جامعة النجاح الوطنية

مركز علوم الأرض وهندسة الزلازل

An-Najah National University

Earth Sciences & Seismic Engineering Center

Urban Risks in the Arab Region

(case study: **Urban Risks in Palestine)**

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(Earth Sciences & Seismic Engineering Center)

Regional Workshop on Urban Risk Reduction

Damascus, Syria, November 4. – 5. 2009

Contents

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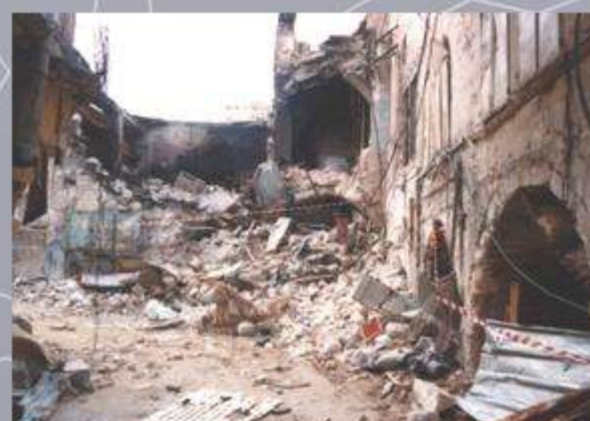
  - Frequency and Intensity of ND are increasing
- Risk assessment and the implementation strategies Of risk reduction programs
- Seismic vulnerability of buildings and infrastructures in Palestine (Buildings, site effect and urban planning)
- Urban planning and risk maps
- Conclusions and recommendations.



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Increasing frequency and intensity of natural disasters pose serious challenges to the sustainability of development investments and the stability of economic growth in the MENA region.

The implementation strategies
Of risk reduction programs

Stop increasing the risk
for new construction
and infrastructures.

Start decreasing the
unacceptable
risk for existing constructions
and infrastructures.

Continue preparing for the
consequences of
expected hazards

Hyogo Framework for Action 2005-2015:
Building the resilience of nations and communities to disasters

Five priorities for action

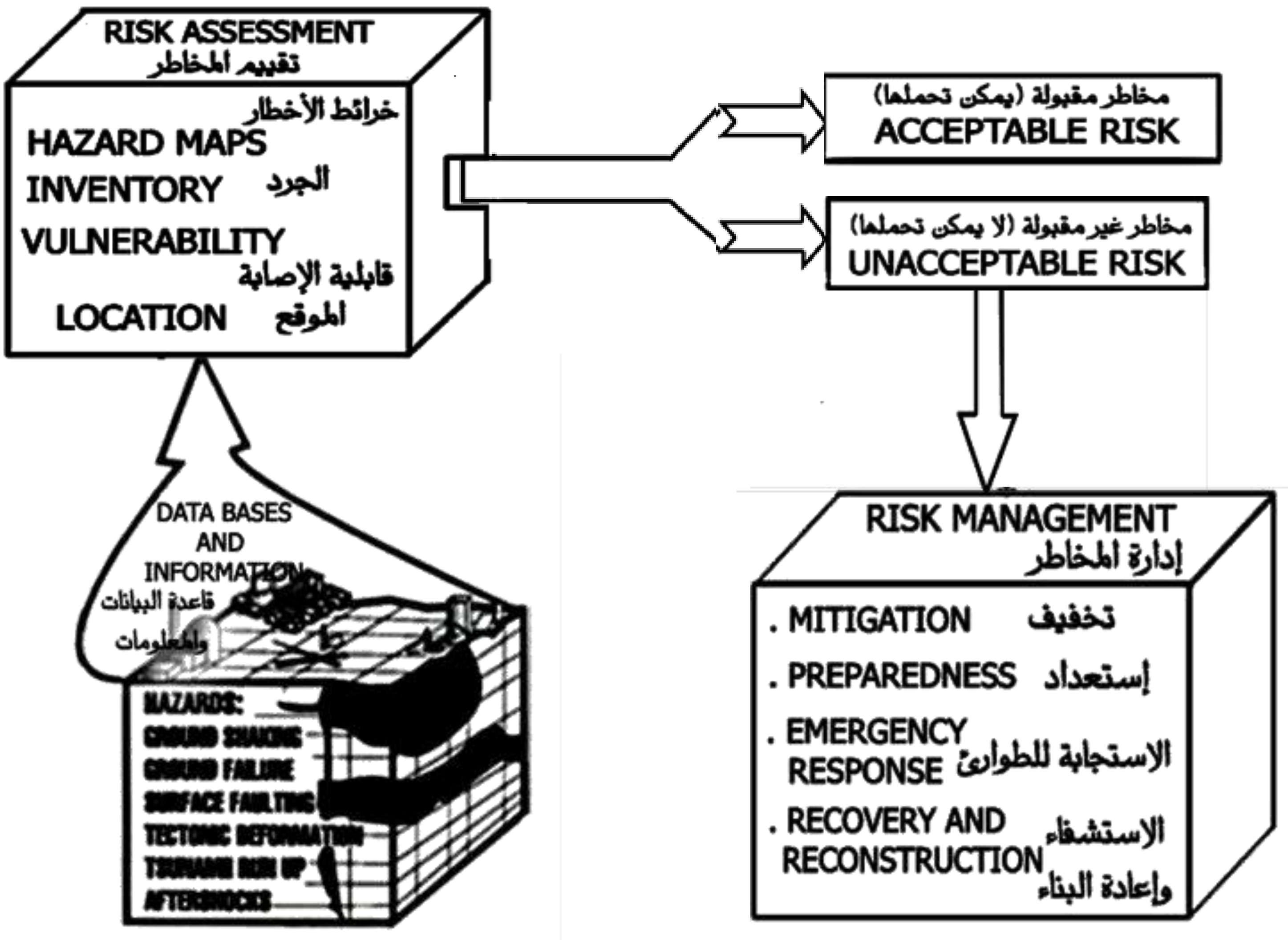
1. **Governance:** ensure that disaster risk reduction is a national and local priority with strong institutional basis for implementation.

2. **Risk identification**: identify, assess and monitor disaster risk and enhance early warning

3. **Knowledge**: use knowledge, innovation and education to build a culture of safety and resilience at all levels

4. Reducing the **underlying risk factors** in various sectors (environment, health, construction, etc.)

5. Strengthen disaster preparedness for **effective Response**


RISK ASSESSMENT
تقييم المخاطر
خرائط الأخطار
HAZARD MAPS
INVENTORY الجرد
VULNERABILITY
قابلية الإصابة
LOCATION الموقع
مخاطر مقبولة (يمكن تحملها)
ACCEPTABLE RISK
مخاطر غير مقبولة (لا يمكن تحملها)
UNACCEPTABLE RISK
DATA BASES
AND
INFORMATION
قاعدة البيانات
والمعلومات
HAZARDS:
GROUND SHAKING
GROUND FAILURE
SURFACE FAULTING
TSUNAMI RUN UP
AFTERSHOCKS
RISK MANAGEMENT
إدارة المخاطر
. MITIGATION تخفيف
. PREPAREDNESS إستعداد
. EMERGENCY RESPONSE الاستجابة للطوارئ
. RECOVERY AND RECONSTRUCTION الاستشفاء وإعادة البناء

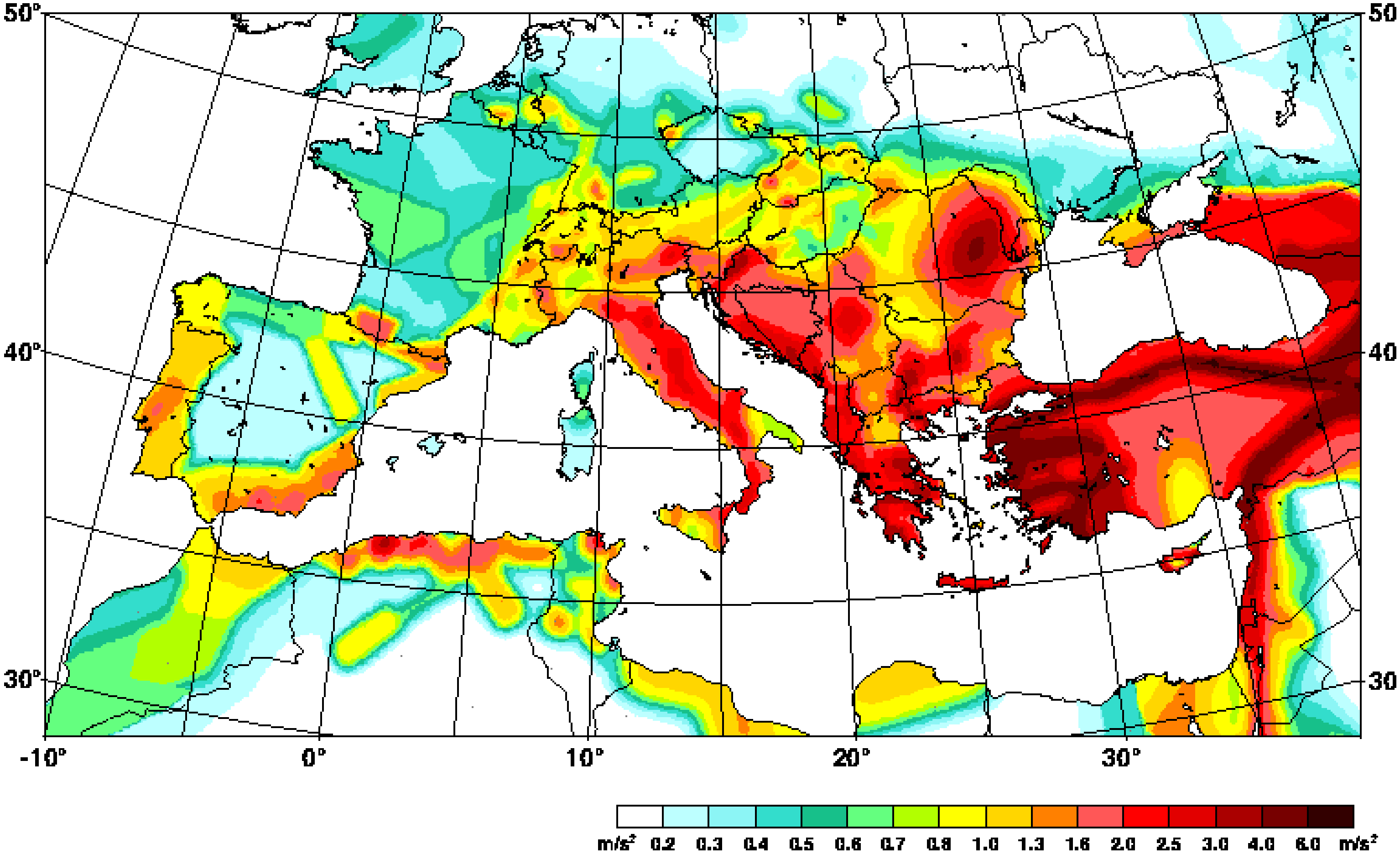
Risk Assessment

المخاطر = مصدر الخطر * قابليّة الاصابة

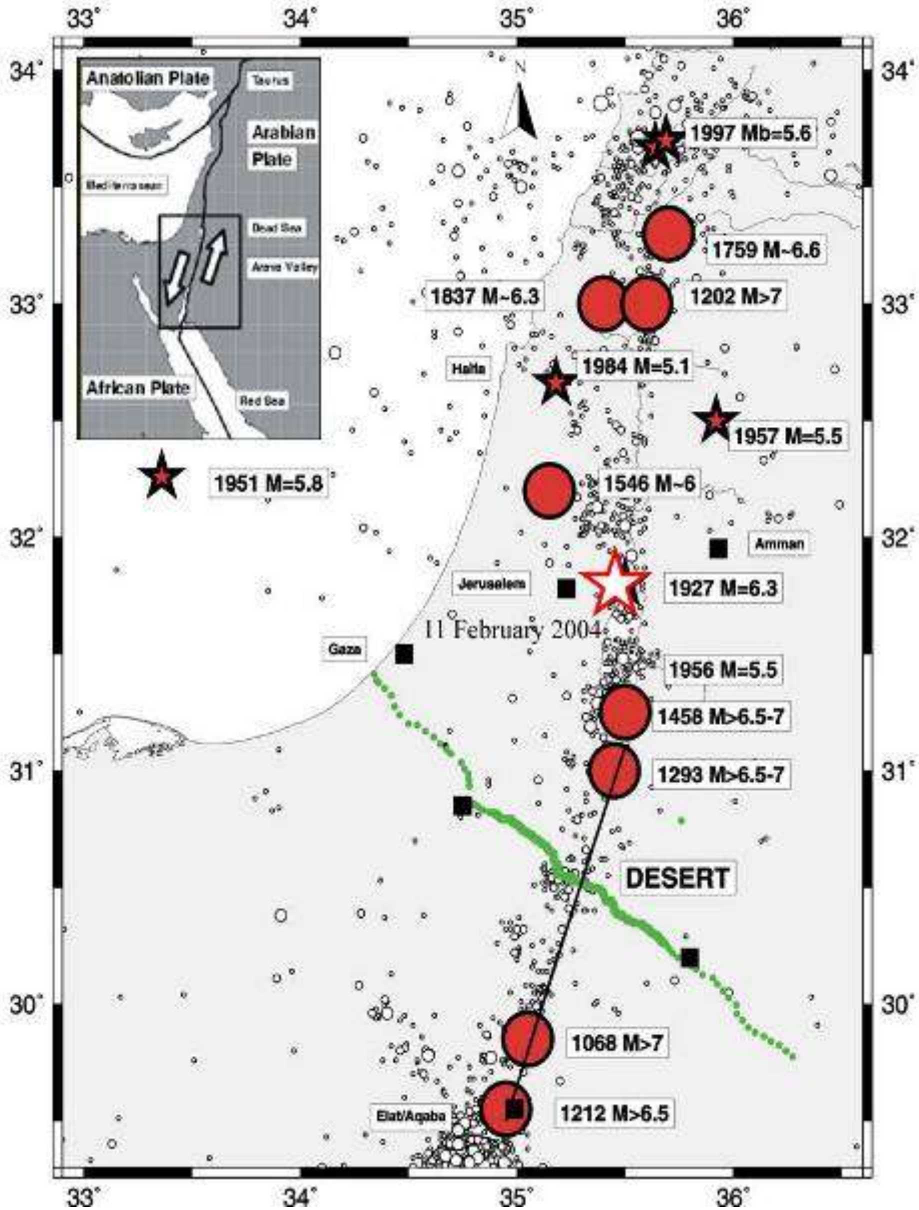
القدرة

$$\text{Risk} = \frac{\text{Hazard} * \text{Vulnerability}}{\text{Capacity}}$$

Hazard Maping



GLOBAL SEISMIC HAZARD ASSESMENT PROJECT

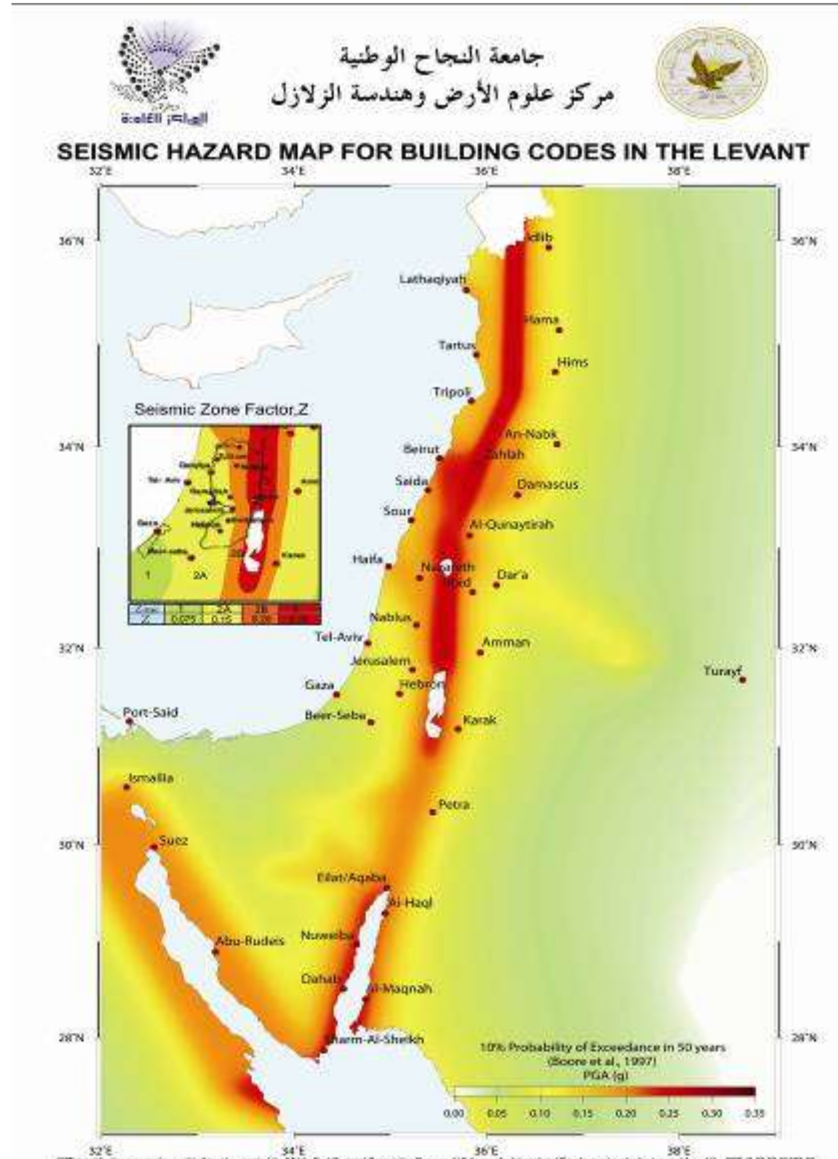


Seismically information including historic and prehistoric data indicate that major destructive earthquake have occurred in the Jordan- Dead- Sea region, caused in several cases severe devastation and many hundreds and sometimes thousands of fatal casualties.

Nablus, 13:04, July 11, 1927

Kal'at Nemrod 1759

Jerash 749 AD



USAID-MERC Project, report 2004

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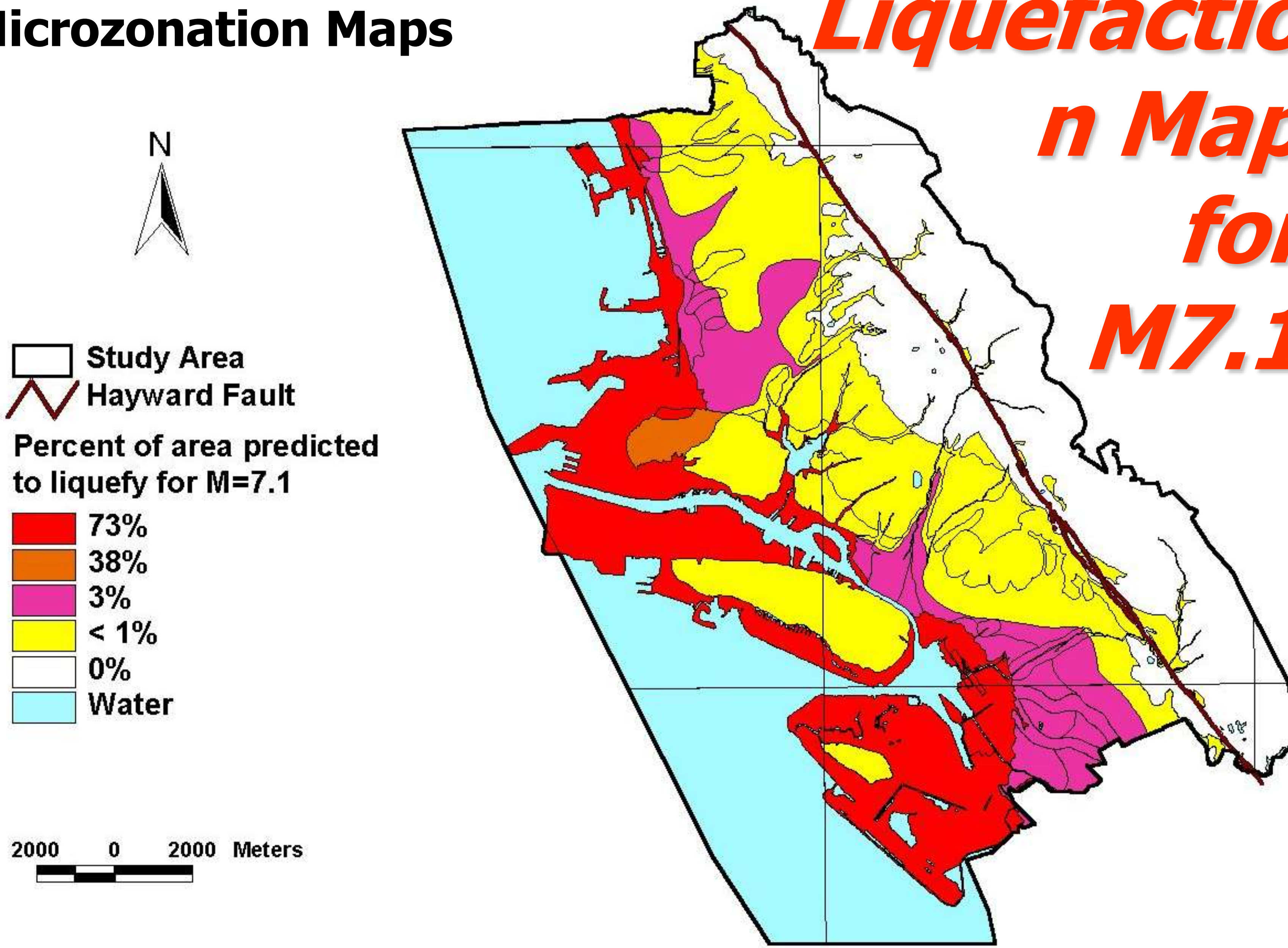
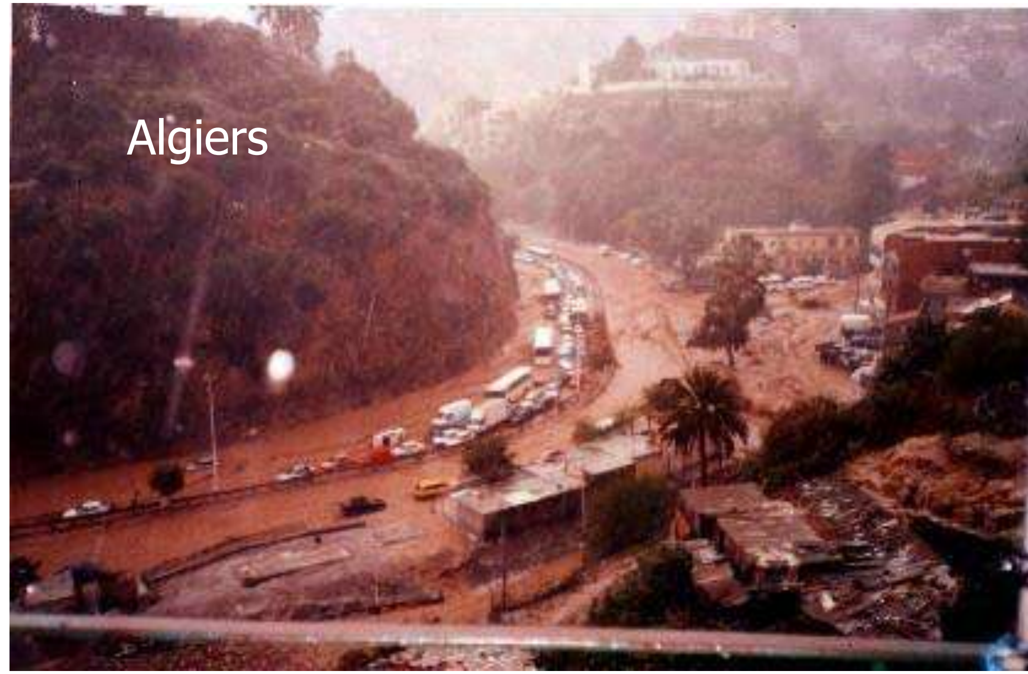
Microzonation Maps

Liquefaction Map for M7.1



Impact of 2003 Floods, Algiers.



Impact of 2008 Floods, Yemen

Between October 23-25, 2008, Yemen witnessed heavy sustained rains as a result of a level-three tropical storm that hit the country. The storm caused widespread flooding in several locations

Case Study

Seismic vulnerability of Palestinian Common buildings

(Rapid Assessment)

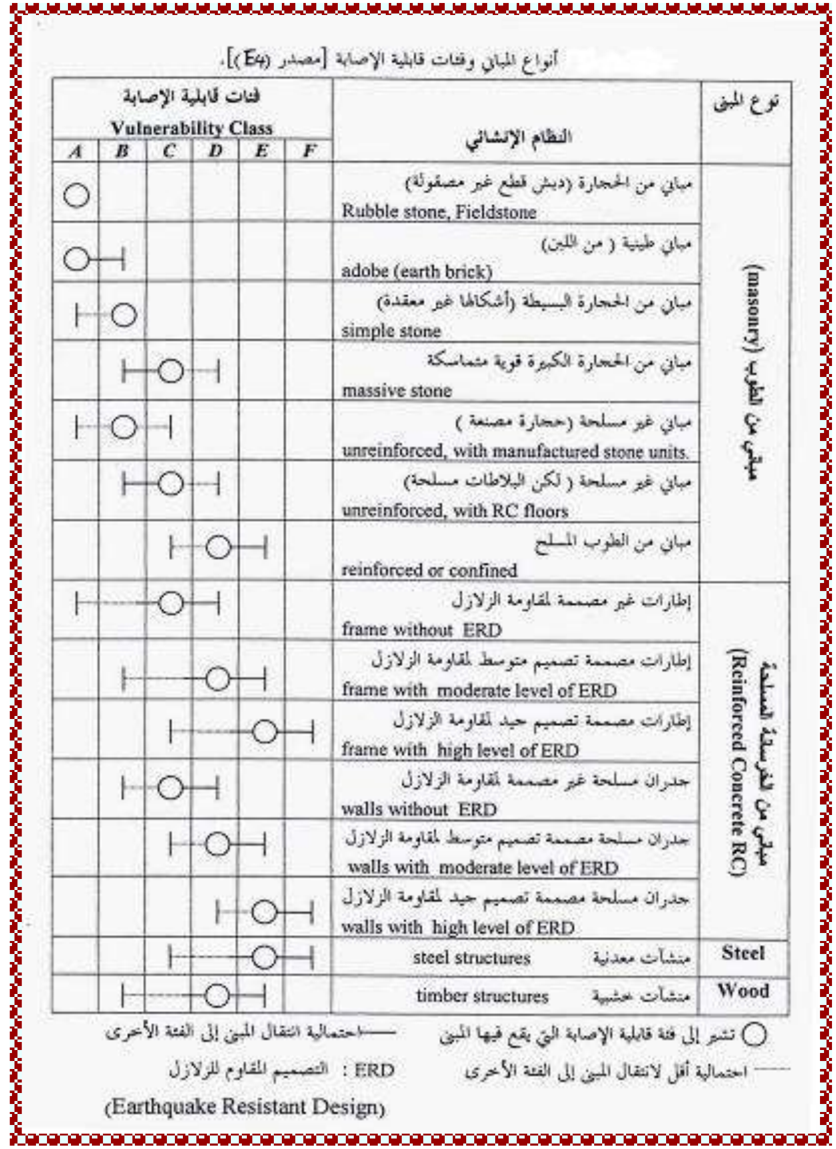
European Macro Seismic Scale

(EMS-98)

Factors Affecting the seismic Vulnerability of Buildings:-

- Building type
- Quality and workmanship
- State of preservation
- Regularity
- Ductility
- Position…..(Pounding)
- Strengthening
- Earthquake resistant design (ERD)
- Site conditions

The high vulnerability to damages and losses in the buildings and infrastructures in oPt, considered as a direct result of high percentage of weak buildings and infrastructures that do not comply with seismic resistant requirements



Vulnerability Classes and Building Type

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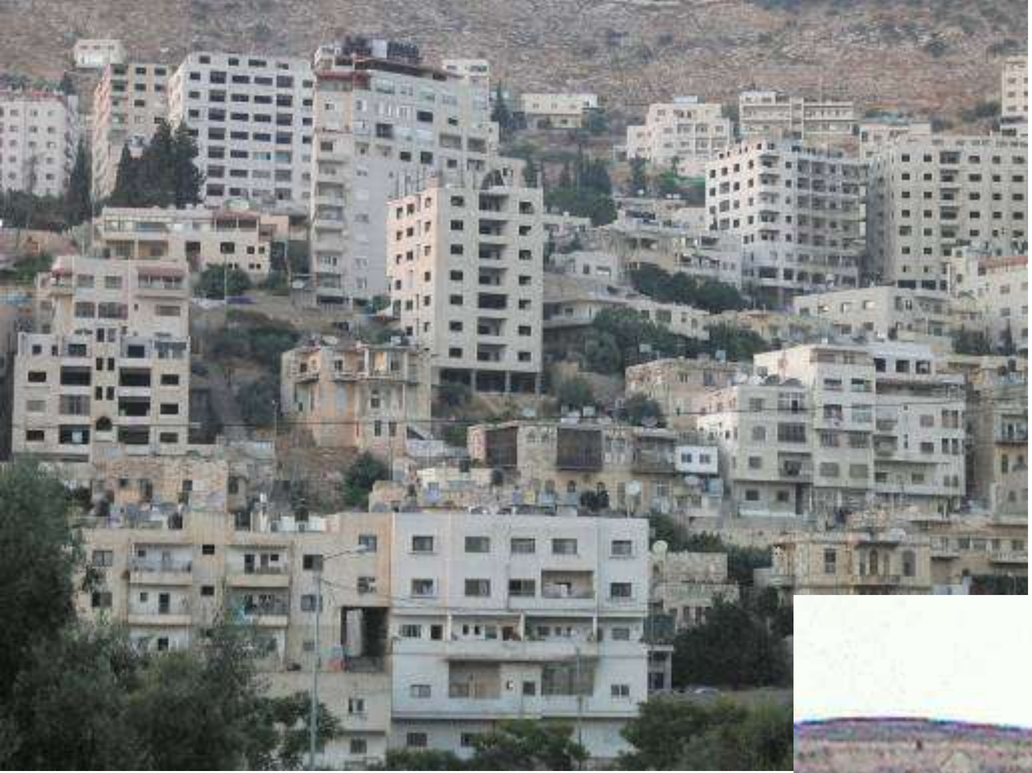
The high vulnerability to damages and losses in the buildings and infrastructures in oPt, considered as a direct result of high percentage of weak buildings and infrastructures that do not comply with seismic resistant requirements



The high vulnerability to damages and losses in the buildings and infrastructures in oPt, considered as a direct result of high percentage of weak buildings and infrastructures that do not comply with seismic resistant requirements

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Palestinian Common Buildings – Architectural and Structural Configurations

Slenderness ratio

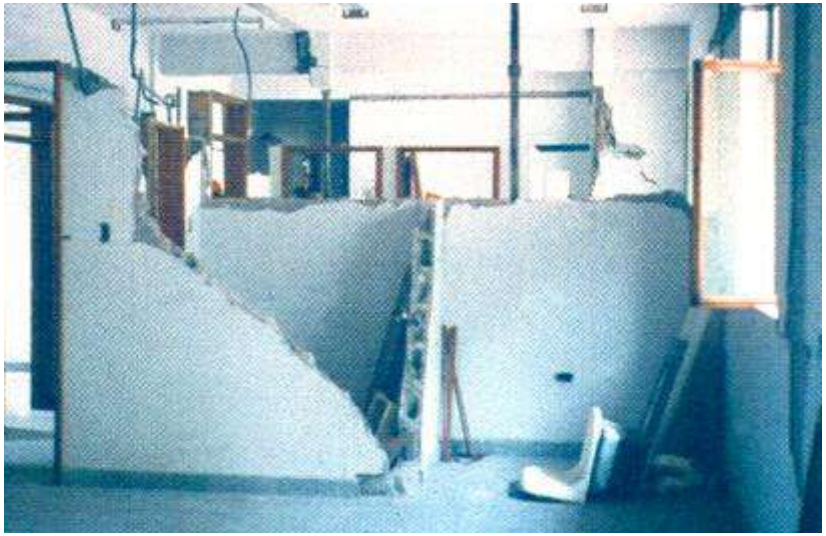
1995 **Japan**

Palestinian Common Buildings – Architectural and Structural Configurations

- Construction over existing old building.

Architectural Configurations



Nonstructural Damages
(learning from earthquakes)

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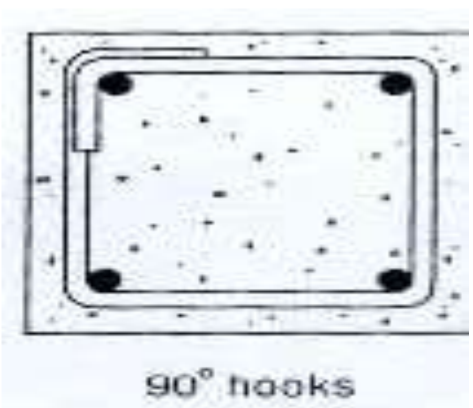
learning from earthquakes

Figure 7: Formation of plastic hinge in the column near the beam-column joint in a hospital building in Mansehra



Dead Sea Earthquake of 11 February 2004, Mb 5.1 - Hospital

learning from earthquakes

Table: Assigning the Vulnerability class.

Category Code	Building Type	ERD	Slope site	Position (seismic Joints)	Plan unsymmetry	Elevation unsymmetry	Slenderness Ratio	Soft story	Short columns	Cantilever system	Soil type	Building condition	Main Entrance	Importance	Vulnerability			
															A	B	C	D
Nablus/Z210	R.C	Without	M	-	L	M	8	H	M	H-W_H	S4	G	?	1.2			●	
Nablus/Z211	R.C	Without	-	-	-	L	<3	-	L	L-W_L	S1	E	-	1		●		
Nablus/Z242	Masonry	Without	-	-	-	M	<3	-	M	L-W_L	S2	G	?	1	●			
Nablus/Z263	Masonry	Without	M	d=2cm	M	H	<3	L	L	M-W_M	S4	B	-	1	●			
Nablus/Z275	Old Masonry	Without	L	d=1cm	-	M	<3	-	L	-	S4	V.G	?	1				

Based on data collected and the analysis done according to EMS 98, the following vulnerability classes have been obtained.

City	Vulnerability Classes				No.of buildings
	A	B	C	D	
Nablus	35.5 %	42%	18%	4.5%	700
Ramallah & Abudis	32%	39%	22%	7%	120
Hebron	43%	31%	26%	---	120
Jenin	45%	43%	12%	0%	100
Qalqilia	34%	45%	21%	0%	100
Tulkarim	41%	37%	19%	3%	80
Bethlahim	42%	39%	19%	0	100

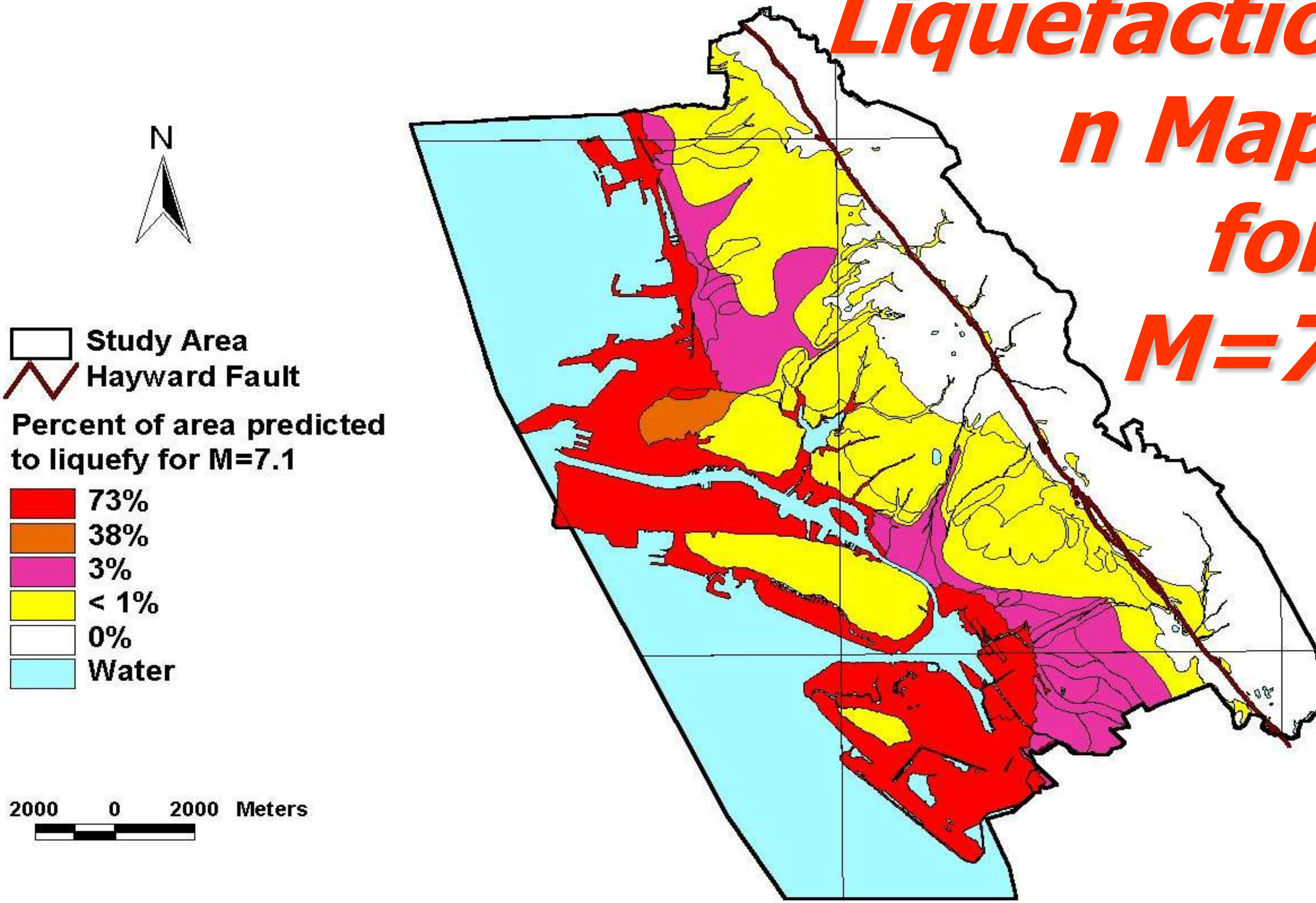
Site Effect

- **Landslides**
- **Site Amplification**
- **Liquefaction**
- **Fault Rupture**

Local site effect (landslides, liquefaction, amplification and faulting systems) play an important role on the intensity of earthquakes.

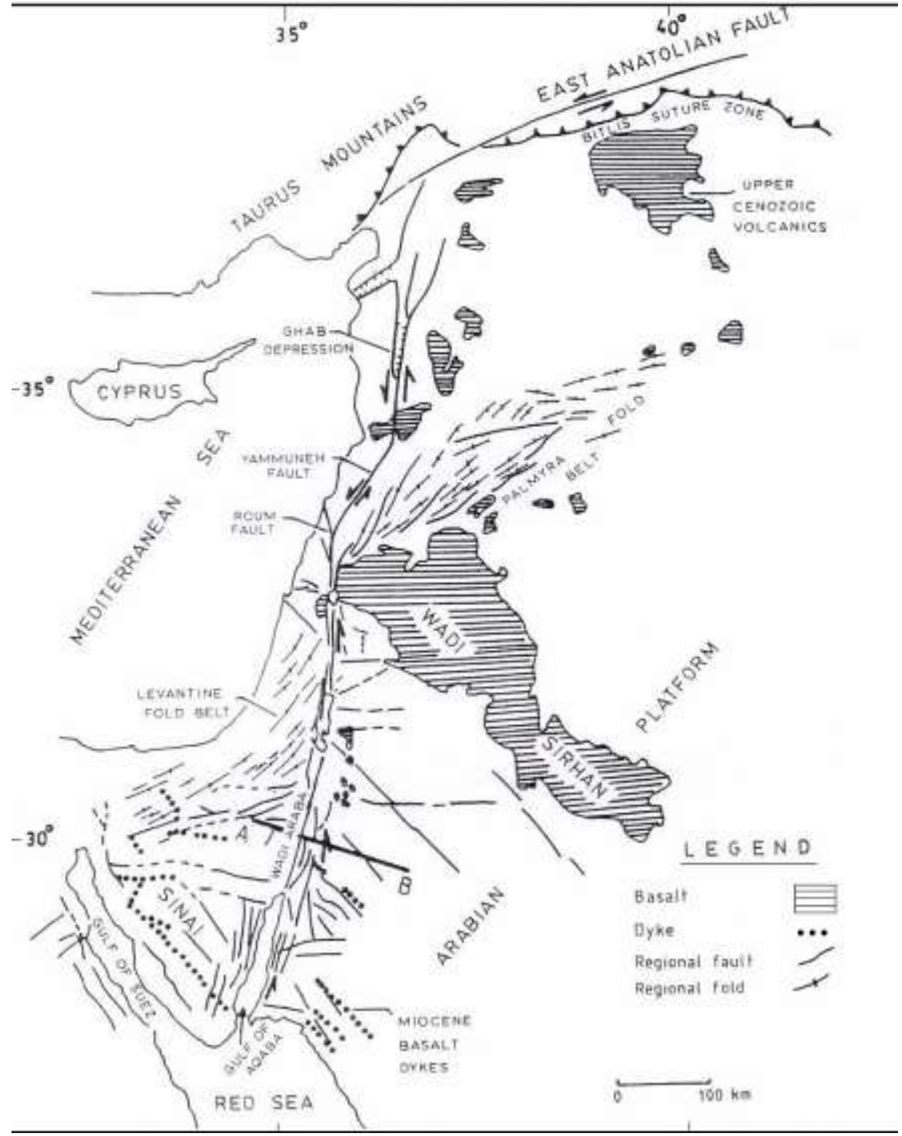
learning from earthquakes - **Liquefaction**

Liquefaction Map for M=7



Due to its geology and location the Gaza Strip is expected to face Liquefaction phenomena in several areas if a strong earthquake occurred in the region in the future

Fault Rupture



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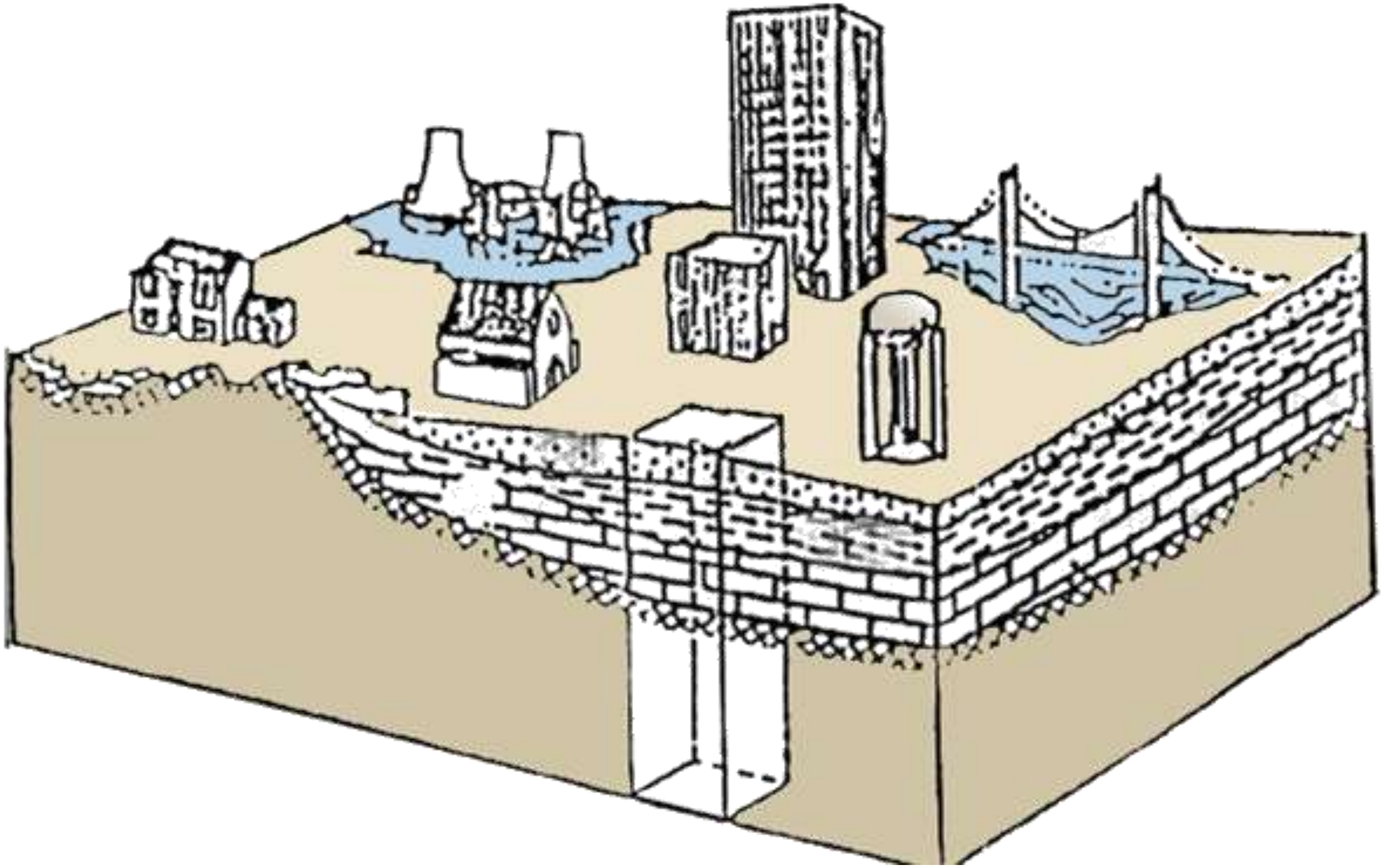
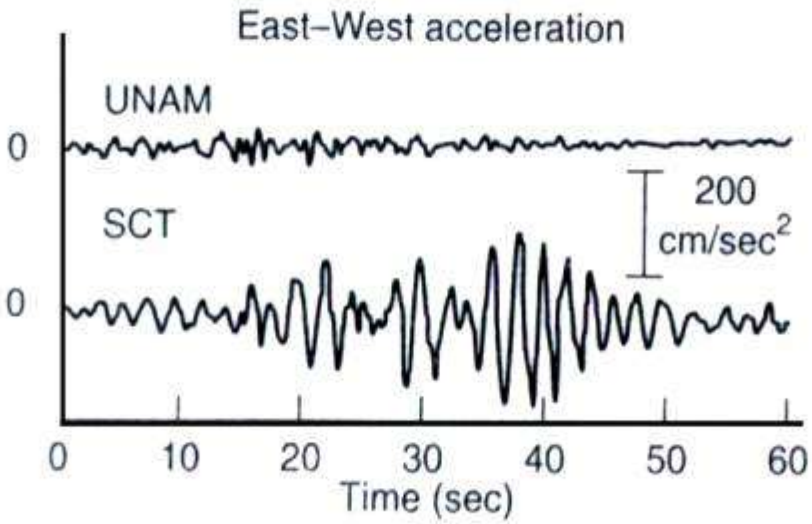
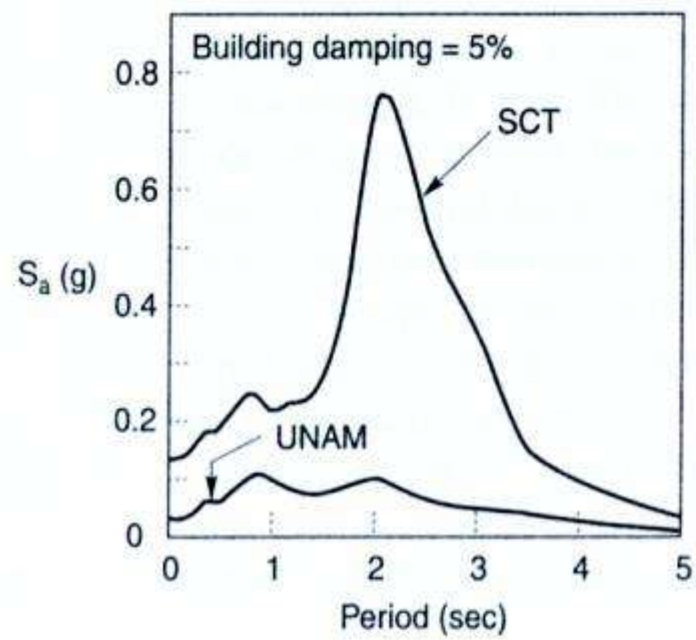
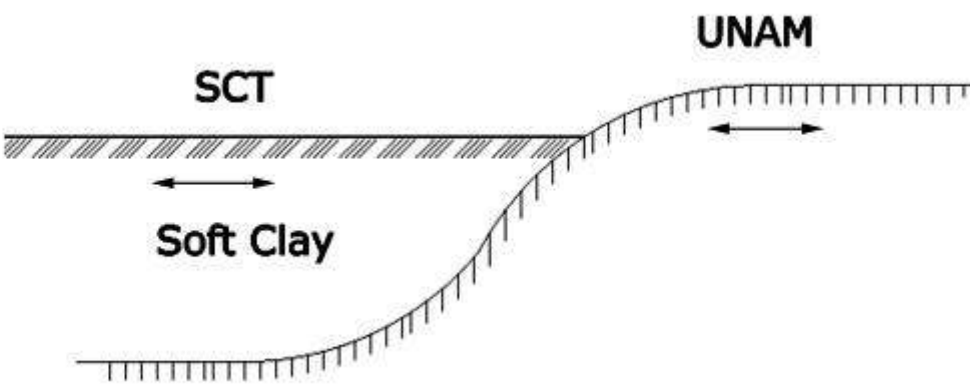
Site Amplification
(Local Geology)







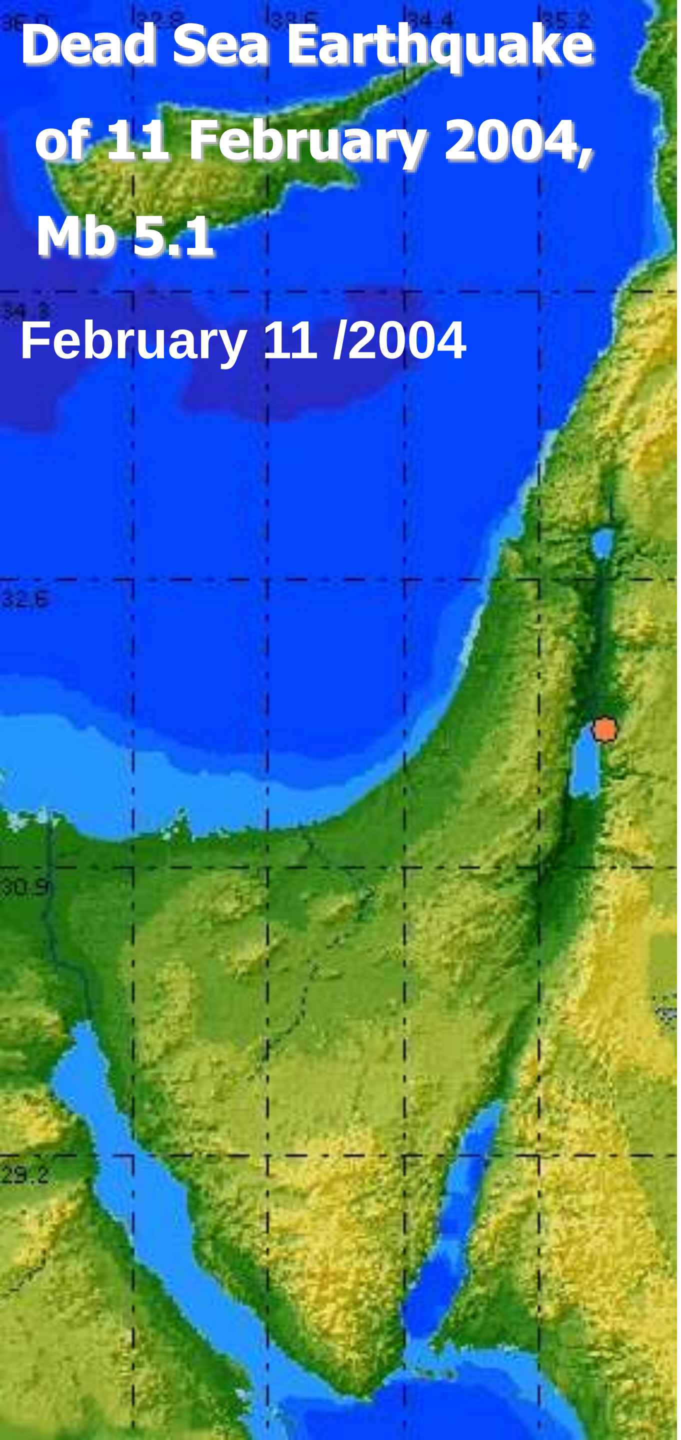


learning from earthquakes – Mexico City 1985,

Site effect Studies in Nablus City - Amplification

Dead Sea Earthquake of 11 February 2004, Mb 5.1

February 11 /2004

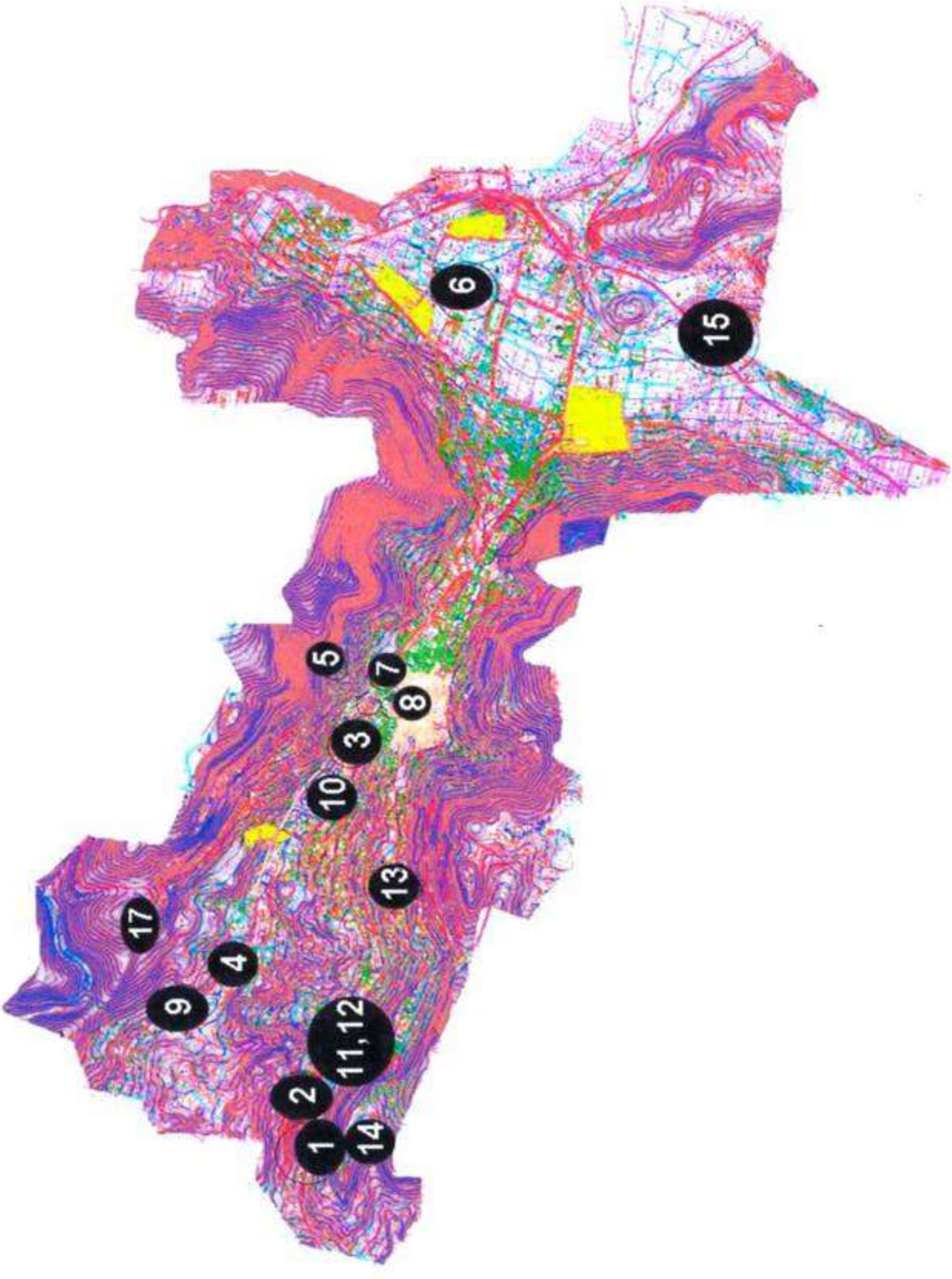


Dead Sea Earthquake

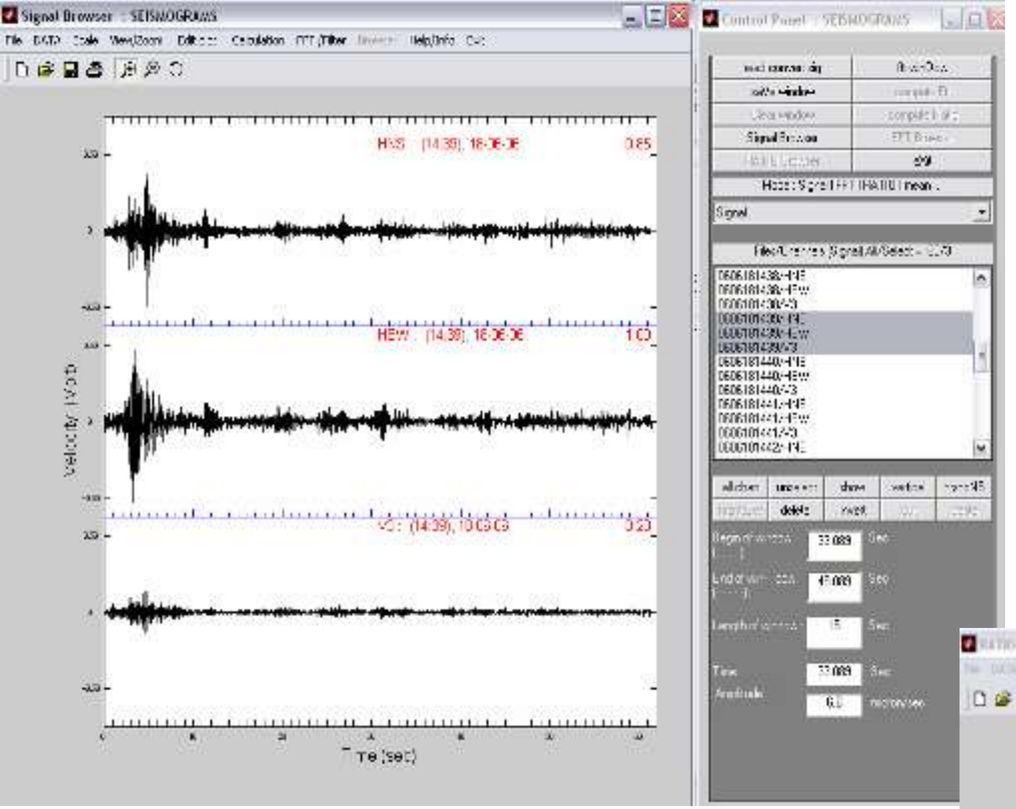
of 11 February 2004,

Mb 5.1

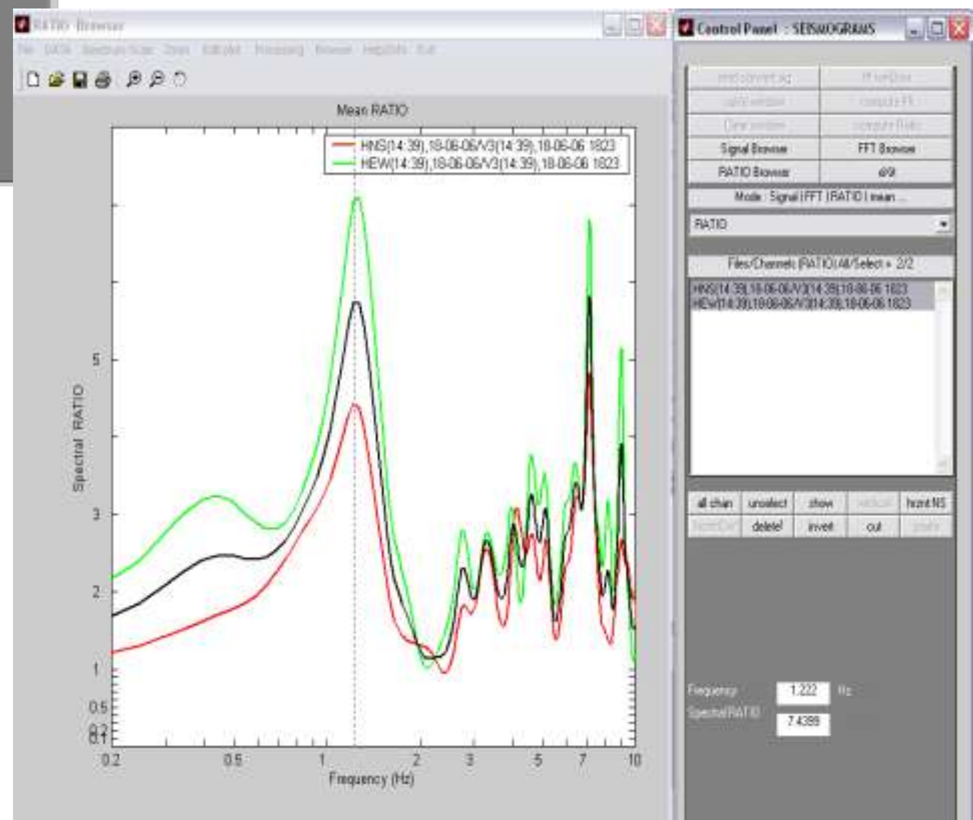


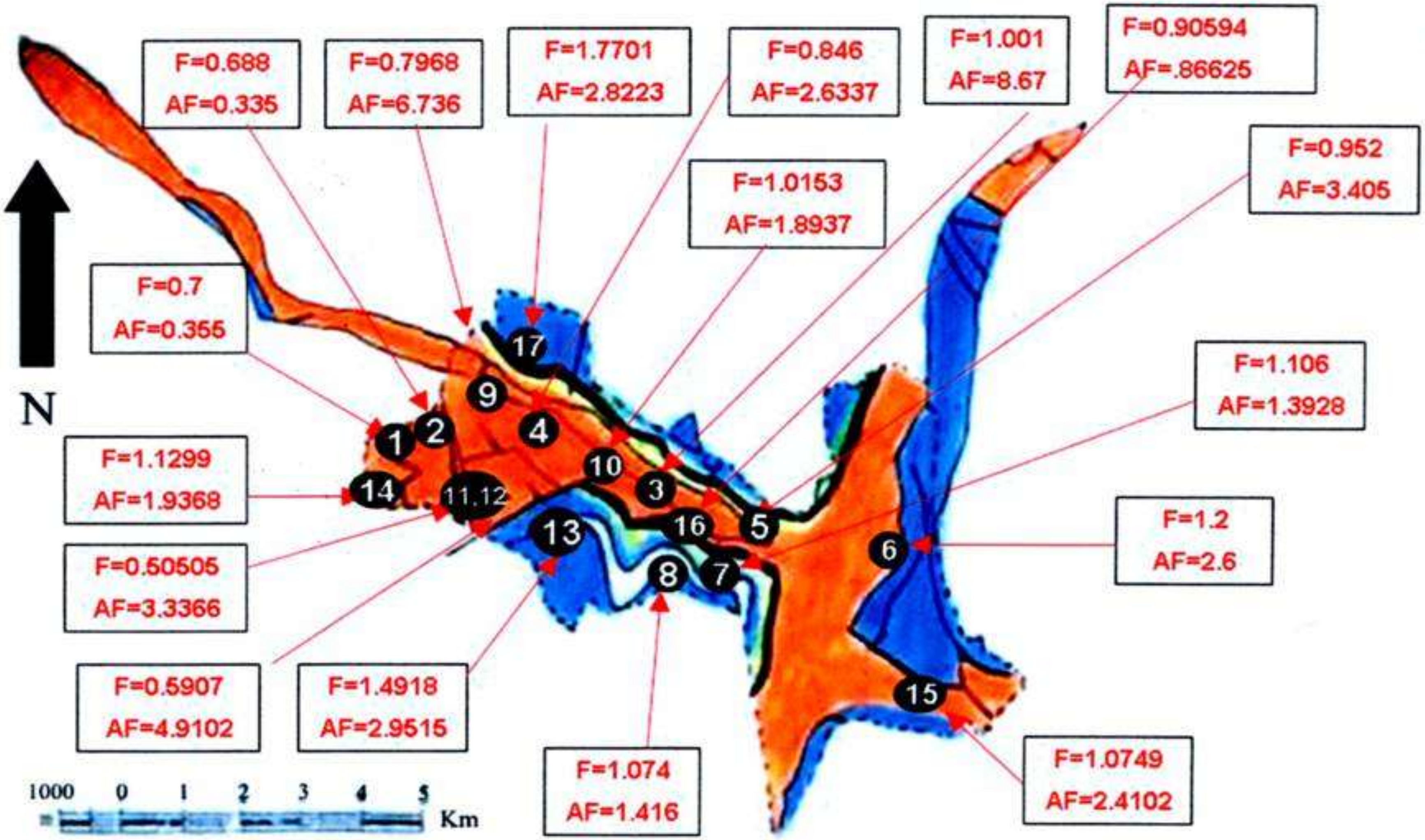
locations of measured sites in Nablus City.



Signal Browser : SEISMOGRAMS
Signal



Control Panel : SEISMOGRAMS
Mean RATIO
HNS(14:39),18-06-06/V3(14:39),18-06-06 1823
HEW(14:39),18-06-06/V3(14:39),18-06-06 1823
Spectral RATIO
Frequency (Hz)
Signal Browser
FFT Browser
RATIO Browser
RATIO
Frequency
1.222
Hz
7.4399



Values of dominant frequencies (DF) and amplification factors (AF) at all measured sites in Nablus City.

Lists the result of dominant frequency and amplification factors

Site	Dominant Frequency Hz	Amplification Factor	Natural period Sec
1.	0.700	0.355	1.429
2.	0.688	0.335	1.453
3.	1.001	8.67	.999
4.	0.846	2.6337	1.182
5.	0.952	3.405	1.050
6.	1.2	2.6	0.833
7.	1.106	1.3928	0.904
8.	1.074	1.416	0.931
9.	0.7968	6.736	1.255
10.	1.0153	1.8937	0.984
11.	0.50505	3.3366	1.980
12.	0.5907	4.9102	1.693
13.	1.4918	2.9515	0.6703
14.	1.1299	1.9368	0.769
15.	1.0749	2.4102	0.930
16.	0.90594	.86625	1.103
17.	1.7701	2.8223	0.565

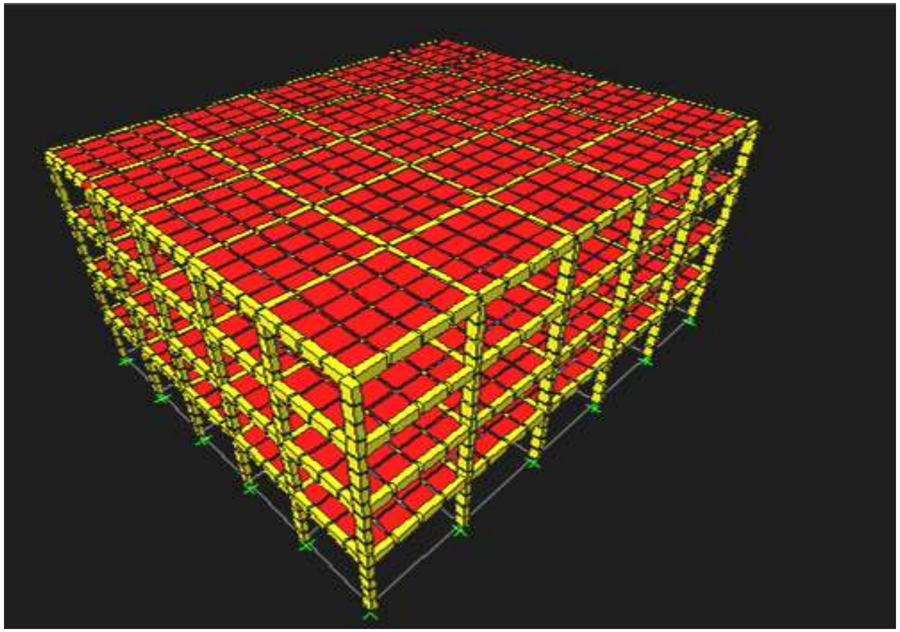


Fig. 6 space frame model of 4 story building in SAP2000

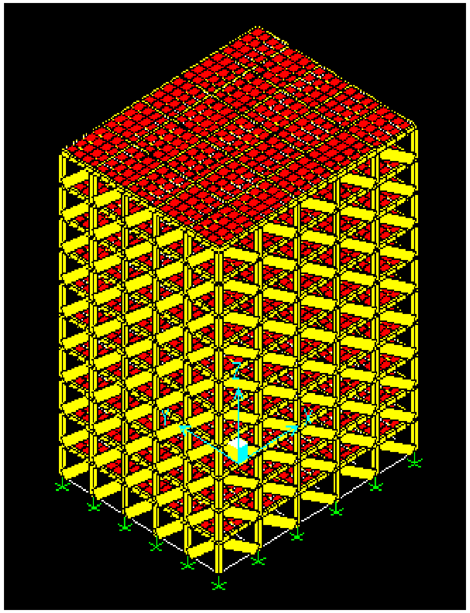
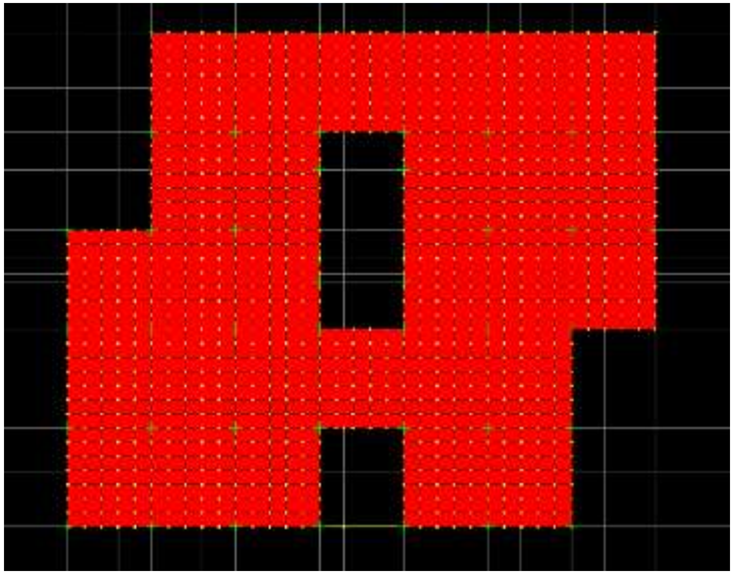
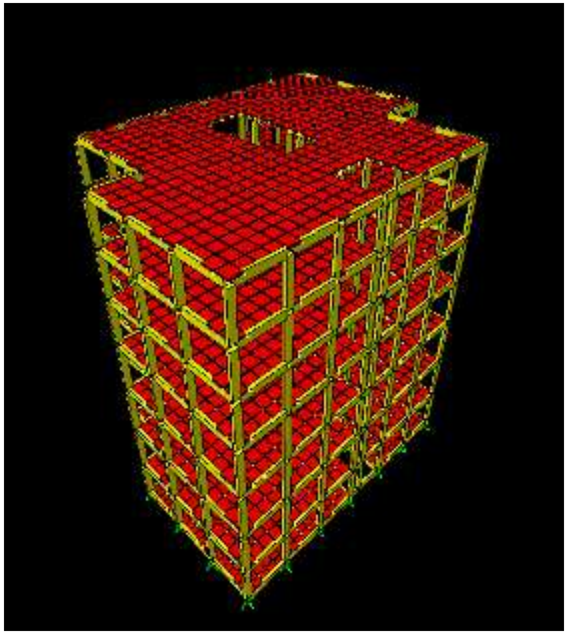
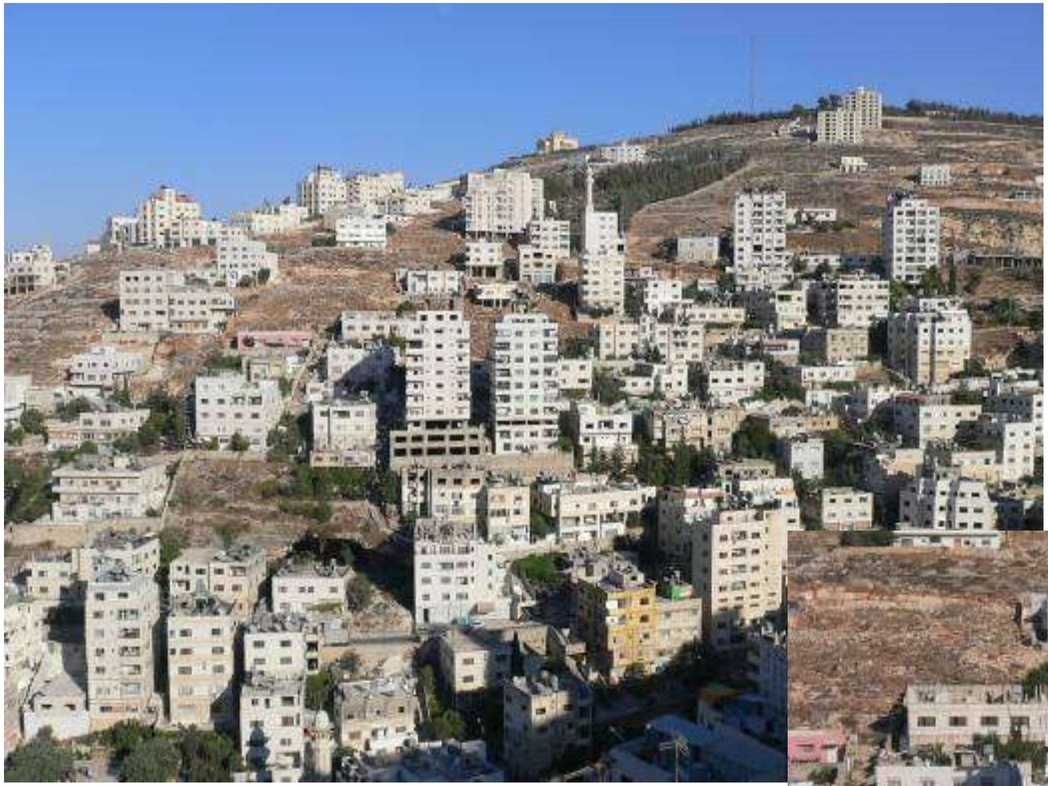


Fig. 21 ten story perimeter walls building - model





Building type	Load Ton/m^2	Period, T For Exterior frame		Period, T For Interior frame		Period, T For Space frame		Period, T Using UBC97
		Uncr.	Cracked	Uncr.	Cracked	Uncr.	Cracked	
4_story frames	0.95	0.5	0.71	0.71	1	0.63	0.8268	0.5
	0.75	0.447	0.63	0.632	0.893	0.56	0.7345	0.5
4_story perimeter walls	0.95	0.15	0.152	0.77	1.09	0.255	0.372	0.336
	0.75	0.14	0.143	0.7	0.988	0.23	0.352	0.336
10_story frames	0.95	1.06	1.571	1.5	2.22	1.3	1.875	1
	0.75	0.947	1.406	1.339	1.987	1.176	1.677	1
10_story perimeter walls	0.95	0.386	0.389	1.619	2.404	0.59	0.63	0.664
	0.75	0.365	0.368	1.474	2.188	0.536	0.576	0.664



Landslides




Nablus City 1997


Nablus City 2003


Nablus City 2005


Hebron City 2006


Hebron City 2006

learning from earthquakes

Site Effects ????

- **Land Use Policy**


Sector
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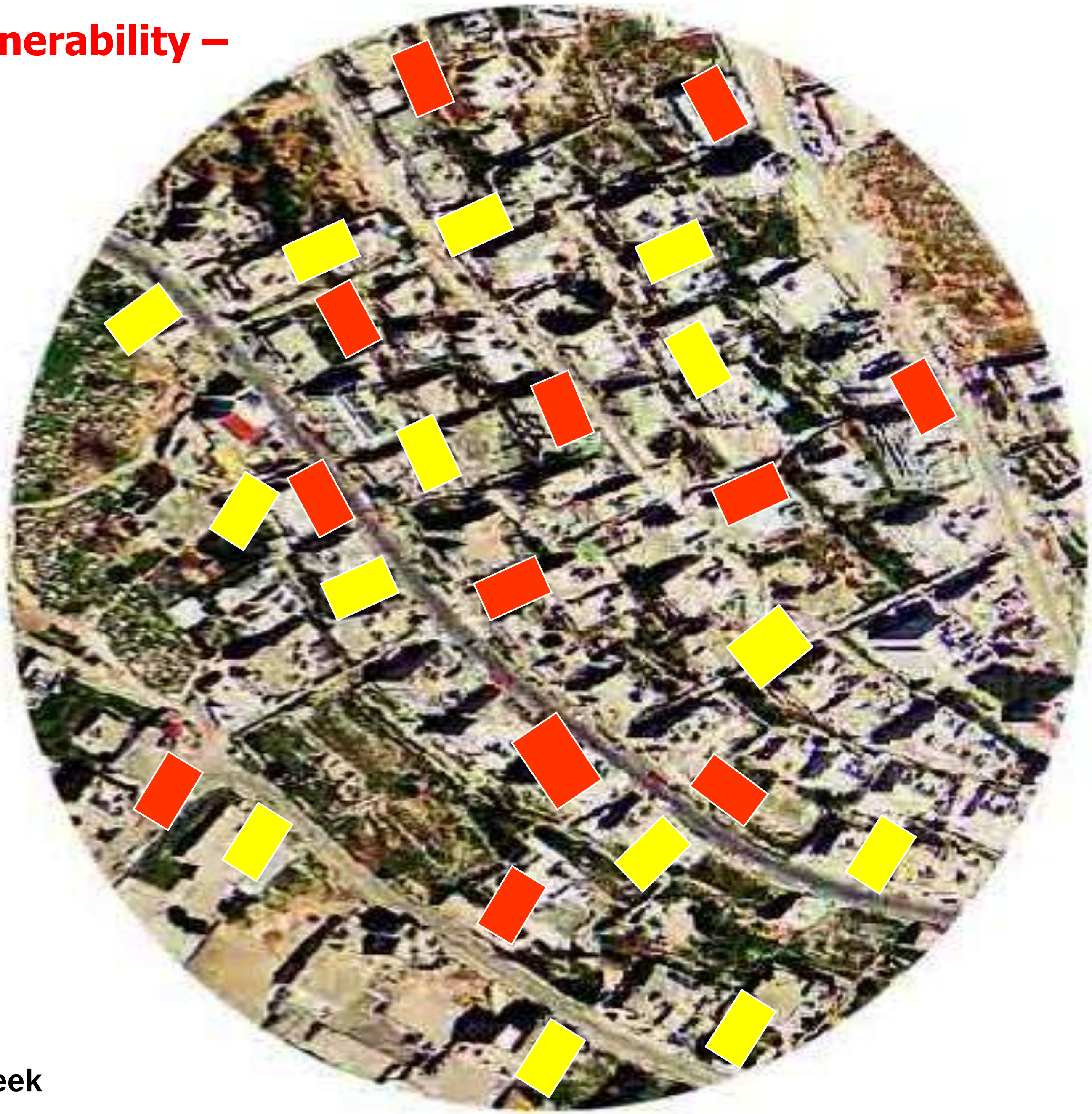
Seismic vulnerability – Nablus city



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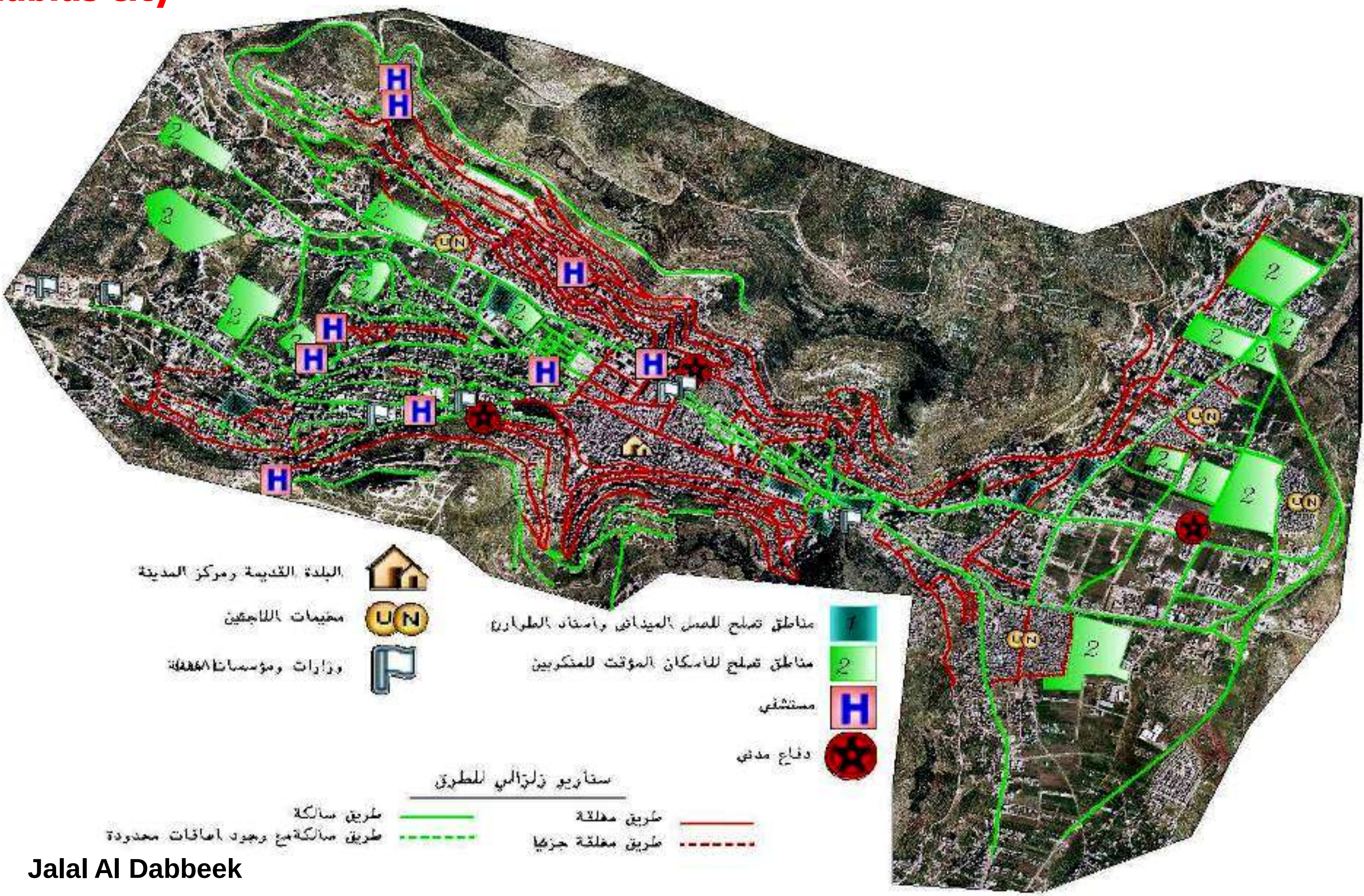
Seismic vulnerability – Nablus city

Urban Risks and Risk Map



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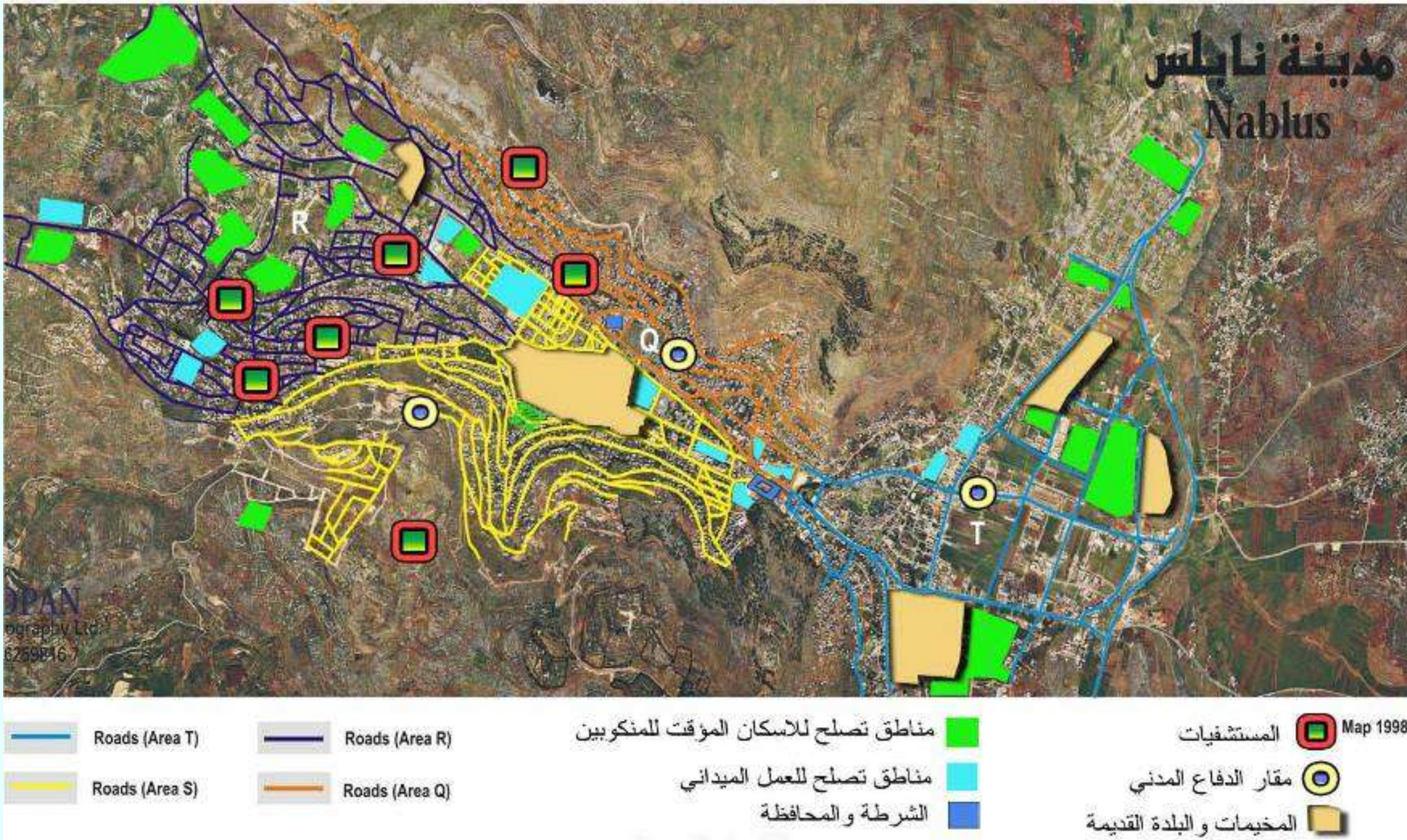
NABLUS CITY

Classification of areas for survey purposes

(ROADS)



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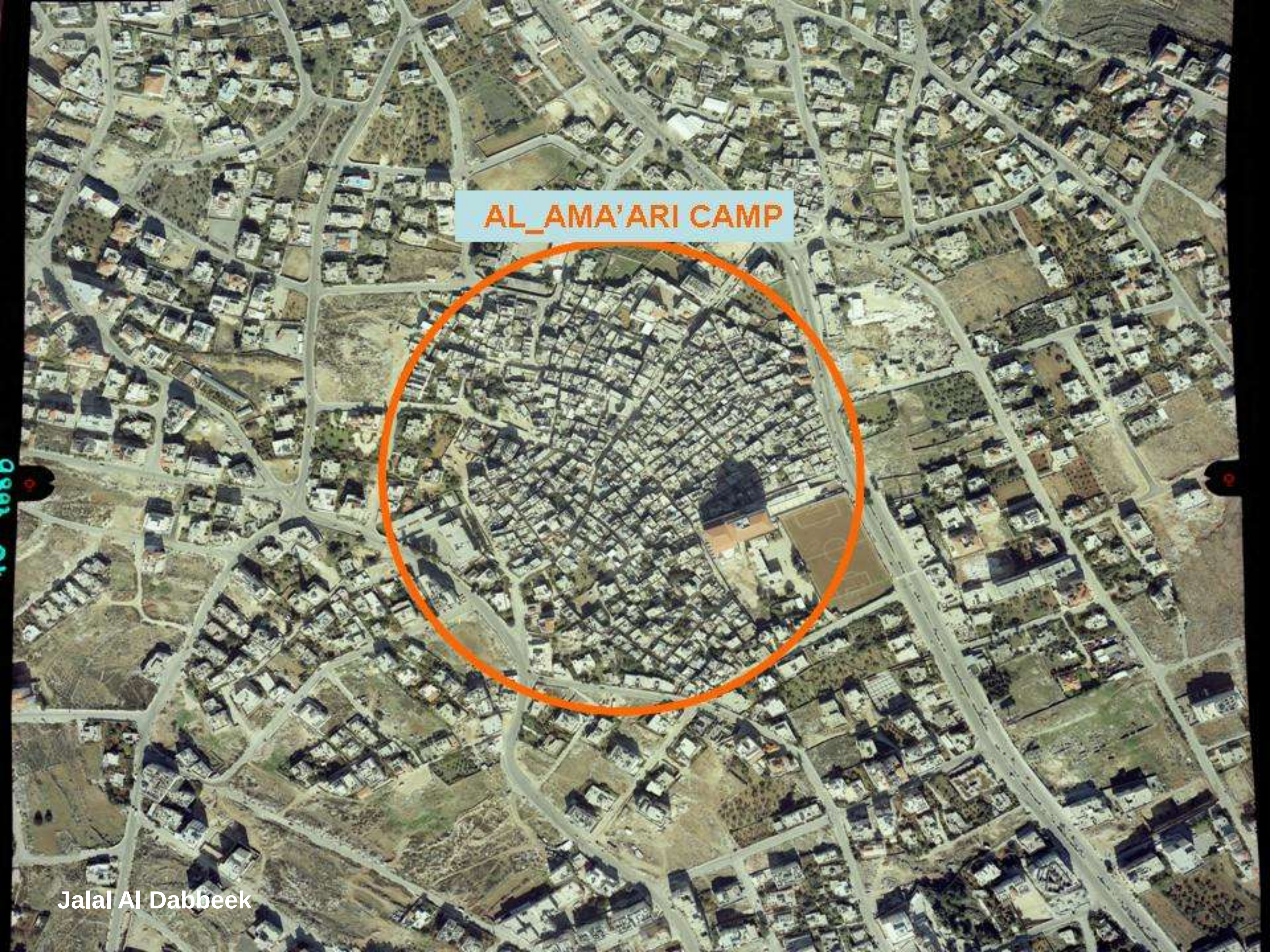
AL_AMA'ARI CAMP
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REO
REO
REO
REO
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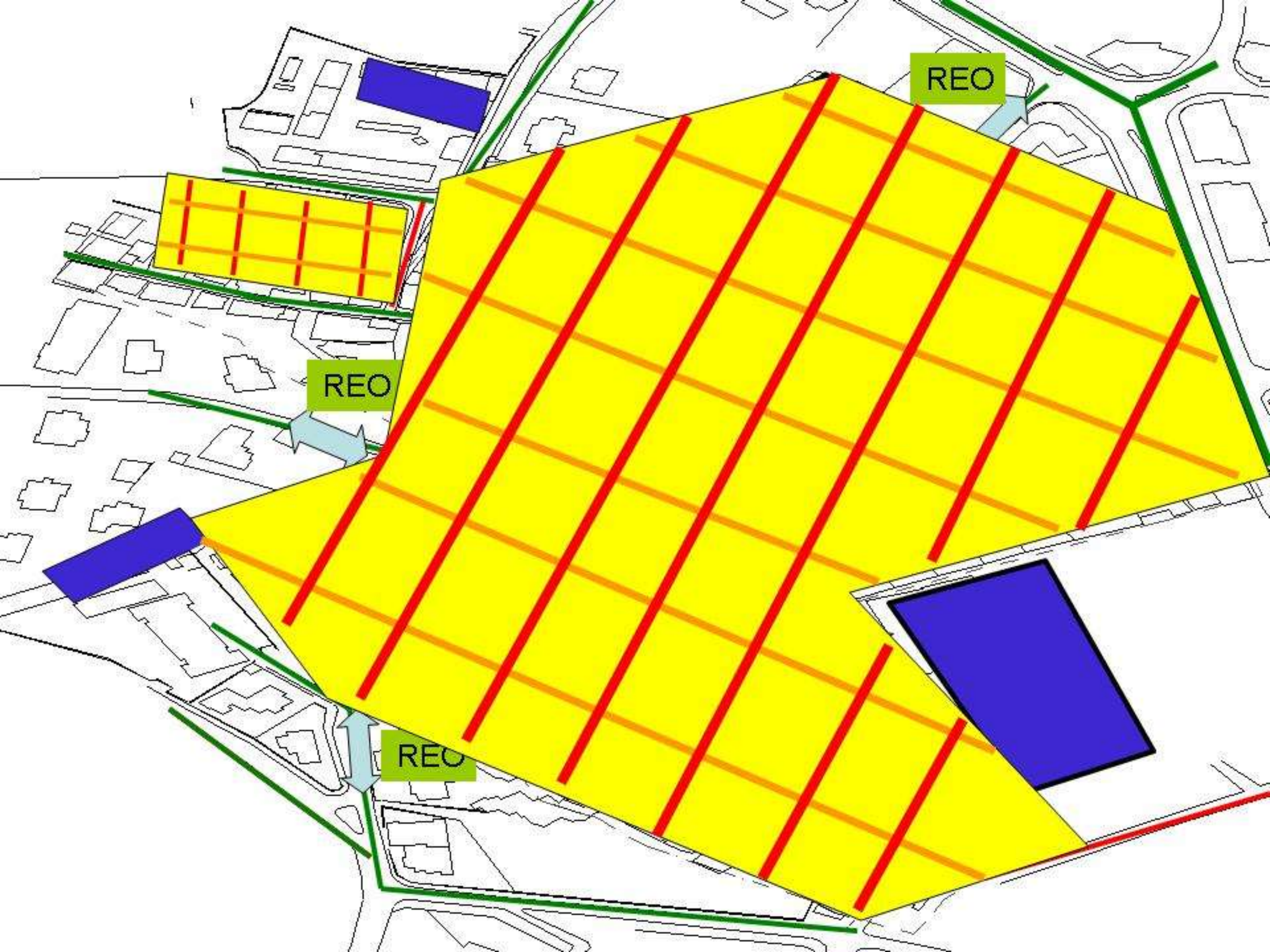
REO
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Case study – Amman City

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Case study – Amman City
Google

Conclusion and Recommendations

Conclusions

The earthquakes, floods, landslides, droughts and desertification are the main natural hazards in Palestine as well as Arab region. Based on data obtained from local and international statistical reports and scientific research studies, important comprehensive conclusions about the following main topics could be concluded:

- ***Regional cooperation and International initiative***
- ***Training and awareness***
- ***Institutional structure and capacity***
- ***National policy, legislation and strategies***
- ***Disaster Profile and risk assessment***

The conclusions are:

-**National and local capacities for disaster risk reduction are generally very weak at all levels.**

-**Legal frameworks for disaster risk reduction are very limited. The disaster risk reduction agenda is driven by response activities, whereas prevention or mitigation is missing.**

-**- Absence of clear and comprehensive national plan for disaster management and focal national office for disaster risk management.**

- **Weaknesses of national programmes and public policies on preparedness, mitigation, and emergency response.**

- Weak institutional capacities and training in disaster management and rescue operations.

- Weakness of awareness by citizens as well as capacity of professionals, engineers, and decision makers.

- Lack of coordination between central and the local level authorities in disaster management activities.

- Disaster risk management system as it is outlined in the Hyogo Framework for Action is not yet regulated.

- National and local disaster management and emergency response plans do not actually exist.

- Absence of clear and comprehensive national plan for disaster risk reduction and focal national office for disaster risk management.
- Lack of adequate coordination among different governmental and non governmental organizations and the private sector as well. This will result in the reduction of the emergency support operations.
- Absence of well equipped operations central rooms on the national levels covering different governorates.
- Few national bodies are key players in disaster risk reduction, but all of them are facing considerable capacity gaps. Also, public responsibilities in disaster risk man-agement are not allocated to one specific relevant authority, but they are shared among different bod-ies.
- The role of the private sector in disaster reduction is also not adequate
- The vulnerability of buildings and infrastructures to earthquakes is very high.
- Absence of codes, rules and regulations which emphasize on the safety requirements in the buildings.
- Absence of land use policy (planning).
However, it is observed that there is a lack of coordinated efforts among various departments, coordination between centers and local administrative bodies and clear definition of the roles and responsibilities towards disaster reduction and management.

Comprehensive recommendations about the following main topics:

- ***National Policies, legislation and enforcement***
- ***Disaster risk reduction database and risk modeling***
- ***The National Disaster Management Plan***
- ***Non Governmental Organizations***
- ***Political Consensus***
- ***Approach towards disaster risk management***
- ***Regional cooperation***
- ***Links from the Center to Local Government***
- ***Links between Policy and Operations***

Based on this fact and considering the importance of earthquake risk reduction, ESSEC managed to contact and talk with different members and groups of the society including citizens, professionals and decision makers, by adopting a comprehensive methodology, these include:

- Conducting a number of academic courses for both graduate and undergraduate students at the faculty of engineering and also some elective course of engineering type for all other students at the university.
- Conducting and organizing many training courses in most of Palestinian cities to support the continuous education among engineers and planners.

- Publishing periodical essays and dissertations in engineering magazines.

- Organizing many conferences, symposiums, workshops and lectures.

- Publishing awareness bulletins and wrote many essays in local magazines and news papers., in addition to public awareness through available local media (To change the methodology of thinking among citizens)

- Supplying the decision makers in related ministries with updated regulations and guidelines in codes of practices and recommendations of international engineering organizations. .

Thanks

- GFZ, SDC, UNDP, USAID, etc
- UN ISDR

THANKS

شكراً لحسن اصغائكم