (see previous section). GAM does not undertake its own checking of drawings for adequacy with the engineering provisions of the building code. It relies on the review and determination from JEA.

c) In relation to Article 11.d.2, except for its own construction projects, GAM does not undertake any field investigation or field testing to observe if the construction is undertaken according to the codes and standards[17]. It also does not receive copies of the testing investigations that may be commissioned by the project design firm or the contractor.

[16] The source of information for our assessment came from interviews of several officials, academics, practitioners and to responses provided by Dr. Adnan Khasawneh from the Royal Scientific Society to a questionnaire that was submitted by EMI.
[17] GAM has its own building construction laboratory which performs field testing and material tests for GAM construction sites but could also do testing for other construction on a consultancy basis.

d) Typically, JEA does not undertake any field visits to check if the construction is actually done according to the plans. At the same time, the JEA does not undertake its own independent material testing and field inspections to ensure that the construction conforms to the drawings and specifications. These last duties are typically left to the project design firm, which typically contract directly with one of the testing firms/laboratory.

e) Recognizing the importance of undertaking independent field testing and control, an Inter-Agency Task Force (*for building standards*) composed of technical representatives of JEA, Contractors Association, the General Directorate of Civil Defense, and GAM was established in 2007 under the governance of a Memorandum of Understanding (MoU). It is tasked with the monitoring of the building construction process and other tasks such as training, and improving construction standards and safety in general. The Task Force has the authority to stop construction in case of violation. However, as of January 2009, many of the activities of the Task Force, including the field inspections, were not taking place due to lack of funding. Whether funding is going to be provided in the future or not is unclear at this point. Thus, the effectiveness of the Task Force is in question.

In summary, Art. 11.d.2 of the National Construction Law does indicate a level of responsibility of GAM as a regulatory body for construction control from *inception* to *completion* of a construction project. However, in practice the process of implementing the seismic provisions of the code relies first and foremost with the design firm, and the regulatory oversight in the field may have gaps since neither JEA, nor GAM, nor the Inter-Agency Task Force systematically undertake field inspections and reviews of the testing protocols and testing results to ascertain that the construction conforms to the drawings and specifications. GAM confines itself to its regulatory responsibilities indicated in Municipal Law 25.

5.5.6 Process of Enforcement of the Code

Article 12.b of the Building Construction Law provides GAM, as a regulatory agency in charge of providing construction licenses, the authority to issue executive notification to suspend construction pending correction of a violation with respect to the construction licensing conditions. It has also the authority to initiate a legal process against the building owner and the contractor in case no corrective action is undertaken within the allocated time. Further, Article 12.c provides GAM as a regulatory agency the authority to impose fines and monetary penalties related to construction violation.

In practice, GAM does impose fines and/or issues notifications to suspend construction. However, these are limited to the construction licensing items that are exercised by GAM (i.e., building and other site and architectural requirements) and not the seismic engineering provisions.

5.5.7 Technical Provisions of the Building Code

The earthquake design provisions of the building code specify the earthquake input by earthquake zone and the related minimum requirements force (base shear) to be considered in the design of the building. The material specifications include reinforced concrete (which is the most widely used material in the country) and steel. Note that zoning requirements obligates the covering of most (if not all) buildings with a thin masonry veneer along its exterior facades. Such façade covering is

sometimes used as the form for putting the concrete in place. By conducting a foot survey around places in Amman and observing a few construction sites, it was observed that mechanical attachments of the veneer to the concrete structure were in some cases present whereas in others they were not. Reference is made in the code to other international codes such as the International Building Code (IBC), which is applicable in the USA since 2006.

5.5.8 Qualifications of the Construction Industry

The construction industry seems to be reasonably well-developed in Jordan as witnessed by the construction of several multi-story high rise multi-use towers. Private discussions with researchers from various national institutions and universities seem to indicate a good understanding of earthquake engineering principles. However, while such knowledge among experts is reassuring, it does not necessarily translate into a generalized competency among practitioners and field workers. The practice of earthquake engineering and design is fairly complex and requires specialized training. Unless an engineer/designer receives specialized training on how to apply the code provisions in various building configurations and materials, weaknesses are likely to remain. The fundamental difference between earthquake loads and gravity loads is that earthquake loads apply laterally on a building, and thus earthquake design requires competence from concept to detailing in order to adequately transfer the lateral loads to the foundations without causing failures of elements. Competent gravity load design does not necessarily translate into competent lateral load design.

There is no professional certification of professional engineers, surveyors, civil engineers, building officials, structural engineers, or geotechnical engineers in Jordan. There is also no professional certification for architects, planners, or contractors. Thus, there are no independently established professional competency requirements for planning, designing and building construction. While professional certification is only adopted by a few countries (e.g., USA, Canada, New Zealand, and a few others), it has proven to be a significant enhancement of the qualifications of professionals as well as a safeguard for quality control. It is also observed that more and more countries are establishing professional certification programs.

Regulation does require that design office be certified by JEA as explained earlier. More importantly, the regulation maintains the liability for design within the design firm. The weakness, as we see it, is not in the design process as it is within the code implementation process, mostly in terms of field checking and field inspections as explained in the previous sections. Several recommendations will be provided later to improve the construction practices in the country in order to create a more resilient built environment.

5.6 Achieving Earthquake Resiliency

For GAM, achieving seismic resilience resides in its ability to:

- Protect the human and physical assets of the city from inevitable earthquakes;
- Protect its rich cultural heritage;
- Minimize social and economic disruption by delivering services as soon as possible after an earthquake; and

- Rebuild in ways that mitigate the effects of future earthquakes.

Part of this responsibility pertains to GAM as provider of certain essential services to the city as indicated in the Municipality Law No. 29, including controlling city and street planning, building licensing, water, electricity and gas, drainage and sewage, sanitation, health inspections, and others. Other responsibilities reside with several other public and private institutions. Thus, achieving earthquake resilience of Amman involves a large number of stakeholders. Nonetheless, by the nature of its mandate GAM can and should provide leadership in ensuring that awareness is raised and resources are dedicated to protect the city from the occurrence of an inevitable earthquake. This is not only a matter of leadership, but also an alignment towards the state-of-the-practice of disaster risk management.

The risk assessment study undertaken by the seismic risk assessment team includes preliminary estimates of potential losses related to essential services, transportation system, and "lifelines." These estimates should provide initial guidance for planning and for awareness raising among the various institutions concerned with delivering services. While more studies and discussions need to take place at the national level on this topic to develop a national policy and a consensus agenda for action on achieving earthquake resiliency for the city, we are providing some initial recommendations as guiding elements as part of the DRMMP Framework.

5.7 Land Use Planning in GAM

Based on several key national legal issuances and policy mandates in Jordan, responsibilities and functions in the performance of land use planning and environmental management are vested in local governments such as the Greater Amman Municipality. The GAM possesses the power and authority of land use planning and environmental management to achieve sustainable utilization, allocation, regulation, development and management of land and natural resources.

Recently, this authority and responsibility to undertake land use planning has come to fore in view of Amman's expanding "metropolitanization" and human settlement development alongside its quest to plan for and manage its urban growth and development. From 1946 to 2006, a short span of 60 years, Amman grew from a small city of 60,000 to an urban agglomeration of 2.2 million people. This population explosion was accompanied by a parallel expansion of its geographic boundaries, from a land area of 31 km^2 to 1,662 km^2. The latest expansion, the annexation of five surrounding municipalities to the capital city of Amman, was undertaken in 2006 in line with the government's National Agenda.

As GAM's rapid population growth and urbanization continue to exert pressure on its land and natural resources, land use planning and natural resource management become ever more critical in sustaining its fast-expanding economic base, especially in view of its high exposure to natural hazards and vulnerability to natural disasters.

In line with national goal of reducing its exposure to disasters, the development and implementation of disaster risk reduction programs at the local level of governance is a necessity. Land use planning as

a regular function of GAM logically lends itself as a system and process in which disaster risk management can be integrated and eventually institutionalized. The Amman DRMMP Framework thus considers land use planning as one of the essential components of disaster risk management.

5.7.1 Land Use Planning Framework of GAM

Traditionally, there were three levels of planning in GAM, which produced a hierarchy of plans: Regional Plans, Structure Plans, and Detailed Plans. The Regional Plan contained maps that were the bases for the Structure and Detailed Plans. It may contain development standards such as setbacks and density requirements. It may state what works and required building licenses. Regional Plans required the approval of the Supreme Planning Council. The contents of Structure Plans were very similar to the Regional Plan at a more detailed level. Structure Plans, on the other hand, required the approval of the Supreme Planning Council. Detailed Plans also had similar content. They were approved by the Regional Committee.

The Structure Plan needed to be developed before a Detailed Plan could be approved, and the Regional Plan was to precede the Structure Plan.

For the Regional Plan, the Regional Committee would consider objections and makes recommendations to Supreme Planning Council, which is the approving body for regional plans. For Structure Plans, District Committees would receive objections and made recommendations to the Regional Committee, which would then report to the Supreme Planning Council. The Supreme Planning Council could provisionally approve a Structure Plan (or part of it). It would go into effect immediately upon publication in the Gazette. Adoption procedures must then be started within a year. The Supreme Planning Council is the planning and development approval for lower tier municipalities and arbitrator in disputes between local and regional municipal committees.

For Detailed Plans, adoption procedures would start at District Committee level. The District Committee received objections and made recommendations to Regional Committee.

In GAM, there was no approved Regional or Structure Plans. In the zoned territories of GAM (62 percent of its territory as of 2005), the District Committee approves subdivisions. In the unzoned areas, it has been the Regional Committee that gives the approval. The Council of Ministers may issue regulations covering a wide range of matters, while the Supreme Planning Council may also develop their own regulations. Special regulations such as the Abdali Zoning Regulation and the Interim Growth Strategy Regulation have been approved as Detailed Plans by the Regional Committee and adopted as interim plans before the completion of the Amman Plan.

The current institutional and organizational framework for urban planning and management within GAM can be characterized as fragmented, a critical concern given its expanding metropolitan area. Various GAM departments and external agencies have their own respective mandates that sometimes overlap with one another or leave gaps for GAM's operations to be efficient.

One institutional weakness is that there is no specific GAM department that has a unified and clear mandate to undertake long-term urban planning. Further, there is limited competency and capacity within GAM to undertake comprehensive and integrated land use planning. In the recent years

though, GAM has been proactive in establishing a mandate for economic and community development. This function is an emerging responsibility for GAM. For it to work effectively, it should be linked to the long-term planning function of GAM.

5.7.2 Existing Legal Context for Land Use Planning

The current legal framework for planning springs from the Cities, Villages and Buildings Planning Law No. 79 of 1966, known as the "Planning Law".

Since 1979, Regulation No. 67, Building and Zoning Regulation in Amman City approved by the Municipality of Amman has been used as basis for guiding development controls, land use and building construction. This regulation provides for land use, zoned land use restrictions, development standards such as setbacks, parking requirements, building envelopes, lot standards, and application procedures. Zoning maps and rezoning would be approved as *Detailed Plans* by the Regional Committee. The most recent amendment to the Building and Zoning Regulation in Amman City was made in 2005.

In the new territory added to GAM in December 2006, zoning has been done in settlement areas. Outside of the zoned areas, applications for building construction are governed by Regulation 535 of Supreme Planning Council (administered by GAM). This unplanned territory under GAM jurisdiction may be the subject of an order of the Prime Minister designating planning areas. When a planning area is created, construction is subject to temporary control pending approval of the plans. Decisions on development applications may then be made on the basis of whether they will detract from the objectives of the plans under preparation or not.

5.7.3 The Amman Plan (2008-2025)

The Amman Plan, commissioned in 2006 by GAM, will be the first comprehensive land use and development plan that can be legally effective in GAM. In the past, there had been four separate Master Plans prepared for Amman from 1955 to 1988. The last one was the Greater Amman Comprehensive Development Plan (1985-2005) published in seven volumes, which was partly implemented (i.e. the ring and radial road network). The lack of full implementation of the plan was due to a lack of political acceptance and legal enactment.

The Amman Plan will be completed in seven planning phases. The first four phases have been completed while the last three are in the process of development:

- **Phase 1: Amman Plan for Tall Buildings (formerly Interim Growth Strategy)** – This focused on the location, planning, design and regulation of a High-Density Mixed-Use (HDMU) development that includes the siting and regulation of tall buildings.
- **Phase 2: Corridor Intensification Strategy** – This covers ten separate but interconnected urban transportation corridors found in the west-central part of Amman.

- **Phase 3: Industrial Lands Policy** – The policy delineates industrial areas in selected locations across GAM where scattered industrial development applications can be consolidated complete with housing, transportation and other urban amenities.

- **Phase 4-A: Outlying Settlements Policy (formerly Rural Residential Policy)** – This policy designates four growth areas around existing villages for consolidation. This is due to expanding residential developments such as large-scale compound and gated communities in GAM's outlying areas.

Thus far, the Metropolitan Growth Report (MGP) has been published by GAM in May 2008. The MGP represents the fifth phase of this planning enterprise.

- **Phase 4-B: Airport Corridor Plan** – This consists of conceptual land use plans for five communities: Arafat Intersection, South Park, Al-Yadouda, Metro Gateway, and Alia International Airport. It also covers the expansion of the new Metro-Parl.

- **Phase 5: Metropolitan Growth Plan (MGP) (completed in 2008)** – This plan is at the top of the planning scale of the Amman Plan. It provides a planning overview of the settlement structure and growth framework for the metropolitan planning area complete with supporting policies. It outlines the growth management approach and contains ten component plans. The regulatory, legal and institutional frameworks that would govern and effectively implement the MGP are also presented.

- **Phase 6: Area Plans (from 2008 forward)** – Five Area Plans inside the urban envelope have been completed so far, and there more are on the drawing board. Area-Based Zoning for the Planning Areas is also currently being drafted for internal review and consultation with stakeholders.

- **Phase 7: Planning Initiatives (from 2008 forward)**-The Amman Plan has lower-level detailed plans as its components, i.e. Metropolitan Corridor Plans, Urban Corridor Plans, Heritage Studies, Community Plans, Sector Plans. Some of these are already in the process of being developed.

The Amman Plan is envisioned to be executed in interim stages to avoid delays of ongoing and planning urban development projects.

Hierarchy of Plans

A new hierarchy of plans has been created by the Amman Plan for GAM[18], which is a new planning approach in Jordan. These planning instruments correspond to the different planning scales—the metropolitan planning area, eight planning areas, and 228 existing communities. These planning instruments, from the high- to the lower-scale, are the following:

1. **Metropolitan Growth Plan (MGP)**: A policy document that outlines the growth direction for the metropolitan area. It provides policies related to the growth strategy for the

[18] The Amman Plan Metropolitan Growth, 2008. Published by GAM.

metropolitan area and will address: growth boundaries; generalized land use; major transportation network, including public transit and hierarchy of roadways; natural and cultural heritage, including major metropolitan parks.

2. **Area Plans:** Plans that detail land use, natural and cultural heritage, transportation and urban infrastructure policies for eight specific Planning Areas as shown in Figure 5.7.
3. **Area Zoning Regulations:** For each of the planning areas, zoning regulations will be prepared to indicate development controls and regulations. The design of the zoning regulations will be consistent throughout the metropolitan area.
4. **Community Plans**: Within each planning area, there may be strategic neighborhoods that require special attention such as Heritage Districts, Redevelopment or Urban Re-generation areas, Natural Heritage Areas and Parks, etc. Detailed Community Plans may be prepared for these areas to provide specific directions for development. In most cases, it is expected that the implementation of the Community Plans will require special intervention by GAM and other public agencies to implement. Community Planning Areas will be identified in either the MGP or Community Plans.

Figure 5.7 Eight Planning Areas in GAM
Source: Amman Plan, 2008.

5. **Site Plans and Associated Development Agreements:** For large scale projects, a site planning approval process will be implemented as is currently the case with the High-Density, Mixed-Used (HDMU) areas. These Site Plans will be accompanied with development agreements that outline the obligations of GAM and the investor/developer.

For GAM to reach its goals in urban planning, development and management, it has to mainstream disaster risk reduction goals and objectives in its land use plans and policies as well as establish disaster risk reduction programs that are aligned with the Amman Plan.

5.7.4 Integration of Disaster Risk Reduction in the Amman Plan

The MGP component of the Amman Plan as the highest-level plan provide an overall policy framework that will govern urban growth and development in GAM. It identifies three areas in terms of growth management approaches: (1)"Limited and No Growth" areas, (2) Primary Growth areas, and (3) Primary Growth-Urban Envelope areas.

The Limited and No Growth areas are natural areas which are experiencing urbanization pressures. Hence, the MGP has spelled out policies for the protection, preservation and conservation of natural heritage areas, cultural heritage areas, agricultural areas, and mining and quarry areas where any kind of development is completely prohibited or restricted.

For instance, the Limited and No Growth approach identifies potential natural hazards in GAM such as flooding, erosion, slope failure and earthquakes. It particularly links such natural hazards to the protection of Amman's natural heritage system (Figure 5.8) under the MGP Natural Heritage Plan by recognizing that development should be limited in areas with hazard potential such as steep slopes, ridges and wadis. This effectively puts people and their assets away from harm that may occur in the future, a proactive disaster mitigation measure. The Natural Heritage Plan contains objectives and policies that directly recognize the need for such integration. An example of an explicit natural heritage policy relates to the retention of a 15-meter buffer on either side of the identified wadis where development will be totally prohibited.

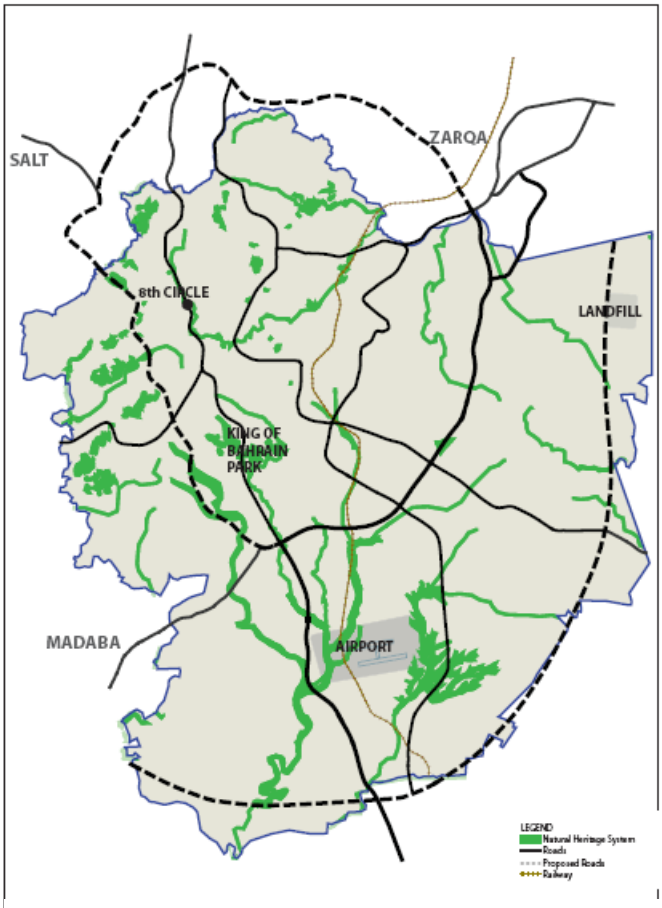


Figure 5.8 Natural Heritage System in the MGP. Source: Amman Plan, 2008.

This is a highly positive feature of the Amman Plan and one that ensures the attainment of its objective to build a city that is based on the principles of sustainable development and to create a healthier community for Ammani residents. Such disaster risk reduction policies at the metropolitan planning scale should then be cascaded down to the Area Plans and eventually to the more detailed lower-level plans.

Seismic Hazard and Risk as a Factor in Land Use Planning

The seismic risk assessment study provides useful scientific information regarding the potential geographical distribution of ground shaking measure in terms of peak ground acceleration (PGA) in the whole metropolitan area. The result of this study is further discussed previously in Section 4. Risk assessment, as part of the wider disaster risk management process, should be utilized in the ongoing planning initiatives in GAM. Land use planning is now acknowledged as an effective tool to manage and reduce disaster risk. The results of a seismic risk assessment make it possible for the identification of areas that are potentially prone to earthquake damages and losses. The information on potentially hazardous areas should be considered in the context of risk-sensitive land use planning to provide guidelines where future development should be avoided or strictly regulated in terms of land use and building regulations.

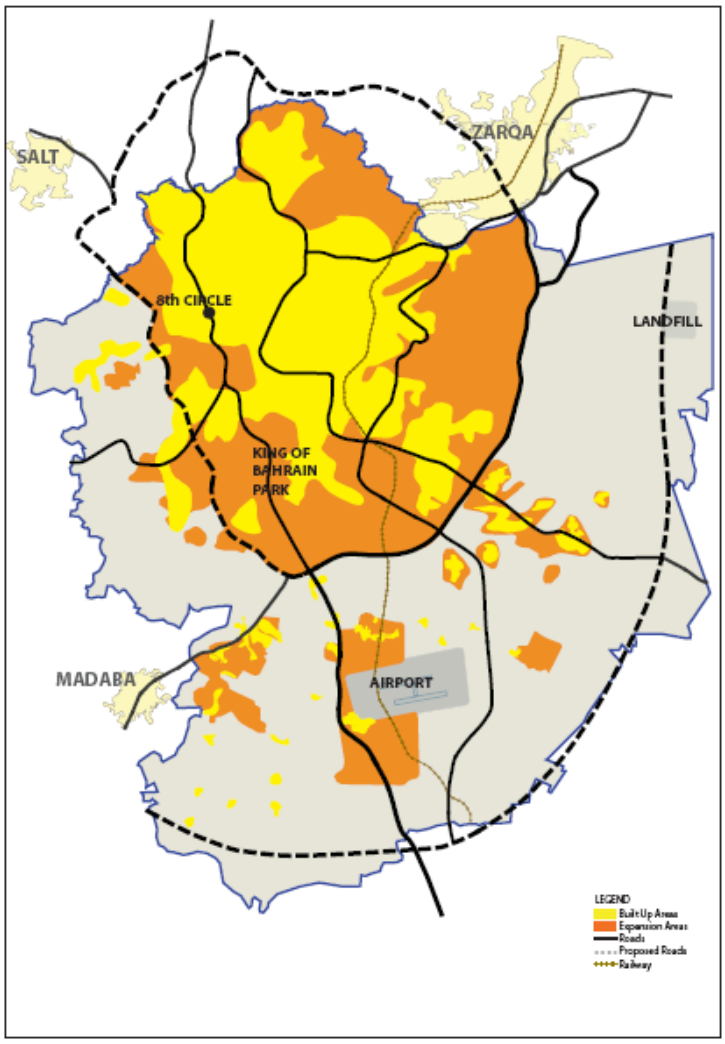


Figure 5.9 Primary Growth areas in GAM.
Source: Amman Plan, 2008.

For instance, existing built up areas located in the West and South West Planning Area may be considered as highly susceptible to high-intensity ground shaking. This can be inferred from the results of the Earthquake Risk Assessment and Analysis of Amman (Figure 4.4), where for these areas there is a 10% probability to exceed in the next 50 years ground shaking levels of 0.19-0.22g (expressed as ratio of gravitational acceleration).

High-risk areas can also be identified at the metropolitan scale and then further delineated in detail at the Planning Area level where appropriate earthquake risk reduction strategies and policies can be formulated. Area-based zoning will then provide specific provisions and guidelines to effectively implement such risk reduction policies and strategies.

Using the seismic risk assessment to identity the highly vulnerable portions of the built-up areas within the city will complement the natural hazard policies integrated in the MGP Natural Heritage Plan. Equally important is the establishment of a basis for a more detailed analysis of vulnerability and potential mitigation measures that can be formulated at the Area Plan level to reduce future earthquake damage and losses in such built-up and densely populated areas of the city.

5.8 Research and Development, Knowledge Management, ICT and Human Resources

Disaster risk reduction is complex, and it takes time, effort, resources, research, and training to assimilate disaster risk reduction in governance and city development strategy processes. Experience has shown that impediments to disaster risk reduction often reside in inter-institutional coordination, and having in place effective warning systems, and adequate human and ICT resources for response, relief, recovery, and rehabilitation following urban disasters. To overcome such impediments, it is

important to full capabilities and resources in the city by fostering a community of practice that constantly improves the knowledge and standards of practice. Further, promoting research and development, knowledge management and developing human and ICT capacity in the context of a DRM practice will build the infrastructure to support the implementation of a disaster risk management practice. This element of the DRMMP reviews the current practice for improving processes related to creation, dissemination, and utilization of knowledge and resources in DRR.

5.8.1 Research and Development

The development of knowledge and competency in the understanding of hazards, vulnerability and risk to GAM has direct implications on achieving Amman's vision of *"A safe, sustainable, and prosperous city…with a soul"*. Reducing potential hazards to Amman's inhabitants is inherently linked to the multiple aspects of improving Amman's livability and sustainability. Research and development in DRR is a long-term, low-visibility process, with no guarantee of tangible rewards in the short term. The problem also lies in the fact that risk reduction programs in Amman may be viewed as a tangential concern. Funding and resource creation for research and development in DRR can only be scaled-up once the paradigm shift of seeing DRR as intrinsically linked to other development priorities is achieved. Synergies between DRR and other goals and priorities exist but they have to be developed and highlighted.

The strategy of funding research and development should be based on consolidating the missions of the existing research and specialized organizations of the country and expanding the involvement to other "active agents" of society such as the private sector, professional organizations and others who could have significant resources to contribute to the effort. Currently, there are several research and specialized organizations including universities, the Royal Scientific Society and others who have significant competency in their own field. However, their work is not coordinated and harmonized to efficiently serve the purpose of risk reduction. What is needed is a national program that can focus and ensure that the various research and knowledge development efforts are integrated in a single goal. An example of such a program would be the National Earthquake Hazard Reduction Program (NEHRP) in the United States, which is credited to have reduced the exposure of the country to earthquakes and improved the protection of people and infrastructure significantly within the last three decades that it has been in place. The program coordinates the government programs and funding for research to ensure knowledge sharing and tangible results.

5.8.2 Knowledge Management

Reducing the risk of disasters in Amman would require that the understanding of the vulnerability and risk parameters of the city not be limited to a small group of experts, but to become common knowledge among policy makers and citizens alike. Therefore, the process by which knowledge is created, shared and utilised has to be facilitated. The knowledge and experiences of disaster management practitioners typically remain in individual or institutional domain. Significant benefit could be gained by establishing a common platform that captures, organizes and facilitate sharing of knowledge and to create a versatile interface among policy-makers in the Government and disaster managers at all administrative levels. Such platform can also be used to educate the public and raise awareness of the population in general. In a broader context, information about disaster

preparedness, dos' and don'ts in emergency, disaster management plans, policies and guidelines are available at various domains from decades. However, millions of people are getting severely affected by disasters every year due to lack of adequate coping mechanisms. This may be attributed to the fact that the information lying at one place is not transformed and delivered as a body of life-saving knowledge for the communities at risk.

Knowledge Management is facilitated through the creation of "knowledge networks". This exchange can be facilitated through the creation and promotion of active communities of practice and professional societies and supported through physical interaction, workshops, documentation of experiences, and knowledge sharing (through web-based portals for example). Active knowledge networks and partnership among prime government agencies, policy makers, disaster managers and experts should be encouraged to help advance the knowledge and practice of disaster risk reduction. The creation of an active and well-informed community of practice is a corner stone of effective knowledge management and knowledge sharing. An active and thriving community of practice is characterized by:

- Fostering a sense of shared commitment among the diverse communities dedicated to disaster risk reduction;
- Facilitating the exchange of information among members and others, and
- Forging a consensus and speaking with a common voice to public forums and legislative bodies on behalf of the diverse risk management community.

5.8.3 Information and Communications Technology (ICT)

Information and Communication Technologies (ICT) are widely used in disaster risk management and can enhance Amman's preparedness and response capacities to disasters. Exchange of information and communication practices play key roles in the realization of effective disaster risk reduction activities. Data availability is crucial for ongoing research to monitor hazards that will aid in the process of assessing risks. Integrating new developments in information management with established and more traditional methods can help create a better understanding about hazards and risk through, for example, public awareness programs. Effective information management and communication are also instrumental for early warning systems and mitigation effort.

With the emergence of powerful and popular community-based systems on the web, new models of knowledge sharing are now emerging, and the web is being used as an increasingly indispensable environment for networking and knowledge management. It is important that the DRR community of practice in Amman is linked to the emerging global network of practitioners where experiences, practical lessons, and wisdom on DRR from various countries meet. While there are many portals and source of information on disaster risk reduction on the web, EMI has developed an online collaborative portal using the latest knowledge collaboration technologies (www.cityriskpedia.com). Practitioners and managers of EMI's network of cities are the users of this portal. As such, the portal has a dedicated site for Amman and can be used by members to document sound practices,

collaborate together in online forums, and use the knowledgebase's powerful search engine for identifying, selecting, and potentially adapting field-tested sound practices.

Geographic Information Systems (GIS) and Remote Sensing Technologies

Innovations in GIS technology are increasingly accepted tools for the presentation of hazard vulnerabilities and risks. GIS, remote sensing imagery and satellite observations can help considerably to show vulnerable areas, enhance mapping, and ameliorate the understanding of hazards. Remote sensing technologies can also play a significant role in the field of disaster management and there are a multitude of opportunities for remote sensing to make an impact on DRR. Generally, these opportunities fall into one of the three categories: pre-event activities, rapid post-event activities, and long-term post-event activities. Pre-event activities generally encompass pre-earthquake loss estimation modelling for different urban areas, which in turn are often used in emergency response planning. Rapid post-event activities include emergency response, disaster reconnaissance, and rapid loss estimation, while long-term post-disaster activities represent detailed studies of disaster effects.

Early Warning Systems

Many early warning systems are in operation today to warn the public and governments about impending climate- or weather-related hazards and other threats. ICT technologies have been playing a major role in designing early warning systems, catalyzing the process of preparedness, response and mitigation. Technical improvements in the provision and accuracy aspects of early warning systems, including expanded hazard monitoring instrumentation cover, has led to a better understanding of physical causes of disasters and modelling, therefore enhancing the prediction of disasters particularly in developed countries.

Communications Technology

Emerging forms of information dissemination provide new insights about knowledge management techniques. Some of the most significant and useful developments in the evolution of information systems relate to innovative web-based knowledge sharing tools which combine the functions of searching for, distributing and collaboratively creating information. These applications could be developed and customized to share and communicate information on disasters and risk reduction to a community of practice as well as the general public.

Multimedia Technology in Disaster Education

Multimedia technology can be used to scale up the training process without deterioration of quality, by capturing knowledge of the best international and local experts, allowing simulations and other interactions with data and learning materials, including knowledge self-checks. However, multimedia alone often in the form of self-paced training modules has limited power in creating a social environment conducive to successful learning experience. This flaw can be addressed by complementing use of multimedia with electronic channels creating opportunities for communication and collaboration among trainers and participants, allowing to move from traditional or self-paced learning to e-learning, and including knowledge assessment tests and course projects and exams that can motivate students to learn. The experience of experts working in using multimedia technology for disaster management education has shown that in making e-learning activities a success, the following

factors play an important role: a) needs-based high quality content; b) adaptation, localization and ownership of the program via collaboration of content developers, adapters, prospective trainers and program managers, c) user-friendly and easy to navigate course materials, learning activities, and on-line environment ensured by the learning management system; d) clear expectations and assessment criteria; e) high interactivity and well structured learning activities via scheduled discussions and strict assignments due dates; f) commitment, capacity, and competencies of partners delivering e-learning activities; g) administrative, pedagogical and technical support of both learners and instructors/facilitators; h) building instructors competencies by taking the on-line courses as students; i) demonstrating the benefits of e-learning to instructors and training them in the use of technology; j) coaching and mentoring the instructors during their first few e-learning course deliveries; and k) blending traditional and technology based approaches especially in the interactions with partner institutions and their staff.

6.0 DISASTER RISK MANAGEMENT MASTER PLAN (DRMMP) FRAMEWORK OF AMMAN

Disaster risk management is defined as the systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.[19]

The Amman DRMMP Framework is founded on the above definition. Its goal is to provide a road map for implementing a state-of-the-practice urban disaster risk management practice at GAM. It follows the EMI DRM Mainstreaming model, an analytical approach for mainstreaming DRR with the principles of local implementation, central coordination and participation integral to it. The DRMMP Framework provides coherent strategies and related recommendations to fundamentally improve the emergency management capabilities, and progressively build physical and societal disaster resiliency in Amman. It encompasses several areas of governance and operations of GAM, including:

- Legal, institutional and organizational arrangements of DRM
- Emergency management and social mobilization
- Construction standards and building codes
- Earthquake resiliency
- Land use planning and environmental protection
- Training and capacity building
- Education, knowledge management and information and communication technology
- Human resources

These components and action plans can provide a systematic basis for structuring GAM's emergency management and DRM functions.

The Amman DRMMP Framework is further grounded on technical analysis and diagnosis of the state of DRM in GAM, i.e. city risk profile, risk assessment and risk analysis. Stakeholder inputs collected during several workshops, meetings and consultations likewise formed the bases for the Amman DRMMP recommendations. Lastly, the consensus revised vision statement of the stakeholders, for Amman to

[19] *UN/ISDR Terminology: Basic terms of disaster risk reduction.*

become "***a safe, sustainable and prosperous city with a soul***" provided additional foundation for the development of the DRMMP Framework.

The following pages detail the key components of the Amman DRMMP Framework along the elements listed above.

6.1 Legal, Institutional and Organizational Aspects

The field investigations in Amman initiated several ideas and proposals to the agencies concerned taking into account experiences of other cities which could lead to the development of approaches that may possibly be adopted for Amman, such as:

1. Shifting from disaster response orientation to proactive disaster risk reduction that includes effective response management.
2. Moving from a highly centralized setup to a more decentralized system where resources can be more effectively used and mainstreaming can be achieved.
3. Strengthening the DRM focal or nodal agency at GAM to build competency at the local level that can complement and support the implementation of DRM program and policies of the national authorities.
4. Protecting the human, physical and cultural assets of the city through competent construction and land use planning practices
5. Putting premium on adopting international standards of practice and scientific know-how on DRM.
6. Building a coalition of informed stakeholders that can further the understanding of risk and the management of disaster risk and improvement of inter-institutional and inter-sectoral coordination.
7. Establishing a strong legal basis on disaster risk management to form the foundation for a clear policy and more viable institutional framework.

6.1.1 Considerations in Building a Capable Municipal Organization for Disaster Risk Management

Modern disaster risk management standards of practice provide a critical role to local governments, and call for specific competencies to be developed by local disaster management structures as explained in Section 2 of this report. The need for a capable municipal organization to deal with disaster risk management has been identified in several discussions with stakeholders. Capable municipal organizational structures for disaster risk management typically have two major components:

- A competent, professionally staffed agency/department/division of the city government, and
- An effective inter-institutional body or board responsible for policy, direction, and ensuring inter-departmental and inter-agency collaboration.

Both these entities require:

1. A sound legal basis—a specific law or ordinance--which establishes the DRM authorities, functions, and responsibilities of various governmental and other entities. They also require assured, ongoing financial support for programs and staffing.
2. The lines of authority and basis for authority must be indicated.
3. The lines of reporting must be the shortest possible and clearly established.
4. Individual responsibilities and authorities should be understood by everyone concerned.
5. Authority to act should be delegated as close as possible to the level where action must be taken.
6. Every function to accomplish the mission should be assigned to a responsible party.
7. The organization should be flexible overall but firm in the achievement of its objectives.

Further, all the involved entities need to work out, explicitly accept and formalize assignments of functions and responsibilities among organizations through disaster legislation, implementing regulations, or a disaster/emergency management plan that carries the force and effect of law. These elements should be indicated in the standard operating procedures of each of the relevant organizations, and in the underlying plans (i.e., emergency response plan, inter-departmental plan, contingency plan, etc.)

BOX 1 FACTORS WHICH INFLUENCE SUCCESS OF DISASTER MANAGEMENT ORGANIZATIONAL ARRANGEMENTS

Disaster management systems that focus on response and relief are inadequate; while response systems must be improved, greater focus on mitigation is essential.

Existing institutions charged with response and relief are generally ill-equipped for broader risk management responsibilities, but they often resist efforts to assign mitigation responsibilities to other institutions or to new mechanisms.

Usually it takes a combination of "top-down" and "bottom-up" approaches to effectively manage risk and disaster response and recovery. This requires involvement of government at all levels in partnership with non-governmental and community organizations.

In some cities, in particular in the Philippines, there has been considerable success in creating the interest and will within local communities to deal with risk reduction and preparedness. This approach taps into a reservoir of initiative, cooperative spirit, and energy that is often dormant in communities, and it builds a sense of community empowerment.

Creating linkages and partnerships between levels of government and between governmental agencies and businesses and non-governmental organizations (NGOs) and community groups can strengthen DRM capabilities at all levels.

Source: Mattingly, 2002 and Mileti, 1999.

6.1.2 Strengthening the national legal and institutional system for DRM

At the national level, the institutional mandates of both the HCCD (Higher Council of Civil Defense) and the NSCMC (National Security and Crisis Management Center) are oriented towards post-event response management and public safety protection. This narrow interpretation of disaster risk management practice limits the potential for impacting disaster risk in the long term and inducing mainstreaming at various levels of government. In the current system, national agencies in charge of development and key services remain secondary agents to support the relief and public safety efforts, and not primary actors in reducing risk and building disaster resiliency. A more pro-active DRM model is needed for the country. This can be accomplished in two ways. One is through the creation of a new national body for DRM by a special legislation that will have an explicit mandate over DRM and will integrate and coordinate efforts and institute a coherent approach on disaster management. The need for this body has been identified in the *Analytical Study on Legislations Effective in the Hashemite Kingdom of Jordan Related to Disasters and Disaster Management (*2007) conducted by the Legal Affairs Department of the Civil Defense. This type of national disaster management council is suggested by the United Nations Hyogo Framework for Action (HFA), which envisions that such body be created from a "National Platform" as a forum for consultation and discussion on DRM for the country. The same can also be accomplished by reviewing the mission and mandate of the HCCD or the NSCMC to reflect a broader DRM mission that integrates competency for emergency response with strategy and action towards prevention and risk reduction. This needs to be supported by appropriate legislation that is modeled after the HFA standards.

6.1.3 Rationale for establishing a focal point organization for Disaster Risk Management in GAM

As suggested by the HFA and other international DRM standards, decentralization of the implementation and coordination of DRM programs and action is crucial to achieving mainstreaming because of the role of local government in providing critical services to the population, their regulatory function, and in being the implementing arm of the central government programs and policy. The DRM competency of local institutions will support the implementation of the national agenda for disaster risk reduction and will enable a more efficient mobilization of resources at the local and community levels. Experience has demonstrated that central action alone is inadequate to achieve the integration of DRM into the various processes and core functions of the government. The central authorities establish policies and programs as well as allocate resources. However, implementation is mostly delegated to local governments and local institutions under a participatory process where the local resources can be mobilized and stakeholders can be directly involved.

At the local level, GAM officials view disaster risk reduction as a priority. No less than the Mayor has expressed strong political commitment to this endeavor. The Mayor maintains that this commitment is to be accompanied by collaboration and cooperation of all stakeholders from both local and national levels and the communities. This position reflects the importance that the city gives to participation and stakeholders' acceptance of the DRM plan. However, to accomplish such a vision GAM needs to

build competency in DRM and put in place a process for mainstreaming DRR within its core functions and operations.

In the first Disaster Risk Management Master Plan Stakeholders' Workshop held on 7 May 2008, an understanding of the current practices in DRM and initial proposals of the various implementing agencies on the most acceptable institutional arrangement for DRM in Amman were obtained from the workshop discussions.

Among the significant findings in the workshop are those related to the following points:

1. The need for greater coordination among the different agencies involved in DRM;
2. Enhancing the capacities of the local government in DRM; and
3. Making higher level authorities realize that empowering local governments should not be seen as competition but rather complementation of efforts emanating from the national government.

The rationale for the creation of a focal point organization for DRM within GAM is well established both by the international standards of practice and by the general input received from the representatives of the key national agencies and other relevant stakeholders. The vision, mission and functions of this new organization are detailed in the following sections. They are centered towards two main activities: 1) Full competency in emergency management; and 2) promotion of mainstreaming through inter-institutional coordination and preparedness.

6.1.4 DRMMP Recommendations for Legal, Institutional and Organizational Aspects

Recommendation LI 1: Align the national legislative and institutional system for DRM to conform to the HFA.

A review of the national legislative and institutional system for DRM modeled after the HFA is suggested by the Project Team. Considering that the Hashemite Kingdom of Jordan is a signatory of the HFA, and that the HFA is a de-facto international standard for DRM that is recommended by the United Nations and supported by most international organizations and countries in the world, it is imperative for Jordan to align itself with these standards by reforming its DRM institutions and legislative system. The United Nations International Strategy for Disaster Reduction (UN/ISDR) and the United Nations Development Program fully support the implementation of the HFA and have published a body of knowledge and models on how to implement the HFA. The UN/ISDR has recently opened a regional office for North Africa and West Asia in Cairo to better coordinate its actions with the governments in the region in support of the implementation of the HFA.

Recommendation LI 2: Review and Update the NDRMP 2004.

One of the priorities of the nation is to review the National Disaster Risk Management Program (NDRMP 2004) which predates the HFA. The NDRMP should be brought in line with the recommendations and processes suggested by the HFA and by its companion guidelines "Putting Words Into Action", which provides the details of the process and initiatives that a country may adopt

in order to implement HFA. The suggested legislative and institutional reforms and the review of the NDRMP 2004 will bring the country in line with the international DRM standards and practice.

Recommendation LI 3: Delineate roles and responsibilities of DRM actors from national to local to improve inter-institutional coordination.

To ensure that there is no duplication of functions and responsibilities, it is necessary to clearly delineate the roles of various stakeholders from national agencies to the sub-national and local institutions (including GAM) and to define the role of civil society and international partners in DRM.

At the national level, the central bodies handle policy making, resource mobilization, training and capacity building including research and development on risk analysis and risk reduction and other major responsibilities, e.g. handling sensitive security related risks. The national government in association with the academe and scientists usually initiates and sustains an organized research and development in the disaster risk reduction of Jordan which includes Greater Amman, for adoption of the recommendations at the local level and relevant agencies. Such studies and research serve as basis for the institution of new policies and reforms in the disaster management practice.

Collaboration with civil society, the business sector, academe, scientific organizations, NGOs and the international community could likewise impart technical assistance and other forms of support.

At the local level, policy making, regulation, resource mobilization and capacity building related to local functions such as land use planning, urban development, social services, public works, building regulation, emergency relief, and education and training ought to be pursued in order to effectively mainstream DRM within the governance functions and development processes at the local level.

Recommendation LI 4: Establish a new DRM and Citizen Safety Office (DRMCSO) within GAM as a focal point organization for disaster risk management, citizens' safety and social mobilization with legal authority, responsibility, human and financial resources, training and support.

The new DRMCSO will serve as a focal point organization for disaster risk management and will also have broad mandate over citizen safety and social mobilization within the city's organizational structure and day-to-day governance functions.

As the term "citizen safety" implies, this organization's function will directly involve the prevention of and protection of the general public from events that can compromise their safety from significant danger, injury, harm, or damage (EMA, 2007). These include disasters and other emergencies that are responded to and considered by emergency managers as well as "every-day" risks that could put citizens in harm's way.

Another substantial element of the concept of Citizen Safety is the use of the term "citizen" which connotes not only an acquisition of rights and privileges but also an assumption of responsibilities and duties of the public. This particular element is relevant to the realization of the concept of "social

mobilization" which is another mandate of the proposed DRMCSO. Social mobilization is a term used to describe a wide-scale movement or process to engage participation of a wide spectrum of societal elements for an action to achieve a common goal such as citizen safety or disaster risk reduction through a self-reliant effort. Thus, as a citizen acquires rights to have his safety protected, the citizen also has its responsibility to act and be involved in addressing this same concern.

The DRMCSO shall also utilize a multi-hazard approach by applying a mechanism to coordinate and define priorities, prepare, and support the response to all types of disasters faced by GAM. These disasters shall include those arising from natural and man-made hazards like earthquakes, flooding, overflowing of the streams, road accidents, biological/chemical emergencies and epidemics.

It must be noted that the DRMCSO is not to duplicate or supercedes the mandate of the General Directorate of Civil Defense but to complement it and support it. Its agenda is focused more towards awareness raising and preparedness as well as coordination. In that sense, the DRMCSO will strengthen, augment, and complement the efforts of national institutions on disaster risk reduction.

Functions of DRM and Citizen Safety Office (DRMCSO)

DRMCSO will coordinate DRM implementation and policy execution on the ground at the Municipal level and assist in communicating, educating and engaging the communities in disaster risk management. It will support and act as Secretariat to the Amman Disaster Risk Management Standing Committee, the policy board of GAM in DRM related issues and concerns. (See recommendation LI5).

The core functions of the DRMCSO shall include the following, among others, that may later be defined by GAM:

1. **Emergency management** - Among its tasks are emergency preparedness, contingency planning and institution of protocols for response operations, supervision of the municipality's emergency centers, and planning for recovery. The DRMCSO will ensure proper coordination between the city and the relevant national agencies on the implementation of emergency management measures.
2. **Inter-Departmental Coordination**– DRMCSO will coordinate with the Planning and Economic Development, Engineering and Public Works Departments and other clustered departments to develop their own departmental disaster management plans. It will support these departments in mainstreaming disaster risk reduction in their functions such as land use planning, physical planning, urban development and redevelopment, and services delivery through training, advocacy and internal communication.
3. **External Coordination -** Coordinate with national authorities and organizations to ensure GAM policies and procedures for DRM are aligned to the national structure.
4. **Risk analysis and prevention**- Determine relevance of research studies on risk assessment conducted in Amman by concerned agencies and institutions and spearhead crafting of programs and projects related to DRM. Department heads or cluster heads who are members of the DRM

Council will likewise incorporate hazards and disaster management parameters in their specific work processes.

5. **Community Preparedness and Risk Reduction** – DRMCSO will be in charge of preparing and executing community awareness and preparedness plans in close coordination with civil society organizations such as the private sector, the academia, the Jordan Red Crescent Society, and professional organizations. It would initiate preparedness programs for schools, and other critical civic functions as well as develop neighborhood awareness programs and other preparedness activities.

6. **Risk Communication and Capacity Building**–This will take care of developing and disseminating risk information and engaging communities in awareness and educational activities. One important function is to work with the GAM services departments to promote a culture of safety and to support them in disseminating standard safety measures to protect citizens from day-to-day hazards and improve their welfare. DRMCSO will take the lead in DRM capacity building for concerned institutions and conduct policy advocacy and awareness campaign among various sectors of society.

7. **Social Mobilization** - Mobilize human, financial, and technical resources to ensure sustainability of GAM's DRM programs and implementation of policies through partnerships, memoranda of understanding, mutual aid agreements and networking.

8. **Knowledge Development** – Build the information management tools and other technology to support competent DRM practice. Promote a community of practice to harness resources and improve the knowledge.

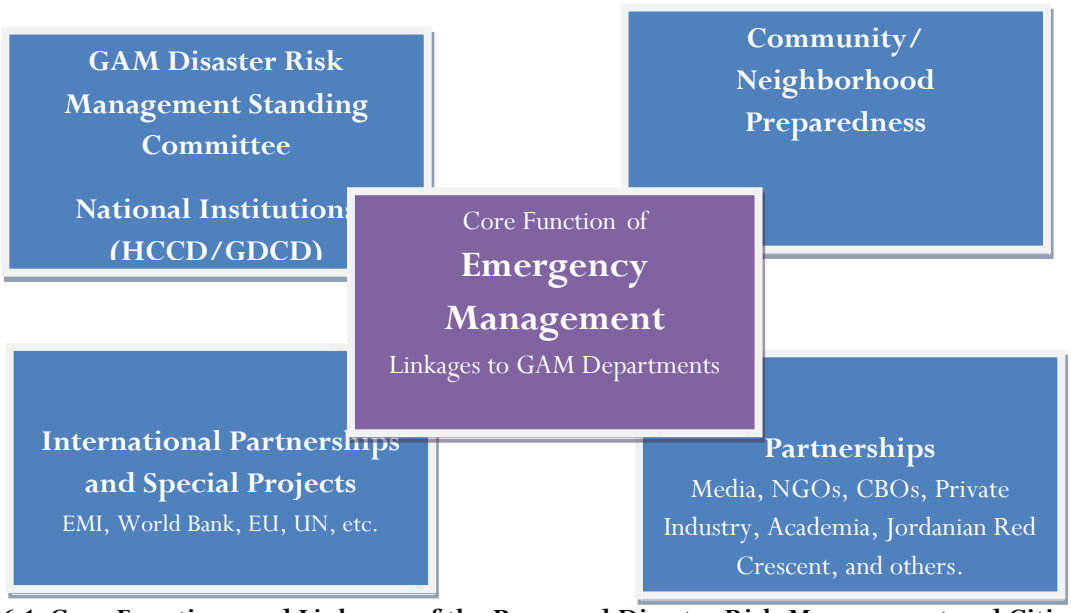


Figure 6.1 Core Functions and Linkages of the Proposed Disaster Risk Management and Citizen Safety Office (DRMCSO)

DRMCSO Staffing

It is proposed that initially, DRMCSO will consist of a Director as DRMCSO head, four specialists (Disaster Risk Reduction Specialist, Emergency Management Specialist, Operations Officer, and a Social Mobilization officer/ trainer) and an administrative assistant. Further expansion of the unit shall be determined after consultation with GAM officials.

The DRMCSO Director will report directly to the City Manager.

DRMCSO will recruit qualified and competent personnel to staff the Office and will liaise with the five (5) service clusters or departments of the GAM under the proposed reorganization plan of Amman and other stakeholders. An operational budget should be approved for the new DRMCSO.

The DRMCSO, in support of the DRMSC, will establish close links with the central bodies, GAM units, specifically the Department of Public Works and Department of Engineering in relation to disaster response, and other stakeholders to ensure coordination and collaboration in the implementation of the programs. The Director of the new office will also ensure open communication among policy makers, departments, and units in order to ensure adequate funding and support and clarity in drawing lines of authority.

Resources and Incentives

DRMCSO will collaborate with national and international partners to mobilize continuous support to replicate innovative and commendable DRM practices at the local level. DRMCSO will also provide information to decision makers at the national level that will assist in developing economic and regulatory incentives for risk reduction.

Moreover, the DRMCSO will institute a set of performance indicators which the organization can use as internal benchmarks for progress. These benchmark data will be the bases for decisions, resource allocation, and risk communication strategies for the communities and key stakeholders. Further, through these indicators, the job of advocating the vision of the DRMCSO and the city as a whole are anticipated to be easier. Figure 6.2 below illustrates the core functions and linkages of the DRMCSO.

Pathways for the Creation of the DRMCSO

A management reorganization study was conducted by an international consulting firm, Bearing Point.[20] In the report, it was recommended that GAM should adopt a phased implementation of the reorganization plan that includes the following five stages.

1) High level organizational design;
2) Senior management appointments;
3) Sector strategies;
4) Integrated GAM Strategy and organizational structural design; and
5) Sector by sector transition

[20] Bearing Point Management and Technology Consultants (2008) *Organizational Performance Improvement Project GAM Organizational Structure Report*

The establishment of the DRMCSO can be set up to coincide with the proposed City's five stages of organizational restructuring. In this case, the establishment of a DRMCSO will be part of the reorganization plan of the City, which is expected to fully unfold within two and a half years. Another alternative is to immediately constitute the DRMCSO and not wait for the phased implementation of the reorganization process of the City. This presupposes that the leadership views the urgency of establishing the DRMCSO and that the financial and technical requirements for its operation are ready and available. However, this latter arrangement is preferred by the Study Team because of the need to immediately develop an ownership structure for DRM within the city structure, and in particular to establish an organization that can own and manage the next steps in the development and implementation of the DRMMP. This presumes prompt action from the GAM policy makers in adopting and putting into operation this recommendation. The DRMCSO can be established through a local ordinance by which its mission and functions are specified together with the institutional arrangements and delineation of roles and responsibilities among city departments and units. It is recommended that the senior officials of GAM will take an active part in designing and detailing the organizational set up for the components of this focal point organization.

Recommendation LI 5: Create a Disaster Risk Management Standing Committee (DRMSC) at GAM.

The DRMSC, composed of high level officials of GAM and other key stakeholders, will act as a policy advisory body to GAM on all matters pertaining to DRM and citizens' safety issues in the city. The DRMCSO will provide support to DRMSC as its technical and operational arm.

The DRMSC will pursue an action agenda which advances the mainstreaming of DRM in various GAM sectors, functions, and programs. Regular meetings will build common understanding and more effective cooperation among key organizations, promote ownership of disaster risk reduction strategies and specific DRR actions by individuals and institutions, and constantly reinforce DRM mainstreaming in GAM functions and priorities. Among its activities the DRMSC will undertake the following:

1) Establish policy to promote and implement the integration of risk reduction, emergency preparedness, disaster response, and recovery programs and policies in GAM's departments and operations to ensure safety and resilience of Amman's citizens and protection of the city's economic assets, and natural environment from natural hazards;
2) Create legal instruments to institutionalize the organizational setup, roles, and responsibilities of the DRMCSO and to clarify the institutional coordination among city departments, units, and other key stakeholders such as national agencies, civil safety organizations, and academic institutions;
3) Ensure that local regulations are consistent with national laws and mechanisms for compliance, and strengthen disaster risk reduction programs within the local plans and processes.

Organizational Set-Up

Figure 6.2 indicates where the proposed DRMSC and DRMCSO will be situated within the GAM organization. It is proposed that DRMSC be attached to the City Mayor's Office while the DRMCSO to the City Manager's office initially. The latter supervises five key departments with clustered services that were previously operating independently. This set up makes up for easier coordination in terms of mainstreaming DRR in City operations and day to day functions. Eventually, the DRCMSO may fall under direct supervision of one of the Clustered Departments.

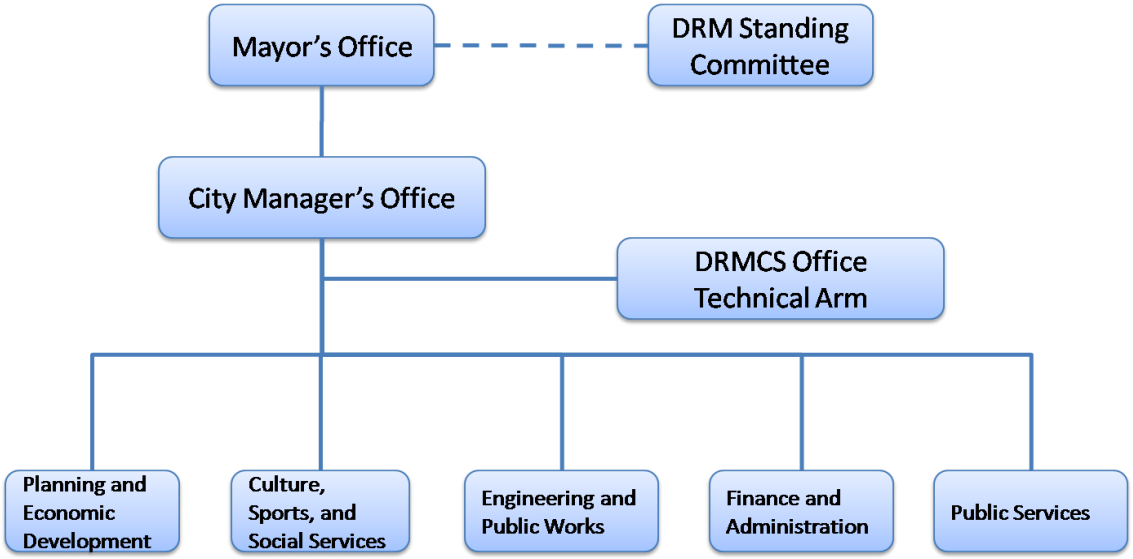


Figure 6.2 DRM in the Proposed Reorganization of GAM

Composition of the DRM Standing Committee

The DRMSC headed by the GAM Mayor shall be composed of Council members of GAM committees and department heads of zoning and building district, social and cultural, public works and engineering, planning and economic development, finance and administration, culture sports and social services, public services, among others.

Aside from the heads of the different city departments and units, there will be representatives from external stakeholders such as the private sector, academe, scientific organizations, and NGOs. This multi-stakeholder composition of DRMSC will help facilitate interdepartmental and inter-institutional coordination and promote collaboration.

NOTE: The formation of "Local Civil Defense Committees," headed by the governor at each center of a governorate throughout Jordan, is acknowledged by the Study Team. The specific duties assigned to these committees include such tasks as checking the availability of the siren system, equipping and maintaining public shelters and supervising shelter operations, controlling traffic, and providing communications. Since most of these duties are overwhelmingly operational in nature, carried out during an emergency, as compared to the policy and strategic nature and broad scope of the proposed DRMCSO, there should be little potential for duplication of effort between the proposed DRM organization and the Local Civil Defense Committee.

Recommendation LI 6: Create a Legal Instrument to institutionalize the functions, roles and responsibilities of the DRMCSO.

An appropriate legal instrument shall be enacted to serve as basis for the creation of the DRMCSO in consultation with GAM senior officials, GAM Legal Office and the GAM City Council.

Recommendation LI 7: Develop the organizational chart, job descriptions, vision and mission of the new DRMCSO and its relationship to the national DRM institutions.

As mentioned above, senior officials shall actively participate in developing the organizational chart, job descriptions and the vision and mission of DRMCSO with the advice of specialists in the field. However, the following positions may be considered initially:

1) Director
2) Four DRM Specialists: Disaster Risk Reduction Specialist; Emergency Management Specialist; Operations Officer; and Social Mobilization Officer/Trainer
3) Administrative Officer

The initial positions can be briefly described as follows:

The **Director** shall act as head of the DRMCSO. He/she will provide leadership and direction and supervise subordinate personnel in the organization.

The **Disaster Risk Reduction Specialist** shall be responsible for coordinating DRR projects or activities of the different GAM departments and other external organizations.

The **Emergency Management Specialist** shall be responsible for the development of emergency plans and procedures in coordination with GAM departments and external organizations.

The **Operations Officer** shall ensure the readiness of GAM to respond to disasters and emergencies (physical facilities of the emergency center, equipment and supplies, training and drills). He/she shall coordinate with the GAM departments and other external organization in the event of emergencies for preparedness, response, relief and recovery efforts.

The **Social Mobilization Officer** shall be responsible in mobilizing of all sectors of GAM for their active involvement in resolving Health and Safety issues relevant for the promotion of a quality of life and a culture of prevention. He/She is responsible for neighborhood-level disaster preparedness and training.

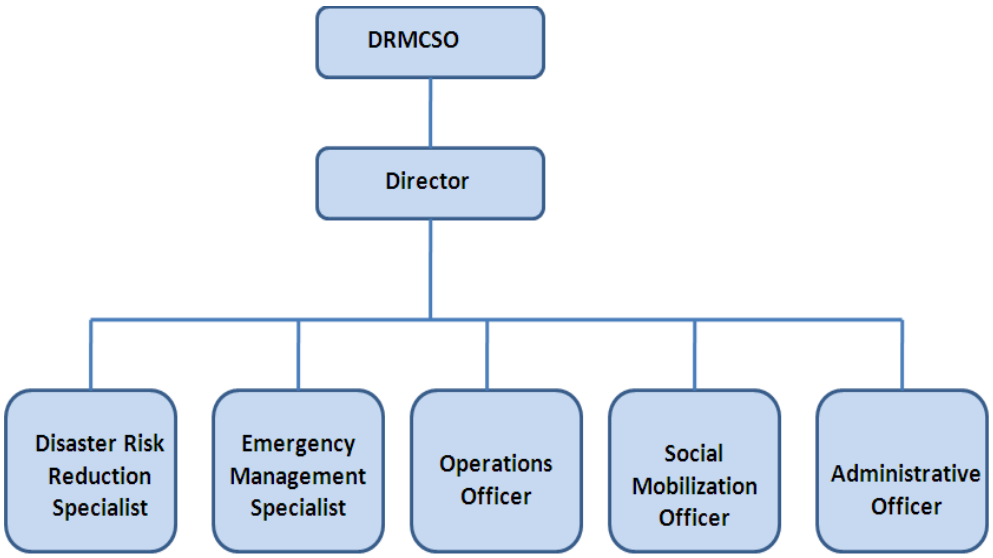


Figure 6.3 Proposed DRMCSO Initial Organizational Chart

The size and composition of the DRMCSO shall depend on the needs of GAM as determined by GAM senior officials.

Recommendation LI 8: Provide adequate funding for the operation of the DRMSC and DRMCSO.

After determining the required positions, scope of duties and responsibilities of DRMSCO staff and identification of DRM programs and projects, the necessary funds should be made available as part of GAM annual budget.

All of the above recommendations address the HFA Strategic Goal of "Development and Strengthening of institutions, mechanisms and capacities to build resilience to hazards," and the HFA strategic goal of "The systematic incorporation of risk reduction approaches into emergency preparedness, response and recovery programs." They also address HFA Priority for Action #1, Ensure that DRR is a strong national and local priority, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response.

6.2 Emergency Management and Social Mobilization

6.2.1 Rationale

Despite the important efforts undertaken by the Greater Amman Municipality to improve its capabilities for emergency response and management, these actions lack operational efficiency and are not in line with the international standards for emergency management such as those established

by IAEM. The Emergency Management Program for Amman needs to be thought of as a city wide System that provides for management and coordination of all preparedness, response and recovery activities for all hazards, as well as being responsible for inter-institutional coordination and resource mobilization. Greater Amman Municipality currently lacks a clear disaster management structure and authorities to attain a cohesive and systematic approach and integration of resources to:

- educate, train and prepare the community as well as local government for disasters
- design and implement measures to lessen vulnerability
- manage a system within GAM to evaluate disaster risk and impacts on city infrastructure and services as well as emergency conditions and needs, and
- coordinate holistic disaster risk management planning, policy, and integration of various overlapping response and recovery functions and operations.

The proposed Disaster Risk Management and Citizen Safety Office (DRMCSO) is essential to the System, as it will be its critical core, its proactive catalyst, coordinator, and facilitator for all facets of the System. Worldwide research and standards of practice dictate that a strong nodal agency like the DRMCSO is essential to effective performance of the diverse and often disparate elements of an overall System for disaster preparedness, response, recovery, and vulnerability reduction.

This System should encompass all organizations, agencies, departments, entities and individuals responsible for any aspect of emergency or disaster management, including those already in place. For instance, the recently established operations room for the Emergency Centers, which operates 24h/7days, with emergency telecommunications systems and hotlines to key offices for coordination of emergency response, would be an important part of this overall System. The System will also integrate the emergency centers Greater Amman Municipality has established in Amman for mobilizing up to 1300 employees from different departments during small to large scale disasters.

The System also requires the development and implementation of a formalized Incident Management System (also referred to as Incident Command System, ICS) for the systematic organization and management of diverse responding resources. The DRMCSO will be responsible for guiding the project and ensuring that all departments are trained in how the system operates. The Incident Management System will address the basic emergency functions of planning, operations, logistics, finance and administration. A strengthened information management system component should also be incorporated, bringing the System's incident management, information management, and coordination systems to the level of international standards.

See Recommendation EM1.

Another critically important responsibility of the DRM and Citizens Safety Office will be to catalyze and guide the inter-departmental contingency planning process, ensuring that the Contingency Plan is continuously updated, tested, and revised based on analysis of: (1) specific disaster risks, needs and capabilities, and (2) performance during tests, exercises, and actual responses. Overseeing this

continuous planning, testing, and revising process requires active management and follow-up with all key entities including scientific organizations. The Plan needs to address not only response and relief but also necessary institutional and organizational arrangements and actions to facilitate early and effective recovery of affected populations and restoration of impacted services. Other elements should include continuity of government functions, coordination of emergency services of relevant response agencies, emergency funding, emergency public information, specialized training programs targeted to specific audiences, among others. This ongoing planning process which the DRMCSO will coordinate will act to stimulate ongoing interactions between different departments and institutions, resulting in increased common understanding and agreement. The updated plans will be well-informed and generally understood and accepted by all involved actors.

Effective contingency plans reflect analysis of disaster scenarios based on likely hazard events and the damages and losses to be caused by these, given the vulnerability of local communities and infrastructure and services. Scenario analysis is also needed in order to list the actions to be undertaken such as the pre-positioning of resources within sectors likely to be heavily impacted and designation of appropriate evacuation routes and sheltering sites. The plan should clearly identify the newly reorganized GAM structure, roles and responsibilities, decision-making processes, available resources, and the specific steps that must be taken in an emergency to enable all involved to respond according to established procedures.

See Recommendations EM2 through EM8.

The different elements of the DRMMP Framework discussed herein require a broad-based alliance building and community action in order to develop and implement effective disaster risk reduction programs and initiatives. For instance, disaster awareness programs, which are necessary to support the implementation of the DRMMP, should engage not only the local authorities but also its citizens and all practical allies and sectors to raise the people's level of disaster consciousness and solicit the cooperation of the general public. Mobilization involves different levels and sectors of the society in order to enhance the disaster consciousness of the people, maintain support for disaster and emergency preparedness, and draw multi-sectoral and community cooperation towards the implementation of the DRMMP Framework of Amman. Mobilization is a highly participatory process in which the members of the community themselves become aware of the issues affecting them and are given the power to be involved in decision making processes. It also involves forming strategic allies at all levels and in all sectors in a wide range of support activities. Such coalitions should be built on the basis of mutual benefits of partners and of a decentralized structure.

See Recommendation EM9.

It is known from experience that community involvement, education and preparedness are rarely sustainable if they do not link to the structures of the local government. At the same time, the social networks and social support systems at the neighborhood level in Amman are critical to the emergency management system. It is necessary to create linkage mechanisms to anchor community efforts to the local government, specifically to the DRMCSO, in order to help institutionalize

emergency preparedness and response procedures and provide continuity and sustainability. Thus, social mobilization is an integral part of the emergency management System.

See Recommendations EM10 and EM11.

Another aspect of social mobilization relates to the education of the GAM core departments in issues related to safety of the citizens from day-to-day hazards. Technical organizations are often not fully aware of the social vulnerabilities of society. Similarly, social organizations are typically not cognizant of the physical vulnerabilities of society. One of the roles of the DRMCSO is to advocate within the core departments and units of GAM for citizens' safety and support these departments in exploring and putting in place measures for addressing social vulnerability and improving the day-to-day safety of the citizens.

See Recommendations EM5, EM7 and EM8.

6.2.2 Addressing Social Vulnerability

The UNISDR Terminology on Disaster Risk Reduction (2009) (www.unisdr.org) defines vulnerability as the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Vulnerability arises from physical, social, economic, and environmental factors, and it varies significantly within a community. Vulnerability exists prior to disaster, contributes to its severity, and impedes effective response and recovery.[21]

The populations most vulnerable to disaster are those groups that, for various reasons, have the fewest defenses against a disaster and are the least resilient in disaster's aftermath. In international practice, Emergency Management Systems as a whole are becoming more holistic, participatory, and community-based, leading those responsible for emergency management to recognize the need to:

- Understand the patterns and trends of social vulnerability within their city;
- Reach out to the most vulnerable populations; and
- Work to reduce social vulnerability and address the needs of these populations.

Understanding and addressing vulnerabilities, then, is a key component of any Emergency Management System and therefore a key task of the proposed DRMCSO.

In the past, disasters were viewed as having similar impacts on people who were similarly exposed to a physical hazard. As exposure to the hazard was based on spatial location and structural factors in the built environment, vulnerability was thought of as an outcome of these physical factors. Today, however, it is recognized that a variety of social and economic factors contribute to vulnerability. The everyday living conditions of the poorest, sickest, most dependent and most isolated residents increase their exposure to physical hazards and increase their susceptibility to the social, economic, political, and psychological impacts of disasters. Women and particularly single women where found

[21] This statement and most of this section are adapted from "Identifying and Addressing Social Vulnerabilities" by Elaine Enerson, who also credits the work of Cheryl Childers, Betty Hearn Morrow, Deborah Tomas, and Ben Wisner, Emergency Management: Principles and Practice for Local Government, Second Edition, ICMA Press, 2007.

to be disproportionally affected by disasters and their needs can be unique. Disasters are not gender blind.

Social vulnerability arises from circumstances and conditions which make it difficult for people to cope; vulnerable groups include, for instance, those with disabling physical or mental conditions, the very young, women and particularly single women, the frail elderly, and those who do not speak the dominant language of the community. Social vulnerability also arises from underlying conditions which marginalize people, such as being chronically unemployed or underemployed, living in poverty, in substandard housing, and/or in highly hazard-prone areas.

Social vulnerability is increased by factors which undermine community solidarity, for example when there is bias against new immigrants or certain religious groups, disapproval of non-traditional living arrangements, or fear of those living with HIV/AIDS. These social divisions add to the complexity of social vulnerability, and their patterns need to be understood and integrated into emergency management planning. For instance, some members of highly vulnerable groups may be reluctant to participate in community affairs due to fear of government authorities, social discrimination, or harassment. People who are disconnected from society, such as the homeless, may become hard to reach with risk information such as warning of a biological attack or hazardous spill. Effective outreach requires a good understanding of societal trends and various aspects of vulnerability as well as good local knowledge.

Reducing social vulnerability is a two-way street, demanding effort by both the vulnerable groups and by the responsible governmental and non-governmental organizations. It begins with increasing local knowledge so as to tailor initiatives to local groups, in particular those most vulnerable, and local conditions. Local knowledge is acquired by walking the neighborhoods, asking questions, meeting with neighborhood leaders and organizations. Then it relies on engaging and mobilizing individuals and groups in the community to increase their awareness of hazards and how to reduce their own vulnerability. Community-driven risk assessments and developing informal community maps are examples of tools which help to expand understanding in the community of local hazards, vulnerabilities, and capacities.

6.2.3 DRMMP Recommendations for Emergency Management and Social Mobilization

Recommendation EM 1: Create an Emergency Management System which is comprehensive and based on professional standards.

Key elements of this comprehensive system include formalized institutional arrangements and local cooperative agreements, incident management system, information management system, resources (human and budgetary support), and institutionalized capacity building programs. The Hyogo Framework for Action and IAEM Emergency Management Standard discussed earlier provide guidance, standards, and a framework for the system. Elements of the system are further detailed in the following recommendations.

This recommendation addresses the HFA Strategic Goal of *"Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards*," and the HFA Strategic Goal of "*The systematic incorporation of risk reduction approaches into emergency preparedness, response and recovery programs*." It also addresses HFA Priority for Action #1, Ensure that DRR is a strong national and local priority, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response.

Recommendation EM 2: Equip DRMCSO with a "Basic Plan" and Concept of Operations as part of the framework for the Emergency Management System.

While GAM has prepared a contingency plan for certain types of disasters, the current plan does not incorporate the newly developed earthquake risk scenarios nor all the elements of the proposed Emergency Management System. The "Basic Plan" will outline the functional processes to improve safety and welfare of the population. In a disaster, the plan will help to minimize the disruption of critical services, guide the protection of people and assets, and provide for post-event rehabilitation and recovery operations. The Concept of Operations forms the foundation for the Basic Plan and overall system. It clearly states the basic understanding of primary and support roles and responsibilities of the various GAM departments and other entities and how they will interact and collaborate in emergency preparedness, response and recovery actions.

This recommendation specifically addresses HFA #5, Strengthen disaster preparedness for effective response, and the Incident Management Element and the Planning Element of the Emergency Management Standard (see Section 6. 2.3 above).

Recommendation EM 3: Complete a revised Contingency Plan, with the participation of all relevant entities, for the City of Amman.

Ensure that up-to-date information on hazards and risk, such as the earthquake disaster scenario based on the earthquake risk assessment study prepared for Amman is fully incorporated into the various components and aspects of the plan. Expand the plan to include the full range of elements, including recovery components, as identified in international standards. Identify and make available the resources necessary to implement the plan. Review and update the contingency plan on a regular basis.

This recommendation specifically addresses HFA Strategic Goal of "The systematic incorporation of risk reduction approaches into emergency preparedness, response and recovery programs." It also addresses HFA #5, Strengthen disaster preparedness for effective response, and the Planning Element, Prevention and Security Element, Incident Management Element, Mutual Aid Element, etc. of the Emergency Management Standard (see Section 6.2.3 above).

Recommendation EM 4: Test the contingency plan through exercises and drills on a regular basis.

Develop table-top and inter-departmental drills to ensure every actor in the EM chain understands their role and how to get engaged in the process once an emergency is foreseen or has occurred. The DRMCSO should take the lead in coordinating the review, updating, and testing of the plan. The updated contingency plan should be tested, following a regular schedule, in light of the Earthquake Damage Scenario Findings through joint table top exercises with key EM stakeholders from GAM. This will help departments to internalize and fully understand their roles and responsibilities, standard operating procedures, typical problems encountered in response operations, potential disaster impacts, and the earthquake damage scenario effects based on the seismic risk assessment conducted by Yarmouk University. Also, the DRMCSO should assist GAM departments in developing departmental plans and procedures to carry out their own responsibilities under the updated Plan. As noted in the Emergency Management Standard, a program of regularly scheduled drills, exercises and appropriate follow-through activities, designed for assessment and evaluation of emergency plans and capabilities, is critical to a local emergency management program.

This recommendation specifically addresses HFA #5, Strengthen disaster preparedness for effective response, and the Exercises, Evaluations and Corrective Actions element of the Emergency Management Standard (see Section 6.2.3).

Recommendation EM 5: Develop the competencies in disaster risk management of the new DRMCSO.

This should be done through a specialized training program based on international standards and the results of a training needs assessment to define the specific needs and environment of GAM and the new DRMCSO staff.

This recommendation addresses the HFA Strategic Goals of "*Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards*," and "*The systematic incorporation of risk reduction approaches into emergency preparedness, response and recovery programs.*" It also addresses HFA Priority for Action #1, Ensure that DRR is a strong national and local priority, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response. It also addresses the Training Element of the Emergency Management Standard (see Section 6.2.3 above).

Recommendation EM 6: Strengthen the municipal capabilities for effective response and recovery operations.

Make available to staff of GAM operating departments a capacity building program based on international standards and customized to meet the specific conditions in GAM. The program should include specialized and standardized trainings for such emergency operations as search and rescue; field damage and needs assessment, standardized data collection and information flow, shelter organization and management, food and water provision, health and sanitation and social infrastructure.

This recommendation addresses the HFA Strategic Goal of "*Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards*," HFA Priority for Action #1, Ensure that DRR is a strong national and local priority, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response. It also addresses the Training Element of the Emergency Management Standard (see Section 6.2.3 above).

Recommendation EM 7: Provide training and guidance to GAM departments on emergency planning in order to develop their own standard operating procedures and departmental annexes to the contingency plan, in accordance with the updated contingency plan and in light of the earthquake damage scenario.

Provide guidance including internationally recognized standards for the various emergency management functions and operations. Also, it is essential that the departments involved in emergency preparedness within GAM understand the implications of the scenario earthquake for the city and use it in developing their own departmental plans and identification of resources needed to cope with disasters.

The target audience for the guidance and training on emergency planning should consider at least three different groups: 1) internal to the municipality so everyone is aware of procedures, roles and responsibilities, 2) basic response organizations and humanitarian groups, such as the Civil Defense, the Fire Service, Police, the Red Cross or designated entity from the Health Sector, and 3) the external partners such as the international cooperation organizations that take an important role in crisis situations, along with the community who need to know what to expect from the authorities and how they can contribute to the system.

This recommendation specifically addresses HFA #5, Strengthen disaster preparedness for effective response, and the Operations and Procedures Element and the Training Element of the Emergency Management Standard.

Recommendation EM 8: Develop a Management Information System to provide organization, analysis, and flow of information among all key players in the Emergency Management System as well as communication and dissemination of emergency public information to the populace.

Access to good information for response planning and immediate intervention of the operations groups is an essential asset in a crisis situation. Information must be gathered, verified, analyzed, and summarized to provide the basis for life and death situations, for allocating materials, personnel, and equipment resources effectively, and for timely and realistic distribution of humanitarian assistance in the response and relief phase. Furthermore, one of the major issues emergency situations carry with them relates to the ways and means that the international community and cooperation has to help out affected communities. In most of the cases, lack of clear procedures for assistance (e.g. provision of human and material resources, donation of food, medical supplies and basic equipment such as

tents and clothing or simply dealing with customs procedures for internalization) prevents donors from providing a more effective and timely assistance. Therefore, the Management Information System (MIS) should also provide a procedure for cross-collaboration between the national and local authorities and its coordination with the international community to meet the gaps between the demands of the affected population and the contributions that the international community can make available.

This recommendation specifically addresses HFA #5, Strengthen disaster preparedness for effective response. It also addresses the Communications and Warning Element and the Crisis Communications, Public Education and Information Element of the Emergency Management Standard (see Section 2.3 above).

Recommendation EM 9: Design and implement a comprehensive disaster awareness program including a communications strategy for Emergency Management.

Central to social mobilization interventions is empowering and educating the people, particularly the vulnerable stakeholder groups such children, women, and the less privileged, to take proactive steps and decisions to improve the quality of their well-being, including their sense of security and day-to-day citizen safety. Government alone cannot protect them against disaster effects; the collaboration of all sectors of society which include schools, the private sector and the general citizenry is also needed. Community awareness and preparedness activities should be organized through a social network of non-governmental organizations (NGOs), community-based organizations (CBOs), the municipality, research institutions, and the community. An evidence-based and intensive information and education disaster preparedness campaign should be developed and implemented by GAM. The information and education campaign should focus on changing the orientation of people from that of reactive to proactive and on emphasizing disaster preparedness and risk reduction.

The DRMCSO should design a communications strategy to disseminate risk information and emergency preparedness messages to vulnerable groups and the populace at large. The campaign should also target different sectors and levels of society and tailor-fit communication strategies for specific target audiences in order to effectively deliver and communicate the risk, particularly to high-risk groups within the city.

Risk communication strategies should utilize the seismic risk assessment study results as well as the earthquake scenario as portrayed in Annex 4 (Volume 2). Lastly, tools for risk communication such as the use of interactive software and maps can be developed and utilized by GAM to effectively deliver the message and initiate the discussions towards disaster preparedness.

This recommendation addresses HFA #3, Use knowledge and innovation to build a culture of safety, and HFA #5, Strengthen disaster preparedness for effective response. It also addresses the Communications and Warning Element and the Crisis Communications, Public Education and Information Element of the Emergency Management Standard (see Section 6.2.3 above).

Recommendation EM 10: Organize partnerships with various sectors and levels of the society such as schools, civic organizations, non-government organizations, professional societies, volunteer groups, business sector, and the media based on a common disaster risk reduction agenda supportive of the Amman DRMMP Framework.

Social mobilization involves a broad-based community partnership so that a sense of ownership by local stakeholders can be gained by community members and so that DRR initiatives would not be seen as externally imposed. DRR initiatives that are externally driven would not be sustainable and would undermine instead of tap the innate resources and self-reliance of the community. Organizing partnerships with the different sectors and various levels of society will support and further strengthen community participation towards sustainability of DRR programs and projects of GAM. Forging inter-sectoral partnerships such as public-private partnerships will allow wider participation and collaboration. Lastly, partnering with the media will widen the diffusion process and strengthen the advocacy efforts to reach all levels of society by utilizing various channels for communication. It will also support the disaster awareness campaign at the same time by assisting in the delivery of information, education and risk communication programs.

This recommendation addresses the HFA Strategic Goal of "*Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards*," and the HFA Strategic Goal of "*The systematic incorporation of risk reduction approaches into emergency preparedness, response and recovery programs*." It also addresses HFA Priority for Action #1, Ensure that DRR is a strong national and local priority, HFA #3, Use knowledge and innovation to build a culture of safety, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response.

Recommendation EM 11: Formulate a monitoring and evaluation system to review the effectiveness and impacts of the disaster awareness strategy of GAM.

There is a need for GAM to keep track and regularly assess the implementation and impacts of its social mobilization program against its expected outputs and outcomes. Constant monitoring and periodic evaluation will enable rectification of mistakes and more efficient use of resources.
A monitoring and evaluation system should include as well GAM's partner organizations through regular meetings and focus group discussions to review the objectives and methodologies of GAM's disaster awareness strategies and interventions.

This recommendation addresses the HFA Strategic Goal of "Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards," HFA Priority for Action #1,

Ensure that DRR is a strong national and local priority, and HFA Priority for Action #5, Strengthen disaster preparedness for effective response. It also addresses the Crisis Communications, Public Education and Information Element and the Exercises, Evaluations and Corrective Actions Element of the Emergency Management Standard (see section 2.3 above).

6.3 Construction Standards and Practice; Infrastructure Resiliency

This part provides considerations and recommendations for improving processes related to construction codes and standards in order to reduce the physical vulnerability of the city as well as to improve the resiliency of the built environment to earthquakes and other disasters.

6.3.1 Considerations in Building Code Effectiveness

There are several considerations in terms of evaluating the effectiveness of the building code and related construction standards and their relationship to hazards (in particular earthquake hazards) and related risks. They include:

1. The adequacy of the technical provisions of the code in terms of reflecting both the level of hazard in Amman, and the latest knowledge in earthquake engineering and technology.
2. The process of enforcement of the code provisions and construction control.
3. The process of enforcement of the code provisions.
4. The general understanding of these provisions within the construction industry including building officials, designers (engineers, architects, planners), construction professionals, and even the general public.
5. The understanding of parameters of earthquake hazards, vulnerability and risk in Amman and their integration in building codes, physical vulnerability reduction and building construction standards and practices.

Some initial clarifications are in order. First, it must be understood that so-called “earthquake-proof” structures do not exist. Buildings and other structures are designed to sway, deform and crack during extreme loads imposed by severe earthquakes. This process is necessary in order for these structures to release the tremendous amount of energy that they are submitted to by the earthquake. However, the general philosophy of earthquake design is that buildings should not collapse even under very extreme conditions; at the same time, they should sustain little if no damage under small earthquakes, and repairable damage under moderate earthquakes. Severe earthquakes are typically those of magnitude greater than 7; whereas moderate earthquake are those of magnitude between 6 and 7, and small earthquake are those of magnitude less than 6 assuming to take place locally.

A second important point is that competent building codes by themselves provide little protection against extreme earthquake loads. Performance is also strongly correlated to the actual understanding, respect and implementation of the code provisions during the construction stage. Thus, the actual field practice, and the process of enforcement of the building code are important factors in terms of the ultimate effectiveness of the building code.

A third point is that building codes often represent compromises that try to balance the supplemental cost driven by stricter construction practices with the competitive nature of building construction. Considering that the general knowledge of earthquakes is imperfect and carries a large uncertainty, there is always pressure to restrict code provisions to the most empirically demonstrated part of knowledge.

A final point is that building codes are established to apply to the whole country, and thus their level of resolution does not necessarily reflect all the seismological and geological conditions of a geographically more restrained area such as Amman. In particular, codes are based on average soil conditions and commonly constructed buildings. The specific soil conditions at a particular site can have much different conditions than the ones assumed in the building code. Similarly, buildings can be much more complex than the generic ones assumed in the code. Thus, the competence of the design professionals becomes extremely relevant in terms of translating general concepts into competent designs.

With all these considerations, minimum safeguards related to building codes and construction standards can effectively protect structures from extreme loads. Some considerations still remain incomplete and/or unknown, and it is necessary to complete the information in the immediate future so as to make this document most relevant to its users.

6.3.2 Rationale for Strengthening Building and Infrastructure Resiliency

The development of a competency in the understanding of the hazards, vulnerability and risk to Greater Amman has far reaching implications on the reduction of physical and social vulnerabilities in Amman and the protection of its population, assets and institutions from destructive earthquakes and other hazards. One should not expect any major reductions in hazard-related risks without an institutional competency related to risk and risk management. This competency can be acquired since the expertise already exists in the country. Further, greater awareness is needed not only among GAM but also among the many public and private institutions that are involved in the development of Amman, the delivery of essential services to the population, and the promotion of a culture of preparedness and safety among its institutions and citizenry.

Tackling this agenda could be overwhelming for many institutions. It triggers additional direct expenses in the construction of facilities, more efficient bureaucratic processes, special qualifications, and also a change in practice that is often resisted by the practitioners themselves. Nonetheless, for countries which are exposed to large seismic events such as Jordan, there are only two alternatives: wait for an earthquake to happen and count on a natural selection process of the earthquake to damage and demolish incompetent buildings, or take a pro-active stand in raising awareness and putting in place the regulations, processes and professional competencies to build structures and facilities that will resist earthquakes and protect their occupants and vital functions to society.

On the positive side Jordan has a modern building code, competent work force and institutions, and already a high level of awareness for social mobilization. Jordan also has the high level expertise to understand the strategic importance of building a resilient city and to build more competence among its practitioners and institutions. Public and private organizations responsible for the development

and servicing of Amman need to be more aware of the threat of earthquakes to the city and to the country, in general.

The weaknesses however lie in many areas, including:

1. The building code is a national document and may not reflect the actual earthquake exposure of Amman.
2. The construction code implementation process currently has a gap in terms of actual field inspection and control to ensure that the buildings are constructed according to plans.
3. The regulatory enforcement process seems to be concerned strictly with the setting, architectural and setting requirements, and not with the engineering provisions of the code.
4. Field construction control is not qualified by GAM as a regulatory agency in charge of building licensing within its jurisdiction.
5. Competency of practitioners and designers is not recognized through a professional certification process.
6. Inter-institutional coordination and awareness need to be improved in order to ensure better earthquake resiliency of the city in the future

The Regulatory Mandate of GAM

Dealing with these weaknesses in the building code development, implementation and enforcement is first a regulatory issue. It is also an essential priority element in the earthquake protection of Amman. Currently, GAM seems to be following the building Licensing regulation of Municipal Law 29 of 1955, which provides a narrow mandate for the granting of licenses and the monitoring and enforcement to the sole areas of "*location and shape of building, its area relative to the area of the lot, and the existence of sanitary conditions"*. As a regulatory agency, GAM relies fully on the JEA for the process of implementation of the engineering provisions of the code. Nonetheless, Art. 11.d.2 of the National Construction Law of 1993, imposes on regulatory agencies (thus, on GAM) requirements for "*Follow-up projects from inception to completion that the codes's requirements, provisions and conditions for licensing are met*". There would be no issue if this "*follow-up work"* was undertaken by other agencies on behalf of GAM (such as for example in the case of the certification of drawings undertaken by JEA).

However, this is not the case now since the Task Force that was established in 2007 to supervise construction is not fully operational due to lack of funding. Similarly, GAM does not get involved in the enforcement process of the engineering provisions since it is not a party in their implementation. This gap in the implementation <u>and</u> enforcement in code provision need to be closed. The preference is for the Municipality Law to be amended in such as way as to clarify the intent of the implementation of Art. 11.d.2 related to the building control to GAM, and to make the two laws compatible.

Covering the matter of building construction control through legislation may take years, whereas the safeguards are needed now. Other measures can be taken by GAM, the National Jordanian Construction Council, JEA and others to ensure that there is competent regulatory control of the

construction process to ensure that buildings and other facilities are build according to the design drawings and specifications.

6.3.3 DRMMP Recommendations for Construction Standards and Practice

Recommendation CS 1: Close the gap in the code implementation and enforcement process by ensuring that buildings are constructed according to approved drawings and specifications.

This can be accomplished in at least three different ways:

a) Activating and fully funding the Building Enforcement Task Force that was established in 2007
b) Locating the responsibility for field implementation and enforcement with GAM since it is the regulatory agency for building code implementation and enforcement within its jurisdiction under the statute of the Building Construction Law
c) Shifting the responsibility for field implementation and enforcement to JEA (or other similar technical organization)

Note that under Option b) above GAM does not need to undertake the actual field work itself. The technical work of field inspections can be done by accredited and independent field and testing laboratories.

The cost of field inspections should be assumed by the building owners (for the field inspection portion) and contractors (for the material testing portion), which are already supposed to undertake it under Art. 11.d.3 of the National Construction Law. The difference is that the field testing is done for GAM as a regulatory agency by independent and fully qualified laboratories.

Recommendation CS 2: Update the provision related to Building licensing in the Municipality Law No 29 of 1955.

The particular provision is, in our opinion, outdated and in contradiction with the Art.11.d.2 of the National Construction Law of 1993. Regulatory authority for licensing should encompass the engineering provisions of the Earthquake Prevention Code. This is essential to ensure regulatory authority over the full process of construction from inception to completion in all aspects of safety, and not only setting, architecture and sanitation as currently worded.

Recommendation CS 3: Review the Earthquake Prevention Code in light of the risk analysis undertaken by the seismic risk assessment study team, including the provisions covering retrofit of existing buildings.

The earthquake provisions of the code are relatively recent but were developed prior to the risk assessment study performed by the “Seismic risk assessment study” team. The study has accumulated a significant amount of scientific information related to earthquake hazards, earthquake vulnerability

and earthquake risk to Amman. It would be beneficial for the Jordanian scientists as well as the regulatory agencies to review this scientific information and to discuss it in order to generate a greater consensus on these parameters. Such consensus can then be reproduced in the code. Further, within the last two or three years, there have been new developments in earthquake engineering related to performance-based design in California and elsewhere (e.g., ASCE7-05, ASCE24, ATC 58, and ATC41) that the scientific community in Jordan can benefit from in reviewing the code performance criteria and the code provisions. We believe that there will be great benefits from a review of the code with a broad agenda that brings together the scientific community of Jordan and the regulatory and specialized research agencies.

The review of the building code should include provisions related to seismic evaluation and design of existing buildings (i.e., seismic retrofit). These provisions should include legal requirements for retrofit of most at risk buildings and facilities, mainly for critical facilities such as hospitals, emergency centers, schools and others. For example, seismic retrofit could be made mandatory in relation to major renovations or major additions.

Recommendation CS 4: Strengthen the field testing and field inspection system in Jordan.

This recommendation is complementary to Recommendation CS 1.

Independent field testing is a requirement for materials such as reinforced concrete or steel and is an integral part of these construction technologies. When learning how to design with concrete, steel and other materials, engineers are also explicitly taught the testing requirements both in the field and in the laboratories. The provisions for design and the provisions for testing cannot be separated. They belong together. Currently, there are testing firms in Jordan which undertake testing on behalf of the contractor or the design firm. However, there does not seem to be any regulatory oversight to ensure that these tests are reviewed and interpreted independently to ascertain respect with respect to code provisions and design specifications. We believe that this regulatory oversight is important to create a system of “checks and balances” in the quality control of the construction project in Amman and other parts of the country. The cost of testing is assumed by the building owner and contractors as indicated in CS-1. T

Recommendation CS 5: Undertake specialized training and competency building in earthquake design and construction.

As mentioned earlier, earthquake engineering and its related technologies are specialized fields that are evolving rapidly. Most often, architects, contractors and other construction professionals are not trained on these specialized fields during their academic training. The training should also extend to areas such as post-earthquake damage evaluation of buildings, and post-earthquake repairs and rehabilitation of buildings. Jordan has specialized technical organizations (e.g., Royal Research Society) and professional organizations (e.g., JEA) that have the competency to undertake such training. It is beyond the scope of this project to evaluate the effectiveness of the current training programs on construction codes and regulations. Generally however, training is always warranted. We recommend thus that a specialized training program in earthquake design and construction be

undertaken in the country. This is particularly important for GAM to improve the competency of its technical staff in earthquake engineering, earthquake evaluation of buildings, and earthquake repair and rehabilitation of buildings This program will create a core of competent engineers within GAM construction and planning offices.

Recommendation CS 6: Establish a professional certification system for building and construction practitioners and professionals.

Putting in place a system of professional certification for architects, planners, engineers, and contractors would be a major step forward in terms of improving the standards of practice in the construction industry and making it competitive with the world's best practices. This should be seen as a long term goal, and should be modeled after countries that have a long standing tradition and experience for professional certifications such as the USA.

6.3.4 Recommendations for Achieving Earthquake Resiliency

Recommendation ER 1: Establish seismic performance goals for new critical facilities such as hospitals, emergency centers, shelters and others that enable the City to recover faster from an eventual earthquake.

Building codes typically assign a higher importance factor to essential facilities. While this is an important safety parameter, experience has shown that this by itself does not guarantee that these facilities would be operational after a major earthquake. Other factors such as construction control, adequate bracing of mechanical, electrical and plumbing systems, availability of power, water and other lifelines are required to ensure functionality of the building after a major shock. Performance criteria are typically not established in terms of engineering parameters (e.g., stresses and displacements) but in terms of functionality parameters, for example: functional immediately after an earthquake, or within one day, or one week depending on the importance of the facility to post-emergency operations.

Recommendation ER 2: Establish seismic mitigation program for essential city services.

As discussed previously resiliency has to do with protecting services and ensuring that they are quickly restored after a major disaster. GAM should review the services it renders to the public in light of this criterion. For these services that are not under its direct authority (e.g., power, water, health care, and others), GAM can exercise its regulatory power to discuss a mitigation program with the appropriate agency.

Recommendation ER 3: Establish a "Lifelines Council" to provide a mechanism for inter-agency coordination to reduce the risk to lifeline systems.

Power, water, transportation, communication, sanitation and other services rely on a complex network of lifelines that are provided and maintained by a multitude of agencies. Resiliency of these networks is essential for minimizing human and physical losses from earthquakes. The creation of a "Lifeline Council" that represents the relevant agencies and has the task of reducing vulnerability to

earthquake can facilitate inter-agency coordination and raise awareness on the issue. One important role of the council would be to commission a seismic performance audit of lifelines in Amman.

Recommendation ER 4: Establish a Seismic Risk Mitigation Program to protect the cultural heritage of Amman

This area may be outside of GAM's mandate but it is important for the country as a whole. Jordan takes pride in its unique cultural heritage that constitutes the soul of the country. Earthquakes can represent a great threat to such heritage. This could be a long term program to protect historical sites, monuments, and the character of the neighborhoods of Amman.

6.4 Land Use Planning

This element presents the recommendations for the current land use planning process of GAM to become a means in reducing vulnerabilities and risk to natural disasters.

6.4.1 Considerations in Land Use Planning and Disaster Risk Reduction

The intensification of land uses and densification of settlements in GAM through the years have led to the exposure of more people and assets to natural hazards such as floods, landslides and earthquakes in the different parts of the metropolitan area. This intensifying land use pattern and demographic change are trends that will continue in the coming years. For instance, the population of GAM is projected to rise to about 6.5 million people by 2025 or in 17 short years.[22] Due to the young population of GAM, the population momentum will continue this trend in the next decades to come.

Amman is also host to thousands of refugees and thousands of workers who regularly commute from surrounding municipalities. For example, an additional 50,000 workers from the municipality of Zarqa is projected to commute daily to GAM by 2025.[23] This burgeoning population will likewise increase the requirement for more social services, facilities and housing and thus more buildable lands. The projected number of dwelling units required by 2025 is 1.3 million units.[24] These land use and demographic phenomena will be reinforced by the process of rapid urbanization as the metropolitan capital strives to become a regional center in the Middle East-North Africa (MENA) region.

6.4.2 Rationale for Reducing Disaster Risk through Land Use Planning and Environmental Management

Years of diverse and changing land uses are a fertile ground where risk can accumulate. In a complex agglomeration like Amman, inappropriate land use choices made in the past and being made in the present are pathways to various types of vulnerabilities to natural hazards and disasters. This chronic situation of risk generation and accumulation is very visible now in modern-day Amman.

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[22] The Amman Plan, Metropolitan Growth, 2008. Published by GAM.
[23] Ibid.
[24] Ibid.

In some parts of the metropolis, organic, uncontrolled growth and development show the lack of benefits of urban planning and disaster risk management. An example is the current built-up areas located in landslide-prone hillsides in GAM. Haphazardly constructed and substandard buildings exist in the city. Environmental degradation exacerbates the vulnerability of residents to disasters as urban sprawl eats up the surrounding countryside and pushes the city's carrying capacity to its limits. Flood and earthquake disasters in Jordan have diminished the gains made in development, destroyed livelihoods, and claimed the lives of thousands throughout the history of the City. The threat of a major earthquake is a reality that cannot be ignored.

Such cross-cutting issues become development issues as increasing vulnerability and risk of people and cities to disasters can hold back and even reverse socio-economic progress. Addressing these issues within the context of land use planning can effectively and efficiently decrease the exposure and vulnerability of people and assets to disasters. Therefore, DRR should be rooted in the regular practice of land use planning of GAM. As such, it is a long-term undertaking. And long-term impacts of DRR can only be ensured and sustained if it is embedded in the planning authority and system of the local government.

6.4.3 DRMMP Recommendations for Land Use Planning

The goals of land use planning are broad, encompassing not only an integrated management and development of land resources but also to achieve an optimum land use pattern consistent with the principles of sustainable development. Land use planning also includes water use management to complement sustainable resource utilization.

By systematically mainstreaming disaster risk objectives and parameters in the different scales of land use planning undertaken in Greater Amman Municipality, improvement of the quality of life and environment as well as the creation of safe and healthy communities will be ensured. This set of recommendations echoes the Hyogo Framework For Action, Priority #3: Reduce the underlying risk factors. Thus, these recommendations pertain to the sustainable use and management of ecosystems, including the built environment, by encouraging the use of risk assessment studies as basis for land use planning to reduce risk and vulnerabilities.

Moreover, structural and non-structural measures such as the protection of critical facilities and infrastructures as well as cultural heritage areas and fragile natural landscapes are included in the recommendations. Lastly, the mainstreaming of disaster risk consideration into the planning practice and process is promoted by recommending the use of planning tools at different planning scales and the development of guidelines for reducing risk in the context of land use planning in GAM.

Recommendation LU 1: Apply the results of seismic risk assessment in the ongoing completion of the component plans, i.e. area plans, community plans, corridor plans, sector plans, of the Amman Plan.

The ongoing completion of the component plans of the Amman Plan should be taken as an opportunity to integrate seismic risk assessment in planning. The integration of risk factors in the spatial and land use planning of the Metropolitan Planning Area of Amman will further enhance the sustainability of its project urban growth and development as proposed in the Metropolitan Growth

Plan (MGP). One way to start mainstreaming disaster risk parameters in the practice and process of land use planning is to immediately utilize the results of the seismic risk assessment study in the process of land use planning.

The MGP recognizes that Greater Amman will experience more pressure to expand vertically and horizontally due to a bourgeoning population, increasing demand for housing, low-density residential developments leading to urban sprawl, and influx of foreign investments triggering a building boom that could distort land and housing markets, among others. In view of this, the MGP provides a general spatial planning framework anchored on smart growth. This smart growth framework promotes the policy of intensifying and expanding existing communities to become socially and environmentally cohesive and financially pragmatic.

At present, Area Plans and their concomitant zoning bylaws are being developed for the eight Planning Areas within the city. Planning Areas were delineated on the basis of a combination of criteria such as development pattern, physical boundaries, and neighborhood boundaries, among others. This presents an opportunity to use the seismic risk assessment as one of the bases for planning at a more detailed planning scale. Safe growth principles will then be included in the smart growth planning and management framework.

Integrating seismic risk factors should be an initial step towards the incorporation of disaster risk factors in future land use and urban development plans of GAM at the various planning scales identified by the Amman Plan. A multi-hazard approach would be ideal because GAM is not only prone to earthquakes but is also exposed to other natural hazards as landslide and flood.

Recommendation LU 2: Revise the Amman Zoning and Building Regulations to include provisions that will mitigate and prevent the potential impacts of future natural disasters.

Land use planning is a process by which cities set goals and objectives and devise strategies to guide future urban development. Land use planning also offers an array of tools and techniques on how to treat risk. Growth management, zoning, urban redevelopment, and environmental management are a few of the planning strategies that can be utilized individually or in combination to mitigate hazards and vulnerability. The pending revision of the existing Amman Zoning and Building Regulations will provide a venue to integrate seismic risk factors in development controls and regulations in the zoned territories of GAM.

Moreover, the preparation and adoption of the Area Plans (and their respective zoning bylaws) and Community Plans will take time and urban development will surely continue in the meantime. An important issue to be addressed therefore is how to regulate new development and deal with existing vulnerable structures in the city at the same time. The Amman Zoning and Building Regulations may be used as valuable tool to support socio-economic development decisions by allowing hazards to be mitigated when new development takes place and by minimizing future disaster damage and losses to existing structures.

At the zone level, the revision of the zoning regulations should include a continuum of land use controls and provisions that reflect the degree of risk of a particular zone. As risks increase, controls and restrictions on the use and development of land should also increase. Zoning regulations can become more permissive as the overall risk level becomes lower.

At the site level, the revision of the Amman Zoning and Building Regulations may include other regulatory tools in the form of project development review and environmental impact assessment for specific critical projects and locations to ensure that such projects incorporate risk parameters.

The choice of planning tools would depend on the underlying risk parameters and the type and scale of vulnerability of elements exposed to the hazard.

Zoning of the "unzoned" lands should likewise be initiated and coordinated in conjunction with the upcoming revision of the zoning regulations.

Recommendation LU 3: Formulate guidelines on the preparation of lower-level plans such as area and community plans that specify the integration of disaster risk factors in the land use planning process.

Several Area Plans and numerous Community Plans are being prepared and will be developed in the future for the different parts of the city. It will be pivotal for GAM to issue the necessary guidelines to make sure that the preparation of such plans will incorporate risk parameters in the land use planning process.

Guidelines on integrating risk factors into the planning process will be very helpful to land use planners who are not familiar with the concept of risk, risk assessment and disaster risk reduction. Planners will also benefit from the issuance of guidelines and/or guidebooks by providing specific procedures and standards in the practice of mainstreaming disaster risk reduction in land use planning. Additional benefits of such guidelines are the assurance that lower-level plans will be vertically linked to the MGP as well as ensure that all Planning Areas will be horizontally linked to one another.

Recommendation LU 4: Delineate hazardous areas and identify high-risk structures and populations in GAM based on risk assessment studies and consider such information whenever land use decisions are made. Related to this is the conduct of a zonation study for GAM.

Hazardous areas and vulnerable structures and population groups in GAM should be identified, assessed and mapped at the level of Area Plans. The physical vulnerability of structures is related to substandard buildings that have been built without the appropriate earthquake protection provisions, putting many people at risk in the event of an earthquake. Many population groups in Amman are likewise inherently vulnerable due to their age (i.e. Amman has a very young population), gender and ethnicity (i.e. refugees living in Amman). At the same time, capacity assessment of the different vulnerable population groups should also be conducted.

This will mitigate disaster losses and casualties, avoid resulting social, cultural and economic dislocations resulting from future disasters, and also help reduce costs spent on disaster response and

recovery through pre-identification of at-risk populations and areas in the city. A policy to promote disaster insurance by targeting at-risk properties should be formulated to support this objective.

As for the zonation study, local authorities typically enact zoning ordinances in order to enforce the parameters of physical planning and development. Such regulatory instruments can include provisions for hazard reduction, vulnerability reduction, and disaster management. However, often the effectiveness of such regulation depends on the quality of the technical information on hazards, vulnerability and risk. For this reason, engineers suggest the use of so called "zonation" studies. These studies are typically probabilistic risk analysis studies but with a resolution suitable to be included in the land use plan. They also include recommendations for reducing hazard-driven vulnerability and risk.

The problem is that planners often do not understand the technical character of these parameters. Zonation studies thus seldom find their way into land use and urban development plans. This weakness in competence, however, should not negate the potential of zonation studies to reduce exposure to hazards and risk in the built environment in the long term, as well as the potential of education and increased awareness that they create within institutions, and all concerned stakeholders involved in city planning and development processes.

A zonation study should be undertaken as a follow-up to the seismic risk assessment study conducted for GAM. Since Area Plans are now in the process of being prepared, it should be at a resolution compatible at the least with Area Planning and should provide recommendations for linking earthquake risk reduction to land use and urban planning strategies at that scale.

Recommendation LU 5: Formulate land use and development controls and restrictions in high-risk areas to assure that new construction meets structural and life safety standards as well as abate hazards posed by existing buildings, critical facilities and infrastructures.

Abatement of structural and nonstructural vulnerability through development restrictions will minimize casualties and property losses from natural disasters. Land use restrictions in such areas may include building density and population density regulations. This objective is aligned with the Construction Safety and Practice and Earthquake Resiliency element.

These planning strategies in identified high-risk areas can then be implemented as additional restrictions through various means such as overlay zoning, area-specific building standards, retrofitting requirements for critical facilities and high risk buildings, population density regulations, subdivision regulations, site design standards, performance standards, financial incentives and taxation, and others. These development controls can be part of the Amman Zoning and Building Regulations at which covers the entire Metropolitan Planning Area. Once a more detailed, multi-hazard risk assessment studies have been done for GAM, including the seismic zonation study mentioned above, land use and development controls at the scale of the Area Plans can be formulated and aligned with the zoning regulations at the metropolitan scale.

Recommendation LU 6: Preserve the architectural character of buildings in GAM and enhance the likelihood of culturally and historically valuable structures to withstand future natural hazards like earthquakes.

Modern Amman is a result of the amalgamation of many layers of land use patterns throughout its rich and long history evidenced by its colorful urban fabric punctuated by cultural and historical heritage sites in its territory. Such cultural heritage sites have been identified in the Metropolitan Growth Plan and a Cultural Heritage Plan for these sites has been drawn. These national treasures should be protected from disaster damage by formulating and implementing a heritage preservation program in GAM that includes reasonable disaster risk reduction measures (e.g. retrofitting) to increase the chances of such invaluable sites to survive disasters.

Specific development controls and disaster mitigation measures in the Cultural Heritage Areas identified in the MGP can be immediately included in the revision of the Amman Zoning and Building Regulations as these are at the scale of metropolitan planning. Areas that fall within the Metropolitan Planning Area include town centers, historic and heritage districts, major heritage landscapes such as historic corridors (i.e. trails including landmarks that have been used for 200 years, connectors) and area landscapes (i.e. gardens, cemeteries, agricultural landscapes) as well as movable features that can be easily transported from one location to another.

Additional cultural heritage features should be identified in detail later at the scale of Area and Community Planning and development controls at that levels should also be formulated and aligned with the MGP and Amman Zoning and Building Regulations.

Recommendation LU 7: Promote the conservation of natural heritage sites in GAM by incorporating hazard-prone areas as protected areas.

The MGP outlines a Natural Heritage Plan to protect natural heritage areas such as forests, wadis, jabals, and other ecologically critical areas in the Metropolitan Planning Area. The plan takes into account the limitations on the type and location of future land uses and development in such protected natural areas. The MGP likewise acknowledges that potential natural hazards such as flooding, erosion, slope failure, and earthquakes threaten GAM. The Natural Heritage Plan of the MGP thus establishes policies to limit the development in areas with hazard potential, steel slopes, ridges and wadis. The overall objectives of the land use policies for the Natural Heritage System are the protection, conservation, and enhancement of these natural features and ecosystems within a systems-based framework. Specific policies aim to minimize the risks associated with the abovementioned natural hazards.

To supplement these policies, land use and development controls in the identified Natural Heritage System should be formulated and included in the revision of the Amman Zoning and Building Regulations to ensure policy implementation. This will direct future urban development to appropriate areas.

As in the Cultural Heritage Areas, areas that are part of the Natural Heritage System should be further regulated by disaster mitigation measures. In the same manner, the Area Plans and their zoning bylaws should include detailed provisions for reducing disaster risk for the Natural Heritage System.

Recommendation LU 8: Establish a cohesive institutional and legal framework for urban planning and development that incorporates disaster risk reduction in its mandate.

Based on the recommendations of the Amman Plan, a new planning structure within GAM should be established in order to streamline the decision making process concerning all metropolitan planning matters, including zoning regulations. This proposed Planning and Community Economic Development Department should include in its mandate not only the aspect of community economic development in order to consolidate planning, development control (zoning and licensing) and economic development functions of GAM in one entity, but also the integration of disaster risk reduction in such functions which is equally important. This goal supports the policy of promoting planning that serve multiple objectives (i.e. social, economic, environmental objectives).

Duties and responsibilities of the staff and personnel of the proposed governance structure for land use planning should include the mandatory incorporation of disaster risk reduction objectives and parameters when formulating land use plans as well as integration of disaster risk management plans in the hierarchy of land use and urban development plans of GAM. The inclusion of disaster risk management in the proposed department as part of GAM's reorganization will reinforce and support the sustainable development goals of GAM and in line with long range urban planning and community economic development.

In addition to having such a mandate, there is also a need to strengthen the coordination of various departments within GAM that are involved either directly or indirectly to urban development (e.g. Engineering and Public Works). There is likewise the need to enhance inter-institutional coordination with national level agencies and civil society as indicated elsewhere in this report.

Meeting the overall goal of mitigating the impacts of natural disasters through land use planning needs extraordinary coordination and cooperation among city departments, national government and non-government organizations. A more coordinated approach is needed to be put in place at the soonest possible to enhance the overall effectiveness of plans and programs that aim to prevent and mitigate the impacts of natural disasters. This can be done even as the proposal to streamline the planning functions within GAM is yet to be implemented.

6.5 Training and Capacity Building

6.5.1 Rationale for Capacity Building in Disaster Risk Management

The implementation of the Amman DRMMP Framework requires different sets of knowledge, attitude, values, and skills and should address the needs of the different departments who will be involved in the DRR programs and projects to be rolled out. This means that GAM should devote time and resources and intensively engage in training and capacity development programs focused on specialized topics that will enhance the cognitive, affective and skills learning of its officers and staff.

The engagement of Cranfield University who provided such skills and knowledge courses in the field of disaster risk management at various levels, e.g. community, city and national level, is an important step towards organizational capacity and human resource development.

6.5.2 DRMMP Recommendations for Training and Capacity Building

Recommendation CB 1: Undertake specialized capacity building activities to fill in critical weaknesses in disaster risk management competencies in GAM and in the country. As a priority, undertake a training program to build the competency of staff of the DRMCSO in disaster management.

The staff of the DRMCSO and the Heads of the core departments at GAM needs to undertake a specific training in disaster management that would enable GAM to build the competency in the field, understand the basis of international standards, and build the elements for standard operating procedures of DRMCSO and the review of the departmental contingency plans. This training will enable the DRMCSO to be operational immediately. Further, such specialized capacity development program will be likewise made available to national government agencies as well as to civil society, the private sector, and other interested groups.

Further, to complement the training program being developed by Cranfield University, equally important training courses such as those discussed in Part 8 under Recommendations for Phase 2 will also benefit people from all levels within the GAM organization.

Please see Section 8.2 for more details regarding the proposed specialized training courses on **Risk-Sensitive Land Use Planning, City-Level Disaster and Emergency Management, and Safe Cities.** These training courses will be applied towards an international certification program for an urban disaster risk management specialist.

Recommendation CB 2: Equip local officials, planners, engineers, building officials and related personnel with the knowledge and skills to enhance their technical capacities and upgrade the organizational capacity of GAM to reduce disaster risk in identified critical competencies.

This is often the weak link for the implementation of DRR. Managers, decision makers and other officials in charge of operational issues in Amman should be more versed in the technical aspects of DRR in order to have confidence to undertake the DRMMP Framework and other DRR initiatives. Lack of or inadequate competency is stopping progress in DRR and is adding to the risk every day. There should be investment in systemic and systematic professional trainings of practitioners so that the standards of practice are improved mainly in emergency management, risk sensitive land use planning, construction, and community preparedness. See for instance Recommendation CS 5 on the need for a training for construction professionals.

Training courses that are geared specifically towards the use of the results of the seismic risk assessment and risk parameters are needed to be undertaken by GAM. Such courses are necessary to facilitate the process of DRM mainstreaming in the basic functions of GAM such as land use planning and urban development process.

Developing knowledge and skills in formulating gender-sensitive disaster risk reduction programs and initiatives should also become part of capacity development of local officials in order to address the special needs of the more vulnerable group in Amman and to be able to integrate this cross-cutting concern in all the appropriate areas of intervention.

See further recommendations on this under Recommendations for Phase 2.

6.6 Research and Development, Knowledge Management, ICT and Human Resources

There has been a broad recognition in Jordan of the need for advancing research and development, building ICT capacity and develop a community of practice. Prudent steps have to be taken in developing a concerted research and development program and developing the necessary human competency and ICT infrastructure such that losses from disasters in Amman are more widely understood and risks are addressed. Many of the recommendations provided in this section will fall under the responsibility of the new Disaster Risk Management and Citizens Safety Office (DRMCSO) that was recommended to be created as a focal agency for disaster management in the city of Amman. However, other are most of the realm of national policy and have national implications.

6.6.1 Rationale for Promoting R&D and Knowledge Management for DRR

Disaster risk reduction is complex, and it takes time, effort, resources, research, and training to assimilate disaster risk reduction in city functions and ongoing operations. Deficiencies remain throughout Amman in terms of inter-institutional coordination, incident command and control, human and ICT resources for response, relief, recovery, and rehabilitation practice following urban disasters. The lack of an organized community of practice and acceptable standards of practice is also resulting in a dispersion of effort and an ineffective use of resources. Promoting research and development, knowledge management and developing human and ICT capacity will enable Amman in understanding and implementing the options that are available to them for managing risks and for planning and implementing urban DRR. This element of the DRMMP reviews the current practice and makes recommendations for improving processes related to creation of knowledge and resourced in DRR. The following recommendations are based on the participatory workshop with stakeholders in Amman, and are intended to help the DRR scientific and practice community in Amman develop a coordinated strategy for its research and development efforts; organize knowledge management and sharing; and use ICT to help manage, mitigate and reduce disaster risk in Amman.

6.6.2 DRMMP Recommendations for Research and Development

Recommendation RD 1: Develop performance targets and indicators to assess effectiveness of DRM policies and to establish benchmarks to measure progress.

An important area for research and development are monitoring and evaluation methods specifically for disaster risk reduction (DRR) that include the scope and complexity of DRR as a comprehensive approach to reducing vulnerability and threat of disasters. These kinds of studies are critical as a way

of implementing effective research, such as the seismic risk assessment for GAM into practical DRR initiatives. Indicators are an effective means for establishing policy and for setting up guidelines for rational decision making and for measuring progress. Indicators are also powerful tools for risk communication and for relying complex scientific aspects of risk in a very simple way that policy makers and layman alike can understand. Several cities have incorporated indicators in their DRM systems including Istanbul, Bogota, Barcelona and others.

Recommendation RD 2: Coordinate and advance the knowledge and ability of institutions and organizations in Amman to accomplish mainstreaming.

Research and development activities should be coordinated with a broader group of stakeholders in Amman to link disaster risk reduction to the multi-faceted aspects represented by the respective actors, experts and authorities in these areas. Scientific community could be of great help to city officials and managers in terms of linking the technical aspects of DRR to the managerial ones. Ensuring better coordination with scientific and technical community working on the different aspects of DRR is critical to achieve mainstreaming and should be undertaken as part of the mission of the DRMCSO.

Recommendation RD 3: Scale up the funding for research and development in DRR.

Research and development is a typically a long-term, low-visibility process and funding resources are stacked against it. Even though disaster risk reduction is not primarily a humanitarian issue, governments are typically more responsive to emergency appeals than to requests for DRR. The country will benefit from a National Earthquake Risk Reduction Program similar to the National Earthquake Hazard Reduction Program (NEHRP) in the USA that coordinates research in the earthquake field and channels outputs towards specific producing tools for disaster risk reduction through better coordination and cooperation between the national research institutions including universities.

6.6.3 DRMMP Recommendations for Knowledge Management

Recommendation KM 1: Develop a professional community of practice for disaster risk reduction in GAM and the rest of Jordan.

In order to establish a long-term strategy for organizing and sharing knowledge on DRR, the creation of an engaged community of practice that is in communication with each other should be promoted. A professional organization that can group various professionals, experts and researchers who deal with the various aspects of earthquake risk including social, legal, emergency management, engineering, architecture, land use planning, earth sciences, and public policy should be formed. This professional organization will enable the sharing of knowledge between the various disciplines and enhance the knowledge and practice of disaster risk management in the country. Members of such a professional society should include researchers, practicing professionals, educators, government officials, and building code regulators. Collectively, a professional community of practice can develop the necessary

critical mass to improving understanding of the impact of disasters on the physical, social, economic, political, and cultural environment, and advocate comprehensive and realistic measures for reducing the harmful effects of disasters. Collective action and active engagement will also help to contribute to DRR through activities such as participation in public policy debate and in public-private partnerships. The Earthquake Engineering Research Institute (EERI) which originated in California is a good example of a successful community of practice which has been able to assimilate and advance knowledge and influence policy decisions in DRR.

Recommendation KM 2: Create and support DRR knowledge networks.

A series of consultations, seminars and workshops should be developed between the scientists and professionals in the field, and the technical, managerial and policy making practitioners in the various institutions of Amman dealing with DRM. The networking meetings and forums should be thematic and tailored to the audience and to the level of responsibility and functions of the participants. While policy makers need only a high –level briefings, technical staff may need a more in-depth training workshops. This could be one of the activities of the DRMCSO as indicated in the section on legal and institutional arrangements.

Recommendation KM 3: Establish a common platform to organize and share knowledge on disaster risk management within GAM.

As a strategic approach to achieving disaster management objectives, knowledge management plays a valuable role in leveraging existing knowledge and converting new knowledge into action. Besides traditional knowledge sharing and networking mechanisms; such as workshops, seminars and conferences, the application of information technology to the human dimension of communication should be emphasized. The link between IT and Knowledge Management are interactive knowledge sharing tools which involve internet technology to facilitate the knowledge collaboration between the network members. The use of web-based knowledge management and discussion forums should be increasingly utilised. Acknowledging the need for a disaster knowledge networking platform to facilitate interaction and have simultaneous dialogue with all related expertise dealing with disaster management in Jordan. At an initial stage, EMI's existing knowledge management portal can be used as a tool to store, search, retrieve, disseminate and manage information related to disaster management**.** This should be an activity of the DRMCSO.

6.6.4. DRMMP Recommendations for Information and Communications Technology (ICT)

Recommendation ICT 1: Use information and communications technology to disseminate knowledge on hazards, vulnerability and risk both among institutions and in the context of public awareness.

Policies and technologies that facilitate the dissemination of hazards and risk information among institutions and to the general public will help create an educated constituency and improve the preparedness level. Disaster risk management is not the business of government alone. It concerns the whole nation. Facilitating public access information portals, or facilities to professionals,

educators, and community leaders is an effective way to raise awareness and self sufficiency The wider public use of information and communication technologies can and should lead to an increased access by the general public to risk management information. The applications offered by the latest information technology provide a powerful interactive working tool for the extended disaster risk community. This should be an activity of the DRMCSO.

Recommendation ICT 2: Use multi-media technology to scale up disaster risk management education.

The training and capacity building program in Amman should leverage multi-media e-learning technology to scale up the outreach effort and in providing access to cutting edge knowledge on disasters. Existing popular applications of this technology can be used for disaster education and knowledge dissemination. For example, the World Bank Institute (WBI) offers this self-study course modules disaster management education and training based on e-learning technology.

Recommendation ICT 3: Promote more active use of satellite, remote sensing, GIS and wireless technologies.

GIS and Remote sensing and satellite technologies should be made better use of in Amman in order to develop more accurate inventories of exposed assets in the pre-event phase. GIS and RS technologies can also be employed to facilitate disaster risk integration the land use planning and monitoring processes of local authorities, local technicians and development project managers. Geospatial technologies should be fully integrated to enhance the response, preparedness and mitigation capacities of GAM to natural disasters. The potential for the application of GIS and RS should be investigated on a range of issues such as disaster management, risk prevention, peace keeping operations, post-conflict reconstruction, environmental rehabilitation and social and economic development. This could be a focus area of research under the suggested National Earthquake Risk Reduction Program.

7.0 PROJECT MANAGEMENT

The DRMMP Framework discussed in the previous section provides in broad strokes the overall goals and objectives of an integrated agenda towards reducing the vulnerabilities to and risk of natural disasters to GAM. This general roadmap will steer the direction of GAM towards enhanced capacities and competencies in disaster risk management, improved local governance processes by mainstreaming DRR in its core functions and operations such as land use planning and infrastructure development, and strengthening its emergency management organization.

It is recommended that the process of DRMMP, with the DRMMP Framework as its solid basis, be further continued in order for the Framework plan to be fleshed out, with specific Implementation Work Outputs (IWOs) being identified by the stakeholders of GAM. This is discussed in detail in Part 6.

At this stage of the DRMMP process, the execution of the DRMMP Framework will require certain resources and tools to be established and put in place. These recommendations for project management are intended to provide guidance to GAM for carrying out the abovementioned recommendations.

7.1 Human Resources

In a capsule, human resource development is fundamental in undertaking any of the elements of the DRMMP Framework of Amman. Core competencies in DRM within GAM should be cultivated immediately and nurtured in the long term. The first priority is to build the human resource capacity and the competency of the DRMCSO and the DRMSC in the field of disaster management and specific standards for emergency management. Further, GAM is still in the formative stage in many competency areas necessary to sustainably develop and implement disaster risk management in the city. By setting up the DRMCSO and the DRMSC, GAM would create the foundation for further strengthening its DRM human resources in the context of the involvement of the DRMCSO staff with other departments and units within GAM and its activities with other stakeholders and communities. The DRMCSO will elevate the DRM knowledge within the operations and functions of GAM and will promulgate the international standards for disaster management as discussed in Part 6 of this document.

Aside from building technical capacities within GAM for its decision makers, officers and personnel, there is also a need to develop organizational capacities and structures through which capacity building in DRM can be institutionalized and sustained. Such organizations and structures are recommended and discussed in Part 6.

Lastly, inter- and intra-institutional coordination should be part of this aspect of project management. The implementation of the DRMMP Framework cannot be done only by the proposed DRMCSO. It entails enacting policies that promote transparency, information sharing, cooperation and collaboration of the different units and departments within GAM as well as with national government agencies of Jordan.

7.2 Sustainability Mechanism

One sustainability mechanism that has been proven to be effective in implementing a city's DRMMP (such as in the case of Metro Manila and Kathmandu) is the use of focus groups. Focus groups can be organized around each element of the DRMMP. In the tradition of the focus group method, a focus group is a loosely structured group that may be inter-agency so that it benefits from the inputs of representatives from the local, regional, and national government organizations. In addition, it may be a multi-sectoral and inter-agency group with representatives not only from the national government and GAM but also from the academic, civil society, and private and business sectors. The focus group can become a venue for inter-institutional collaboration among the members and the organizations they represent. As a focus group, it is relatively homogenous with common needs and agenda that engages in flexible, open discussions but always focusing on local perspectives and experiences in disaster risk reduction as these relate to the particular DRMMP element of the group. The organization and management of the focus groups can become an integral function of the DRMCSO.

Aside from conducting roundtable discussions related to the DRMMP elements, the focus group could become a valuable resource in program planning and decision-making. For instance, the proposed training modules may be validated by the concerned focus group through a validation workshop and provide inputs necessary for target group analysis and in content development. In the future, a focus group may also become a resource and mechanism of the monitoring and evaluation system, specifically the feedback process, while implementing the DRMMP Framework. In this manner, the focus groups can then be involved in the future iterative planning activities to update the Amman DRMMP.

Focus groups could also turn into champions of DRR within their respective organizations and become a means to raise disaster reduction awareness, appreciation and commitment, a mechanism to generate political will among decision-makers and a vehicle to initiate and sustain the process of mainstreaming DRR into their respective organization's regular functions and practices.

In GAM, several Focus Groups are recommended to be organized around the DRMMP elements discussed above to analyze and explore opportunities and challenges for each of the following thematic areas: (1) Research and development (R&D) and information and communication technologies (ICT), (2) Land Use Planning and Urban Development, (3) Training and Capacity Building, (4) Emergency Management and Social Mobilization, and (5) Legal and Institutional Arrangements for DRM.

The existing focus groups that have been established by the project to address the different aspects of the project may be reorganized around the abovementioned thematic areas to provide continuity and to further strengthen local ownership over the DRMMP.

8.0 FUTURE WORK IN GREATER AMMAN

8.1 The DRMMP Process

The concept of Disaster Risk Management Master Plan has been fully discussed in Section 2.4. Figure 1 shows graphically the process of developing a Disaster Risk Management Master Plan of a city such as Amman. The process has four distinct phases plus a competency building component and peer-to-peer sharing component.

The original scope of work proposed by EMI at the onset of this project envisioned the undertaking of the full components of DRMMP. However, in the discussions between UNDP-Jordan, UNDP-BCPR and EMI, a reduced scope of work was agreed upon due to the limitations in the budget and other overall project priorities. In particular, it was agreed to limit the goal of the study to developing a "DRMMP Framework" for the City, one which will provide the overall road map for disaster risk management in Amman but not necessarily lead to selected set of prioritized action items for project implementation. The difference resides in the following components which were left out from the scope of work in the first phase of the project:

- Development of Implementation Work Output and an overall DRR Strategic Plan Component

  This component reduces the large set of DRMMP recommendations to a specific and well limited set of disaster risk reduction project elements that can be undertaken in the short term to raise the full practice of disaster risk management in the city. These elements are referred to as Implementation Work Outputs (IWO's).

- Competency and Training Component

  This component concerns undertaking specific training and competency building activities that enable the staff and managers of GAM to understand, manage and implement the DRMMP and take it to the next step. The priority is in training the staff of the DRMCSO and other Heads of departments and units in standards for emergency and disaster management and in building operating procedures for the DRMCSO as well as the inter-departmental plans and the contingency plans.

- Information Technology Component

  This component concerns the development of information technology tools that enable the dissemination of hazard, vulnerability and risk elements in a web-based user friendly environment where they can be used for various purposes such as public awareness, response and recovery planning, drills and simulations, land use planning and urban development planning.

While agreeing on the reduced scope of work, EMI has always stated that this scope would be incomplete in terms of accomplishing the goals of the project and would fall short in terms of

operationalizing the outcome of the study. The completion of all the components of the DRMMP is a necessity of the analytical model. A framework by itself is an incomplete outcome to expect improvements in DRM practice and . Thus EMI recommends that the work be completed in a second phase of the project in order to actually reach its original objectives and full benefits of the project to Amman and the rest of the country.

8.2 Recommendations for Phase 2

Phase 1 of the project reached significant accomplishments in terms of understanding of earthquake risk to Amman, raising awareness of institutions, risk communication and competency in disaster risk management. However, one of the weaknesses of the project resides in the lack of involvement of the officials from GAM during the project undertaking. This project is about providing GAM with a disaster risk management master plan. The premise is that the Kingdom of Jordan cannot achieve a competent level of disaster risk management in the country if the public and private institutions that manage its capital city Amman do not have the competency for disaster risk management and have not mainstreamed DRM into their functional, operational and planning processes. This is fundamental in terms of modern disaster risk management practices. Thus, the scope of Phase 2 should focus on activities and tasks to accomplish this goal by completing the activities that were specified in the original scope of work proposed by EMI.

Phase 2 Activity 1: Support to Establish the DRMCSO and the DRMCS

It is essential that the proposed DRMMP framework be evaluated by the GAM authorities and its elements be institutionalized with GAM. This is envisioned to be under the newly established DRMCSO. This task consists of supporting the set up of the DRMCSO through the definition of its mission, standards operating procedures and coordination mechanisms and the training and development of its staff. The DRMCSO is expected to be the key partner in the development of the next phase of the DRMMP.

Phase 2 Activity 2: Development of a Strategic Disaster Reduction Plan and Related Implementation Work Outputs

This activity consists of a series of workshops and consultations among key departments of GAM and their staff and managers to analyze the recommendations provided in the DRMMP and develop a set of prioritized Implementation Work Outputs (IWO's) that represent the consensus action plan for DRR in GAM. The process includes consultations with the policy makers including the mayor. This activity is also an opportunity to educate and raise their awareness on DRR and to clamor for institutional ownership and commitment of GAM. Such ownership process must take place in order to ensure long-term sustainability for DRR.

The activity will be undertaken with the close involvement of the staff of the DRMCSO. The task will also include the restructuring and consolidation of the Focus Groups around the selected IWO's to ensure continuity of project planning and transfer of knowledge to the local and national entities in the country.

Phase 2 Activity 3: Competency Building

As indicated previously, the aim of the competency building program is to undertake specialized capacity building activities to fill in three critical weaknesses in disaster management competencies in GAM and in the country. The suggested training program will incorporate both face-to-face and web-based training that would be sanctioned by a certificate for those who complete the training.

Training in City-Level Disaster and Emergency Management

At the city level, disaster management professionals need to have specific competencies that are tailored to the role and responsibilities of local government and local authorities in disaster and emergency management. These competencies are meant to be acquired by the proposed DRMCSO within GAM. They are intended to equip GAM with the structures and capabilities to respond and recover from major emergencies and potentially disastrous event by linking them directly to GAM operations and functions. They will complement those of the national agencies such as the General Directorate of Civil Defense.

Training in Risk Sensitive Land Use Planning

It is critical that land use, urban planners, environmental planners and other planning professionals be trained in the concepts and techniques that linked disaster risk management to physical, urban and developmental planning. This training will be on risk-sensitive land use planning and will provide concepts, techniques and case studies to understand the interaction between land use planning and disaster risk management.

Training in Safe Cities

This specific training module would provide training to GAM professionals and other practitioners on how to mainstream disaster risk management within a city's operations and functions. It starts from the understanding of hazards, vulnerability and risks and their incorporation in city planning processes. It provides examples and case studies from other cities.

Phase 2 Activity 4: Risk Communication and Information Technology for Risk Communication

The outputs of the risk analysis undertaken by Seismic risk assessment team University Team are relevant to many aspects of disaster risk management. The access to hazard, vulnerability and risk information is necessary for awareness raising and preparedness, pre-event response planning, preparations of drills and simulations, contingency planning, physical and land use planning, resource management, and construction standards, among others. Developing a risk aversion culture among institutions and citizens requires an understanding of risk and vulnerability parameters. Unfortunately, the risk outputs from the Seismic risk assessment study are difficult to interpret and typically accessible to the experts only. That limitation in access significantly impairs their usability and value.

This task will enable the inclusion of relevant hazards, vulnerability and risk parameters from the Seismic risk assessment study and other available data to be incorporated into an indicator-based system which can be used as the platform for developing a risk communication and planning tool and help communicate urban seismic risk by providing a relative comparison of not only the expected physical damage, but also the social fragility and lack of resilience in the different districts of GAM.

A web-based Geographical Information System (GIS) that is user friendly and accessible to experts and non-experts alike will also help communicating the results of the seismic risk assessment to a greater audience. The web-based GIS Viewer application will enable users to access the information they need in a format they want without having a GIS software on their own computers or being an expert in risk assessment or GIS technology. A simple training on the manipulation of the GIS viewer technology will be included to ensure that the various agencies will have the competency to use the system. The technology would be password protected so that to restrict its access only to these individuals who have authority to access the information.

Phase 2 Activity 5: Monitoring and Evaluation

An indicator-based system should be developed to assist city officials in decision making , in monitoring key indicators, and in evaluating the performance of Amman in disaster risk management.. Such a tool will also help enhance stakeholders' ownership and assist in policy development, decision-making, and assessment of the effectiveness of specific risk reduction options. This scope of work for an eventual Phase 2 of the project is indicative only. EMI will be pleased to detail the scope, budget and timeline for implementation of Phase 2 upon request from UNDP-Jordan.

ANNEX A

MATRIX OF THE AMMAN DISASTER RISK MANAGEMENT MASTER PLAN FRAMEWORK

DRMMP Element	Recommendation	Rationale
1. Legal, Institutional and Organizational Aspects *The national body has to be strengthened to fulfill its strategic oversight and resource support roles in the DRM process and integrate and coordinate efforts and institute a coherent approach on disaster management. DRM efforts should be decentralized at the local level in order to be effective and to align with the international standards of practice in disaster risk management.*	**Recommendation LI 1:** Align the national legislative and institutional system for DRM to conform to the HFA	Considering that the Hashemite Kingdom of Jordan is a signatory of the HFA, and that the HFA is a de-facto international standard for DRM that is recommended by the United Nations and supported by most international organizations and countries in the world, it is imperative for Jordan to align itself with these standards by reforming its DRM institutions and legislative system. A review of the national legislative and institutional system for DRM modeled after the HFA is suggested.
	Recommendation LI 2: Review and Update the NDRMP 2004.	One of the priorities of the nation is to review the National Disaster Risk Management Program (NDRMP 2004) which predates the HFA. The NDRMP should be brought in line with the recommendations and processes suggested by the HFA and by its companion guidelines "Putting Words Into Action", which provides the details of the process and initiatives that a country needs to put in place in order to implement HFA. The suggested legislative and institutional reforms and the review of the NDRMP 2004 will bring the country in line with the international DRM standards and practice.
	Recommendation LI 3: Delineate roles and responsibilities of DRM actors from national to local to improve inter-institutional coordination.	To ensure that there is no duplication of functions and responsibilities, it is necessary to clearly delineate the roles of various stakeholders from national agencies to the sub-national and local institutions (including GAM) and to define the role of civil society and international partners in DRM.
	Recommendation LI	Modern disaster risk management practice

DRMMP Element	Recommendation	Rationale
	4: Establish a new DRM and Citizen Safety Office (DRMCSO) within GAM as a focal point organization for disaster risk management, citizens' safety and social mobilization with legal authority, responsibility, human and financial resources, training and support.	calls for an important role of local authorities which should have the competency for disaster management to support and complement the duties of the national authorities. The DRMSCO will serve as a focal point organization for disaster risk management and will also have broad mandate over citizen safety and social mobilization within the city's organizational structure and day-to-day governance functions. It would be responsible for supporting the various departments in preparing their departmental emergency plans and for understanding the risk reduction policies and actions relative to their functions within GAM. It would also be responsible for inter-institutional coordination within national agencies as well with preparedness and awareness activities. The DRMCSO will also act as the technical arm of the GAM Disaster Risk Management Standing Committee.
	Recommendation LI 5: Create a Disaster Risk Management Standing Committee (DRMSC) at GAM.	A policy advisory body to GAM on all matters pertaining to DRM and citizens' safety issues in the city is necessary. The DRMSC will pursue an action agenda which advances the mainstreaming of DRM in various GAM sectors, functions, and programs. Regular meetings will build common understanding and more effective cooperation among key organizations, promote ownership of disaster risk reduction strategies and specific DRR actions by individuals and institutions, and constantly reinforce DRM mainstreaming in GAM functions and priorities.
	Recommendation LI 6: Create a legal instrument to institutionalize the functions, roles and responsibilities of the	An appropriate legal instrument needs to be enacted to serve as basis for the creation of the DRMCSO in consultation with GAM senior officials, GAM Legal Office and the GAM City Council.

DRMMP Element	Recommendation	Rationale
	DRMCSO.	
	Recommendation LI 7: Develop the organizational chart, job descriptions, vision and mission of the new DRMCSO and its relationship to the national DRM institutions.	It is important that senior officials of GAM actively participate in developing the organizational chart, job descriptions and the vision and mission of DRMCSO with the advice of specialists in the field. The size and composition of the DRMCSO shall depend on the needs of GAM as determined by GAM senior officials.
	Recommendation LI 8: Provide adequate funding for the operation of the DRMSC and DRMCSO.	The scope of duties and responsibilities of DRMSCO staff, identification of DRM programs and projects and the necessary funds should be made available as part of GAM annual budget.
2. Emergency Management, Disaster Preparedness and Awareness and Social Mobilization *An Emergency Management System should encompass all organizations, agencies, departments, entities and individuals responsible for any aspect of emergency or disaster management, including those already in place.* *Building broad alliances and partnerships among the different stakeholders such as national government agencies, local government authorities, NGOs, civic groups, professional organizations, business*	**Recommendation EM 1:** Create an Emergency Management System which is comprehensive and based on professional standards.	Despite the important efforts undertaken by the Greater Amman Municipality to improve its capabilities for emergency response and management, these actions lack operational efficiency and are not in line with the international standards for emergency management such as those established by IAEM. The Emergency Management Program for Amman needs to be thought of as a city wide System that provides for management and coordination of all preparedness, response and recovery activities for all hazards, as well as being responsible for inter-institutional coordination and resource mobilization.
	Recommendation EM 2: Equip DRMCSO with a Basic Plan and Concept of Operations as part of the framework for the Emergency Management System.	While GAM has prepared a contingency plan for certain types of disasters, the current plan does not incorporate the newly developed earthquake risk scenarios nor all the elements of the proposed Emergency Management System. The "Basic Plan" will outline the functional processes to improve safety and welfare of the population. It is the core element of the city's Emergency Management System. This recommendation is cornerstone to complying with international emergency management standards.

DRMMP Element	Recommendation	Rationale
sector, religious organizations, and other sectors of the society are crucial in effective emergency management. Such coalitions should be built on the basis of mutual benefits of partners and should be of a decentralized structure.	**Recommendation EM 3:** Complete a revised Contingency Plan, with the participation of all relevant entities, for the City of Amman.	Effective contingency plans reflect analysis of disaster scenarios based on likely hazard events and the damages and losses to be caused by these, given the vulnerability of local communities and infrastructure and services. Scenario analysis is also needed in order to list the actions to be undertaken such as the pre-positioning of resources within sectors likely to be heavily impacted and designation of appropriate evacuation routes and sheltering sites.
	Recommendation EM 4: Test the contingency plan through exercises and drills on a regular basis.	The plan should be regularly tested through simulation exercises developed by professional emergency managers to assess its efficiency and to ensure that the various responsible parties including policy makers understand the plan and can implement it.
	Recommendation EM 5: Develop the competencies in disaster risk management of the new DRMCSO.	A specialized training program based on international standards and the results of a training needs assessment to define the specific needs and environment of GAM and the new DRMCSO staff is a must in order to strengthen this institution and their capacities to build resilience to disasters.
	Recommendation EM 6: Strengthen the municipal capabilities for effective response and recovery operations.	The program should include specialized and standardized trainings for such emergency operations as search and rescue; field damage and needs assessment, standardized data collection and information flow, shelter organization and management, food and water provision, health and sanitation and social infrastructure.
	Recommendation EM 7: Provide training and guidance to GAM departments on emergency planning in order to develop their own standard operating procedures	It is essential that the departments involved in emergency preparedness within GAM understand the overall emergency management process for the city and their respective role into it. It is also important that they comprehend the implications of the scenario for the city and use it in developing

DRMMP Element	Recommendation	Rationale
	and departmental annexes to the contingency plan, in accordance with the updated contingency plan and in light of the earthquake damage scenario.	their own departmental plans and identification of resources needed to cope with disasters. This training should be based on internationally recognized emergency management standards of practice.
	Recommendation EM 8: Develop a Management Information System to provide for the organization, analysis, and flow of information among all key players in the Emergency Management System as well as communication and dissemination of emergency public information to the populace.	Access to good information for response planning and immediate intervention of the operations groups is an essential asset in a crisis situation. Information must be gathered, verified, analyzed, and summarized to provide the basis for life and death situations, for allocating materials, personnel, and equipment resources effectively, and for timely and realistic distribution of humanitarian assistance in the response and relief phase.
	Recommendation EM 9: Design and implement a comprehensive disaster awareness program including a communications strategy for Emergency Management.	Mobilization involves different levels and sectors of the society in order to enhance the disaster consciousness of the people, maintain support for disaster and emergency preparedness, and draw multi-sectoral and community cooperation towards the implementation of the DRMMP Framework of Amman. The different elements of the DRMMP Framework require a broad-based alliance building and community action in order to develop and implement effective disaster risk reduction programs and initiatives.
	Recommendation EM 10: Organize partnerships with various sectors and levels of the society such as schools, civic organizations, non-government	It is known from experience that community involvement, education and preparedness are rarely sustainable if they do not link to the structures of the local government. At the same time, the social networks and social support systems at the neighborhood level in

DRMMP Element	Recommendation	Rationale
	organizations, professional societies, volunteer groups, business sector, and the media based on a common disaster risk reduction agenda supportive of the Amman DRMMP Framework.	Amman are critical to the emergency management system. It is necessary to create linkage mechanisms to anchor community efforts to the local government, specifically to the DRMCSO, in order to help institutionalize emergency preparedness and response procedures and provide continuity and sustainability. Thus, social mobilization is an integral part of the emergency management System.
	Recommendation EM 11: Formulate a monitoring and evaluation system to review the effectiveness and impacts of the disaster awareness strategy of GAM.	There is a need for GAM to keep track and regularly assess the implementation and impacts of its social mobilization program against its expected outputs and outcomes. Constant monitoring and periodic evaluation will enable rectification of mistakes and more efficient use of resources.
3. Construction Standards and Practice **Construction Standards and Practice** *Dealing with the weaknesses in the building code development, implementation and enforcement is first a regulatory issue. It is also an essential priority element in the earthquake protection of Amman.* *At the same time professional competency is critical in ensuring that buildings are designed and build competently to*	**Recommendation CS 1:** Close the gap in the code implementation and enforcement process by ensuring that buildings are constructed according to approved drawings and specifications.	The construction code implementation process currently has a gap in terms of actual field inspection and control to ensure that the buildings are constructed according to plans and several measures can be done to immediately fill this gap.
	Recommendation CS 2: Update the provision related to Building Licensing in the Municipality Law No 29 of 1955.	The particular provision is, in our opinion, outdated and in contradiction with the Art.11.d.2 of the National Construction Law of 1993. Regulatory authority for licensing should encompass the engineering provisions of the Earthquake Prevention Code. This is essential to ensure regulatory authority over the full process of construction from inception to completion in all aspects of safety, and not only setting, architecture and sanitation as currently worded.

DRMMP Element	Recommendation	Rationale
resist earthquakes and other hazards. One must keep in mind that earthquake engineering is a specialized field that requires particular training.	**Recommendation CS 3:** Review the Earthquake Prevention Code in light of the risk analysis undertaken by the seismic risk assessment study team, including the provisions covering retrofit of existing buildings.	The risk assessment study has accumulated a significant amount of scientific information related to earthquake hazards, earthquake vulnerability and earthquake risk to Amman. It would be beneficial for the Jordanian scientists as well as the regulatory agencies to review this scientific information and to discuss it in order to generate a greater consensus on these parameters. Such consensus can then be reproduced in the code. It is also important to add provisions related to the evaluation and seismic retrofit of existing buildings as well as legal provisions to mandate seismic retrofit especially for non-complying critical facilities such as hospitals and emergency centers.
	Recommendation CS 4: Strengthen the field testing and field inspection system in Jordan.	Independent field testing is a requirement for materials such as reinforced concrete or steel and is an integral part of these construction technologies. Currently, there are testing firms in Jordan which undertake testing on behalf of the contractor or the design firm. However, there does not seem to be any regulatory oversight to ensure that these tests are reviewed and interpreted independently to ascertain respect with respect to code provisions and design specifications.
	Recommendation CS 5: Undertake specialized training and competency building in earthquake design and construction.	Earthquake engineering and its related technologies are specialized fields that are evolving rapidly. Most often, engineers, architects, contractors and other construction professionals are not trained on these specialized fields during their academic training. The training should also extend to areas such as post-earthquake damage evaluation of buildings, and post-earthquake repairs and rehabilitation of buildings.
	Recommendation CS 6: Establish a professional certification system for building and construction practitioners and	Putting in place a system of professional certification for architects, planners, engineers, and contractors would be a major step forward in terms of improving the standards of practice in the construction industry and making it competitive with the

DRMMP Element	Recommendation	Rationale
	professionals.	world's best practices. This should be seen as a long term goal, and should be modeled after countries that have a long standing tradition and experience for professional certifications such as the USA.
4. Earthquake Infrastructure Resilience *Achieving a resilient city is the ultimate goal of a sound disaster risk management program. First of all, critical infrastructure such as water distribution, sanitation, health care, power, communication and other lifelines should be protected; cultural heritage should also be included in the effort to make a city resilient.*	**Recommendation ER 1:** Establish seismic performance goals for new critical facilities such as hospitals, emergency centers, shelters and others that enable the City to recover faster from an eventual earthquake	Building codes typically assign a higher importance factor to essential facilities. While this is an important safety parameter, experience has shown that this by itself does not guarantee that these facilities would be operational after a major earthquake. Specific performance goals should be established that relate to the importance of the facility in emergency management and in relief and recovery. Some facilities are so critical that they need to be operational immediately after an earthquake (i.e., emergency centers and critical data centers for example); whereas others may not require such high standards.
	Recommendation ER 2: Establish seismic mitigation program for essential city services	Resiliency has to do with protecting services and ensuring that they are quickly restored after a major disaster. GAM should review the services it renders to the public in light of this criterion. It should engage into a discussion with other critical service providers to engage them into disaster risk reduction
	Recommendation ER 3: Establish a "Lifelines Council" to provide a mechanism for inter-agency coordination to reduce the risk to lifeline systems.	Power, water, transportation, communication, sanitation and other services rely on a complex network of lifelines that are provided and maintained by a multitude of agencies. Resiliency of these networks is essential for minimizing human and physical losses from earthquakes. Since these services are provided by many different agencies, it is suggested to create a Lifeline Council to coordinate the preparedness standards and requirements of these agencies.
	Recommendation ER 4: Establish a Seismic Risk Mitigation Program to protect	This is an area that may be outside of GAM's mandate but it is important for the country as a whole. Jordan takes pride in its unique cultural heritage that constitutes the soul of the country.

DRMMP Element	Recommendation	Rationale
	the cultural heritage of Amman	
5. Land Use Planning *In a complex agglomeration like Amman, disaster risk arising from inappropriate land use choices made in the past and being made in the present are pathways to various types of vulnerabilities to natural hazards and disasters. This chronic situation of risk generation and accumulation is very visible now in modern-day Amman.* *Such cross-cutting issues become development issues as increasing vulnerability and risk to disasters of people and cities can hold back and even reverse socio-economic progress.* *Addressing these issues within the context of land use planning can effectively and efficiently decrease the exposure and vulnerability of people and assets to disasters. The mainstreaming of disaster risk consideration into the planning practice and process is promoted by recommending the use*	**Recommendation LU 1:** Apply the results of seismic risk assessment in the ongoing completion of the component plans, i.e. area plans, community plans, corridor plans, sector plans, of the Amman Plan.	The ongoing completion of the component plans of the Amman Plan should be taken as an opportunity to integrate seismic risk assessment in planning. The integration of risk factors in the spatial and land use planning of the Metropolitan Planning Area of Amman will further enhance the sustainability of its project urban growth and development as proposed in the Metropolitan Growth Plan (MGP). One way to start mainstreaming disaster risk parameters in the practice and process of land use planning is to immediately utilize the results of the seismic risk assessment study in the process of land use planning.
	Recommendation LU 2: Revise the Amman Zoning and Building Regulations to include provisions that will mitigate and prevent the potential impacts of future natural disasters.	The preparation and adoption of the Area Plans (and their respective zoning bylaws) and Community Plans will take time and urban development will surely continue in the meantime. An important issue to be addressed therefore is how to regulate new development and deal with existing vulnerable structures in the city at the same time. The Amman Zoning and Building Regulations may be used as valuable tool to support socio-economic development decisions by allowing hazards to be mitigated when new development takes place and by minimizing future disaster damage and losses to existing structures.
	Recommendation LU 3: Formulate guidelines on the preparation of lower-level plans such as area and community plans that specify the integration of disaster risk factors in the land use	Several Area Plans and numerous Community Plans are being prepared and will be developed in the future for the different parts of the city. It will be pivotal for GAM to issue the necessary guidelines to make sure that the preparation of such plans will incorporate risk parameters in the land use planning process. Guidelines on integrating

DRMMP Element	Recommendation	Rationale
of planning tools at different planning scales and the development of guidelines for reducing risk in the context of land use planning in GAM.	planning process.	risk factors into the planning process will be very helpful to land use planners who are not familiar with the concept of risk, risk assessment and disaster risk reduction.
	Recommendation LU 4: Delineate hazardous areas and identify high-risk structures and populations in GAM based on risk assessment studies and consider such information whenever land use decisions are made. Related to this is the conduct of a zonation study for GAM.	The physical vulnerability of structures may be the result of utilizing substandard building materials and low quality of construction, putting many people at risk in the event of an earthquake. Many population groups in Amman are likewise inherently vulnerable due to their age (i.e. Amman has a very young population) and ethnicity (i.e. refugees living in Amman). Hazardous areas and vulnerable structures and population groups in GAM should be identified, assessed and mapped at the level of Area Plans. Zonation studies seldom find their way into land use and urban development plans. This weakness in competence should not negate the potential of zonation studies to reduce exposure to hazards and risk in the built environment in the long term, as well as the potential of education and awareness that they create within institutions, and all concerned stakeholders involved in city planning and development processes.
	Recommendation LU 5: Formulate land use and development controls and restrictions in high-risk areas to assure that new construction meets structural and life safety standards as well as abate hazards posed by existing buildings, critical facilities and infrastructures.	Abatement of structural and nonstructural vulnerability through development restrictions will minimize casualties and property losses from natural disasters. Land use restrictions in such areas may include building density and population density regulations. This objective is aligned with the Construction Safety and Practice element.
	Recommendation LU 6: Preserve the architectural character of buildings in GAM and enhance the likelihood of	National treasures should be protected from disaster damage by formulating and implementing a heritage preservation program in GAM that includes reasonable disaster risk reduction measures (e.g. retrofitting) to increase the chances of such

DRMMP Element	Recommendation	Rationale
	culturally and historically valuable structures to withstand future natural hazards like earthquakes.	invaluable sites to survive disasters. Additional cultural heritage features should be identified in detail later at the scale of Area and Community Planning and development controls at that levels should also be formulated and aligned with the MGP and Amman Zoning and Building Regulations
	Recommendation LU 7: Promote the conservation of natural heritage sites in GAM by incorporating hazard-prone areas as protected areas.	The overall objectives of the land use policies for the Natural Heritage System are the protection, conservation, and enhancement of these natural features and ecosystems within a systems-based framework. Specific policies related to Natural Hazards aim to minimize the risks associated with the abovementioned natural hazards. To supplement these policies, land use and development controls in the identified Natural Heritage System should be formulated and included in the revision of the Amman Zoning and Building Regulations to ensure policy implementation. This will direct future urban development to appropriate areas.
	Recommendation LU 8: Establish a cohesive institutional and legal framework for urban planning and development that incorporates disaster risk reduction in its mandate.	The proposed Planning and Community Economic Development Department, a new planning structure within GAM, should include in its mandate not only the aspect of community economic development in order to consolidate planning, development control (zoning and licensing) and economic development functions of GAM in one entity, but also integrate disaster risk reduction in such functions.
6. Training and Capacity Building *The implementation of the Amman DRMMP Framework requires different sets of knowledge and skills and should address the needs*	**Recommendation CB 1:** Undertake specialized capacity building activities to fill in critical weaknesses in disaster management competencies in GAM and in the country. As a priority, undertake a training program to build the competency	The staff of the DRMCSO and the Heads of the core departments at GAM needs to undertake a specific training in disaster management that would enable GAM to build the competency in the field, understand the basis of international standards, and build the elements for standard operating procedures of DRMCSO and the review of the departmental contingency plans. This

DRMMP Element	Recommendation	Rationale
of the different departments who will be involved in the DRR programs and projects to be rolled out. The staff of the DRMCSO and the Heads of the core departments at GAM needs to undertake a specific training in disaster management that would enable GAM to build the competency in the field.	of staff of the DRMCSO in disaster management.	training will enable the DRMCSO to be operational immediately.
	Recommendation CB 2: Equip local officials, planners, engineers, building officials and related personnel with the knowledge and skills to enhance their technical capacities and upgrade the organizational capacity of GAM to reduce disaster risk in identified critical competencies.	This is often the weak link for the implementation of DRR. Managers, decision makers and other officials in charge of operational issues in Amman should be more versed in the technical aspects of DRR in order to have confidence to undertake the DRMMP Framework and other DRR initiatives. Lack of or inadequate competency is stopping progress in DRR and is adding to the risk every day. There should be investment in systemic and systematic professional trainings of practitioners. Training on formulating gender-sensitive disaster risk reduction programs should also be included.
7. Research and Development, Knowledge Management, ICT and Human Resources ***Research and Development*** *Deficiencies remain throughout Amman in terms of inter-institutional coordination, warning systems, incident command and control, human and ICT resources for response, relief, recovery, and rehabilitation practice following urban disasters. The lack of an organized community of practice and acceptable*	**Recommendation RD 1:** Develop performance targets and indicators to assess effectiveness of DRM policies and to establish benchmarks to measure progress.	Indicators are an effective means for establishing policy and for setting up guidelines for rational decision making and for measuring progress. Indicators are also powerful tools for risk communication and for relying complex scientific aspects of risk in a very simple way that policy makers and layman alike can understand. Several cities have incorporated indicators in their DRM systems including Istanbul, Bogota, Barcelona and others.
	Recommendation RD 2: Coordinate and advance the knowledge and ability of institutions and organization in Amman to accomplish mainstreaming.	Research and development activities should be coordinated with a broader group of stakeholders in Amman to link disaster risk reduction to the multi-faceted aspects represented by the respective actors, experts and authorities in these areas.
	Recommendation RD 3: Scale up the funding for research	Research and development is a typically a long-term, low-visibility process and funding resources are stacked against it. Even though

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standards of practice is also resulting in a dispersion of effort and an ineffective use of resources. Promoting research and development, knowledge management and developing human and ICT capacity will enable Amman in understanding and implementing the options that are available to them for managing risks and for planning and implementing urban DRR.	and development in DRR.	disaster risk reduction is not primarily a humanitarian issue, governments are typically more responsive to emergency appeals than to requests for DRR. The country will benefit from a National Earthquake Risk Reduction Program similar to the National Earthquake Hazard Reduction Program (NEHRP) in the USA that coordinates research in the earthquake field and channels outputs towards specific producing tools for disaster risk reduction through better coordination and cooperation between the national research institutions including universities.
Knowledge Management	**Recommendation KM 1:** Develop a professional community of practice for disaster risk reduction in GAM and the rest of Jordan.	In order to establish a long-term strategy for organizing and sharing knowledge on DRR, the creation of an engaged community of practice that is in communication with each other should be promoted.
	Recommendation KM 2: Create and support DRR knowledge networks.	A series of consultations, seminars and workshops should be developed between the scientists and professionals in the field, and the technical, managerial and policy making practitioners in the various institutions of Amman dealing with DRM. The networking meetings and forums should be thematic and tailored to the audience and to the level of responsibility and functions of the participants. While policy makers need only a high –level briefings, technical staff may need a more in-depth training workshops.
Information and Communication Technologies	**Recommendation KM 3:** Establish a common platform to organize and share knowledge on disaster risk management within GAM.	As a strategic approach to achieving disaster management objectives, knowledge management plays a valuable role in leveraging existing knowledge and converting new knowledge into action. Besides traditional knowledge sharing and networking mechanisms; such as workshops, seminars and conferences, the application of information technology to the human dimension of communication should be

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		emphasized.
	Recommendation ICT 1: Use information and communications technology to disseminate knowledge on hazards, vulnerability and risk both among institutions and in the context of public awareness.	Policies and facilities that encourage community-based approaches to information processing and dissemination should be developed. This can be achieved through local risk mapping based on community needs and values, public access information portals, or facilities enabling the exchange of locally derived risk information among community members.
	Recommendation ICT 2: Use multi-media technology to scale up disaster risk management education.	The training and capacity building program in Amman should leverage multi-media e-learning technology to scale up the outreach effort and in providing access to cutting edge knowledge on disasters.
	Recommendation ICT 3: Promote more active use of satellite, remote sensing, GIS and wireless technologies.	GIS and Remote sensing and satellite technologies should be made better use of in Amman in order to develop more accurate inventories of exposed assets in the pre-event phase. GIS and RS technologies can also be employed to facilitate disaster risk integration the land use planning and monitoring processes of local authorities, local technicians and development project managers.