DRMMP AQABA

Disaster Risk Management Profile for Aqaba Special Economic Zone

Project:
Support to Building National Capacity for Earthquake Risk Reduction at ASEZA in Jordan
May, 2010

UNDP

سلطة منطقة العقبة الإقتصادية الخاصة

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"We are determined to make Aqaba Special Economic Zone (ASEZ) a successful project and bring in more investment to the area."

King Abdulla II, Monday, 23 Aug 2004.

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UNDP	The United Nations Development Program
ASEZ	Aqaba Special Economic Zone
ASEZA	Aqaba Special Economic Zone Authority
NDRMP	National Disaster Response Master Plan
DST	Dead Sea Transform fault system
JWA	Jordan Water Authority
FAO	World Food Organization
WFP	The World Food Programme
USAID	Development United States Agency for International
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
HCCD	The Higher Council of Civil Defense
RSS	The Royal Scientific Society
NRA	The Natural Resources Authority
GAM	Greater Amman Municipality
JNBC	Jordan National Building Council

BRC	Building Research Center
ADC	Aqaba Development Corporation
AIIE	Aqaba International Industrial Estate
JIEC	Jordan Industrial Estates Corporation
QIZ	Qualified Industrial Zone
GRP	Gross Regional Product
HUDC	Housing and Urban Development Corporation
PGA	Horizontal Peak Ground Accelerations
SA	Spectral Acceleration
DOS	Department of Statistics
MERC	Middle East Regional Cooperation program
USGS	The United States Geological Survey
JSO	Jordan Seismological Observatory
JCD	Jordan Civil Defense

Chapter 1 : Introduction

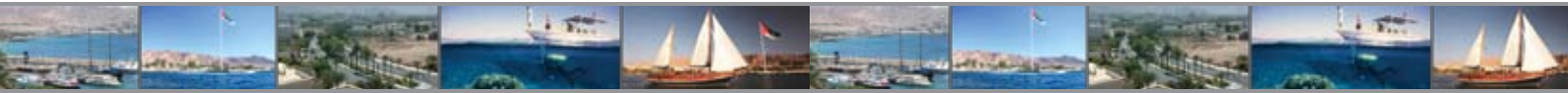
1.1 Demographic, economic, social and cultural characteristics

• Jordan

Jordan (Arabic: الأردنّ al-'Urdunn), officially the Hashemite Kingdom of Jordan, is an Arab country in Southwest Asia. The country is bordered by Syria (north), Iraq (northeast), the West Bank and Israel (west), and Saudi Arabia (east and south). Jordan shares control of the Dead Sea with Israel, and the coastline of the Gulf of Aqaba with Israel, Saudi Arabia, and Egypt. The country is located within the geographic coordinates: 31º 00 N, 36º 00 E (Figure 1).

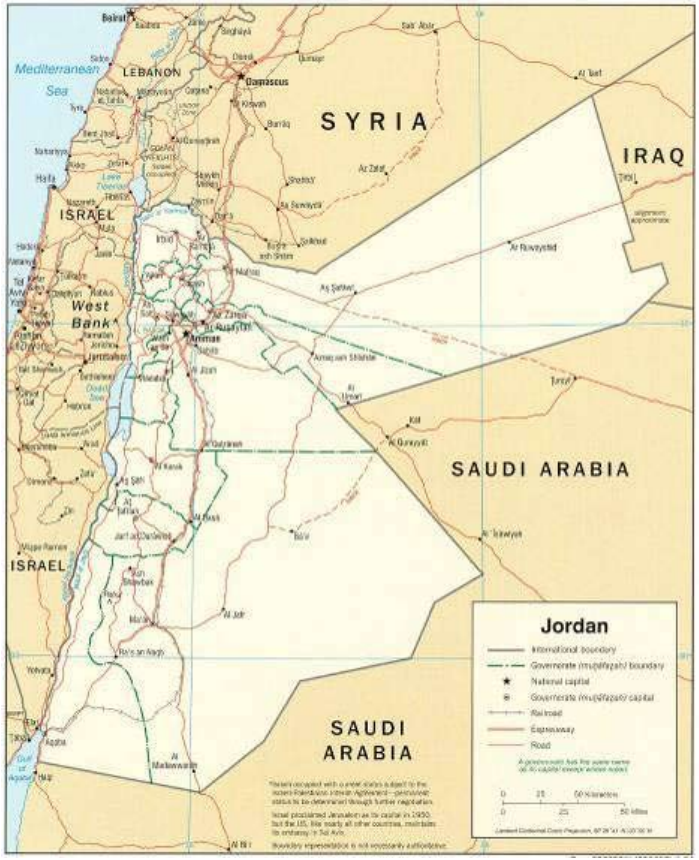
During its history, Jordan has seen numerous civilizations possessed political sovereignty and influence: Akkadian, Assyrian, Judean, Babylonian, and Persian empires. Jordan was for a time part of Pharaonic Egypt and also the Arab Nabataeans civilization which left rich archaeological remains at Petra. Cultures from the west also left their mark, such as the Macedonian, Roman, Byzantine, and Ottoman Turkish empires. Since the seventh century the area has been under Muslim and Arab cultures, with the exception of a brief period when the west of the area formed part of the Crusader Kingdom of Jerusalem and a short time under British rule.

Jordan is a modern Arab nation with a predominately middle class population. The majority of Jordan's population of 5.92 million live in urban areas; mainly Amman, Zarqa, and Irbid (Figure 1). A population increase occurred when refugees in 1948, 1967, 1991, and 2003 came to Jordan. The population of Jordan is growing at a rate



of 2.3%, with life expectancy of 71.5 years. Unfortunately this population growth created poverty and affected ecologically fragile environments. Amman is the capital and located in the central west part of the country. The official language of Jordan is Arabic, though many people speak English fluently.

Much of Jordan is covered by desert (90% of its area); however the north-western area is regarded as part of the Fertile Crescent. Generally, the country has warm, dry summers and mild, wet winters, with annual average temperatures ranging from 12 to 25° C and summertime highs reaching the 40°C in the desert regions. Rainfall averages vary from 50 mm annually in the desert to as much as 800 mm in the northern hills, some of which falls as snow.



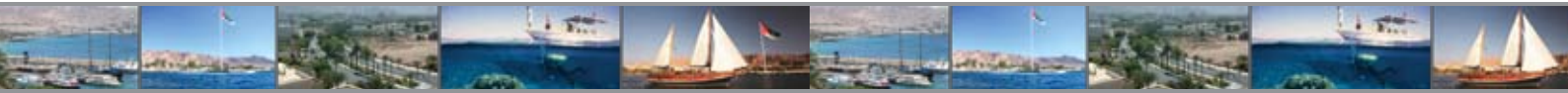
The country is divided into 3 regions made up of 12 governorates, Irbid, Jarash, Ajloun and Mafraq are in the Northern region, Amman, Zarqa, Balqa and Madaba are in the Central Region, and Karak, Taffileh, Ma'an and Aqaba in the southern region (Figure 1).

Jordan's economy has changed from an agricultural based to a diversified economy, which includes services and industry as well as agriculture.

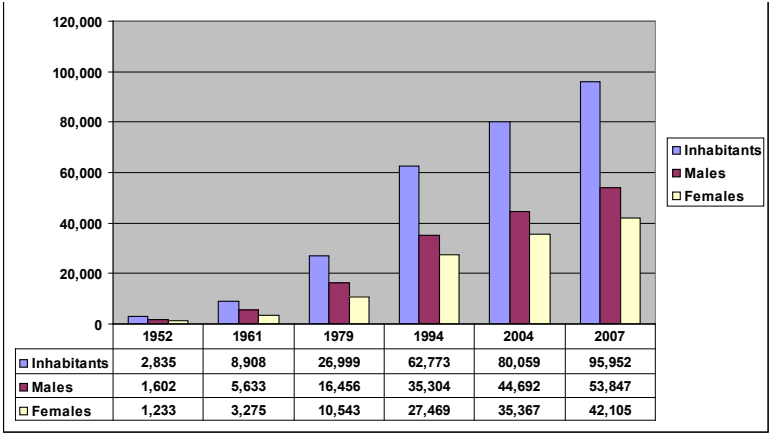
Figure 1: Political map of Jordan.

• Aqaba

Following the passage of the Aqaba Special Economic Zone Law, No. 32 of the year 2000, the Aqaba Special Economic Zone (the ASEZ) began functioning in early 2001 and was formally established in May of the same year. The heart of ASEZ is Aqaba city (Arabic: العقبة, Al-Aqabah) which is a coastal town in the far south of Jordan (Figure 1). ASEZ currently has an



estimated population of about 103,000. By the end of 2007, Aqaba city population was 98,750 (Department of Statistics); of which 56.1% are male. About 82% of the population was Jordanians. Out of the non-Jordanians total about 44.9% are Egyptians. Population growth was about 4.3% for the period 2004-2007, compared to 2.3% Jordan growth population. The number of working force is 27,958, among them 13% female of which 74% are Jordanians. The unemployment counted about 10% of the working force. Figure 2 shows the pronounced growth in population for Aqaba since the year 1953.



	1952	1961	1979	1994	2004	2007
Inhabitants	2,835	8,908	26,999	62,773	80,059	95,952
Males	1,602	5,633	16,456	35,304	44,692	53,847
Females	1,233	3,275	10,543	27,469	35,367	42,105

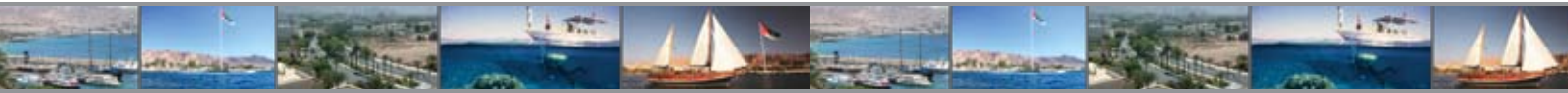
Figure 2: Population growth of the Aqaba[1].

1 Aqaba City Population & Housing Census 2007,(DOS, 2008).

Aqaba has been an inhabited settlement since 4000 BC profiting from its strategic location at the junction of trading routes between Asia, Africa, and Europe. It was a center of the early settlement Edomites, and then of the Arab Nabataeans, who populated the region extensively. Aqaba probably dates back to Iron Age. The Romans called it Aila and Aelana. During Roman times, the great long distance road the Via Traiana Nova (The King's Highway) led south from Damascus through Amman, terminating in Aqaba, where it connected with a west road leading to Philistines and Egypt.

Soon after spread of Islam, it came under the rule of the Islamic Caliphate, and thereafter passed through the hands of such dynasties as the Umayyads, Abbasids, Fatimids and Mamluks. The early days of the Islamic era saw the construction of the city of Ayla, which was described by the geographer Shams Eddin Muqaddasi as being next to the true settlement, which was lying in ruins close by. The ruins of Ayla (Figure 3) are a few minutes walk north along the main waterfront road. Some stories in the famous Arabian **Nights also refer to Sinbad adventures to take the sea from this port city of Ayla.**

Figure 3: Ruins of the Turkish Ayal fort.

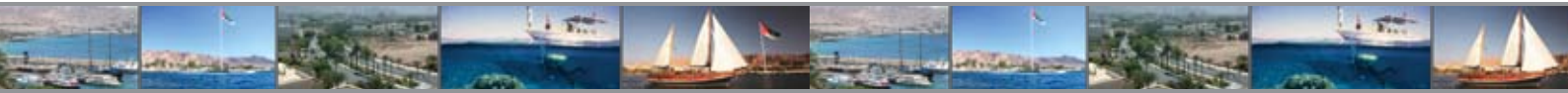


By the beginning of the 16th century the area came under the influence of the Turkish/Ottoman Empire. During the following period, the city declined in status, for 400 years remaining a simple fishing village of little significance. During World War I, the occupying Ottoman forces were forced to withdraw from the town in 1917, making the territory part of the Kingdom of Hejaz, under the rule of Prince Faisal. Aqaba was ceded to the British protectorate of Transjordan in 1925. Figure 4 shows a picture of the old dwellings of Aqaba. The picture was taken after the Capture of Aqaba in July 6, 1917. In 1965, the Saudis traded 12 kilometers of prime coastline to the south of Aqaba in return of 6000 square kilometers of desert land in Jordan's interior. In addition to the extra land for expansion of the port, the swap also gave the country access to the magnificent Yamanieh coral reef. Later, Aqaba port grew to be a major site for imports of Iraqi goods in the 1980s until the 1991 Gulf War.

Figure 4: Old dwellings of Aqaba (T. E. LAWRENCE collection, 1917)[2].

Jordan's first free zone was set up in Aqaba in 1973, when a small facility was established at the port to serve transit trade. More modest efforts at regional planning followed, until the creation of the Aqaba Regional Authority

2 http://mlc.la.marist.edu/faculty/keith/T.E.LAWRENCE/TEbatch3/aqabaDwellings.jpg

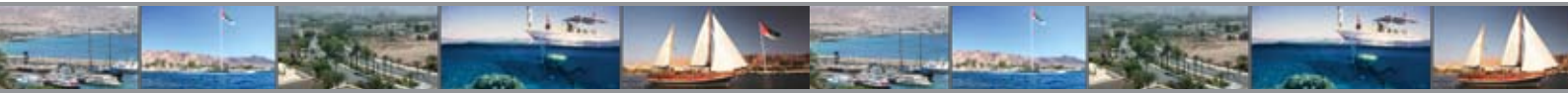


(ARA) in 1983. In 1990, Aqaba was designated as a Governorate (population numbered 74,399 persons). The population of the main city was 63,157.

In August 2000, the Aqaba Special Economic Zone Authority Law was passed by the Jordanian Parliament. The law established the ASEZA as the statutory institution empowered with regulatory, administrative, fiscal and economic responsibilities within the ASEZ.

Aqaba city is strategically important to Jordan as it is the country's only seaport at the Red Sea. The port is Jordan's most important import/export hub. It plays an important role in the economic life of Jordan and has many attractions to offer the vacationer. Figure 5 shows a picture of the new city of Aqaba. The town is best known today as a diving and beach resort. However, industrial activity remains important to the area, and the town is an exporter of phosphate. The town is also an important administrative center within the far south of Jordan.

Figure 5: News hotels and dwellings of Aqaba.



1.2 Governance style

• Jordan

The Hashemite Kingdom of Jordan is a hereditary monarchy with a parliamentary system. The reigning monarch is the Head of State, the Chief Executive and the Commander-in Chief of the Armed forces.. The king exercises his executive authority through the Prime Ministers and the Council of Ministers, or cabinet. The cabinet, meanwhile, is responsible before the democratically elected House of Deputies which, along with the House of Notables (Senate), constitutes the legislative branch of the government. The judicial branch is an independent branch of the government.

The Constitution mandates the separation of the executive, legislative and judicial branches of government. The King exercises his executive authority by appointing the prime minister, who then organizes a cabinet of ministers to be appointed by the King. The prime minister and the cabinet must then be approved by the Lower House of Parliament, the House of Deputies. The cabinet is responsible before the elected House of Deputies which, along with the House of Notables (Senate), constitutes the legislative branch of the government. The judicial branch is an independent branch of the government. Legislative powers are shared by the King and Parliament, which is comprised of the 80 member House of Notables (Majlis al-A'yan), or Senate, and the 120 member House of Deputies (Majlis al-Nuwwab). While senators are appointed by the King, deputies of the lower house are directly elected by universal suffrage[3].

3 HRM King Abdullah II web site: http://www.kingabdullah.jo.

The Constitution stipulates that the reigning monarch must approve laws before they can take effect, although his power of veto can be overridden by a two-thirds majority of both houses of Parliament. The King also authorizes the appointment and dismissal of judges, regional governors and the mayor of Amman, and he approves constitutional amendments, declares war and is commander-in-chief of the armed forces. As head of state, the King concludes and ratifies treaties and agreements, with the approval of the Cabinet and Parliament. The King is also entitled to grant special pardons and amnesties. The administration of all internal and external Jordanian affairs is entrusted to the prime minister and the cabinet.

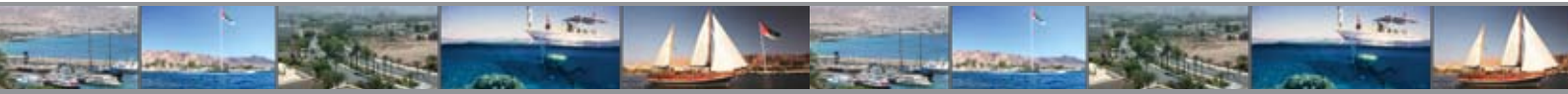
• Aqaba Special Economic Zone Authority (ASEZA)

The ASEZA is the financially and administratively autonomous institution responsible for the management, regulation, and the development of the ASEZ. ASEZA is a service – oriented organization offering one – stop assistance covering all investment needs[4].

ASEZA has a juridical personality with financial and administrative autonomy. The Authority may perform all legal acts necessary to achieve its objectives. The Authority is associated with the Prime Minister.

The Authority is administered and supervised by the "Board of Commissioners", which is composed of six full-time members, including the Chief Commissioner and the Vice-Chief Commissioner who is appointed by a decision of the Council of Ministers upon the recommendation of the Prime Minister for a renewable four-year

4 The Aqaba Special Economic Zone Law no (32) for the Year 2000 and its amendments, Aqaba Special Economic Zone Authority web site: http://www.aqabazone.com.



term, provided that such a decision shall be endorsed by a Royal Decree.

The Commission has the task of running the ASEZ, and is vested with zoning, licensing, and other regulatory powers that distinguish it from the rest of Jordan. Wages, allowances and all financial entitlements of the Chief Commissioner and the Board members shall be determined by the Council of Ministers decision upon the recommendation of the Prime Minister. The Board shall issue its resolutions by a majority vote of the attending members, provided that it is not less than three votes.

The Governor's powers in the Governorate of Aqaba pursuant to the legislation in force. If the Minister of Interior, upon the approval of the Council of Ministers, does not appoint a Governor for such, whereby in the event of his appointment, a memorandum of understanding shall be prepared between the Minister and the Chief of the Board of Commissioners, which shall be approved by the Council of the Ministers. The Governor shall, when performing his functions in accordance with the enacted legislation, take this memorandum of understanding into consideration. In the event a dispute arises between the two parties when implementing the memorandum, the matter shall be referred to the Prime Minister for resolution.

The five commissions of ASEZA are:

1. Environmental Affairs Commission.
2. Administrative and Financial Affairs Commission.
3. Customs and Revenue Affairs Commission.

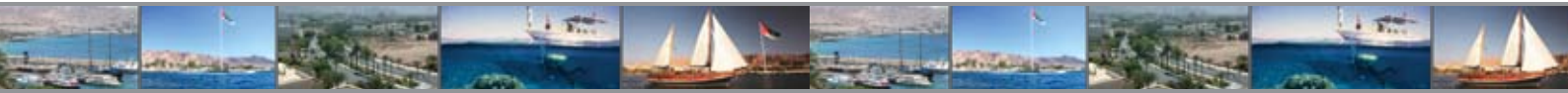
4. Economic Development and Investment Affairs Commission.

5. Infrastructure and Services Affairs Commission.

ASEZA has an independent budget, which is endorsed by the council of ministers. Any budget surplus is transferred to the national treasury. To benefit from the financial incentives, companies should register at the ASEZA, in which case they do not have to register with the Companies Comptroller at the Ministry of Trade and Industry.

The ASEZA tasks are to include developing the area for investments, increasing job opportunities and giving priority to Jordanians, and preventing monopoly of economic activities. To achieve those objectives, the authority would have command over a wide range of affairs including financial regulations in the region, labor issues, health inspection, environmental protection, and project licensing as well as municipal affairs.

The ASEZA is invested with authority over legal and administrative affairs as well promoting the ASEZ both at home and abroad. The ASEZA also shares power with some service ministries in Amman. For example, the ASEZA is responsible for the provision of healthcare, in accordance with a memorandum of understanding (MOU) signed with the Ministry of Health (MOH). According to the MOU the ASEZA is responsible for upholding national health and safety standards throughout the Zone, and this applies to new investment projects - the maintenance of recognized standards is intended to attract investors. Yet another example of good governance is the three-year experience of the ASEZ Customs Department -a unit that is totally autonomous from the National Customs body.



1.3 National hazardscape

The National Disaster Response Master Plan (NDRMP) of Jordan (2004) identifies the following main hazards as potential threats to Jordan: earthquakes, flash floods, drought, locusts, and weather emergencies (snowstorms, frost), as well as human-made disasters such as fires, chemical dangers (industrial releases, hazardous materials transportation accidents, etc.), chemical, biological, and radioactive contamination, armed conflict, and mass population migration.

A summary of major disasters over the past century is provided in Table 1. The table shows the disaster types, date, affected populations as (injured and displaced), and deaths.

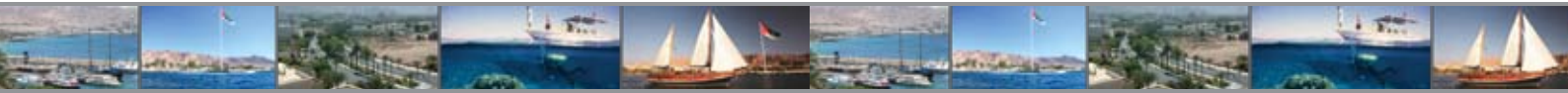
Figure 6 shows the natural hazard profile of Jordan according to Munich Re Group[5]. According to their results, it is evident that seismic and drought hazards are the dominant sources of hazard to the country. However, according to the United Nation's report "2009 Global Assessment Report on Disaster Risk Reduction" Jordan Mortality Risk Index for floods is 3, whereas the index for earthquakes is very low (2). The multi-hazard risk for tropical cyclones, floods, earthquakes and landslides is 3. The maximum index value is 10. On the other hand, the economic vulnerability is high and the economic resilience accounts to 25-50%.

5 Globe of Natural hazards DVD, Version 2009.

Table 1: Major disasters in Jordan over the past 100 years[6].

Disaster	Date	Affected Population	Deaths
Earthquake	1927	Unknown	242
Flooding	1963	Unknown	25
Flooding	1965	500	0
Flooding	1966	5792	295
Drought	1966	180,000	0
Epidemic	1981	715	4
Flooding	1987	29	9
Flooding	1991	18,000	8
Earthquake	2004	19	0
Terror attack	2005	100	60
Floods	2006	25	6

6 Disasiter Risk Mangment Profile Amman-Jordan, 2008.



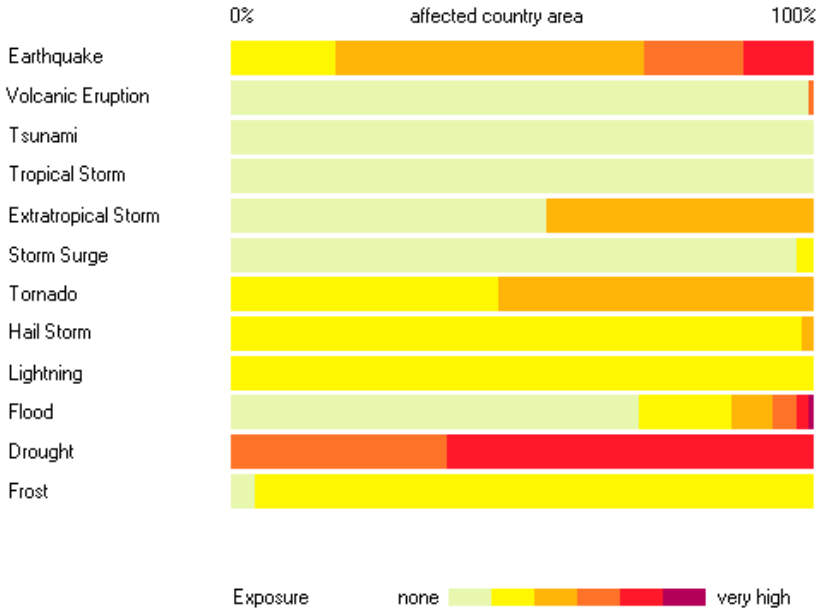
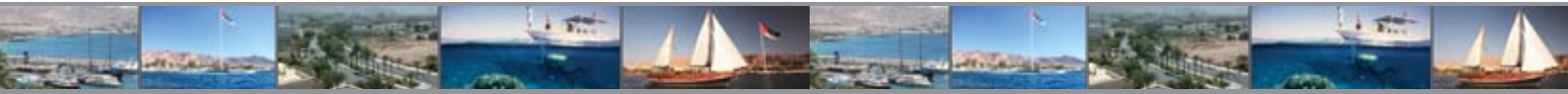


Figure 6: Natural hazard profile of Jordan (Munich Re Group, 2009).

Seismic Hazard:

The Middle East region is tectonically and seismically active (Figure 7) due to the continuous interaction between the Arabian, African and Eurasian Plates. Within this tectonic framework the Dead Sea Transform (DST) fault system defines the western edge of the Arabic plate and forms a 1000 km long continental transform fault extending from the spreading centers of the Red Sea northwards through Jordan, Syria, and Lebanon towards the collision zone in southern Turkey. The Dead Sea Rift Valley which extends along the western border of Jordan is a continuation of the East African Rift Valley and the Red Sea and it defines the single most important geological feature of seismic significance within the country.



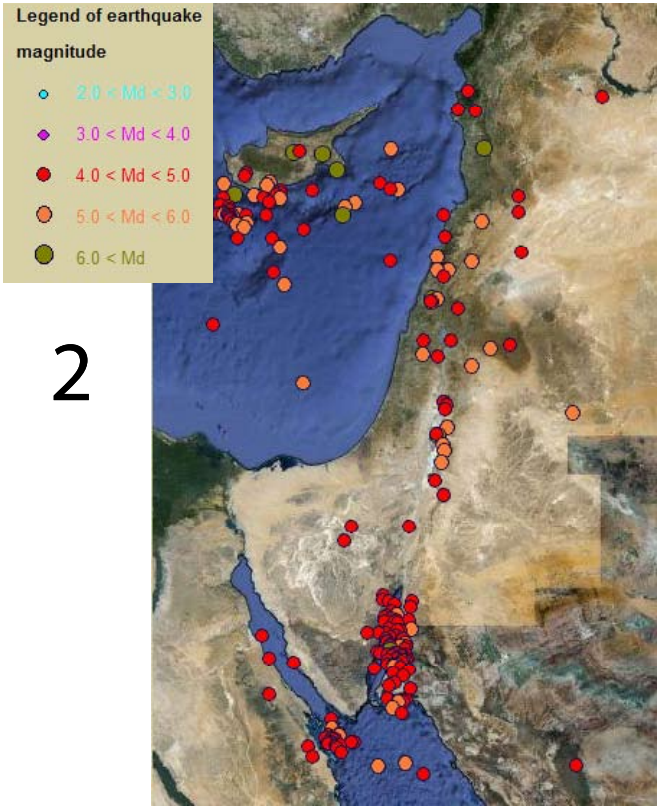


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Figure 7: Earthquake events of magnitudes greater than 4.5 taking place during the period 1900-2008[7].

Jordan, as well as the surrounding nations is vulnerable to strong earthquakes due to the 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 tidal waves on the Dead Sea and landslides in adjacent areas.

Some of the recent pronounced earthquakes occurred on 11th July 1927, magnitude 6.2 in which 242 people died (epicenter in Amman), 31 March 1969,

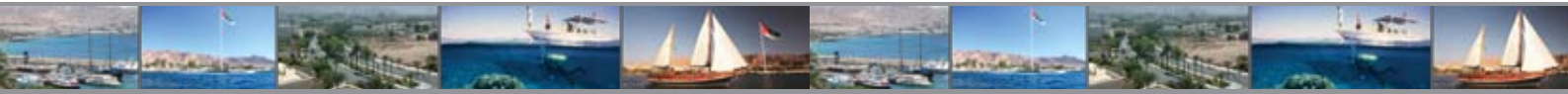
7 Data retrieved from the catalogue of the Geophysical Institute of Israel (GII): http://www.gii.co.il.

magnitude 6.1 (Northern Red Sea), 22 November 1995, magnitude 7.1 located within the Gulf of Aqaba, 90 Km to the SSW from the city of Aqaba, and the 11th February 2004 earthquake epicentered 45 Km from the capital Amman. The final earthquake occurred at a shallow depth of 25.8 km and was strongly felt in Amman and the northern area of Jordan. Although no deaths were recorded from this earthquake, the initial panic and confusion it triggered suggest that more attention needs to be placed on preparedness and earthquake risk reduction.

Flooding:

In the past half century incidents of flash flooding in Jordan have claimed the lives of 345 persons and affected 24,321 lives. Additionally, floods usually leave vast agricultural areas covered with heavy water.[8].The most recent incident occurred in the Jordan Valley. In 2006 and 2007, 17 districts north of the Dead Sea have been hit by sediment-related disasters. The Wadi Nhairr area was struck by a disaster on October 27, 2006 which caused damage to the houses and waterways. Agricultural lands and roads were also damaged in Kraima district[9]. Similarly, historical records concerning flash floods threatening Petra, south Jordan, have shown that flood protection and mitigation measures are urgently needed to protect tourists and the existing monuments. The 1963 and the 1991 flashfloods are the most extreme events that hit the ancient city of Petra[10].

8 Disasiter Risk Mangment Profile Amman-Jordan, 2008.
9 IKEYA, H. (2008): A Proposal on Arid Land Sabo Works - a case study in Jordan: http://www.sabo-int.org/projects/jordan.pdf.
10 Al-Weshah, R. and F. El-Khoury (1999): Flood Analysis and Mitigation for Petra Area in Jordan, Journal of Water Resources Pla - ning And Management, v. 125, no. 3, pp 170-177.



Many developments in ASEZ are taking place on alluvial fans of wadis, which do not always have water, so the area will inevitably be hit by disasters when flood happen (Figure 8). In fact, a container company's yard at the mouth of Wadi Mabrak was struck by a disaster in February 2, 2006, causing a casualty. On the same day, the disaster hit the alluvial fan of Wadi Yutum and caused large scale sediment-related damage which included five deaths, the destruction of 18.5 km of water pipes and water production wells, and damage to the airport. Wadi Yutum is within the main development area in the Aqaba Special Economic Zone[10].

Figure 8: Development area north of Aqaba city on the alluvial fan of Wadi Yutum.

The northern parts of Aqaba are the most vulnerable regions for flashflood hazards. These areas contain all the town residential expansion area, the Aqaba International Industrial Estate, the King Hussein International Airport, and all the northern light industries and logistics areas. The total development potential of that part of Aqaba required the construction of a rain water diversion flood channel along the new northern Aqaba airport parallel highway which connects with Dead Sea-Aqaba road (Figure 9). The total expected cost is JD 30 millions. The flood channel is near completion (96% of the work). Figure 10 shows an example of flood diversion channels in northern Aqaba.

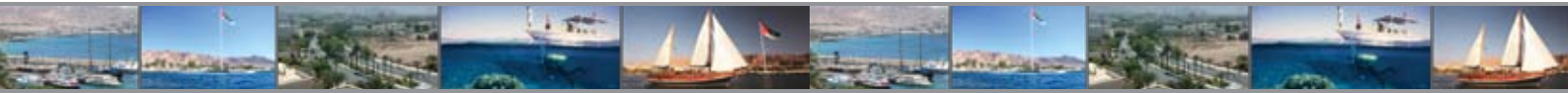


Figure 9: Flood diversion channel system of northern Aqaba city.

Drought:

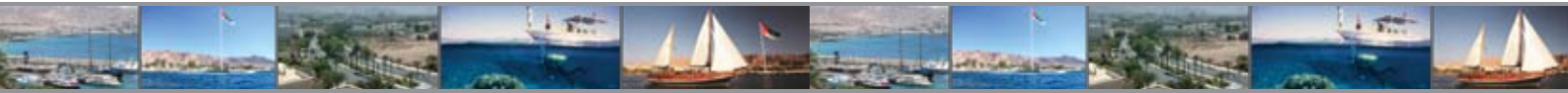
Jordan is currently one of the world's four water poorest nations (JWA, 2008), with more than 90% of the country classified as desert to arid (semi-desert) areas (Figure 10). Approximately 80 percent of the country receives less than 100 mm of precipitation annually (Figure 11) (Nortcliff et al., 2008). Drought is defined as "…the naturally occurring phenomenon that exits when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resources production systems."[11] The potential for the occurrence of drought and associated adverse consequences for the economy and society are ever-present concerns in arid regions such as

11 UNCCD 1999: United Nations Convention to Combat Desertification (Bonn: Secretariat for the Convention to Combat Desertification).

Jordan. Drought has been a prevalent feature of the Jordanian landscape during the latter part of the 1990s, producing serious socioeconomic and environmental consequences. In 2001 Jordan suffered eight successive years of drought, which led to international assistance by FAO (World Food Organization), WFP (The World Food Programme), USAID (United States Agency for International Development) , the European Union, GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH) and others. According to Batarsh and Bruins (2008), the worst drought occurred in 1999[12]. In 1999, severe drought cut rainfall in Jordan by up to 70% with declining rainfall levels and increased demand on water resources. The effective management of water resources is crucial for meeting the demands of the productive sectors and national households. During that period drought affected over 200,000 persons including small landholders who have lost their harvest and their inputs, small-scale herders and landless rural households[13].

12 Bataresh, S. And H. Bruins (2008): The Impact of Drought on Agriculture in Jordan, Drylands, Deserts and Desertification Conference.

13 Disasiter Risk Mangment Profile Amman-Jordan, 2008.



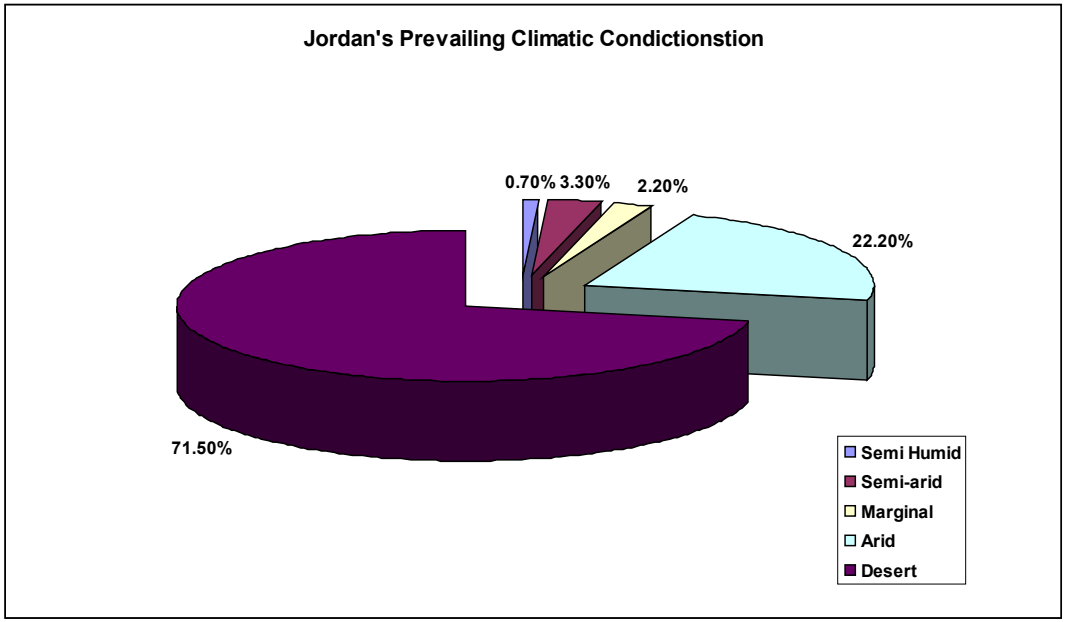


Figure 10: Jordan's prevailing climatic conditions.

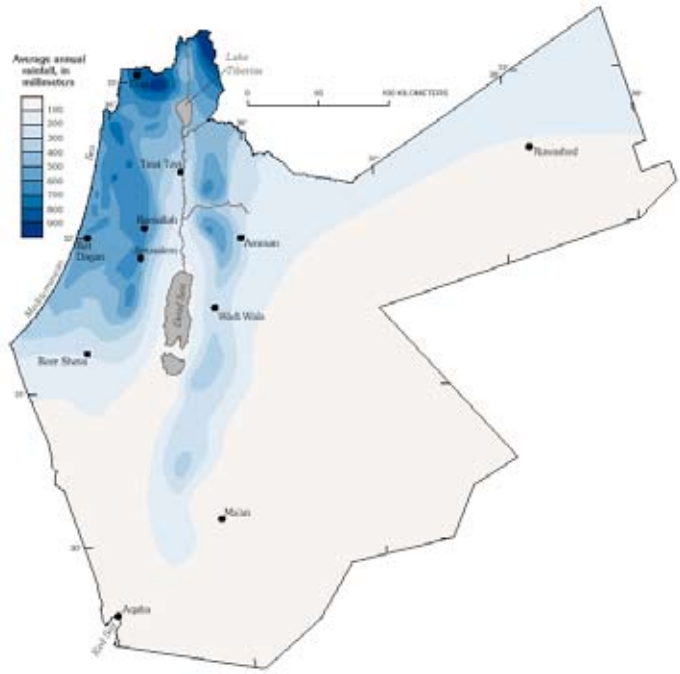


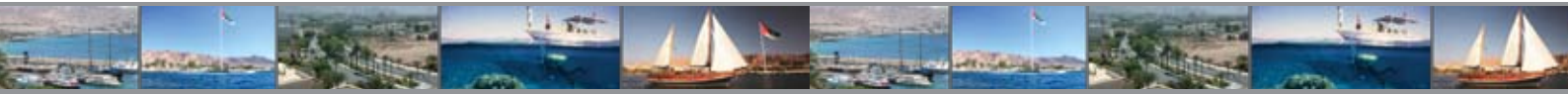
Figure 11: Annual rainfall distribution map of Jordan[14].

14 Executive Action Team-EXACT (1998): Overview of the Middle East Water Resources: http://www.exact-me.org/overview/images/p04_map.gif.

Water shortage in Jordan has been compounded by recent droughts, over-exploitation of water resources and a high population growth which is another area of concern. The water use for household and municipal purposes per capita has decreased from 3600 m^3 in 1946 to 160 m^3 at the present time. Despite plans for additional water resources and the upgrading of the water supply infrastructure, the race between supply and demand will continue[15].

The existing groundwater resources account for more than 60 million cubic meters per year, available for the purpose of domestic water supply for Southern Region of Jordan. The Al- Dissi water project also secures Aqaba demand for domestic and non-domestic demand.

15 Disasiter Risk Mangment Profile Amman-Jordan, 2008.



1.4 National disaster management structure and relevant legislation

The Government's (NDRMP) (2004) addresses encountering disasters and major accidents as part of the Civil Defense Law no. 18, 1999, and is an adjustment to law no. 57, 2002. The plan has procedures and actions to be carried out by the Civil Defense Department. Members of the Higher Council of Civil Defense (HCCD) and its committees in the administrative divisions perform plan's actions. The HCCD includes the Minister of Interior who is the chairman and the Director General of Civil Defense Department as vice chairman. It also includes the following additional members[16]:

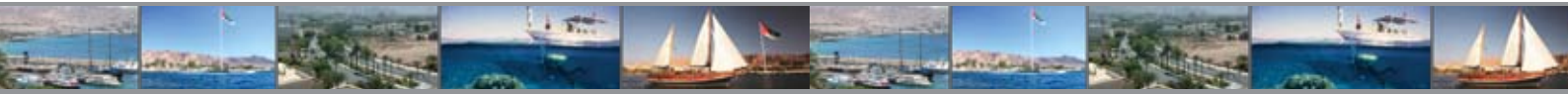
- Secretary General of Prime Ministry.
- Secretary General of all ministries.
- Secretary General of the Highest Council of Youth.
- Jordanian armed forces deputy assigned by the Chairman of the Jordanian Armed Forces.
- Public security deputy assigned by the Public Security General Director.
- Public Intelligence deputy assigned by the Director of the Public Intelligence Directorate.
- Amman Municipality Deputy.
- The Chairman of the Jordanian Red Crescent Society.

16 National Report in preparation for WCDR (2004): http://www.preventionweb.net/files/901_Jordan-report.pdf

- The Chairman of the Commerce Chambers union.
- A Chairman for one of the industrial chambers assigned by the Ministry of Industry and Trade.

The HCCD is responsible for carrying out the following duties:

- Setting public plans to take necessary 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 corporation with specialized concerned parties.
- Issuing required directives to organize the council's duties, and managing its operation rooms, operation rooms of the parties represented within, and the operation rooms of civil defense committees in the governorates and provinces.
- Establishing and equipping public shelters.
- Specifying duties and tasks of civil defense committees formed in governorates in accordance with the rules of this law.
- 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 to support civil defense actions.



- Demonstrating alarming techniques to citizens against emergencies and disasters, and specifying required methods.
- Setting financial estimation for the budget to encounter emergencies and disasters, and submitting it to the Cabinet for confirming and including it within the public budget.
- Recommending to the Cabinet to obligate concerned local departments, organizations and authorities for assigning required financial allowances in their annual budgets to carry out duties and tasks determined by the council.
- Any other duties submitted by the chairman and approved by the council.

Within HCCD, there are three subcommittees; media, relief, and earthquake technical committees, that have been established. The relief and earthquake committees have developed their terms of reference as follows[17]:

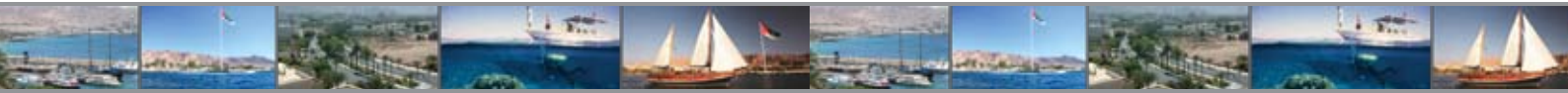
The Relief Committee:

The committee is formed 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.

17 Disasiter Risk Mangment Profile Amman-Jordan, 2008.

The committee's duties are:

- Conduct disaster rapid damage and need assessments.
- Request relief material for the vulnerable people.
- Provide logistics services (receive, store, distribute and deploy) for the relief material in adequate time.
- Supervise the relief subcommittees operation in the field and monitor relief operation in the field.
- Coordinate with the HCCD and the civil defense committees in the governorates during relief operations and emerging situations.
- Supervise international relief operations.
- Follow up international appeal and external support.
- Reporting to HCCD on the relief operations.



Earthquake Technical Committee[18]:

The committee consists of: Ministry of Public Works and Housing, Civil Defense, The Royal Scientific Society (RSS), Natural Resources Authority (NRA), Engineer's union, Greater Amman Municipality (GAM), Ministry of Municipalities, Ministry of Water and Irrigation. The committee's duties are:

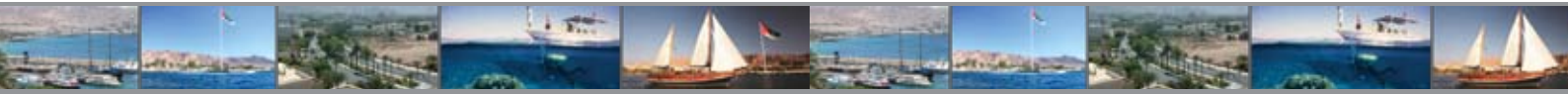
- Training civil engineers, Ministry representative, and emergency teams in earthquake resistant building design.
- Implementing the Jordan building code for earthquake-resistant buildings
- Monitoring the implementation of the Jordan building code in coordination with GAM and the Engineers Association.
- Identifying buildings at risk
- Creating and updating a database of engineering offices and institutions that have the necessary skills to conduct building evaluation and rehabilitation for earthquake resistance
- 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.

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 in response operations. The HCCD

also conducts evacuation simulation exercises in public hospitals and institutions. Moreover, there are many privet sectors, societies, NGOs, academies and medias participating in disaster risk reduction efforts such as[18]:

- Jordanian Red Crescent Association.
- Jordan Hashemite Charity Organization.
- The General Corporation for Environmental Protection.
- International Agency for Atomic Energy.
- The National Committee for Demining and Rehabilitation.
- All Universities in Jordan.
- Public and private medical centers and hospitals.
- UN office in Amman.
- International Red Cross Committee-Jordan.

18 National Report in preparation for WCDR (2004): http://www.preventionweb.net/files/901_Jordan-report.pdf.



1.5 National land use management system and relevant legislations

The Ministry of Municipal Affairs prepared a comprehensive plan designating the land use throughout the Kingdom. This Master Plan "Land Use Project, 2006" is distinctive in that it is a directive map illustrating the natural, geographic and demographic characteristics, including the sustainability of natural resources. In a way that fulfills the government's development and economic plans. This comprehensive Master Plan attempts to achieve the following goals[19]:

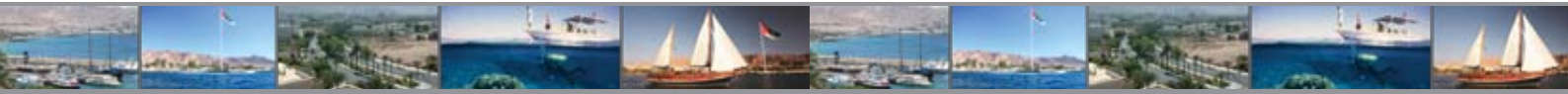
- Preservation of agricultural lands, ensuring its continuity, and its development.
- Stopping the arbitrary urban spreading.
- Limitation of urban development based on natural features and actual needs.
- Decentralize the economic activities to cover all regions in the Kingdom and lessen the concentration on the capital.
- Protect the environment from pollution.
- Limit the size of cities and villages and defining their functional role as a preliminary step towards a comprehensive Master Plan. This will be undertaken using in depth studies for a total development plan for each municipality according to a set of priorities.

19 UN Economic and Social Development, the Division for Sustainable Development (DSD): http://www.un.org/esa/agenda21/natlinfo/countr/jordan/land.pdf

- Designating the location of the pilot projects and directing their execution to give a boost to the development of the more impoverished governorates.

The deliverables of the Land Use Project include:

- The general state of land classification from the perspective of their potential use for various purposes.
- Defining the basic parameters for land classification based on analytical studying of the following:
  - Soil depth
  - Rock outcroppings
  - Land topography
  - Soil relative humidity
  - Rain quantities
  - Irrigation opportunities (some locations)
  - Elevation above sea level
  - Land arability
  - General characteristics
- Land classification from the perspective of ideal use and on the basis of defining agricultural land according to its characteristics.



The Land Use Project proposed the following recommendations based on the carried out economic, social and geographic studies:

a Designating areas with potential characteristic for the purposes of agricultural development.

b Designating areas with potential characteristic for the purposes of touristic development.

c Designating areas with various metallurgical/ mineral potential.

d Designating areas for urban development in cities and open areas for housing investment and industrial projects.

e Designating industrial cities and areas and preparing a map for existing and suggested industrial areas.

Based on the outcomes of the Land Use Project, a Planning Land Use System has been officially implemented and it has the following general characteristics[20]:

- The system uses an executive land use map which classifies land according to its potential characteristic which depends on the comprehensive natural studies.
- This system gave the Higher Urban Planning Council an adequate flexibility to change the land use designation and referring it to the Ministry Council.
- This system gave the proper regulations for uses and activities which can be established on various segments of the land uses which preserves their general characteristics, and which allows using these lands for other uses.

20 UN Economic and Social Development, the Division for Sustainable Development (DSD): http://www.un.org/esa/agenda21/natlinfo/countr/jordan/land.pdf

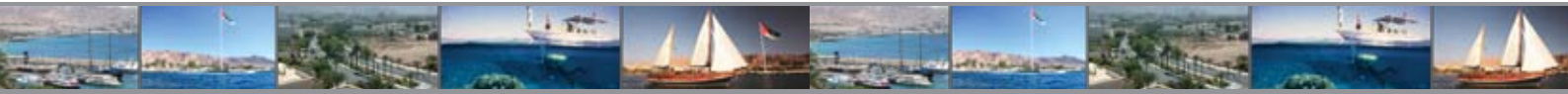
The Planning Land Use System directs building activities and expansion in the regulated areas away from:

- Dangers of flash floods in natural washes and valleys.
- Dangers of polluting subsurface water sources.
- Dangers of building in potential landslide areas.
- Dangers of environmental pollution (land, air, visibility and sound).
- The system takes into account the preservation of agricultural lands, directing the building activity, and executing various project on areas which compatible with such expansion and building activities.
- The system protects metallurgical/ mineral areas and natural recourses from misuse to preserve the options of its ideal exploitation.

Relevant legislations with land use management are mainly related to the development of earthquake code within the loads and forces code that was set in 1993. Jordanian National Building Council developed 35 codes to control and monitor the building constructions in Jordan. These codes represent the technical principles and conditions as well as the necessary requirements which must be followed as a minimum at the stage of design and execution to realize safety and efficiency in various engineering field for all installation at the stages of work[21].

The Ministry of Public Works and Housing published the earthquake resistance building code in December 2005[22]. Motivated by the importance of seismic hazard mitigation and by the necessity to update the seismic

21 Jordan National Building Council (JNBC) web site: http://www.jnbc.gov.jo.
22 Disasiter Risk Mangment Profile Amman-Jordan, 2008.



regulations, the Jordan National Building Council (JNBC) commissioned the Building Research Center (BRC) of the Royal Scientific Society (RSS) to draft a comprehensive set of seismic provisions and regulations for the first Jordanian Code for Earthquake-Resistant Buildings, referred to hereinafter as the Code. Employing the state-of-the-art knowledge in earthquake resistant design of structures, the new seismic regulations aim at providing minimum design requirements for structures in relevance to their functions with due consideration of providing safety and prosperity for people through reducing quake inflicted hazards. Moreover, these regulations aim at maintaining the functionality of both essential and hazardous facilities during and after an earthquake. The new Code is intended to provide designers with the required provisions for the "performance-based" seismic analysis and design of new structures.

The philosophy for earthquake design for structures, other than essential facilities, can be summarized as follows:

- To prevent frequent non-structural damage in frequent minor ground shaking.
- To prevent structural damage and minimize non-structural damage in occasional moderate ground shaking.
- To avoid collapse or serious damage in rare major ground shaking.

A task force was established in 2007 based on memorandum of understanding signed by Engineering Association, Contractors Association, Civil Defense and GAM. The task force consists of representatives from the above mentioned organizations. The purpose of the task force is to monitor the building construction process. The group is authorized to stop the constructions if they found any violations. The structure of the task force is

divided into three teams. Each team has a representative of each participating organization. The task force agreed to divide Amman into three major sections; each section consists of nine districts. They developed an organized system for their monitoring process that includes a database of new buildings, reporting system on their findings, and a database of buildings, contractors, supervising engineers, and locations[23].

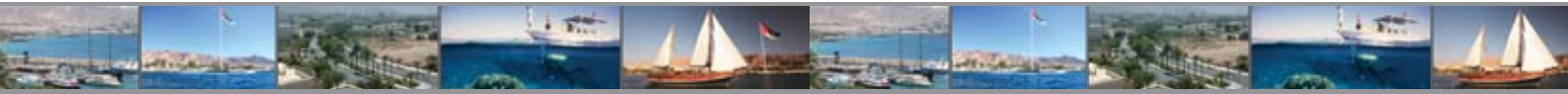
1.6 Significance of the Aqaba Special Economic Zone to the nation

The Southern Region of Jordan has prevailing potentials of significance for the socio-economic development. The Region has the only sea outlet of the country, mineral resources, and touristic places with national and international significance. Even with a minor potential in agriculture due to low rainfall, less than 50 mm per annum, but with great underground water resources. The City of Aqaba has always been associated with the natural geographical factors as an important functional Sea Port, all through historical ages. Aqaba's importance nowadays started emerging when Aqaba and Ma'an were annexed officially to Emirate of East Jordan (Trans-Jordan).

Aqaba has, throughout history, played an active role in international transit due to its strategic position along East-West and North- South trade routes and the presence of its seaport that dates back to biblical times. Today, the ASEZ endeavors to sustain and enhance Aqaba's historic role.

The creation of the ASEZ in 2001 was intended to accomplish a wide-ranging set of objectives, among which

23 Disasiter Risk Mangment Profile Amman-Jordan, 2008.



were to manage and oversee the development of activities that would transform the zone into a leading center of commerce, trade, industry, and leisure. ASEZA and the related commercial development agency, the Aqaba Development Corporation (ADC), have succeeded in significantly stimulating investment in the region, with JD 4.4 billion estimated as new investment over the 2006-2015 period.

Construction has already started or is soon to be underway on several major residential developments, as is work on reconstruction and relocation of Port of Aqaba, now privately-managed since ASEZA's creation, promising greater operating efficiency and increased throughput once work is completed. Local output grows initially because of increases in construction activity. This stimulates a number of regional businesses engaged in supply of services and materials in support of construction. Local workers benefit with income earned directly on the projects, as do local merchants who see additional revenue from sales enabled by those construction wages. The construction impact is largely coincident with project expenditures and will continue for as long as projects are active. These are the short-run impacts of the investment.

1.6.1 ECONOMY:

Aqaba is potentially an important seaport and regional transport center. The oil price correction of 1973 and the various gulf wars illustrated its importance, as Jordan's transport network focused on developing Aqaba. During the Iran-Iraq War, Aqaba became an indispensable part of Iraq's supply line. By early 1981 Jordan had become the main supply route for war materiel and civilian goods destined to Iraq, and appeared to be holding up well

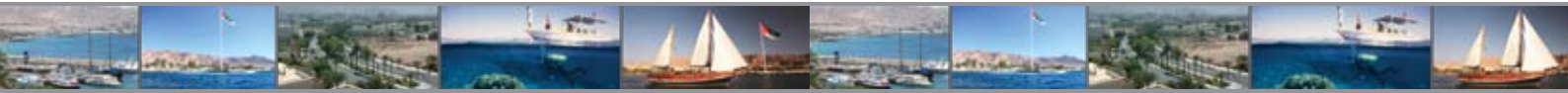
under the strain of massive expansion. In addition to the Jordanian-Iraqi connection, Aqaba had also become a key transit point for war materiel going from Egypt to Iraq, and for Egyptian workers going to and from Jordan and Iraq.9

However, the Second Gulf War and the imposition of United Nation sanctions against Iraq, curtailed the utility of Aqaba as a regional seaport. Aqaba then faced stiff competition from Latakia, Beirut and Dubai. The port, which employed around 5,000 workers, was by the late 1990s underutilized, handling 12.5 million tons of goods each year, whereas its annual capacity is estimated at 30 million. During its peak in the late 1980s, Aqaba was handling 21 million tons per annum.

Aqaba's economy is skyrocketing because of the economic zone. New resorts are being constructed (e.g. Saraya al Aqaba), but most are still on its leveling stage. New projects will provide high-end vacation and residential homes to locals and foreigners alike.

Twenty billion dollars have been invested in Aqaba since 2001 when the Special Economic Zone was established. Along with tourism projects, Aqaba has also attracted global logistic companies such as APM Terminals and Agility to invest in logistics, which boosted the city's status as a transport and logistics hub.

Many industrial activities are located in the South Coast Industrial Zone adjacent to Saudi Border. The main activities are: the Jordan Phosphate Mines Co. Industrial Complex, the Thermal Power Plant, and the Arab Potash Corporation. The Arab Gas Pipeline is a pipeline that is planned to export Egyptian natural gas to the Middle East and possibly to Europe. Additionally, plans are put into action to build nuclear power plant. The



plant, projected to initially generate 750 to 1,100 megawatts of electricity, is expected to be operational by the year 2020.

Aqaba International Industrial Estate (AIIE) covers an area of 530,000 square meters east of the Aqaba International Airport and 12 km north of the port was established in 2001.With technical and financial support from the USAID, the Jordan Industrial Estates Corporation (JIEC) aims to create, manage and expand this Industrial Estate that will serve as a hub for fully serviced light manufacturing and logistics. Recently, the infrastructure work in AIIE has completed and it is expected to be managed by the private sector. AIIE enjoys both the status of a special economic zone and a qualified industrial zone (QIZ). The latter gives access of the products from AIIE to the markets of the USA with custom and tax exemptions.

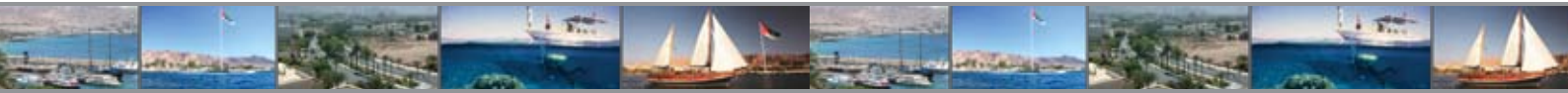
Moreover, numerous hotels reside in Aqaba but new hotels are also under construction. Over twenty billion dollars worth of investment is pouring into Aqaba by Gulf and European investors which overshadows Eilat, the prosperous Israeli Red Sea resort only several miles away. Some projects currently under construction are:

- Saraya Aqaba, a $700 million dollar resort that will be completed by 2010.
- Ayla Oasis, a $1 billion dollar resort. The project will be completed by 2017.
- Tala Bay, a $500 million resort. It is already completed.
- Marsa Zayed, a $10 billion marina community that is the largest real estate project in Jordan's history. This project will be completed by 2017.

- Port relocation. Aqaba's current port will be relocated to the southernmost part of the province near the Saudi border. Its capacity will surpass that of the current port. The project costs 5 billion dollars and it will be completed by 2013.
- Aqaba will be connected by the National Railroad System which will be completed by 2013. The rail project will connect Aqaba with all Jordan's main cities and economic centers and several countries like Saudi Arabia, Iraq, and Syria.
- University of Jordan-Aqaba Branch: on October 9, 2008, University of Jordan (UJ) signed an agreement with ASEZA to establish a branch for UJ in Aqaba. His Majesty King Abdullah II laid the foundation stone for the Branch on April 30, 2009.The ASEZA will allocate 438,000 square meters of its land for the Aqaba Branch, which will start receiving students beginning with the 2009/2010 academic year. The first phase of the project will include the faculties of Languages, Management and Finance, Tourism and Hospitality, Information Technology and Systems, and Marine Sciences, as well as a model school. The infrastructure of the Marine Science Station will be developed to accommodate the Faculty of Marine Sciences. A Faculty of Medicine, a hospital, sports halls and fields, a conference palace and an investment building are planned for the second phase. It is anticipated that JU-Aqaba will receive students from Jordan and neighboring countries including Saudi Arabia and Palestine.

1.6.2 TOURISM:

Aqaba is well known for its beach resorts and luxury hotels, which service those who come for fun in the sand as well as watersports. It also offers activities which take advantage of its desert location. A very popular venue in Aqaba is the Turkish Bath (Hamam) built in 306AD, in which locals and visitors alike come to relax after a hot day.



In 2006, the Tourism Division of the ASEZA reported that the number of tourists visited the Zone in 2006 rose to about 432,000, an increase of 5% over previous year. Approximately 65% (293,000) were Jordanians. Of foreign tourists, Europeans visited the Zone in the largest numbers, with about 98,000 visiting during the year.

Aqaba has been chosen for the site of a new waterfront building project that would rebuild Aqaba with new man-made water structures, new high-rise residential and office buildings, and more tourist services to place Aqaba on the investment map and challenge other centers of waterfront development throughout the region.

1.6.3 TRANSPORTION:

The Hejaz railway system no longer functions for travelers, therefore the popular routes in and out from Aqaba are buses from Amman (and other major Jordanian cities), boats to Egypt (down the Gulf to the city of Nuweiba or Sharm el-Sheikh) or by air via Aqaba Airport.

- **Roads & Rail**

Land Transport: A network of highways and roads connects Aqaba to the rest of Jordan and neighboring countries. Bus services are plentiful between Amman and Aqaba. Jordan Express Tourist Transport Company Ltd (JETT) and Trust International are the most common lines. These buses use the Desert Highway, which features particularly beautiful scenery in the Wadi Rum region and in the descent into Aqaba. Aqaba is also accessible by rail, with dedicated lines for phosphates from the Al-Hassa Mines in the Kerak Region to the Port

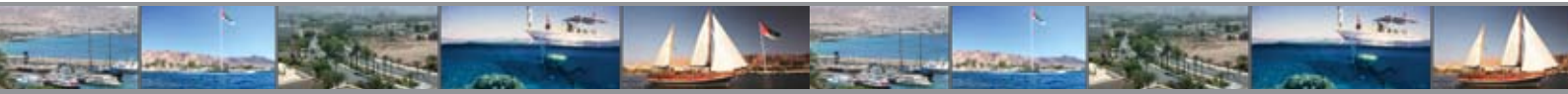
of Aqaba. Planned rail and road extensions and improvements will further increase Aqaba's accessibility in the coming years. By land, a network of modern highways connects Aqaba to the surrounding region. From Aqaba's town centre, the borders of Israel, Egypt's Sinai and Saudi Arabia are no more than a half-hour drive away.

- **Aqaba International Airport**

Aqaba International Airport: one of three airports in Jordan is situated to the north of the town, just 20 minutes from the town centre. The existing runway is totally suitable for most of the aircraft operating internationally. Expansion plans for the airport include enlarging the terminals to service up to 1,000,000 passengers a year on a 24 hours basis, as well as adding a new runway - all to the highest international standards Today Aqaba International Airport offers regular internal flights between Amman and Aqaba as well as some European cities, and can accommodate all kinds of commercial and chartered aircrafts from any destination in the world. Direct flights to Aqaba are now available from Amman, Sharm el-Sheikh, Dubai and Alexandria.

- **Aqaba Port**

Today, the deep-water Port of Aqaba offers facilities for general cargo, containerized cargo and specialized cargo, including liquid and solid chemicals and fertilizers. The port can accommodate ships handling a wide variety of cargos, including dry bulk vessels of 75,000 DWT, and container vessels of Panamax size. The port also has a separate passenger terminal servicing cruise and passenger ships. There are three ports in the Port of Aqaba, the Main Port, the Industrial Port, and the Container Port. The Industrial Port has three Jetties. An Abu Dhabi



consortium of companies called 'Al Maabar' has won the bid to relocate and manage the Aqaba Port for 30 years and expand the existing ferry terminal which receives about 1.3 million passengers and thousands of trucks and cars coming from across the shore in Egypt.

1.6.4 ECONIMIC GROWTH:

For the 2000-2005, the Aqaba Governorate gross regional product (GRP) grew by 13%, almost three points above what we estimate the underlying trend to be prior to ASEZA's creation. This generated JD 180 million in additional output for Jordan as a whole by 2005, of which approximately JD 100 million went to Aqaba and JD 80 million went to the rest of Jordan. Measured in employment terms, Jordan gained a total of 10,000 jobs by 2005, evenly split between Aqaba and the rest of the country.

Table 2: ASEZ regional product baseline projections (1995-2015)[24]

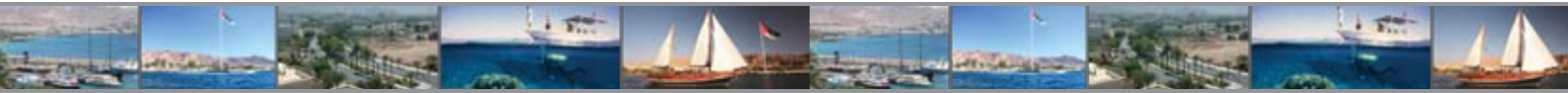
Aqaba Governorate Regional Product Baseline Projections, 1995 – 2015.

(JD 2005 millions)

	Economic Activity	1995	2000	2005 P	2010 P	2015 P	Annual growth rate 1995 – 2015
1.	Agriculture, forestry, hunting	1.8	2.4	3.1	4.2	5.6	6.0
2.	Mining and quarrying	0.3	0.3	1.6	7.1	7.8	17.3
3.	Manufacturing	26.0	32.3	54.3	113.0	135.5	9.6
4.	Electricity and water	2.3	6.2	8.3	14.4	25.0	11.7
5.	Construction	6.7	32.0	82.2	207.5	394.1	17.0
6	Wholesale/retail trade	12.7	29.2	59.7	123.8	256.7	15.7
7.	Hotels and restaurants	10.0	12.9	19.2	46.5	69.7	13.8
8.	Transport, storage, communications	42.7	72.7	127.4	202.1	320.8	9.7
9.	Finance and insurance	3.0	5.4	11.7	20.9	37.6	12.4
10.	Real estate, renting, business activities	13.1	30.0	54.1	120.2	266.7	17.3
11.	Pubic administration, defense, social security	16.5	21.4	24.0	46.3	79.7	12.8
12.	Education (private)	0.7	1.0	1.3	1.7	2.2	5.1
13.	Health and social services	0.8	1.2	2.0	2.8	3.8	6.4
14.	Other community, social, personal service activities	2.3	2.7	3.1	4.6	7.3	9.0
15.	Private households with employees	0.0	0.1	0.1	0.1	0.2	7.4
16.	Imputed bank charges	-1.2	-2.9	-6.3	-12.8	-22.5	13.6
17.	Gross domestic product (at basic prices)	137.8	246.6	445.7	902.6	1590.4	13.6
18.	Net taxes on products	0.0	0.0	3.7	7.5	13.2	13.6
19.	Gross domestic product (at market prices)	137.8	246.6	449.4	910.1	1603.5	13.6

Note: P = Projected.
Source: AZEM (2005). Projections by Nathan Associates, Inc.

24 Rockler, N., 2006: The Impact of the Aqaba Special Economic Zone on the Jordanian Economy, (last accessed August, 2009, http://www.kavetrockler.com/pdf/Jordan-Revised-ExecutiveSummary%2B070506.pdf).



Over the next 10 years, we expect growth in Aqaba to be extremely strong. We conclude this not only based on the underlying rate (10% per year) which would more than double Aqaba's output by itself, but after taking account of planned investment of more than JD 4.4 billion over the next 10 years. A growth rate of more than 13% per year barring capacity constraints is projected. Using this projection, it is estimate that the change in total output in all of Jordan will be JD 4.8 billion by 2015 as a result of Aqaba's growth, fully JD 860 million above what the trend rate would have produced. Aqaba will see JD 2.6 billion of the output change, while the rest of Jordan will get JD 2.3 billion. The national employment gain is nearly 56,000 above the trended value post-ASEZA, with increases of 35,000 and 21,000 jobs in Aqaba and the rest of Jordan, respectively.

1.7 Geographical Setting of the Aqaba Special Economic Zone

Covering the Kingdom's sole seaport of Aqaba and its environs, including Wadi Rum, ASEZ is currently established on 375 km^2 of territory in the south of Jordan (Figure 12). ASEZ extend to the land borders of Israel and Saudi Arabia and the territorial waters of Egypt.

Aqaba city is the capital of Aqaba Governorate and the main city of ASEAZ. Aqaba governorate is divided into 3 sub-regions (Figure 13):

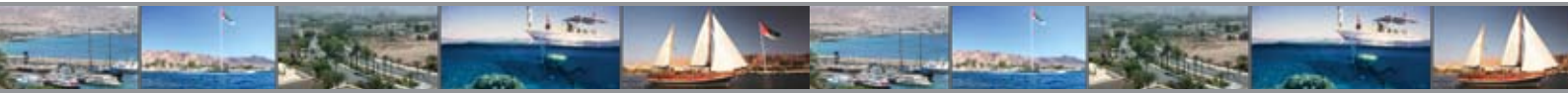
- **Al-Aqaba**
- **Al-Quwayra**
- **Wadi Araba**

Aqaba city strategically situated at the crossroads of four countries and three continents. It is situated about 328 km south of the capital Amman on the north shore of the Gulf of Aqaba. The time zone is GMT +2 hour.

Although the Gulf is only 26 kilometers wide at its widest point, it is exceedingly deep, as much as 1,800 meters in some points, with an average depth of 800 meters (Figure 13). These unusual geographic features are due to the Gulf being situated within the Syrian-African Rift Valley, which, which stretches from East Africa Rift all the way to Turkey.

Very little water flows into the Gulf of Aqaba, and its southern mouth at the Strait of Tiran is extremely narrow. As a result of these factors, the Gulf is a highly saline, still environment, with little hydrological interface with the Red Sea or the larger Indian Ocean. The prevailing wind is from north to south (from land to sea), so the water in the bay tends to be calm, with occasional winter storm winds blowing from the south. The prevailing wind speed ranges from 2 m/s to 7 m/s with occasional gust during the few storms. Tides are semidiurnal with tide height ranging from 0.3 to 1.0 m.

The city of Aqaba is hot during the summer and warm in the winter, but there is often a dry refreshing northerly breeze. Average rainfall is only 60 mm annually. In winter, the temperature of Aqaba hovers steadily at about 25° C. The prevailing winds are from north with occasional winter storm winds blowing from the south. The average relative air humidity ranges from 30 to 35%. The surface water temperature of the Gulf varied from 20° C in February to 27.3° C in September while the marine temperature is constant at 21.5° C below a depth of 200 m. The salinity of the sea water ranges from 40.3 to 41.6 Kg/m^3.



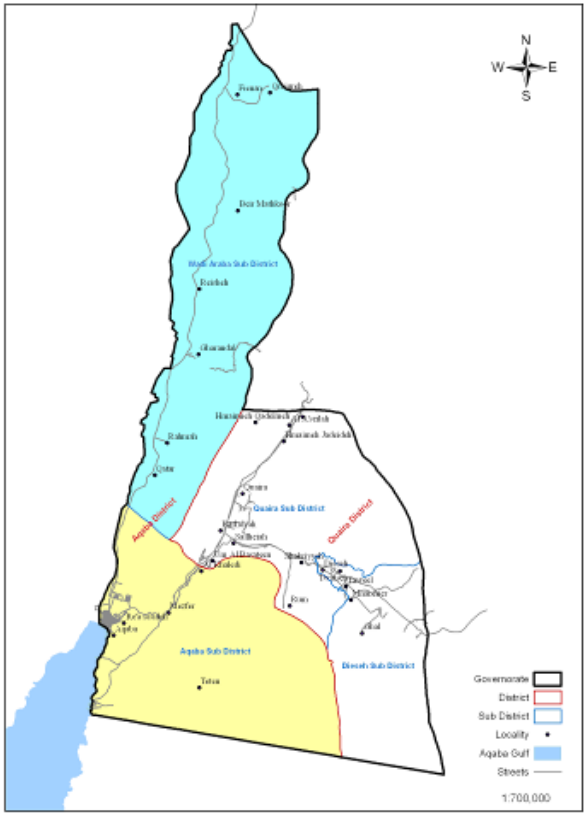


Figure 12: Governorate of Aqaba and its jurisdictional subdivisions.

The semi enclosed characteristics of the Gulf of Aqaba have led to its rich biodiversity. The Gulf hosts an extraordinary diversity of coral and related marine life. The reefs which fringe the Gulf of Aqaba coast line host more than 1000 species of fish. Sea grasses exist in the immediate vicinity of the coral reefs. Providing and important feed for fish, shrimp and other invertebrate and serving as host organisms for many species of micro and macro algae. Marine mammals in the Gulf include sea cows and dolphin. Sea turtles are observed in the Gulf waters.

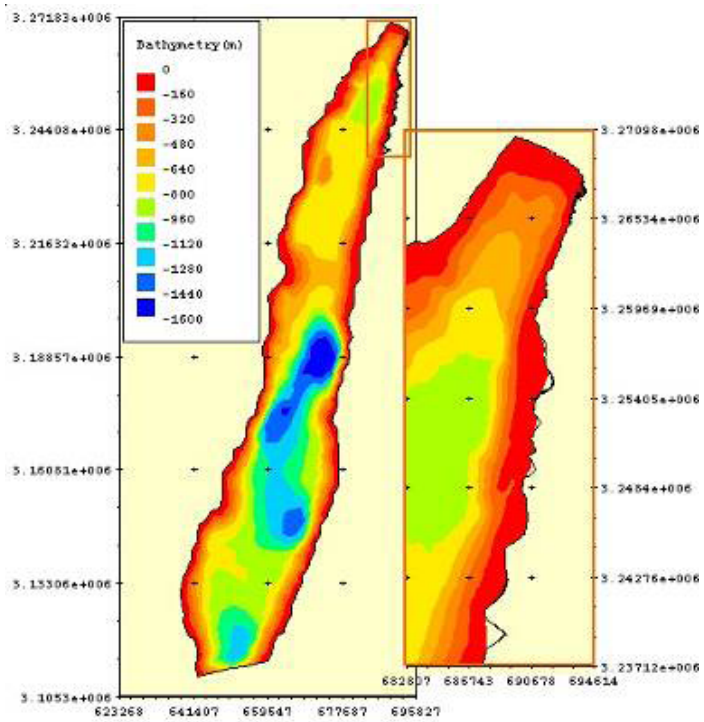


Figure 13: Bathymetric map of the Gulf of Aqaba[25].

25 Sustainable Management of Scarce Resources in the Coastal Zone - D08.1 Case Study Report: Aqaba, Jordan (2005): http://www.ess.co.at/SMART/DELIVERABLES/D08.1.doc.

Corals depend on two principal environmental elements: clear water free from sediments, and steady, slow currents to carry off waste and provide nutrition. In this regard, The Gulf of Aqaba is exceptionally well suited for mature coral reef ecosystem. The deep still waters of the Gulf allow sediment to settle, and the bright sunshine penetrates the water as far as100 meters. As a result, coral formation-both reef building and soft coral is extensive and unusually deep in the Gulf. The slow, circular currents of the Gulf of Aqaba provide abundant nourishment without endangering coral polyps, and the high levels of dissolved oxygen in the warm waters allow luxuriant coral growth[26].

The semi enclosed nature of the environment of the Gulf of Aqaba causes the sea to particularly susceptible to pollution. Marine pollution sources include urbanization, industrialization, aquatic tourism, oil spills, solid waste, waste oil contamination, phosphate dust, air pollution from land transportation, chemical pollution from industries, thermal pollution from power plant, return flow from irrigation, pollution of the shallow, brackish water aquifer and sewage from the municipal sewage treatment ponds. If these activities are not controlled in an environmentally sound and sustainable manner environmental degradation will build up.

Chapter 2 : Inter-City Linkages

2.1 Internal division of the Aqaba Special Economic Zone

The city of Aqaba is divided into four regions, where each region is internally divided into several hays or neighborhoods (Figure 14).

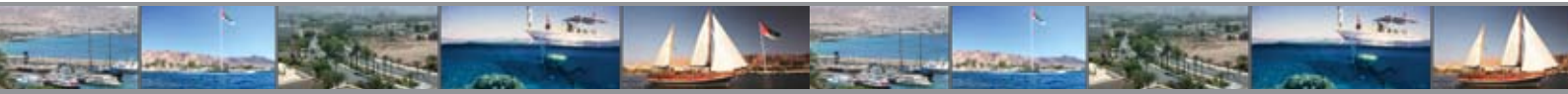
Figure 14: Internal divisions of ASEZ.

2.2 Governance/management style of the Aqaba Special Economic Zone

ASEZA is a financially independent private corporation. ASEZA is governed through an Administration Regulation Law no. 32 for the year 2000 and through a set of regulations. The functions are administered by the ASEZA Board of Commissions, which includes six members. The Board is the zones' highest governing body. According to the Administration Law of ASEZA, the administration structure of ASEZA consists of:

1. The Council Board of Commissioners

2. The Chief Commissioner



3. The Consultants

4. The Directors

5. The Office of Chief Commissioner

The following directorates are associated with each member of the board, where each head of directorate is held responsible before the associated commissioner or the Chief Commissioner:

A. The Chief Commissioner

1 Management Information Systems (MIS) Directorate.

2 Strategic Planning Directorate.

3 Governmental Affairs Directorate.

4 Legal Affairs Directorate.

5 Quality Assurance Directorate.

6 Public Relations Directorate.

B. Environmental Affairs Commission

1 Environmental Directorate.

2 Health Care Directorate.

3 Laboratory Directorate.

C. Administrative and Financial Affairs Commission

1 Human Resources Directorate.

2 Financial Affairs Directorate.

3 Administration Affairs Directorate.

D. Customs and Revenue Affairs Commission

1 Revenue Directorate.

2 Customs Directorate.

3 Storage & Warehousing Directorate.

E. Economic Development and Investment Affairs Commission

1 Local Community Development Directorate.

2 Investment Directorate.

F. Infrastructure and Services Affairs Commission

1 Public Works Directorate.

2 Permitting & Building Directorate.

3 Regional Affairs Directorate.

4 Planning & Studies Directorate.

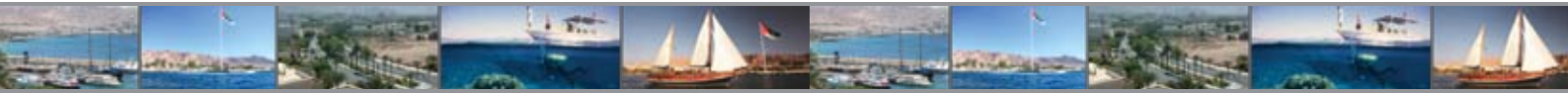


Figure 15 shows a flow chart of the organizational structure of ASEZA.

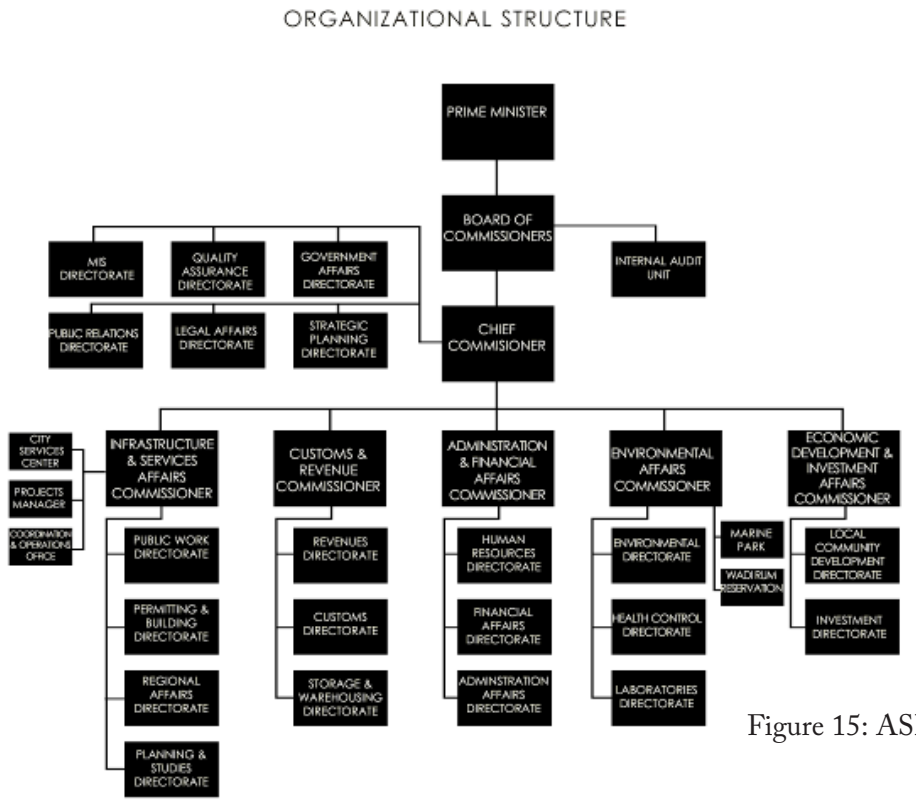


Figure 15: ASEZA administrative hierarchy.

2.3 Formal Arrangements

Pertaining to the ASEZA law no (32) for the Year 2000 and its amendments published on page (3423) of the Official Gazette no (4453) dated 31/8/2000, ASEZA shall assume the following activities:

A- Develop and qualify the Zone to attract investments and create an advanced investment environment to stimulate industry, trade, tourism and services in the Zone.

B- Increase job opportunities for Jordanians, coordinates and cooperate with investors in the Zone to train, qualify and enhance the capacity of Jordanian manpower and give the priority to their employment.

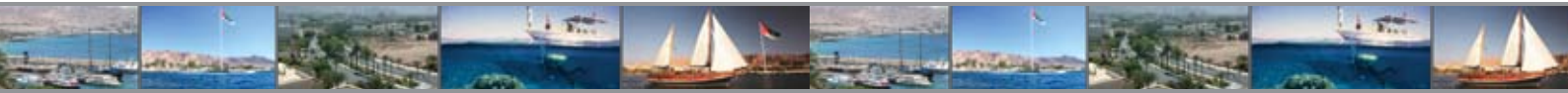
C- Enhance the role of the private sector in participating in the development of the Zone, including providing infrastructure services and any public services.

D- Encourage competition and prevent monopoly in the various economic activities within the Zone.

E- Plan, design and execute projects for the development of the Zone in various fields, directly or through other parties.

F- Protect the environment in the Zone.

G- Encourage Registered Enterprises to conduct and support research and development.



Accordingly, the Authority shall assume the following responsibilities:

A- Administer the Zone and oversee its affairs according to its authorities entrusted therewith pursuant to this Law and the by- laws issued pursuant thereto.

B- Prepare the necessary plans and programs for developing the Zone.

C- Establish the applicable basis for investment in the Zone.

D- Register enterprises wishing to enjoy the benefits and exemptions stipulated pursuant to this Law.

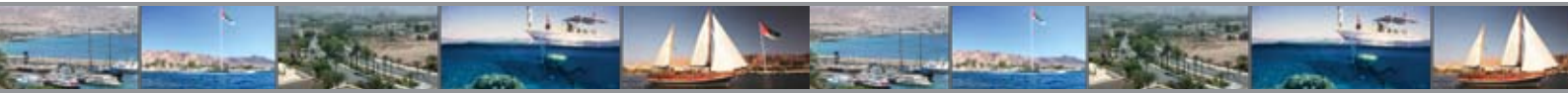
E- Promote the Zone in coordination and cooperation with the relevant bodies.

2.4 **Relevant Legislations/Regulations**

These regulations were issued in accordance with relevant articles of the ASEZA's law no. 32 for the year 2000. These regulations include:

- Labor and Residency Regulation
- Customs Regulation
- Marine Park Regulation
- Development & Management Regulation

- Organizing Finance & Accounts Regulation
- Environmental Protection Regulation
- Registration & Licensing Regulation
- Financial Regulation
- Sale & Lease of Land Regulation
- Income Tax Regulation
- Sales Tax Regulation
- Investment Climate Regulation
- Wadi Rum Regulation



Chapter 3 : Land Use Management

3.1 Relevant Legislations

In the years 1952-1960 Aqaba did grow in a natural way in the absence of planning laws. People clustered near their work in the City Centre near the Port and Palm Coast. The expansion was towards the east.

In 1962 an outline of future plan for Aqaba was put to cover the following points:

1- The Coastal Area (Palm Belt & Cultural Area) which was realized only in the year 2000.

2- The north of the city was planned for special use. The north and northeast were allocated for housing. This factor was put into action since that time

3- A proposal for upgrading of the old city and the replacement of poor areas. This problem has been of importance from the mid eighties until now.

4- Crafts areas had to be in the very north of Aqaba (on its gate from/to Amman, where Trucks Parks).

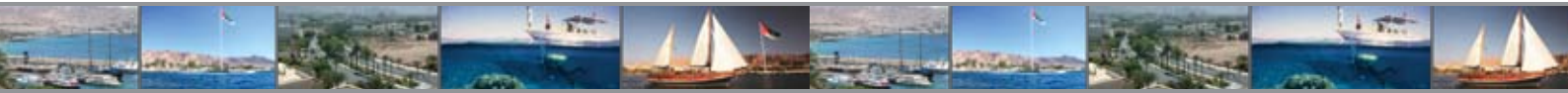
5- The Industrial areas took place in the south.

Later, more plans were issued: 1966 by DOXIADIS, 1975 by DAR AL-HANDASAH & TANS, 1981 by SHANKLAND COX. All these plans confirmed the points of the first one with slight differences in the details due to political and historical events.

The most recent development plan is the master plan for the years 2001 to 2020. The development of the ASEZ is in part a continuation of the long-term vision of making Aqaba a growth pole- a thriving and successful export processing zone for the country; and a pleasurable aesthetic experience, while maintaining its unique identity. The Master Plan divides the Zone into five areas of planned development with consideration to land use requirements, investment flows and population growth over the next 10 to 20 years: Aqaba Town, the Port Areas, the Coral Costal Zone, the Southern Industrial Zone and the Airport Industrial Zone, in addition to Reserves and Environmental Zones.

The integrated master plan promises to change the face of the city to grow to 250,000 within the next two decades. Aqaba possesses several location advantages important to industry, including availability of low-cost land and buildings, skilled and trainable labor, transportation infrastructure, and a stable microeconomics policy framework. Moreover, producers may be interested in exploiting the benefits of the duty-free access to imported input materials, not to mention Jordan's free trade agreements with US, EU and several Arab countries.

The Zone and the Region shall be considered a regional zoning area according to the provisions of the Zoning of Cities, Villages and Building Law in force and the regulations issued pursuant thereto. For this purpose, the Board shall assume the powers of the Higher Zoning Council and the Province and Local Zoning Committees. The Board may delegate the powers of these Committees to special committees formed for this purpose. The Chief Commissioner shall also, and as the case may be, assume the powers of the Minister stipulated in the enacted Zoning of Cities, Villages and Buildings Law and the regulations issued pursuant thereto.



The Council of Ministers may, upon the recommendation of the Board, issue a special regulation in which it determines the bases for zoning and buildings in the Zone and other matters related thereto. Additionally, the Board shall administer the coastal areas. The basis of administering such areas on land and in the sea shall be determined according to a Regulation to be issued for this purpose.

Plans to rehabilitate existing development zones will provide property developers with opportunities for industrial estates, technology parks, logistic and warehousing centers, and commercial centers. Land may be leased for a period of up to 50 years, renewable in special circumstances or it may be purchased for hotel, commercial, health, educational and residential developments. Land use map of ASEZ is shown in Figure 16, while land use map of the city of Aqaba is shown in Figure 17 which is modified after Water Authority of Jordan, 2000.

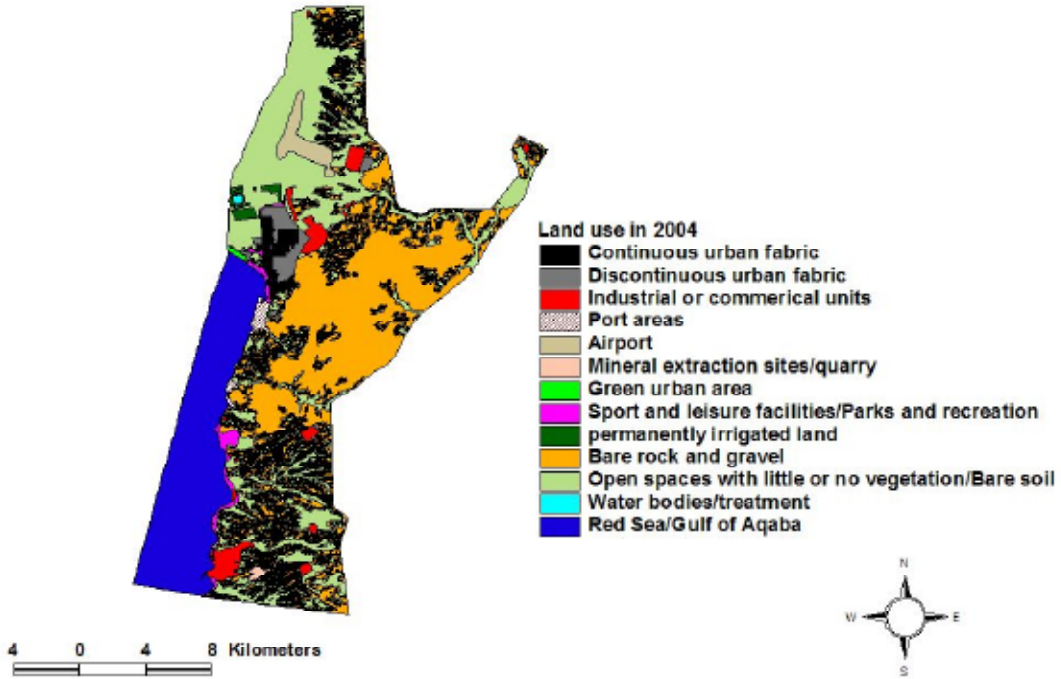
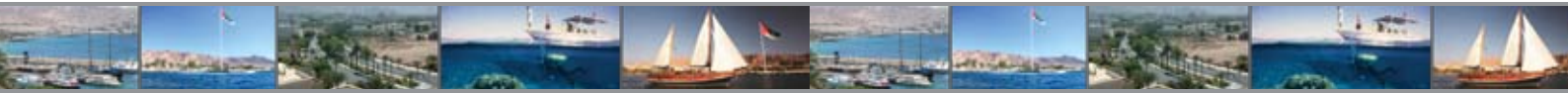


Figure 16: ASEZ land use map of 2004[26].

26 Sustainable Management of Scarce Resources in the Coastal Zone - D08.1 Case Study Report: Aqaba, Jordan (2005): http://www.ess.co.at/SMART/DELIVERABLES/D08.1.doc.



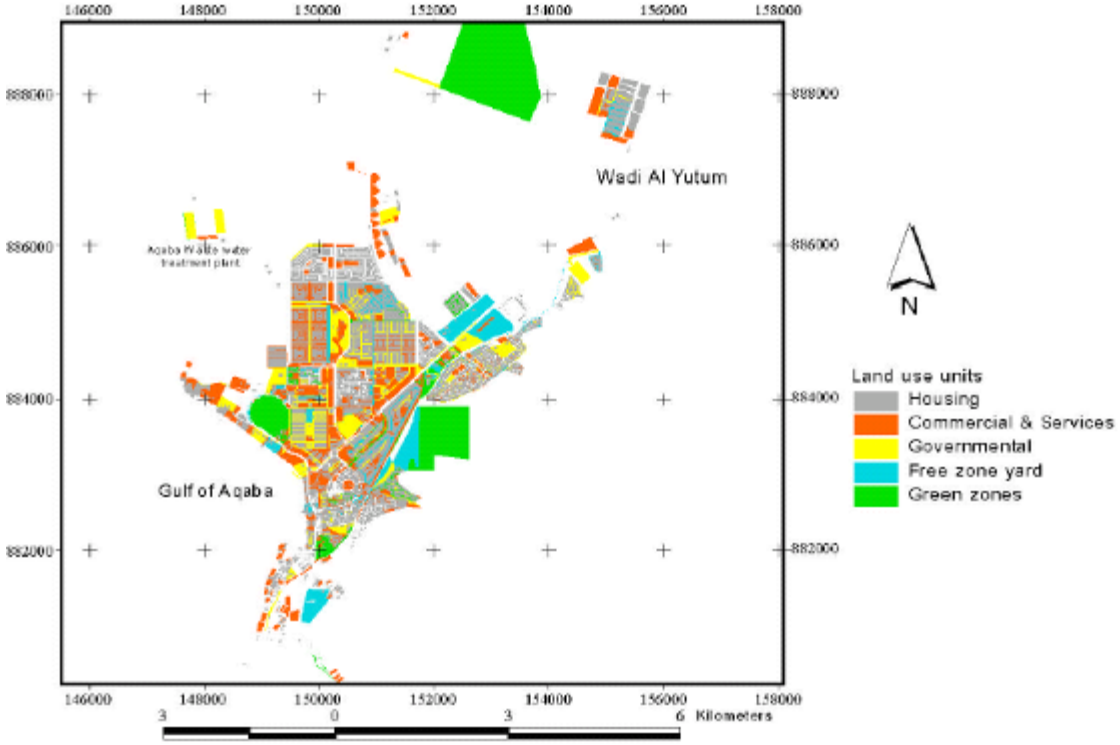


Figure 17: Land use map units of the city of Aqaba.

THE ASEZ MASTER PLAN

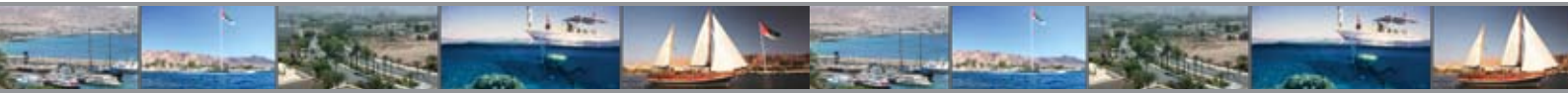
In 2002, ASEZA adopted a comprehensive Master Plan that encompasses development activities in the Zone for the promotion of portal, urban, tourist, commercial, academic and other investment sectors. Developed planning already covers the following special areas:

1. The City of Aqaba

The city is envisioned as the heart of future tourism and commercial development. Plans exist for revitalization, expansion and promotion of its waterfront Cornish, urban hotels, commercial districts, historical sites, Old Town and Shallalah districts, in addition to new residential areas. The Cornish is in the process of being transformed into a bustling entertainment and commercial centre, lined by historical and cultural attractions, such as the Mamluk Castle, the Ayla archaeological site, and the Al Hafayer palm grove.

2. The Port Zone

The Aqaba Port Areas include the Main Port, the Container Port and the Southern Industrial Port. According to the Master Plan, a common location- the Main Port- is established to merge the three existing port area activities into one expanded entertainment, residential, hotel and cruises service center. The main port zone will be converted to a waterfront recreation, entertainment, and hi-tech businesses area with potential for cruise ship tourism in a redeveloped harbor area. The container and southern industrial ports will be redeveloped and expanded to accommodate the relocation of the main port's cargo operations. APM Terminals signed a 2-year



management contract with the Aqaba Development Corporation (ADC) for the management and upgrading of the Aqaba Container Terminal operations. The Industrial Port will also undergo expanded development activities for new facilities.

3. The Coastal Zone

The southern beach areas are planned for resort hotels, residential home-sites and public beach facilities development. This area also includes sensitive and exotic coral reefs, the Aqaba Marine Park, the Marine Science Station, Royal Diving Club, campsite, and public beaches. Planning and development will focus on promoting sustainable development, protecting the marine environment while maintaining its balance with private sector development.

4. The Southern Industrial Zone

The industrial zone near the Saudi border is already home to several industries, and has its own industrial port facilities. This area is the centre for current and future heavy agro-chemical industries. This area is planned for expansion, and efforts to reduce industrial pollution are actively sought and employed. New transportation systems, including a railway terminal, will serve the developed area.

5. The Airport Industrial Zone

In addition to forming a strategic component of Aqaba's transport hub, the Airport Zone will become the centre for light industry and warehousing development, light manufacturing, showrooms, office complexes and airport-

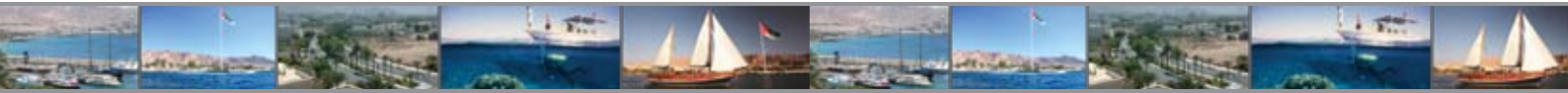
related business activities. The Airport Zone is the planned site of a fully serviced International Industrial Estate with QIZ status, which confers duty-free entry to the United States markets for products produced within the site.

6. Reserves and Environmental Zones

The Master Plan aims at preserving natural resources within the construction frame. It comprises several zones and reserves for the protection of Aqaba's cultural, archeological, historical and natural heritage and diversity. Areas include: five environmental zones, coral reserves, archeological reserves, natural area reserves and a Beach Protection Zone.

3.2 Responsible agents and their relationship

Land use regulations and development are a function of both the national government and the authority. There are basic regulations prepared by the national government that should be applied in the entire country. On a national level the Housing and Urban Development Corporation (HUDC) deals with housing issues. HUDC's tasks are to "study, formulate, and implement" laws and codes relative to the Housing and Urban sector as well as improving urban areas. The role of HUDC had shrunk with the advent of ASEZA as an authority to develop the region. However, HUDC is still addressing limited issues related to the poor and their housing needs, through what is known as the "Royal Makruma" Housing Project for the Poor.



In December 2003 the Aqaba Development Corporation (ADC), a limited private shareholding company was formed to take full responsibility for the development of ASEZ's strategic assets in a manner consistent with the Master Plan and prudent private sector principles and practices. Accordingly, ASEZA has delegated responsibility for ASEZ's development to the Aqaba Development Corporation. ADC has acquired substantial assets (Land, Port, Airport) and development rights (utilities, others) to accelerate their development according to private sector principles and partnerships. ADC is funded by equity contributions and revenues from assets (notably the Port). While initially owned by the Government (50%) and ASEZA (50%), ADC will ultimately seek private sector equity participation.

The divestiture of responsibility for ASEZ's development from ASEZA to ADC is expected to realize the following principal benefits:

- Enable ASEZA to focus exclusively on its regulatory function while empowering a dedicated corporation to drive the development function.
- Achieve ASEZ's 'holistic' development through an agency vested with full operational and financial responsibility over development matters, including land, infrastructure, utilities and development rights.
- Accelerate ASEZ's development by introducing private sector principles, practices and imperatives to planning and implementing development projects, including stringent performance metrics.
- Escalate private sector participation in ASEZ's development, either on a stand-alone basis or through public-private

partnerships or other means that optimally leverage ADC and private sector strengths.

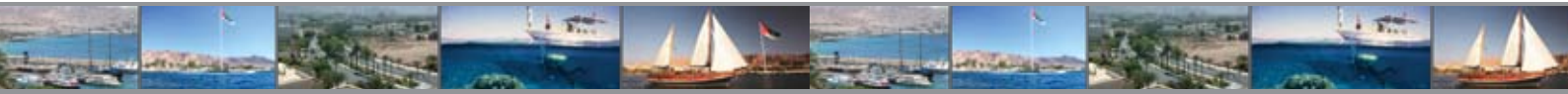
- Access a wider pool of private sector technical and management resources.
- Eliminate potential conflicts of interest within ASEZA by separating its regulatory function from its development function;
- Insulate key development decisions from political influence
- Facilitate greater access to market-sourced capital.

3.3 Effectiveness of current arrangements

The current arrangement effectiveness is not clear since there has not been any impact evaluation or assessment. This is due to the fact that the initiative to implement such studies is a recent one. The high interest of different agencies in Jordan to building up risk reduction programs is significant. Different organizations have invested in organizing or carrying out training for their staff in building up skills in disaster management[27].

The Ministry of Health, Ministry of Environment, Civil Defense, GAM and other institutions are working on building up their strategies for emergency preparedness and humanitarian action.

27 Rockler, N., 2006: The Impact of the Aqaba Special Economic Zone on the Jordanian Economy, (last accessed August, 2009, http://www.kavetrockler.com/pdf/Jordan-Revised-ExecutiveSummary%2B070506.pdf).



Chapter 4: Vulnerability Issues

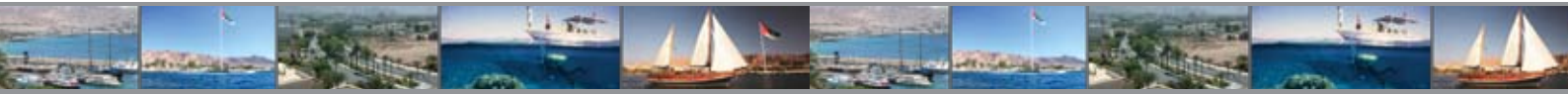
The ASEZA's law that has been approved in 2001 did not address the issue of disasters and emergency situations. However, the Environmental Affairs Commission is responsible to:

- Establish and sustain environmental monitoring programs to maintain the quality of the environmental elements in the Zone.
- Guarantee the compliance with the current environmental legislations to go along with the development in the Zone.
- Guarantee the efficient control of environmental risks.
- Keep on attracting international and regional support in the environmental fields.
- Increase environmental awareness to boost the investments in the Zone.
- Guarantee the safety of the food products distributed locally (establishing a computerized risk-based system for control and research purposes).
- Guarantee the safety of the consumer and facilitate the trade by applying risk-based system for health to control the imported food according to pragmatic proofs and transparent procedures.
- Increase the customers' food safety awareness (planning, developing and issuing educational and instructive materials) and release the updated health requirements.
- Improve public health services in the pharmaceutical sector and other medical services in the Zone.

- Reduce the risks and threats to the marine environment to create a sound marine environment.
- Disseminate the mission and objectives of the Marine Park to all the community sections and institutions to increase awareness of the importance of preserving the marine environment and to involve them in the protection of the Park natural resources.
- Keep on offering and developing high-quality coastal services to meet the client's needs.
- Ensure a sustainable tourism development in Wadi Rum while preserving the natural and cultural resources in the Zone.
- Increase economic income of the local community and raise its participation in the management of the Zone.
- Adopt laboratories services by different control authorities in Aqaba, Jordan and the neighboring countries.
- Cover all the needed analysis services of the food elements in the targeted markets.
- Turn the laboratory into a key reference for the local, regional and international authorities.
- Turn the laboratory into a center to stand out in the training and consultant services.

There are several sources and activities that affect the environment in ASEZ. The followings are man-made examples:

- Aquatic Tourism.
- Oil Spills.



- Waste Oil Contamination.
- Air Pollution from Land Transportation.
- Solid Waste.
- Phosphate dust.
- Chemical pollution from industries.
- Thermal pollution from Power Plant.
- Sewage discharge.
- Return flow from Irrigation.

However, the following potential future developments may also affect the environment:

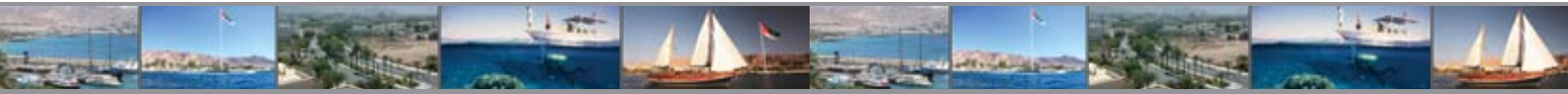
- Development of new hotels and resort cities.
- Increase in population due to new job opportunities.
- The proposed Red Sea-Dead Sea conduit.
- New industries.
- Tourist activities.
- Housing developments.

4.1 Seismicity of the region

As mentioned Earlier, the natural disasters that may have influence on the region include mainly earthquakes, floods and droughts. But, for the purposes of this project, earthquakes only will be discussed. The Dead Sea Transform fault system and its related branching faults are associated with the highest concentration of earthquakes in the region. Historical records indicated that numerous destructive earthquakes have occurred during historical times, many of them are documented in the Bible and Later Roman and various Arabic sources. The most recent destructive earthquakes that have ruptured the plate boundary are the 1927 and 1995 earthquakes in Jericho and the Gulf of Aqaba, respectively[28].

The more recent major earthquake (22 November 1995), with a moment magnitude Mw = 7.1 and a local magnitude ML=6.2, struck the shorelines cities of the Gulf of Aqaba. The earthquake was felt in a 600-km radius. The calculated intensity was VII which is explained by the topography effects and the very thick accumulations of soft lose sediments, such as sand, gravel, and brittle corals. As a result of this earthquake at least 11 people were killed and 47 injured in all Gulf cities (PDE bulletin, 1996, Dara Al-Handasah, 1995, Civil Defense, personal communication).

28 Al-Zoubi A. S., Z.S.H. Abu-Hamatteh, and A. Amratet, 2006: The seismic hazard assessment of the Dead Sea rift, Jordan, Journal of African Earth Sciences 45 (2006) 489–501.



Damage occurred in Aqaba city and high waves were reported along the coast of the city. The field survey conducted after the main shock indicated that some hotels along the northern beach suffered serious structural damage, where many gaps in walls were observed and the inner walls collapsed. Some concrete-constructed water tanks in the southern beach collapsed and were severely damaged. Figure 18 shows earthquake density map of the Gulf of Aqaba for the events recorded during the period 1900-2008.

It is worth mentioning that the November 22, 1995 earthquake of the red Sea was the largest earthquake along the DST in the last few centuries. The mainshock was preceded by earthquake swarms near both ends of its fault rupture and was followed by intense aftershock activity, concentrated mainly northwest and southeast of the NE–striking main rupture (Figure 18).

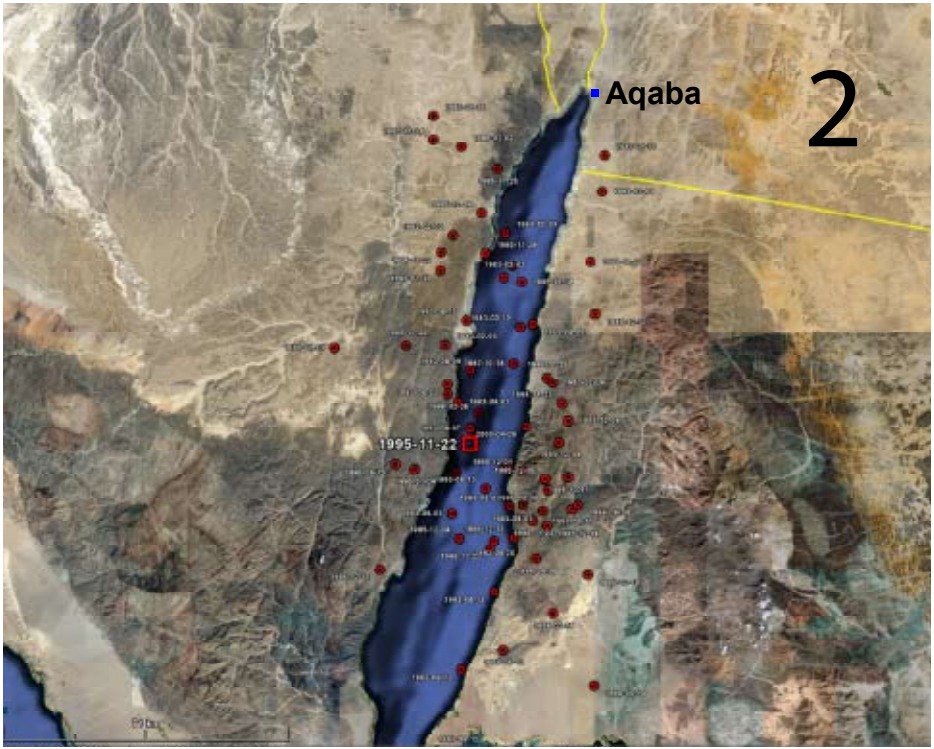
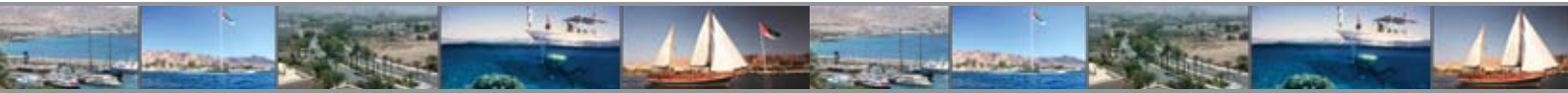


Figure 18: Earthquake events of magnitudes greater than 4.5 taking place during the period 1900-2008[29].

29 Data retrieved from the catalogue of the Geophysical Institute of Israel (GII): http://www.gii.co.il.



Within the Gulf of Aqaba region, the seismic activity in the last 20 years could be characterized by the incident of swarm earthquakes (Figure 19). Among the most significant are:

1- The 1983 swarm with a maximum magnitude of 5.3 with the epicenters concentrated in the northern tectonic block of the Gulf of Aqaba.

2- The 1993 swarm with a maximum magnitude of 5.6 with the epicenters concentrated in the middle tectonic blocks.

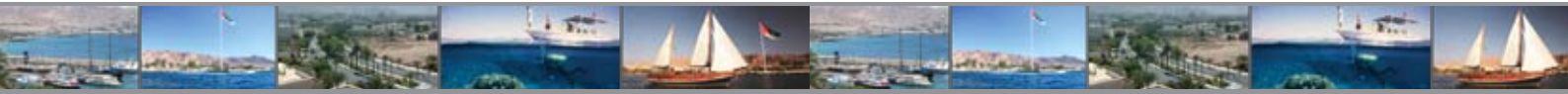
3- The 1995 swarm which had a maximum magnitude of 7.2 where the epicenter of the main event was located 80 km to the south of Aqaba City. A summary of the characteristics of these swarm episodes are listed in Table 3.

During the historic time, the seismic activity of the Gulf of Aqaba has been relatively high. Historic documentation and archaeological studies show that several destructive earthquakes with moment magnitude (M) more than 6 have occurred. The archaeological record shows that the Ayla City (Aqaba) has been totally destroyed by the earthquake of 1068.

The instrumental recording of the earthquake in the region that started late in the last century and continued for sometime using instruments lack the accuracy in comparison with modern instruments. Seismological results show that the rupture of the 1995 event originated in the vicinity of the 1993 event and propagated to the north, where the major movement release of two subevents took place, 20 and 40 km away, respectively. Studies indicated that

the source mechanisms of the major events in the two swarms are different. The 1993 earthquake (August 3rd, 1993) has a predominantly normal faulting mechanism[30], whereas that of 1995 (November 22nd) shows that the main event and the aftershock are predominantly left lateral strike-slip mechanism[31]. At the same time the 1983 (Fig. 19A) and 1993 (Fig. 19B) swarms indicated that the seismic activity migrated from north to south, whereas the 1995 swarms (Fig. 19C) showed end to end migration of energy sources from south to north.

30 Pinar, A., Turkelli, N., 1997. Source inversion of the 1993 and 1995 Gulf of Aqaba earthquakes. Tectonophysics 238, 279–288.
31 Hofstetter, A., Feldmann, L., Rotstein, Y., 1991. Crustal structure of Israel, constraints from teleseimic and gravity data. Geophysical Journal International 104, 371–379.



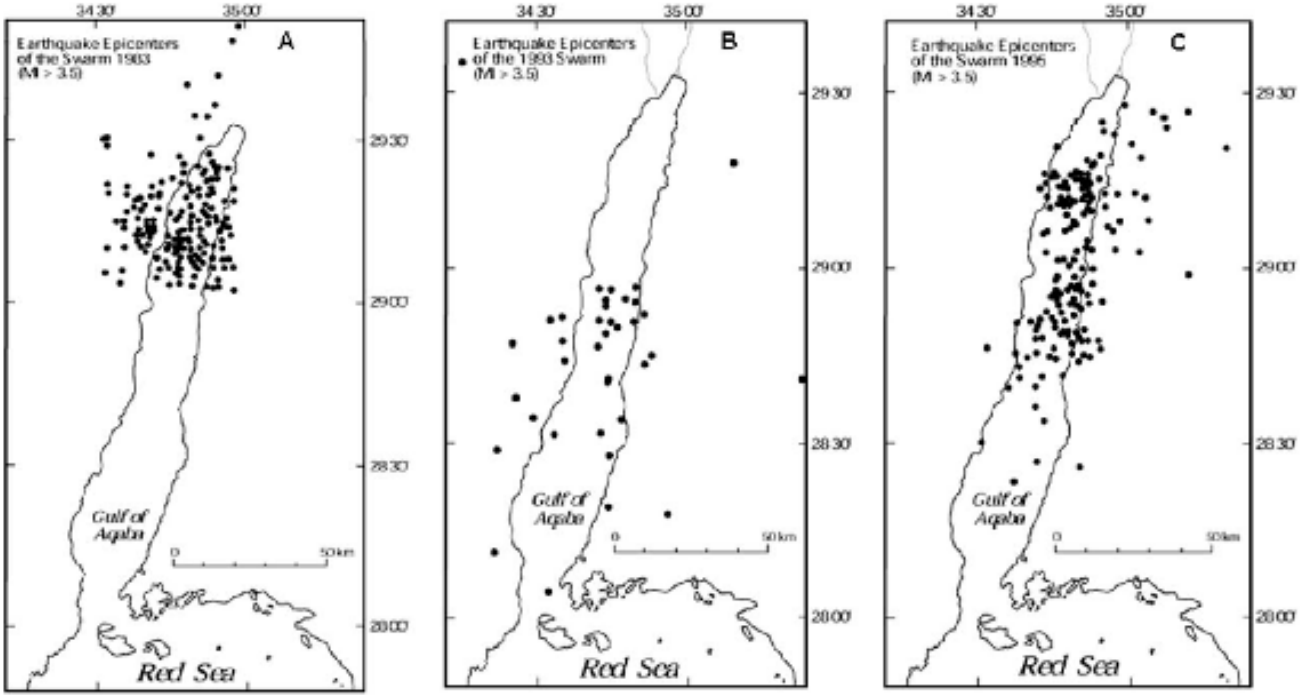
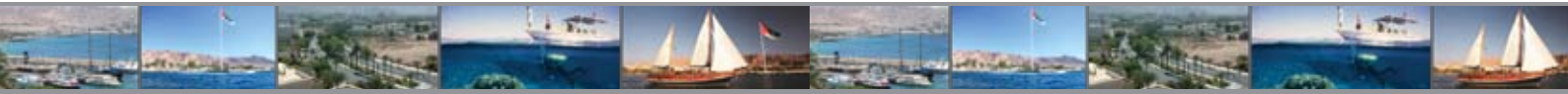


Figure 19: Map showing the distribution of earthquake epicenters of the Gulf of Aqaba (A) 1983, (B) 1993 and (C) 1995.

Table 3: Statistics on the 1983, 1993, and 1995 Aqaba Gulf earthquake swarms[32].

Aspect	1983 swarms	1993 swarms	1995 swarms
Inception date	21 January	3 August	22 November
Duration (days)	22	148	more than 6 months
Total no. of events	249	272	1236 until 31 December 1995
No. of events of M_L > 4.0	29	25	18
Largest M_L	4.85	5.6	6.2
Total released energy (ergs)	1.65 × 1020	1.64 × 1020	2.432 × 1021

32 Fahmi, K. J. and A. Husein malkawi, 1998: Dynamic site response evaluation of the Port City of Aqaba (Jordan) employing the equivalent linear method, Can. Geotech. J. 35: 961–975.



4.2 Faulting systems

Jordan is situated along a major fault line 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 160 km to the Gulf of Aqaba.

A number of radial patterns of faults have branched off or triggered in association with tectonic stresses accumulating across the DST. The strike of these faults roughly coincides with the main trend of the Dead Sea fault system. The strike-slip along the main fault induced faults such as Riedel shear, conjugate Riedel shear and P-shear faults. Figure 20 shows a general structural map of Jordan. Among the dominant structural elements are:

- The Zarqa-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.
- The 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.
- The Amman-Hallabat structure having NE-SW trend branching from the northeast corner of the Dead Sea.

Figure 21 shows an updated geological map of ASEZ produced as part of the RSS microzoantion study in Aqaba. It shows a large number of fault structures that run across the region. These fault trends are potential for future earthquake sources.

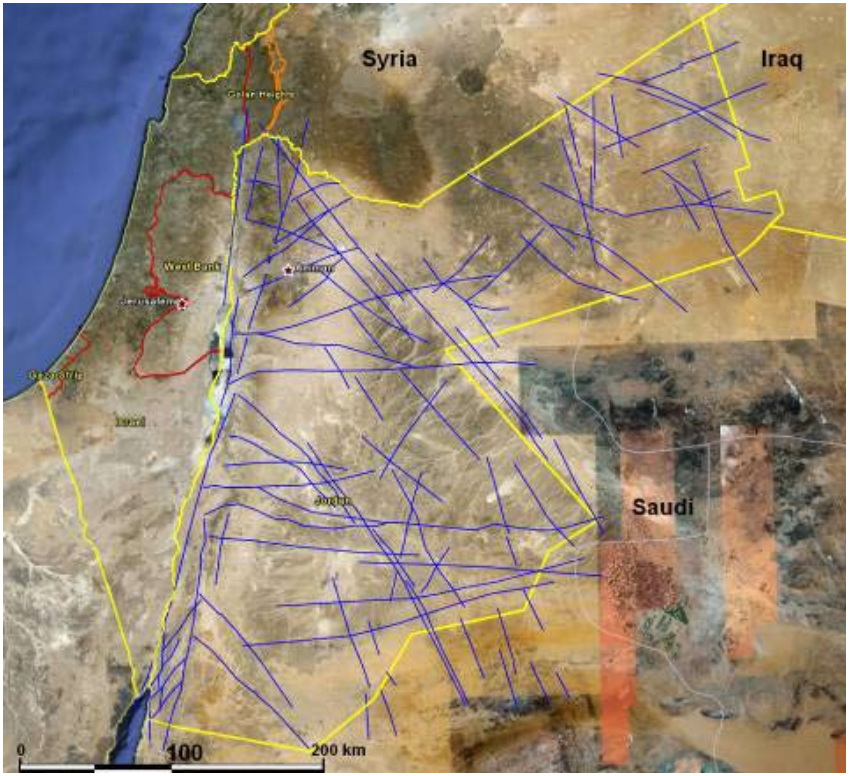
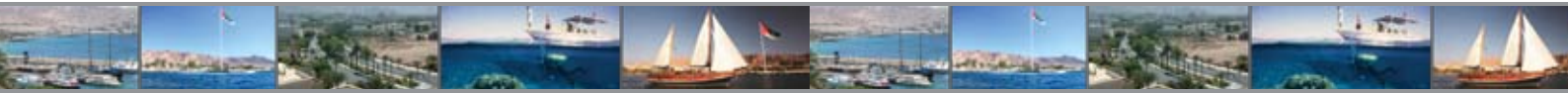


Figure 20: Faulting structural elements of Jordan.



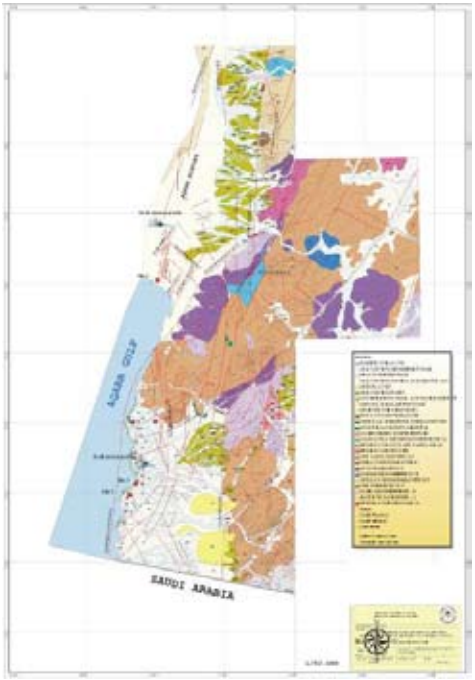


Figure 21: Geological map of Aqaba[33].

On the other hand, The Gulf of Aqaba, 180 km long structure, comprises four main sedimentary basins, the Dakar, Tiran, Aragonese and Aqaba Deep, whereas, the Hume deep structure, which is located outside the limits of the Gulf, is considered to be the fifth basin (Figure 22). These sedimentary basins are distributed in an en-echelon faults pattern and represent pull-apart basins with different shapes and sizes. The evolution of the Gulf started with the initiation of the Red Sea rift in the Late Oligocene to Early Miocene. The displacement along the main fault has been continuous since that time, with an increase in the component of transverse separation along the Dead Sea transform before five million years. Earthquake events taking place within the Gulf of Aqaba are strongly associated with pull-apart tectonics associated with these basins producing large vertical displacement components[34].

33 Royal Scientific Society (RSS), 2008: Seismic hazard mitigation in Jordan, SDC funded project.

34 Al-Zoubi A. S., Z.S.H. Abu-Hamatteh, and A. Amratet, 2006: The seismic hazard assessment of the Dead Sea rift, Jordan, Journal of African Earth Sciences 45 (2006) 489–501.

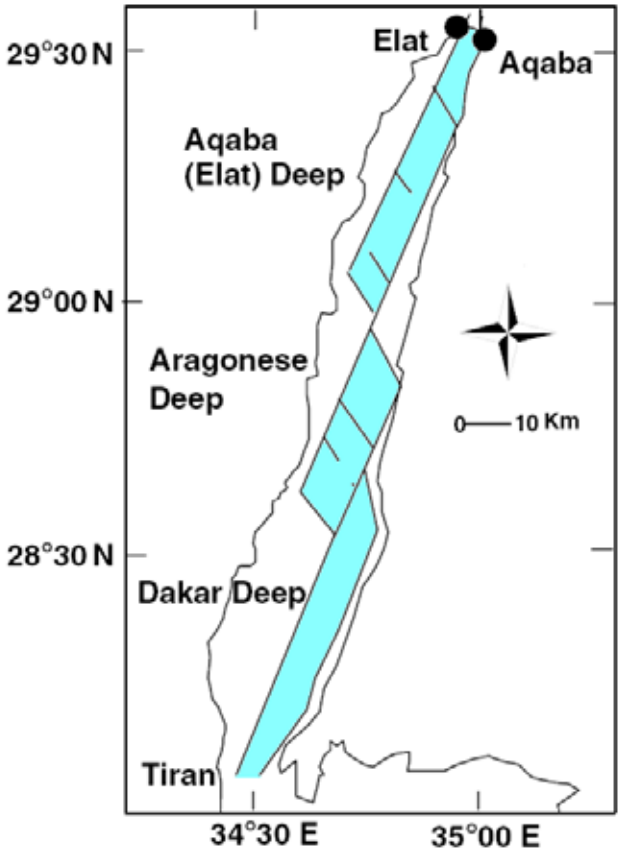
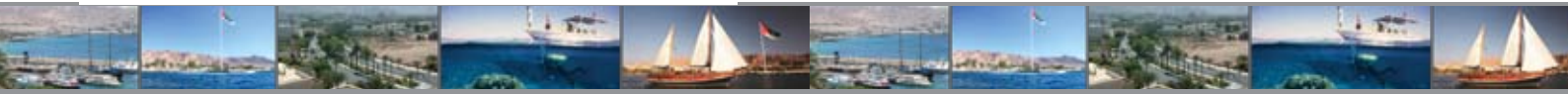


Figure 22: General tectonic structure of the Gulf of Aqaba (modified)[35].

However, it can be said that historical events are unequally distributed along the fault and only four events have been reported in the Araba Valley over the last few thousands of years. Magnitudes estimated from the historical record are probably slightly smaller than that of Mw~7.3 earthquake that struck the Gulf of Aqaba in 1995. The relatively short length of the Dead Sea fault segments implies that moderate-size earthquakes are expected to occur. Analyses of historical records suggest a maximum local magnitude (ML = 7.3), which corresponds to a maximum rupture length of 115 km[36].

35 Al-Zoubi A. S., Z.S.H. Abu-Hamatteh, and A. Amratet, 2006: The seismic hazard assessment of the Dead Sea rift, Jordan, Journal of African Earth Sciences 45 (2006) 489–501.

36 Ben-Avraham, Z., Grasso, M., 1991. Crustal structure variations and transcurrent faulting at the eastern and western margins of the eastern Mediterranean. Tectonophysics 196, 269–277.



4.3 Ground motions

A number of seismogenic sources occurring within the region tend to dominate the seismic hazard map of Jordan and neighboring countries. Accurate assessment of the intensity of seismic hazard requires the crucial definition of the characteristics of these dominating seismic sources based on updated earthquake catalogue of the whole region.

In accordance with the current Jordan Building Code, seismic hazards can be quantified in terms of Horizontal Peak Ground Accelerations (PGA) and Spectral Acceleration (SA) maps having a probability of 10% of being exceeded at least once within an exposure time of 50 years. PGA values are computed for rock site conditions. The probabilistic ground motion maps integrate the parametric contributions of the spatial and temporal characteristic of the seismogenic sources. Usually more than one map is required to characterize the ground shaking hazard completely. Probabilistic ground shaking maps are used in model building codes, disaster scenarios, risk assessments, loss estimation, and seismic zonation. Figures 23, 24 and 25 display maps of PGA, SA for 0.2 s period and SA for 1.0s period, respectively.

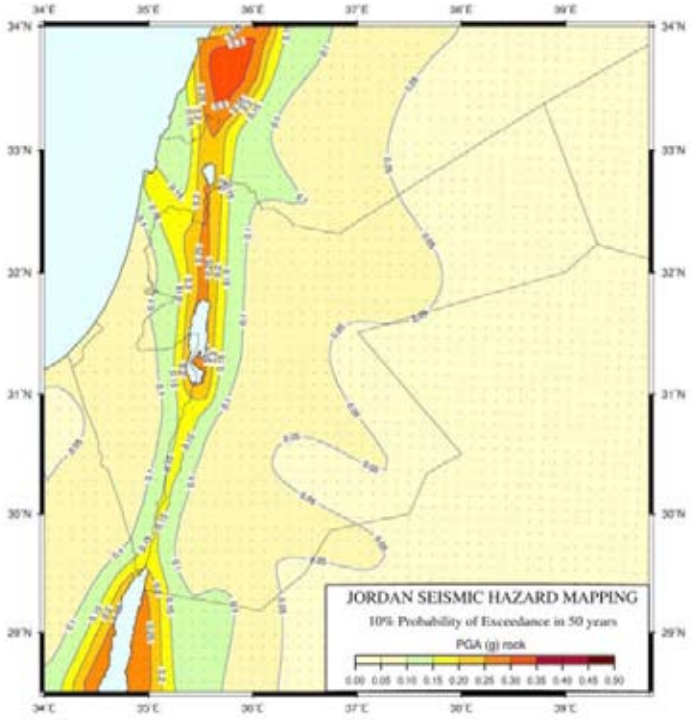
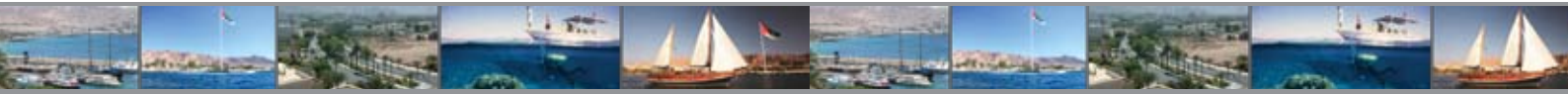


Figure 23: Peak ground acceleration (PGA) map at 10% probability of exceedance in 50 years[37].

37 JIMENEZ, M., H. AL-NIMRY, A. KHASAWNEH, T. AL-HADID and K. KAHHALEH, 2006: ASSESSMENT OF SEISMIC HAZARD IN JORDAN, First European Conference on Earthquake Engineering and Seismology (a joint event of the 13th ECEE & 30th General Assembly of the ESC) Geneva, Switzerland, 3-8 September 2006.



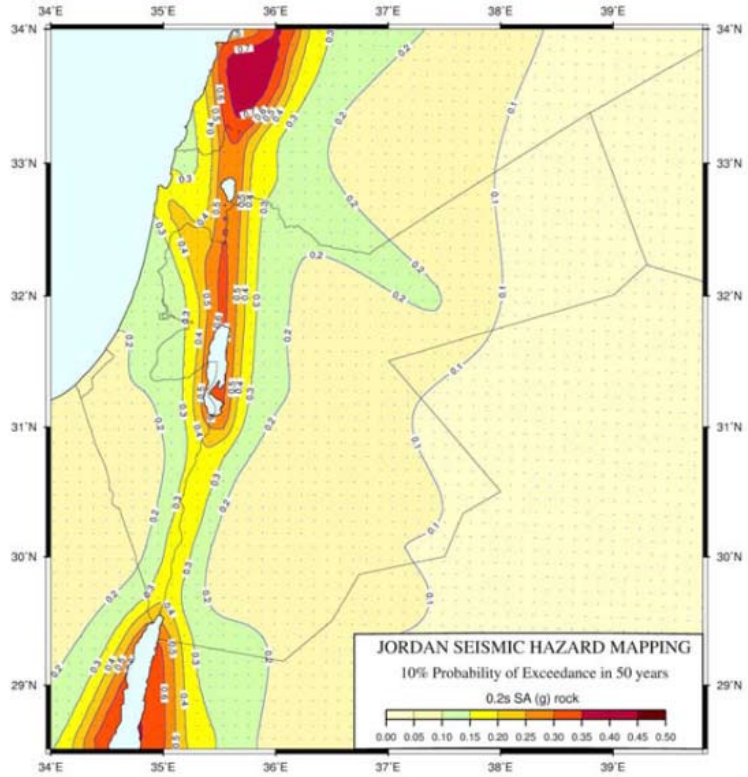


Figure 24: Spectral acceleration (SA) map for a period of 0.2 s at 10% probability of exceedance in 50 years.

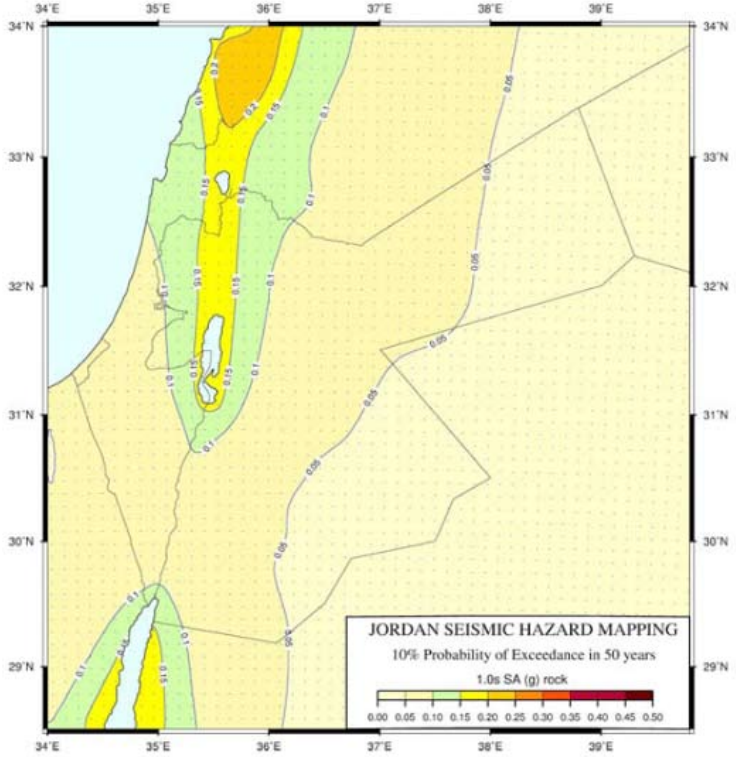
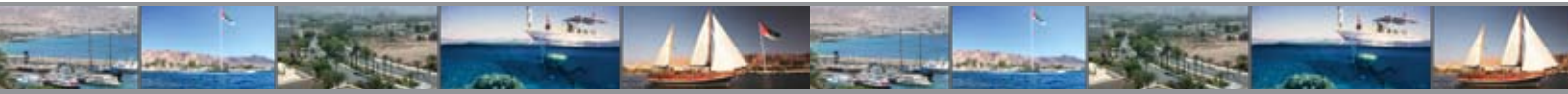


Figure 25: Spectral acceleration (SA) map for a period of 1.0 s at 10% probability of exceedance in 50 years[38].

38 JIMENEZ, M., H. AL-NIMRY, A. KHASAWNEH, T. AL-HADID and K. KAHHALEH, 2006: ASSESSMENT OF SEISMIC HAZARD IN JORDAN, First European Conference on Earthquake Engineering and Seismology (a joint event of the 13th ECEE & 30th General Assembly of the ESC) Geneva, Switzerland, 3-8 September 2006.



4.4 **Seismic Zonation**

Based on the seismic zoning map shown in Figure 26, a site is assigned to one of five zones: 0, 1, 2A, 2B and 3 with increasing hazard towards the Dead Sea Transform Fault which constitutes the major source of seismic hazard in Jordan[39]. Each of the zones is characterized with a seismic zone factor Z (Table 3) that describes the level of expected seismicity and that is directly associated with the effective peak ground acceleration (Table 4). Accordingly, Aqaba is located within the 2B seismic zone, such that its seismic zone factor (Z) is equal to 0.20.

39 Jordanian National Building Council (JNBC), Jordanian Code for Earthquake-Resistant Buildings, Jordan, 2005, 236p.

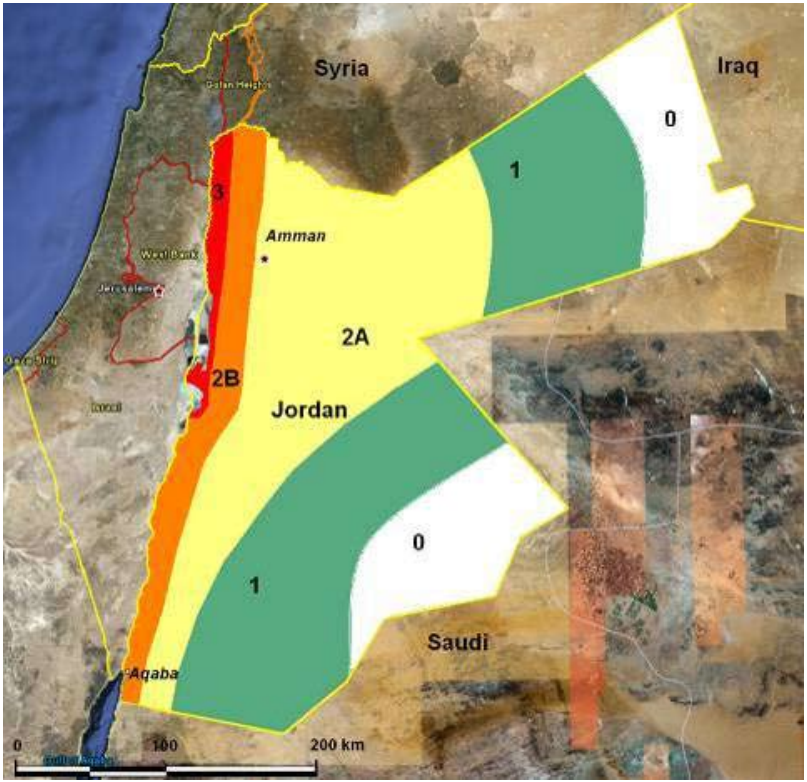


Figure 26: Jordan seismic hazard zonation map (modified after the HBC).

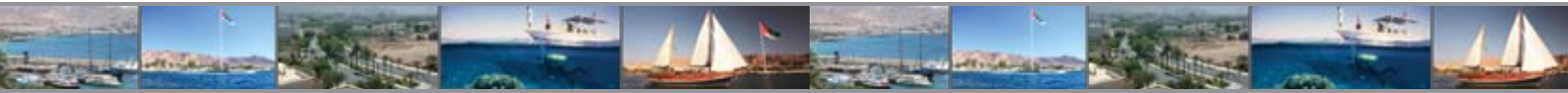


Table 4: Seismic zone factor definition.

Seismic zone	Seismic zone factor
0	-
1	0.075
2A	0.15
2B	0.2
3	0.3

4.5 Site Geology and Soil characteristics

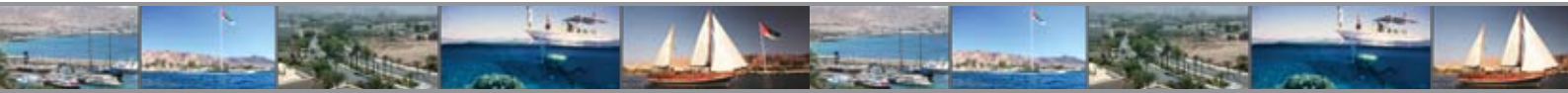
Using geotechnical data and soil properties for the top 30 meters of soil profile, the Code provides a site categorization procedure. Comprehensive data which includes shear wave velocities, standard penetration test values and undrained shear strength are used to assign one of six soil profiles (ranging from hard rock to soft soils) to the site. To take the effect of the soil column, i.e. local site effect, on the expected ground shaking into consideration, two seismic coefficients Ca and C_v (i.e. site response coefficients) are introduced. Values for C_a and C_v are determined based on the Z factor and the soil profile. Accordingly, RSS developed a soil type map for the region, where the following 4 types of soil were dominant: S_A, S_B, S_D, and S_E (Figure 27). The corresponding

shear wave velocity ranges for these types are: >1500 m/s, 760-1500 m/s, 180-360 m/s, and <180 m/s. Values for corresponding site response coefficients for ASEZ are listed in Table 5.

Table 5: Seismic zone factor definition[40].

Soil Type	Soil Description	Shear wave velocity m/s	C_a for Z=0.20	C_v for Z=0.20
S_A	Hard rock	>1500	0.16	0.16
S_B	Rock	760-1500	0.20	0.20
S_D	Stiff soil	180-360	0.28	0.40
S_E	Loss soil	<180	0.34	0.64

40 Jordanian National Building Council (JNBC), Jordanian Code for Earthquake-Resistant Buildings, Jordan, 2005, 236p.



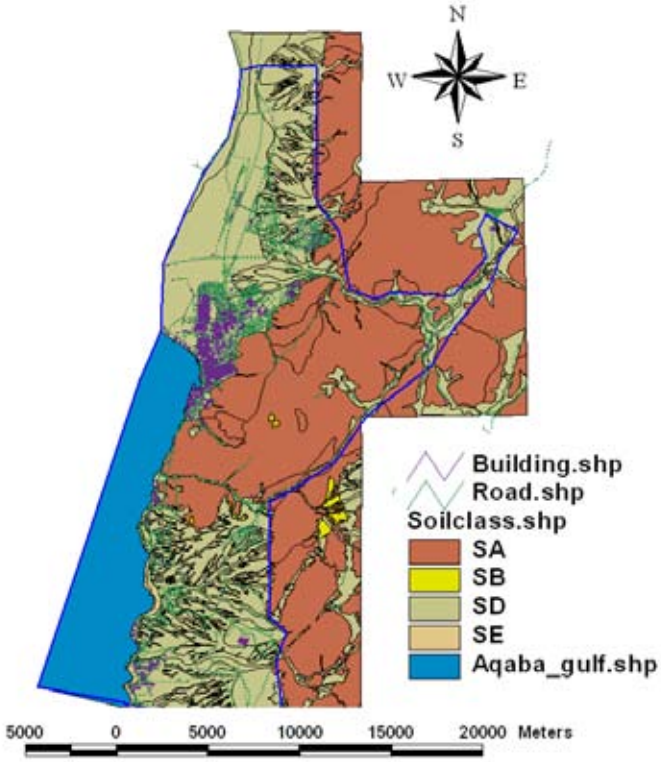


Figure 27: Soil type map for the top 30 meters of soil profile. ASEZ area is shown with the blue border.

4.6 At-Risk Groups

In urban areas buildings, population, lifeline systems and socio-economic activities constitute the "elements at risk". Buildings and lifeline systems are generally termed "Built Environment". To pin-point at-risk groups, earthquake hazard maps are prerequisite. Additionally, areas with high density population and vulnerable structures are usually at risk. Therefore structures not subjected to the earthquake resistant building codes are vulnerable to high damage consequences (Figure 28). An example of such areas is the Sha'beyyah area (منطقة الوحدات الشعبية في شمال العقبة), Al-Naser Neighborhood, north of Aqaba (Figure 28). According to the Department of Statistics survey on 2004, the number of housing units is 421 units, the number of families is 392 family (i.e. 1198 males and 1012 females), and the total number of population is 2210).

Other areas of similar structure types and population density will be also vulnerable. In case of liquefaction, the residents and workers on the coastline will be in danger. During the 1995 earthquake event signs of local liquefaction were evident.

It is hoped that the currently UNDP project will assess the risk of an earthquake in ASEZ. The project will enable the assessment of earthquake risk in the city and consequently evaluate the geographical distribution of potential human and material losses.

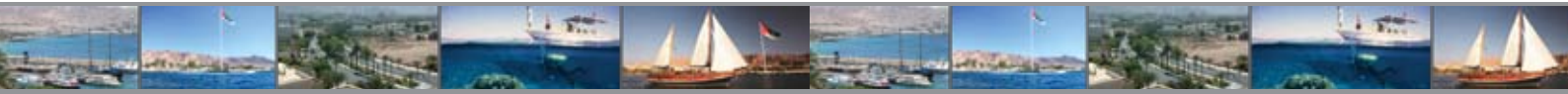


Figure 28: Building example form the Sha'beyyah area (منطقة الوحدات الشعبية في شمال العقبة) north of Aqaba.

4.7 At-Risk Locations

According to the RSS's microzonation study in 2008, it can be said that most of the residential buildings and other commercial, industrial, and leisure locations within ASEZ have a stiff soil (S_D) foundation material (Figure 29). In the incident of an earthquake, it is expected that buildings located within this soil type will suffer immense ground shaking levels due to the effect of seismic signal amplification. Figures 30 and 31 show the response design spectra for the various types of soil types for the northern and southern areas of ASEZ, respectively. Notice the amount of site amplification that is expected when comparing stiff soil site response (Figure 30B) with rock site response (30C).

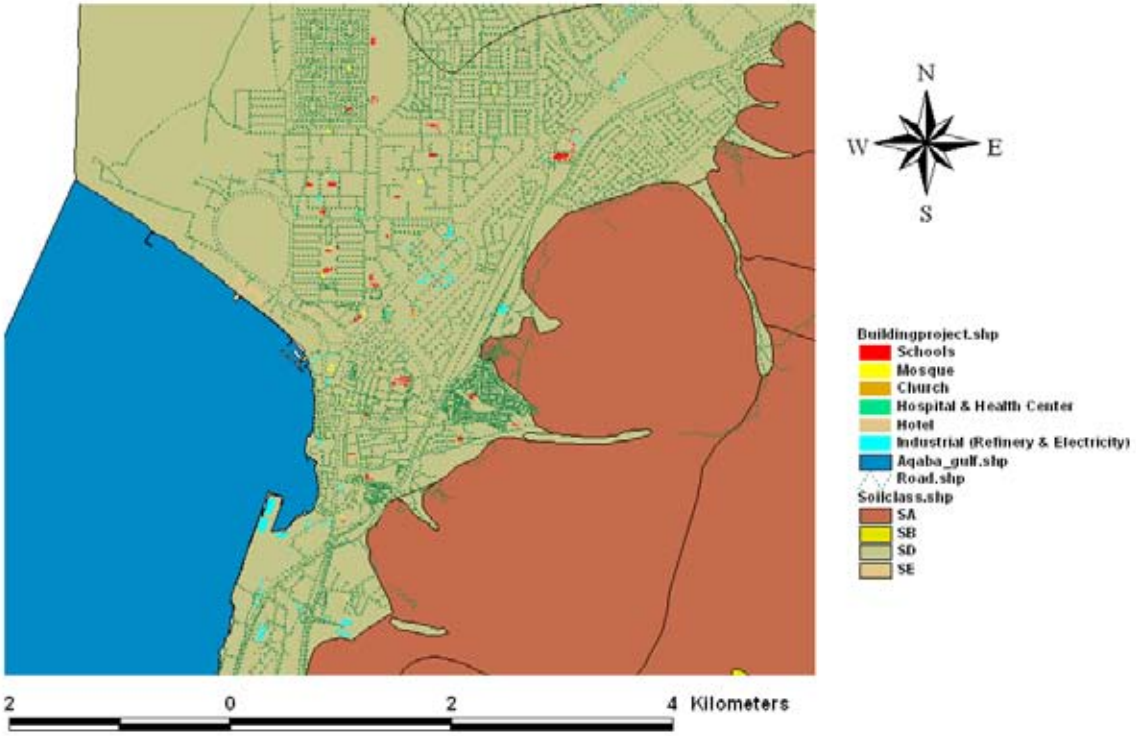
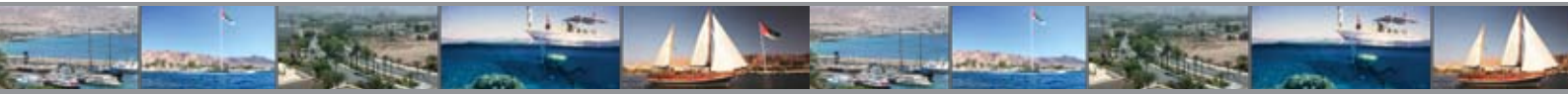


Figure 29: Spatial distribution of at-risk locations overlaying the soil type map for the top 30 meters of soil profile.



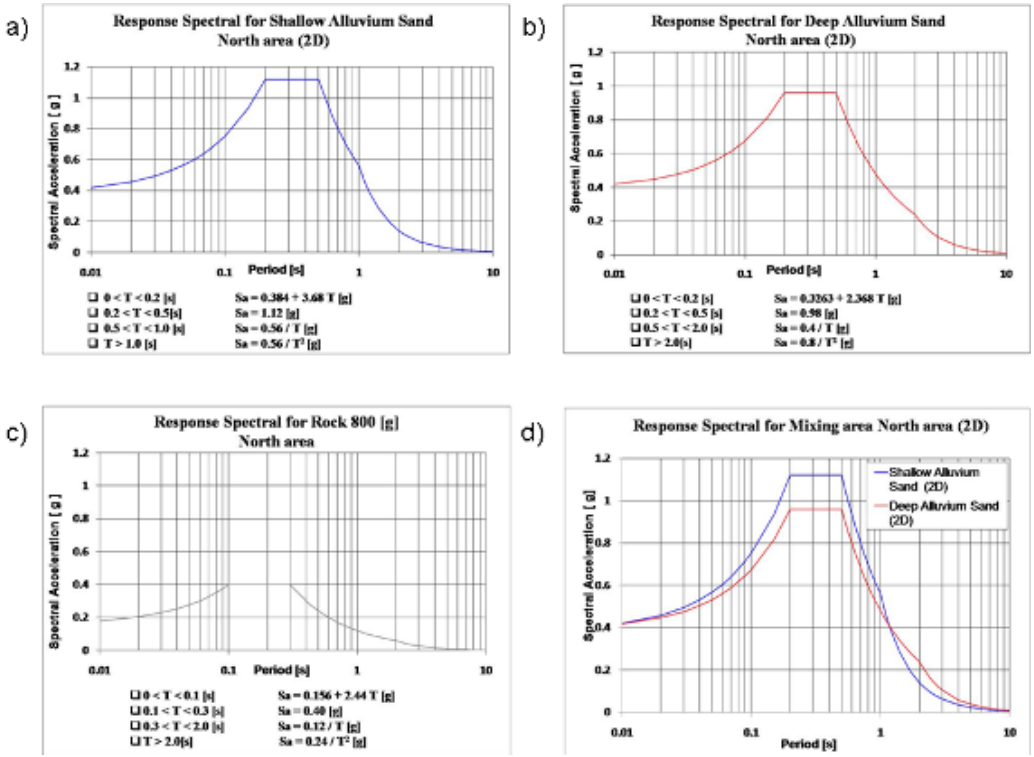
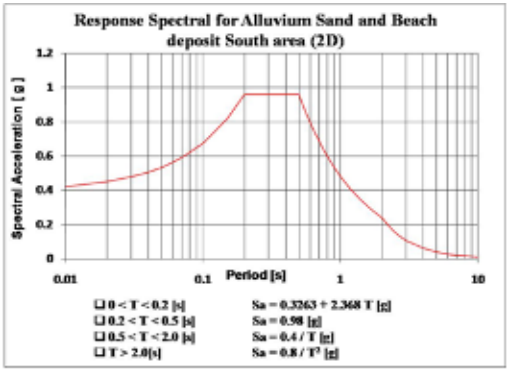


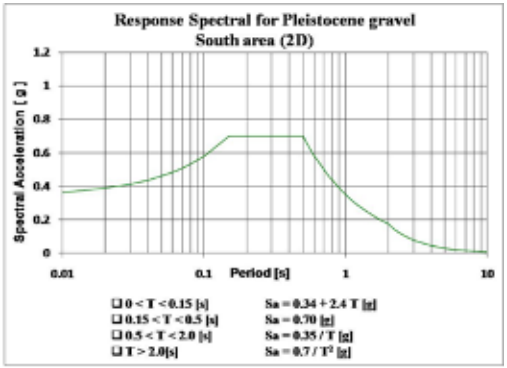
Figure 30: Response design spectra of the northern area for the various types of foundations[41].

41 Royal Scientific Society (RSS), 2008: Seismic hazard mitigation in Jordan, SDC funded project.

a)



b)



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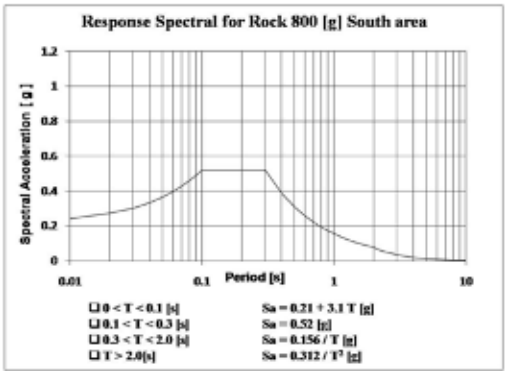
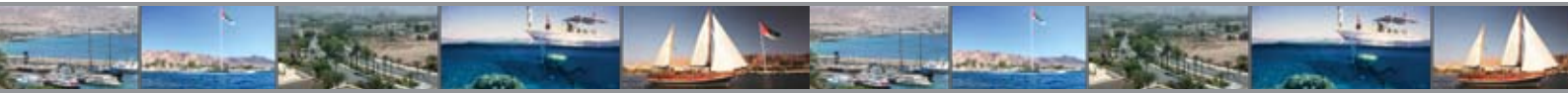


Figure 31: Response design spectra of the southern area for the various types of foundations[42].

42 Royal Scientific Society (RSS), 2008: Seismic hazard mitigation in Jordan, SDC funded project.



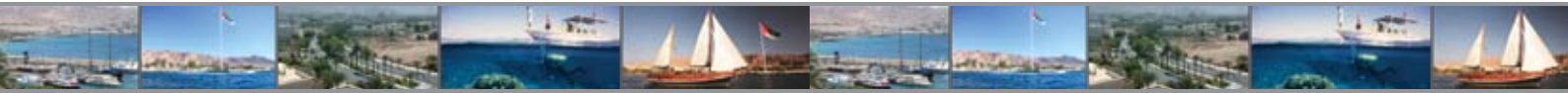
4.8 Non-engineering Dwellings

The number of dwellings in Aqaba (12,109) increased by 21% since 2004 (DOS, 2008). About 47.9% of them are Amara (a building with several apartments), 33% are Dar (a private building housing a family), and 14% villa (a single storey attached property with 1332 common walls, and surrounded by a garden, similar in style to a townhouse). Buildings constructed before 1990 formed 44% of the total and 29.2% within the period 2000-2007. About 94.9% of the buildings are Villa, Dar and apartment. About 2% of the buildings are temporarily (tins, tents, etc) and hameshyyeh. We assume that structures built before 1990 are not designed according to the engineering standards, which make them highly vulnerable to earthquakes. Temporarily and hameshyyeh buildings are very weak to withstand an earthquake. Additionally, the new structures built after 2000 are not well designed according to the Jordanian earthquake code. Table 6 shows the distribution of dwellings for each area/subarea of the City of Aqaba.

Table 6: Distribution of buildings by type of occupancy of Aqaba City[43].

Area and Subarea	Type of Building						نوع المبنى		المجموع	المنطقة والحي
	آخرى Other	تحت التشييد Under Construction	منشأة / مؤسسة Establishment	بيت شعر / خيمه Tent / Hair Tent	براكية Barracks	فيلا Villa	دار Dar	عمارة Amarah	Total	
Aqaba										العقبة
FIRST										الأولى
01 Main Port	0	0	29	0	0	0	1	0	**30**	01 الميناء
02 Al Burayj	0	0	7	0	0	12	21	31	**71**	02 البريج
03 Middle Coast	0	0	26	0	1	0	9	10	**46**	03 الشاطئ الاوسط
04 Salah ad Din	0	0	16	0	2	0	225	40	**283**	04 صلاح الدين
05 Old Town	0	0	84	0	14	0	1273	61	**1432**	05 البلدة القديمة
06 Ash Shallala	0	0	57	0	346	0	1230	54	**1687**	06 الشلالة
07 Al Madina al Janubi	0	1	80	0	0	0	133	30	**244**	07 المدينة الجنوبي
08 Al Madina al Awsat	0	1	206	0	0	0	0	20	**227**	08 المدينة الاوسط
09 Al Manara	0	0	31	0	3	0	201	51	**286**	09 المنارة
10 Al khazzan	0	4	13	0	2	0	293	125	**437**	10 الخزان
11 Al Madina ash Shamali	0	4	49	0	0	0	1	60	**114**	11 المدينة الشمالي
12 Ar Rabwa	0	0	5	0	13	10	18	116	**162**	12 الربوة
13 North Coast	0	0	3	0	0	0	2	1	**6**	13 الشاطئ الشمالي
14 As Safa	0	1	22	0	0	0	1	15	**39**	14 الصفا
15 Ad Dustur	0	1	26	0	0	1	5	1	**34**	15 الدستور
17 Al Saraya	0	0	0	0	0	63	0	0	**63**	17 السرايا
18 Ar Ridwan	0	0	13	0	0	1	346	273	**633**	18 الرضوان
19 At Talla Al Hamra	0	2	8	0	0	3	4	24	**41**	19 التلة الحمراء
20 Al Akhdar	0	0	15	0	1	0	0	0	**16**	20 الاخضر
21 An Nasir	0	0	8	0	0	0	485	7	**500**	21 النصر
22 Ad Dawha	0	5	9	0	0	0	2	314	**330**	22 الدوحة
23 Al Fayha	0	2	1	0	0	0	15	63	**81**	23 الفيحاء
25 An Nakhil	0	2	12	0	0	0	10	2	**26**	25 النخيل
26 Ar Rawda al Janubi	0	1	6	0	0	0	73	361	**441**	26 الروضة الجنوبي
27 Ar Rawda al Awsat	0	0	3	0	0	1	93	336	**433**	27 الروضة الاوسط

43 Department of Statistics, Population and housing Census, Aqaba City, 2007.



4.9 Aqaba Special Economic Zone Policies on Vulnerability Alleviation

Emergency procedures adopted by ASEZA to deal with emergency situations are those in reflection to Jordan's general response plans of the Higher Council for Civil Defense. However, there is no policy for disaster preparedness, response, and rehabilitation that governs the emergency operations.

The earthquake resistance building code has been published in 2005 but has not been activated until 2007 by the establishment of the technical committee. The mission of this committee is to follow up the implementation of the code and in monitoring the construction of new buildings, especially those of more than 1000m^2, but the effectiveness of this committee has not proven tangible yet.

The microzonation project of RSS (2008) can be seen as a fundamental project and step forward into earthquake vulnerability alleviation of buildings, which enables construction engineers to design according to predefined intrinsic site response spectra. Moreover, Jordan Engineering association, and the RSS are encouraging engineers training on assessment criteria of earthquake damaged concrete buildings.

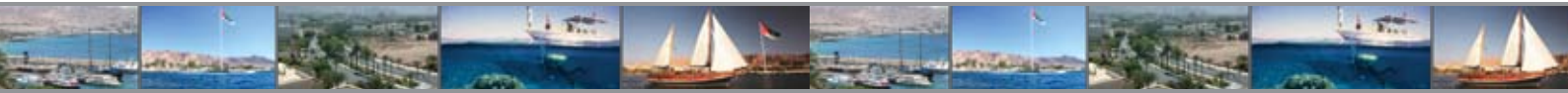
The seismic risk assessment project for the Greater Amman Municipality (2008), funded by UNDP, can be considered among the pioneering projects in the field of earthquake risk assessment in Jordan. It was able to draw the attention expected level of losses in the aftermath of a catastrophic earthquake scenario hitting the region[44]. In complimentary to this project, UNDP carried out a training program of 14 courses will build national capacities

44 Jaradat, R., Awawdeh, M., Y. Fahjan, Al-Qaryouti, M., Nusier, O., Diabat, A., and A. Al-Rawabdeh, (2008), Earthquak Risk Asses - ment of the Greater Amman Municipality. UNDP project, no. 51485, UNDP report.

to reduce earthquake risks and vulnerabilities for the capital city of Amman.

ASEZA has adopted a number of policies associated with the control, management and protection of the natural environment. The environmental policy requires preservation and protection of the environment and the sustained development of the Zone's natural resources. The water policy requires the protection and management of the groundwater resources to bring down annual abstractions from the various renewable aquifers to a sustainable rate, as well as the development of wastewater management and reuse schemes. Water conservation is to be enhanced by managing both supply and demand and efficiency of use through the utilization of improved water-saving technologies and management practices, and the modification of current practices through public awareness programs.

ASEZA has adopted a stringent discharge policy of "Zero Discharge" to the sea in order to preserve the marine environment through the complete elimination of marine pollution. The Gulf of Aqaba is defined as a 'special area' according to the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) signifying that discharges of oil are prohibited from vessels. Jordanian and Israeli environment delegates have agreed to launch a long-term action plan to control pollution caused by sewage treatment plants at the twin Red Sea cities of Aqaba and Eilat and to combat swarms of mosquitoes irritating residents and tourists.



Chapter 5 : Disaster Risk Management Arrangement

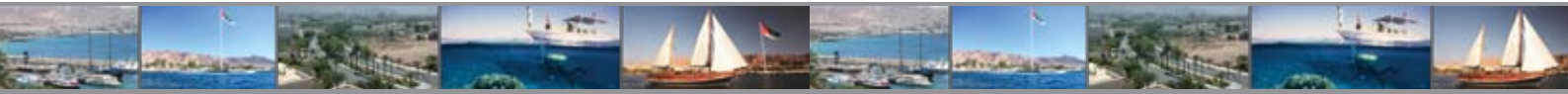
5.1 Functional arrangements

In case of emergencies and disasters, the Minister of Interior 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 take the following procedures during the time required by these situations:

- Laying hands on all means of transportation, restricting their moves and moves of drivers, laying hands on their spare parts, and restricting sale.
- 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.
- Taking hold of various types of flammable materials, restricting use and the way of storing.
- Organizing, specifying, distributing foods and all required materials in order to encounter emergencies and disasters for the stability of people's living.
- Organizing the use of electricity and water resources in coordination with concerned parties.
- Maintaining the work of radio and wired communications.

- 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.
- 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.
- Charging any public employee with running civil defense services all the required time.
- 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.
- Issuing any directions, orders, and other decisions necessary for comprehensive civil defense requirements. Establishing coordination and cooperation through signing agreements with neighboring countries, Arab states, European countries and international organizations.

The HCCD has four regional warehouses under construction distributed in the Kingdom (al-Azraq, al-Muaqqar, Ma'an, and el-Mafraq). The location for these warehouses was selected for their distance from earthquake high risk locations. The Jordan Government has two established public emergency storage facilities in the middle and south regions of Jordan. Also, there are many storage facilities maintained by the Red Crescent Society and Jordan Hashemite Charity Organizations as well as private storages, all of which to be used under HCCD instructions during emergencies.



5.2 Risk Assessment

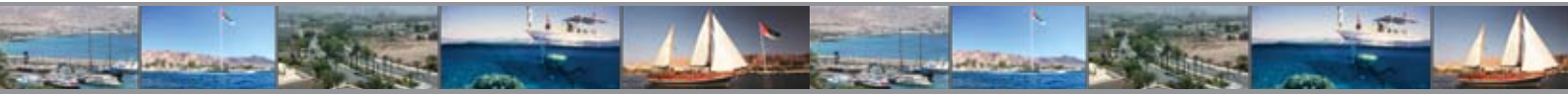
On a national level the Jordan government through the HCCD is carrying out hazard assessment. This follows the national comprehensive plan for encountering disaster and major accidents as in the law of civil defense of 1999. Administrative Divisions, which are formed from committees HCCD, use this for the preparedness stage to response stage. The HCCD and the technical committee look at seismic hazard assessment. This includes:

- Characteristics
- Impacts
- Historical Data
- Geological and topographic maps
- National strategies
- Multi-hazard approach

In October 1999 the Earthquake Hazard Assessments for Building Codes project was funded by USAID and Middle East Regional Cooperation (MERC) program. It involves the combination of Seismology and Engineering Seismology to effectively quantify earthquake threats. This project includes seismic hazard assessments that will be applied to engineering practices and applied to building codes. This helps aid the governmental institutions in Jordan, as well as in Israel and Palestinian National Authority, in the process of preparing and updating their building codes. The following studies and surveys to be conducted have the following goals:

- "A unified catalogue of earthquakes."
- "Determination of seismogenic zones."
- "Regionalization of seismogenic zones and assessment of their seismic capabilities."
- "Scaling lows of dynamic source parameters of local and regional earthquakes and attenuation of seismic energy across the region."
- "Implement state of the art procedures for earthquake hazard assessments and testing new approaches."

The Government of Jordan, in 1983, established a seismological observatory to monitor earthquakes in Jordan. Project funding was by the government of Jordan and the US Agency for International Development. The observatory included eight stations located around Amman. These locations were determined by the NRA of Jordan and the US Geological Survey (USGS). The seismic network has expanded as part of the Program for Assessment and Mitigation of Earthquake Risk in the Arab Region (PAMERAR) and was funded by the Government of Jordan, the Arab Fund and the Islamic Development Bank. It now includes 26 stations throughout the country. This seismic network is operated by the Jordan Seismological Observatory (JSO) from its headquarters at the NRA in Amman. In 1998, the NRA, the USGS, and the University of California Lawrence Livermore National Laboratory (LLNL) included two broadband seismic stations to observe the "long-period constraints on earthquake source mechanisms in the Dead Sea rift (e.g., moment magnitudes, moment tensor descriptions) and other regions of the Middle East, to characterize regional seismic wave propagation and to improve estimates of crust and upper mantle structure in the region.



5.3 Risk Communication

Jordan uses the national system through the Jordan Civil Defense (JCD), who is responsible for providing, organizing, and supervising a disaster alarm system. However, the JCD and non-governmental organizations have public awareness programs that discuss disaster risk reduction, where they are all participate in disaster reduction efforts through the following general aspects[45]:

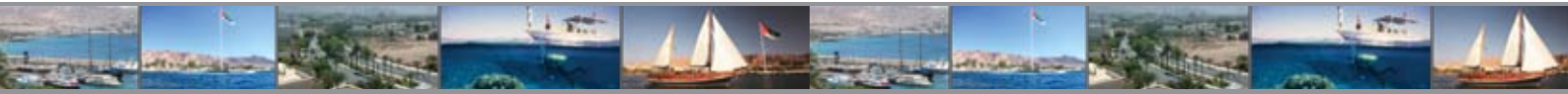
1. Arising public awareness and education on disaster, protection, and prevention, using all means of media.
2. Participating in different kinds of meetings, assemblies, seminars, workshops. etc, related with disasters concepts.
3. Providing all assistance needed during preparedness stage, response stage, or recovery stage of disasters, also for man powers, equipment, essential materials, or financial support.
4. Participating in establishing, improving, and providing refugee camps.
5. Participating in mine awareness and demanding programs.
6. Providing all medical and aid assistance needed depending on previous and mutual agreed plans.
7. Participating in all training programs of JCD on first aids, firefighters, rescue, and dealing with disasters and emergencies.

45 1 National Information Relating with Disaster Risk Reduction, UN-ISDR.

Chapter 6 : Disaster Risk Management Vision

ASEZ overall vision is to build a world class Red Sea business hub and leisure destination enhancing the quality of life and prosperity of the community through sustainable development and a driving force for the economic growth of Jordan. From this overall vision, ASEZA defines its vision for disaster risk management as building safer and more resilient community and environment.

The root of this vision springs from its objectives and its continuous efforts to ensure the sustainable economical and social development for the region by attracting investments and by maintaining the efforts to preserve the environmental resources of this region and in line with the overall vision of the State in this regard.



Chapter 7 : Sound Practices (SP)

1. Disaster Risk Management Master Plan

Objectives:

1. To put in place a comprehensive disaster risk management system that incorporates preparedness, mitigation and emergency response procedures, as means to reducing future potential losses and overall risk in the city.
2. Provide a citywide strategy for incorporating vulnerability reduction in urban and land use planning and to supply the elements to improve emergency management.
3. Utilizes the process of land use planning that is based on seismic risk assessment to formulate guidelines and regulations to control future urban developments in the city.

Actions:

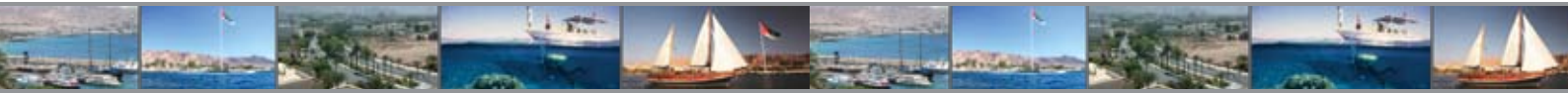
1. Initiate concrete actions to reducing physical and social vulnerability.
2. Involve leading experts and organizations to prepare the Master Plan.

3. The master plan must be comprehensive that incorporates all aspects of disaster management and proposes major project for managing various risks and for reducing future disaster losses in Aqaba.
4. Putting a plan of financing the Master Plan.

Contribution to Hyogo Framework for Action:

HFA 1: Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation.

HFA 4: Reduce the underlying risk factors.



2. Mandatory implementation of the National Building Code

Objectives:

Enforce the earthquake-resistant building design set in 2005.

Actions:

1. Make the seismic building code obligatory for all major government and non-governmental building constructions.
2. It also urged the municipal authorities to strengthen the current building permit process so that code compliance will be mandatory for all new constructions in urban areas.

Contribution to Hyogo Framework for Action:

HFA 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

HFA 4: Reduce the underlying risk factors.

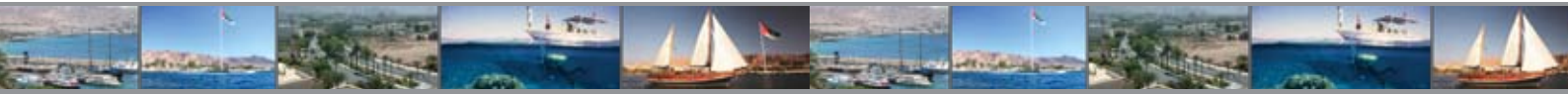
3. Reducing Flooding Risk

Objectives:

1. To reduce the risk associated with flooding.
2. Decrease the flood exposure to residences, businesses, and critical facilities and thus, the overall future flood impact on Aqaba City.

Actions:

1. ASEZA started a project which main purpose was to mitigate the disaster risk generated by flooding in the northern side of the city. A JD 35 millions project aimed at constructing a physical infrastructure to control and regulate heavy rainfall,
2. Additional actions are to improve the capacity of the community, solid waste management, urban planning and municipal structure strengthening.



Contribution to Hyogo Framework for Action:

HFA 1: Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation.

HFA 4: Reduce the underlying risk factors.

4. Development of the Disaster Information System

Objectives:

1– Develop a Disaster Information System (DIS).

2– Use advanced technologies in Disaster Risk Management.

Actions:

1. To map and evaluate the essential vulnerable elements in a city based on their relevance to the population.
2. Use Geographic Information System (GIS) for managing a database of disaster information as well as for preparing potential hazard maps.
3. Present the graphical display of past disasters in the region and the analysis of the causative factors of such

disasters in the future.

4. Mapping seismic events regularly.

Contribution to Hyogo Framework for Action:

HFA 2: Identify, assess and monitor disaster risks and enhance early warning.

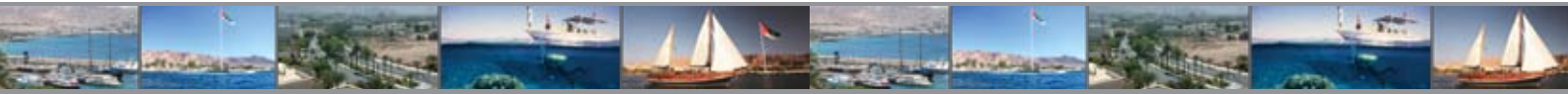
HFA 4: Reduce the underlying risk factors.

HFA 5: Strengthen disaster preparedness for effective response at all levels.

5. Promoting Schools' Role in Disaster Risk Management

Objectives:

1. To provide capacity building workshops and materials for the school community.
2. Initiate a risk management plan in the educative centers of the city.
3. To introduce risk management concepts in school curricula.



Actions:

1. The writing of a Guide for the organization of a risk management plan in schools (SRMP).
2. Including risk management concepts in schools curricula by designing material appropriate for different grades.
3. Selected schools of the city will carry out, simultaneously, an earthquake simulation drill.

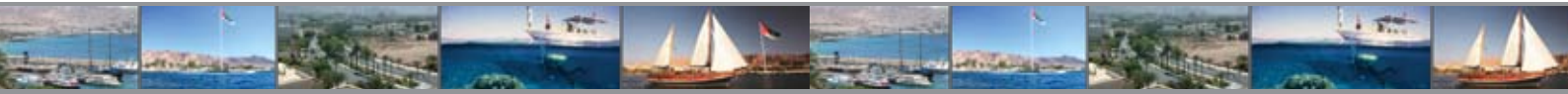
Contribution to Hyogo Framework for Action:

HFA3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

Chapter 8 : Issues

The city of Aqaba has witnessed a dramatic population growth and a fundamental restructuring over the past years. Natural and technological incidents (nuclear, biological and chemical) may be envisaged and may highly impact Aqaba with severe disasters. The role of ASEZ as part of the holistic development plans and aims of prosperity to the nations, urges the need to develop policies, strategies, and action plans in order to make ASEZ a safer place, with adequate capacity to prevent, mitigate and reduce risk as well as be able to respond on the face of a given emergency.

While risk management may be identified as a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, acting on and communicating risk issues. The integrated risk management can be seen as a continuous, proactive and systematic process to understand, manage and communicate risk from a nation-wide perspective. It is about making strategic decisions that contribute to the achievement of a nation's overall objectives. Accordingly, ***Integrated Risk Management Framework*** includes all phases of a risk management cycle: **Mitigation, Response and Recovery**. Mitigation requires planning of structural and non-structural measures to reduce existing risks and prevent the build-up of new ones, response aims at reducing the impact of disasters through rescue, relief and rehabilitation, and recovery intends to reduce possible losses in future with adapted recovery.



Problems associated with population growth, poverty, shortage of public resources and awareness and institutional weakness are among the primary obstacles towards a safe and secure place to live by elevating its vulnerability factors. In order to meet such challenges it is urgently required that ASEZA to develop:

1. Risk Reduction Plan:

This requires the development of a comprehensive risk reduction plan based on an Integrated Risk Management Framework. The plan needs to focus on actions leading to the prevention and preparedness for disasters.

2. Adequate institutional arrangements for preventive disaster management:

This requires:

1. Design and implement permanent policies related to risk prevention and mitigation and establish appropriate legislation and control mechanisms.
2. Overcome weak institutional arrangement and coordination misconducts, to incorporate disaster prevention and crisis planning.
3. Develop and adequate institutional framework by clarifying roles of different involved actors, risk institutionalization, and it is suggested, that the municipality should lead institutional coordination.

3. Increase disaster management capacities at the ASEZA and the local levels:

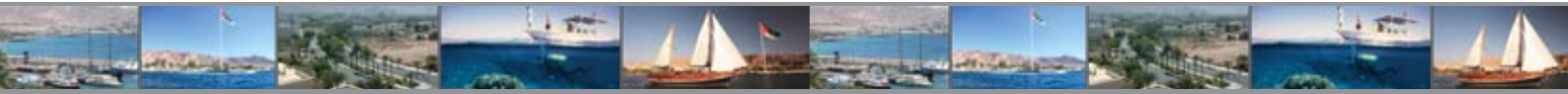
This requires:

1. Building intuitional capacities to analyze, assess, and manage risks and disasters.
2. Strengthen the disaster response structures to cope with disasters.
3. Improve search and rescue capacities of responsible agents.

4. Increase the resilience of the society to disaster management and risks:

This requires:

1. Raise the public awareness of disaster reduction by fostering the means of knowledge, training, and instrumental empowerment.
2. Foster community-based voluntary approach.



5. Sustainability of efforts:

This requires:

1. All activities that are related to reducing disaster risk must, under ASEZAs' jurisdiction, adhere to the principles of sustainability.
2. Measures must be designed to be environmentally sound and cost-effective, and they must be adapted to the circumstances of the society that is affected.
3. Disaster risk reduction is part of the sustainable use of natural resources and of sustainable development in general. Therefore, paramount importance is given to making projects disaster-resistant.
4. Scientific research and monitoring are crucial inputs to the issue of sustainability of efforts.