REPUBLIC OF TURKEY
PRIME MINISTRY
Disaster and Emergency Management Presidency

MIDDLE EAST TECHNICAL UNIVERSITY
Disaster Management Implementation and Research Center

Economic Effects of Disasters

Middle East Technical University Disaster Management Implementation and Research Center

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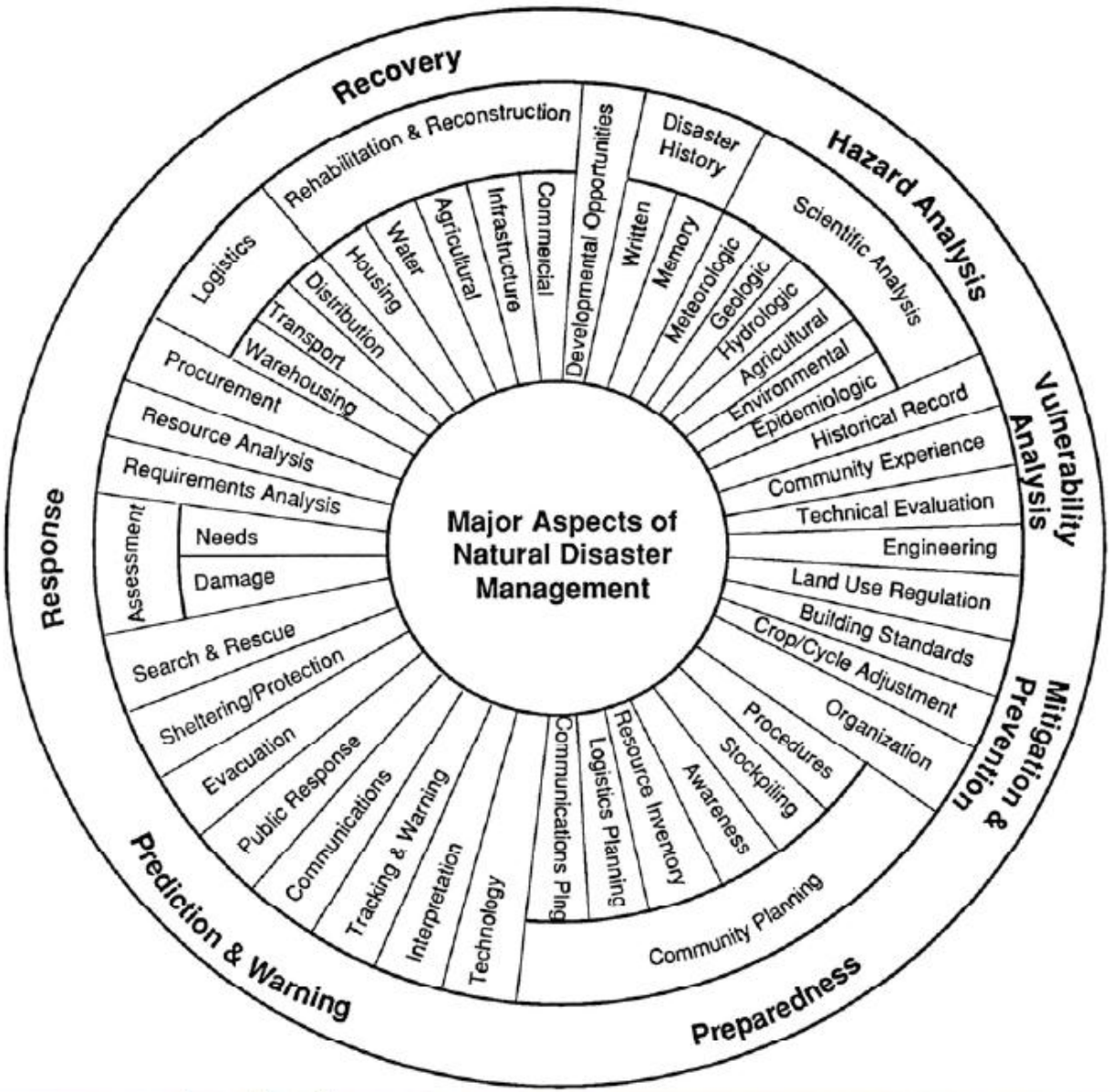
03.04.2013, Istanbul

Outline

- Disaster Management
- Disaster Statistics 2012
- Van Earthquakes
- Insurance / Wrap up

Disaster Management Cycle / Disaster Continuum

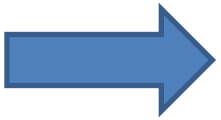
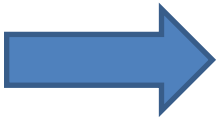
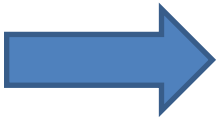


PROFESSIONS ACTIVE IN VARIOUS PHASES OF DISASTER

Types of Disasters	Prevention	Mitigation	Preparedness Planning	Emergency	Reconstruction
Drought	Climatologists Agronomists	Agronomists Agricultural Engineers & Extensionists Water Engineers	Water Engineers Agronomists Nutritionists	Nutritionists Physicians Nurses Social Workers	Agronomists Engineers Water Engineers
Earthquakes		Architects Engineers Contractors	Architects Engineers Physicians Nurses	Physicians Nurses Social Workers	Financial Specialists Architects Engineers Contractors
Floods	Engineers Rangeland Managers	Engineers Rangeland Managers	Engineers Planners		Architects Engineers Planners
Hurricanes		Engineers Architects Contractors Agronomists	Planners Nurses Physicians Meteorologists	Physicians Nurses	Engineers Architects Contractors Agronomists
Volcanoes		Planners	Planners		Planners
Insect Infestation	Entomologists Climatologists Meteorologists	Entomologists Agricultural Extensionists Agronomists	Chemical Engineers	Pesticide Applicators	Entomologists Agricultural Extensionists Agronomists

GFDRR reports indicate:

- The economic losses from disasters over the past 30 years are estimated at 3.5 USD tn.
- In 2011, estimated losses of around 380 USD bn occurred .
- Floods in Thailand cost the equivalent of 5% of the country's Gross Domestic Product (GDP)
- Economic losses of Japan's earthquake and tsunami were estimated as equivalent to 4% of GDP.
- The economic impact of the Haiti earthquake in 2010 was equal to 120% of its GDP
- The 2004 Grenada hurricane caused losses equivalent to more than 200% of GDP.

- Mitigate  save many!
- Mitigate  response faster/better
- Mitigate  recover faster/stronger

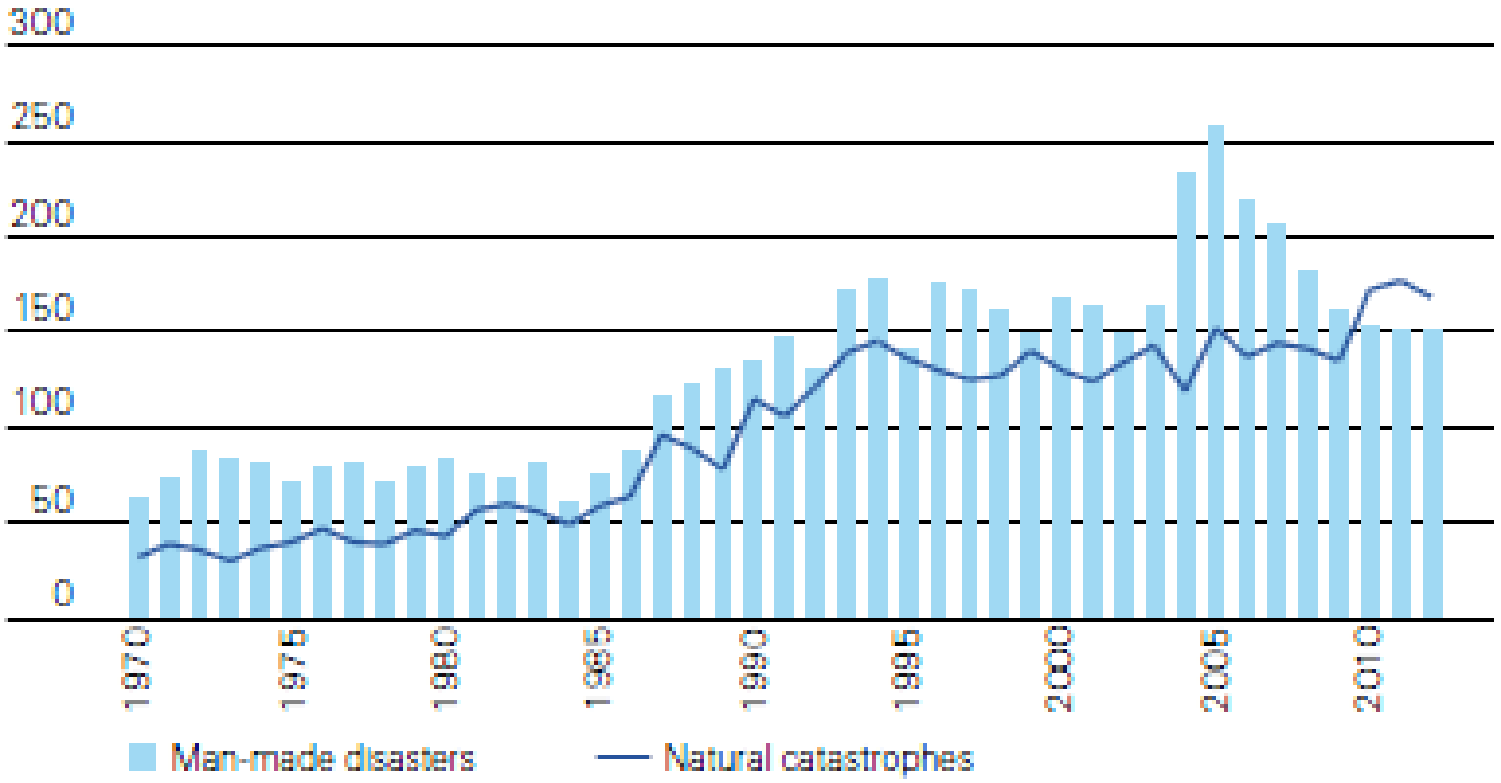
In 2012: 318 disasters

- 168 natural and 150 man-made disasters.

Typhoon Bopha in the Philippines
Floods in Pakistan
Earthquake in Iran
Cold wave in Europe
Hurricane in the US (2nd most expensive after Katrina in 2005)

- Multi-hazard/multi-disaster and all losses are **Global!**

Number of events 1970-2012



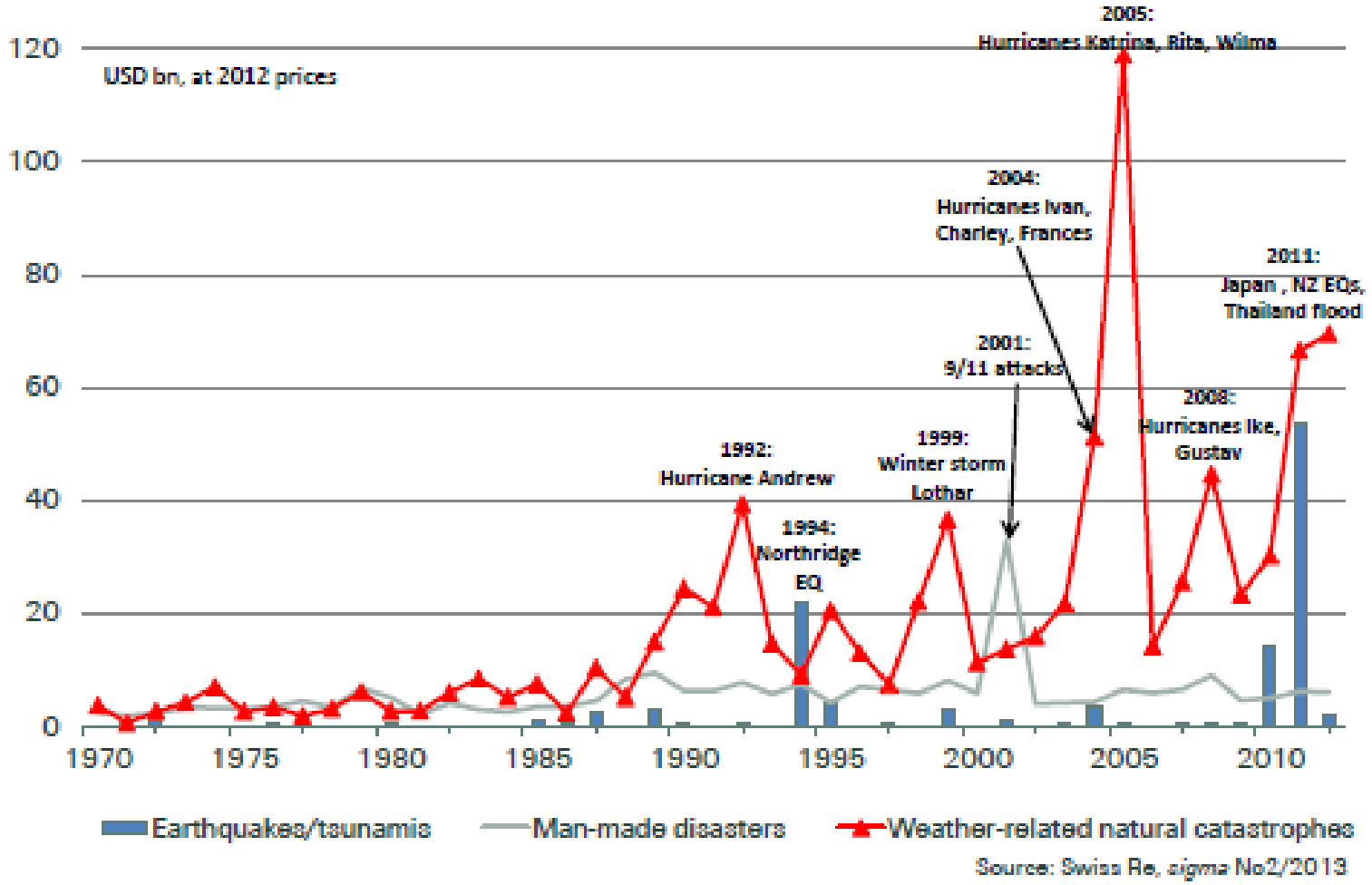
Source: Swiss Re Economic Research & Consulting

2012 Economic Losses by Region (Source: Swiss Re)

Region	No. of events	Victims	Insured loss in USD bn	Total Loss in USD bn	% of GDP
North America	**43**	**560**	**64.6**	**118.5**	**0.68 %**
Latin America and Caribbean	30	1167	0.9	4.2	0.08 %
Europe	33	1480	5.5	26.8	0.13 %
Africa	53	2300	0.2	1.5	0.08 %
Asia	115	7177	3.4	30.5	0.13 %
Oceania	7	97	0.3	1.1	0.07 %
Seas/Space	37	1148	2.4	3.1	-
Total	318	13929	77.2	185.7	0.13 %

Swiss Re

Insured catastrophe losses 1970–2012



Source: Swiss Re, *sigma* No2/2013

	Number	in %	Victims[25]	in %	Insured loss[26] (in USD m)	in %
Natural catastrophes	**168**	**52.8%**	**8948**	**64.2%**	**71278**	**92.3%**
Floods	63		2979		2712	
Storms	61		3129		54065	
Earthquakes	15		717		1787	
Droughts, bush fires, heat waves	8		139		11524	
Cold, frost	13		1806		250	
Hail	5				900	
Other natural catastrophes	3		178			
Man-made disasters	**150**	**47.2%**	**4981**	**35.8%**	**5960**	**7.7%**
Major fires, explosions	**40**	**12.7%**	**1367**	**9.8%**	**2933**	**3.8%**
Industry, warehouses	19		497		1137	
Oil, gas	12		94		1696	
Department stores						
Other buildings	5		454			
Other fires, explosions	4		322		100	
Aviation disasters	**11**	**3.5%**	**449**	**3.2%**	**557**	**0.7%**
Crashes	8		449		142	
Explosions, fires						
Damage on ground						
Space	3				415	
Maritime disasters	**43**	**13.5%**	**1701**	**12.2%**	**2208**	**2.9%**
Freighters	4		14		224	
Passenger ships	26		1679		719	
Tankers	3		6		130	
Drilling platforms	6		2		929	
Other maritime accidents	4				206	
Rail disasters (incl. cableways)	**5**	**1.6%**	**141**	**1.0%**		**0.0%**
Mining accidents	**2**	**0.6%**	**66**	**0.5%**		**0.0%**
Collapse of buildings/bridges						
Miscellaneous	**49**	**15.4%**	**1257**	**9.0%**	**262**	**0.3%**
Social unrest	15		152		116	
Terrorism	25		785			
Other miscellaneous losses	9		320		147	
Total	**318**	**100.0%**	**13929**	**100.0%**	**77238**	**100.0%**

The 40 most costly insurance losses (1970-2012, Swiss Re)

Insured loss[27] (in USD m, indexed to 2012)	Victims[28]	Date (start)	Event	Country
76254[29]	1836	25.08.2005	Hurricane Katrina: floods, dams burst, damage to oil rigs	US, Gulf of Mexico, Bahamas, North Atlantic
35735	19135	11.03.2011	Earthquake (M_W 9.0) triggers tsunami: aftershocks	Japan
35000[30]	237	24.10.2012	Hurricane Sandy: floods	US et al
26180	43	23.08.1992	Hurricane Andrew: floods	US, Bahamas
24349	2982	11.09.2001	Terror attack on WTC, Pentagon and other buildings	US
21685	61	17.01.1994	Northridge earthquake (M 6.6)	US
21585	136	06.09.2008	Hurricane Ike: floods, offshore damage	US, Caribbean: Gulf of Mexico et al
15672	124	02.09.2004	Hurricane Ivan: damage to oil rigs	US, Caribbean: Barbados et al
15315	815	27.07.2011	Floods caused by heavy monsoon rains	Thailand
15315	181	22.02.2011	Earthquake (M_W 6.3), aftershocks	New Zealand
14772	35	19.10.2005	Hurricane Wilma: floods	US, Mexico, Jamaica, Haiti et al
11869	34	20.09.2005	Hurricane Rita: floods, damage to oil rigs	US, Gulf of Mexico, Cuba
11000[31]	123	15.07.2012	Drought in the Corn Belt	US
9784	24	11.08.2004	Hurricane Charley: floods	US, Cuba, Jamaica et al
9517	51	27.09.1991	Typhoon Mireille/No 19	Japan
8467	71	15.09.1989	Hurricane Hugo	US, Puerto Rico et al
8421	562	27.02.2010	Earthquake (M_W 8.8) triggers tsunami	Chile
8205	95	25.01.1990	Winter storm Daria	France, UK, Belgium, Netherlands et al
7994	110	25.12.1999	Winter storm Lothar	Switzerland, UK, France et al
7453	354	22.04.2011	Major storm with wind up to 340km/h, over 355 tornadoes	United States (Alabama et al)
7198	155	20.05.2011	Major tornado outbreak, storms with winds up to 405km/h	United States (Missouri et al)
6748	54	18.01.2007	Winter storm Kyrill: floods	Germany, UK, Netherlands, Belgium et al
6264	22	15.10.1987	Storm and floods in Europe	France, UK, Netherlands et al
6255	38	26.08.2004	Hurricane Frances	US, Bahamas
5952	55	22.08.2011	Hurricane Irene, extensive flooding	United States et al
5607	64	25.02.1990	Winter storm Vivian	Europe
5568	26	22.09.1999	Typhoon Bart/No 18	Japan
5263	-	04.09.2010	Earthquake (M_W 7.0), over 300 aftershocks	New Zealand
4972	600	20.09.1998	Hurricane Georges: floods	US, Caribbean
4673	41	05.06.2001	Tropical storm Allison: floods	US
4622	3034	13.09.2004	Hurricane Jeanne: floods, landslides	US, Caribbean: Haiti et al
4357	45	06.09.2004	Typhoon Songda/No 18	Japan, South Korea
4000	45	02.05.2003	Thunderstorms, tornadoes, hail	US
3890	70	10.09.1999	Hurricane Floyd: floods	US, Bahamas, Columbia
3775	59	01.10.1995	Hurricane Opal: floods	US, Mexico, Gulf of Mexico
3724	6425	17.01.1995	Great Hanshin earthquake (M 7.2) in Kobe	Japan
3489	25	24.01.2009	Winter storm Klaus, wind up to 170km/h	France, Spain
3308	45	27.12.1999	Winter storm Martin	Spain, France, Switzerland
3119	246	10.03.1993	Blizzard, tornadoes, floods	US, Canada, Mexico, Cuba
2947	38	06.08.2002	Severe floods	UK, Spain, Germany, Austria et al

Financial Management of Disaster Impacts

- Returning to better conditions than pre-disaster conditions, in the shortest possible period of time after a disaster occurs

- Optimum use of scarce resources

Damage or Loss

- Damage: By economics definition the damages on stocks including physical and human capitals

- Loss: Business interruptions, such as production and/or consumption, caused by damages

Mainly three types of effects are observed:

1- Direct

2- Indirect

3- Secondary = 1+ 2

Direct effects:

- Structural damage
- Wage losses
- Damage to infrastructure (e.g. railways, highways, telecommunication)
- Damage to public goods (e.g. schools, **hospitals**)
- Production losses (e.g. loss of cattle, shutdown of small businesses)
- Expenses for emergency sheltering

Indirect effects:

Observed as a result of direct effects.

- Reduction in production demand
- Changes in GDP per capita
- Increased transport cost

Secondary effects:

Observed after a while of disaster occurrence. Combined direct + indirect effects.

- Epidemics
- Budget deficit
- Changes in the environment (e.g. nuclear leak, effect of oil pipe leakage in the agricultural products)
- Import / export

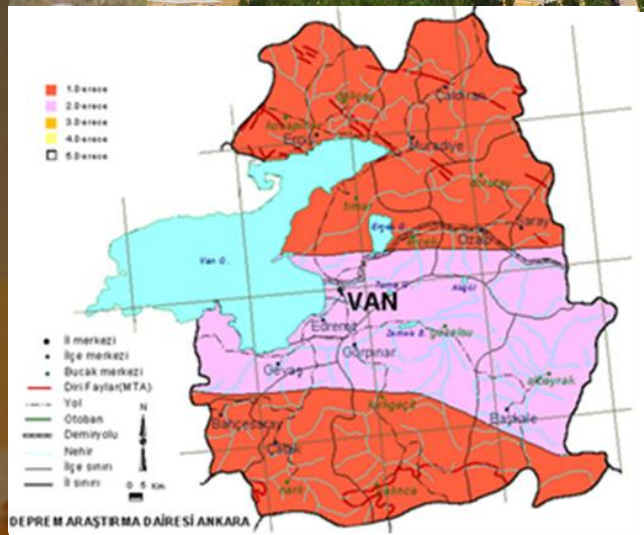
Some figures on 1999 Marmara Earthquake

- 5-7 % of GDP around 20 USD bn in 45 seconds!

- At sectoral level:

  - Industrial facilities: 2 USD bn
  - Structure: 5 USD bn
  - Railways: 1 USD bn
  - Highways/roads: 0.2 USD bn
  - Ports: 0.2 USD bn
  - Telecommunication: 75 USD m
  - Energy: 3 USD m

The City of Van: dates back to 5000 BC

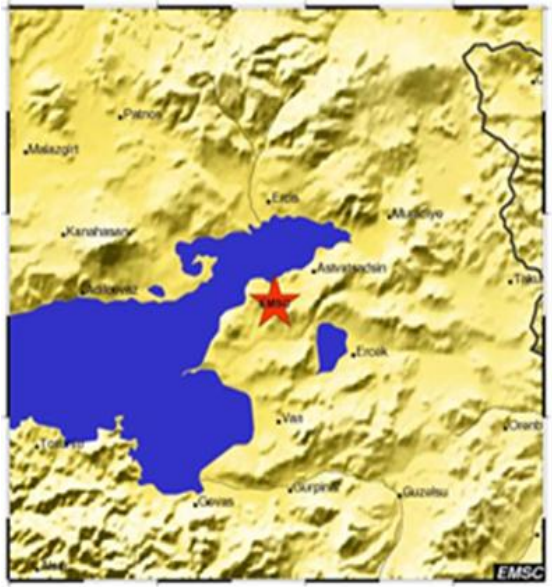

1.Derece
2.Derece
3.Derece
4.Derece
5.Derece
VAN
İl merkezi
İlçe merkezi
Bucak merkezi
Diri Faylar(MTA)
Yol
Otoban
Demiryolu
Nehir
İlçe sınırı
İl sınırı
DEPREM ARAŞTIRMA DAİRESİ ANKARA

- Tuspha – capital of Urartian Kingdom in 9th century BC
- 331 BC Alexander the Great conquered Van
- Byzantine (12 years)
- Muslim Arabs
- The Kingdom of Ani
- Vaspurakan
- The Seljuk Empire (Turks enter Anatolia:1071 Manzikert War)
- The Timurids
- The Ottoman Empire

October 23, 2011 Sunday at 13.41 pm local time – magnitude 7.2 – epicentre Tabanli Village

Population: 1 million

The Lake of Van: Largest in Turkey – saline and soda lake



Date	Place	Details
24.11.1976	Muradiye - Van Depremi	Magnitude: 7.5 Life losses: 5000 Buildings damaged: 9232 Heavy winter conditions

1111
1245
1276
1441
1646 or 1648
1701
1704
1715
1791
1871 (5 March)
1871 (7 June)
1900 (June-September)
1902
1904 or 1905
1906
1924
1932 – 1933
1941 (11 September)
1945 (15 January)
1945 (2 ve 9 March)
1945 (September)

- November 9, 2011 : second EQ strike Van city centre – magnitude 5.6
- 644 life losses in total
- Building losses: 25 % of building stock in Van city had heavy damage or total collapse
- Reconstruction cost: 3.5 USD bn
- April 6, 2012 -- 8064 claims -- 38 USD m paid

- Van is ranked 75th in 81 provinces of Turkey in terms of development.

- It is the most developed city among the neighbouring provinces (Muş, Bingöl, Hakkari).

- The unemployment rate is 15.6 %.

- Incentives: exemption from electricity bills
  delay in loan payments
  credit/loan for farmers

permanent housing construction completed in 1-year after the EQ, 2011 to 2012

Economic mitigation

Mitigation of the impacts of hazards can be adopted through normal planning (Ministry of Development / Former State Planning Organisation-SPO) are:

- **Adjusting normal development programs to reduce losses.**

  For example, certain varieties of crops that are more wind- or flood-resistant can often be introduced in areas prone to floods or cyclones.

- **Economic diversification.** In regions where the principal or only source of income is threatened, planners should attempt to diversify the economy and introduce economic activities that are less vulnerable, or not as vulnerable to the same types of disaster.

  Diversification is very important where economies are based on a single cash crop.

Example: Small island countries that depend on exporting bananas or palm oil are vulnerable to extensive damage in a cyclone.

How to mitigate: Diversify into fishing or light manufacturing

Diversification will help protect the economy against natural disasters and also against unanticipated price fluctuations on the international market.

- **Developing "disaster resistant" economic activities within a region**.

For example:

Coconut palms are more suitable than citrus or other fruit trees in cyclone-prone coastal areas.

❖ Efforts should be made to identify and to encourage the development of enterprises that are less vulnerable to the hazards.

- **Economic Incentives**

  Governments are often able to extend a number of economic incentives to people and organizations in order to encourage development away from hazardous areas.

For example: loans, grants, taxation, technical assistance

- **Economic Mitigation**

Aim: to reduce the disaster's impact on the economy and on the economic well-being of the disaster survivors.

- Strengthen those sectors of the economy that are particularly vulnerable to disasters,
- Diversify the economy,
- Introduce or expand "disaster-resistant" economic activities, and
- Spread or relocate economic activities to less vulnerable areas so that not all the principal enterprises would be affected at the same time.

Insurance or other economic risk-spreading activities are also possible.

1. The key elements of the economy and those that are not particularly vulnerable to disaster are identified.

Often this is not difficult, especially for countries that have one-crop economies or only a few industries that earn foreign currency.

2. Every economic activity is examined to determine if a hazard could affect a significant portion of that activity. This analysis is conducted on both the macro and micro levels.

In other words, even though a flood may not have a significant economic impact on a country as a whole, it may have a major impact on a community or region.

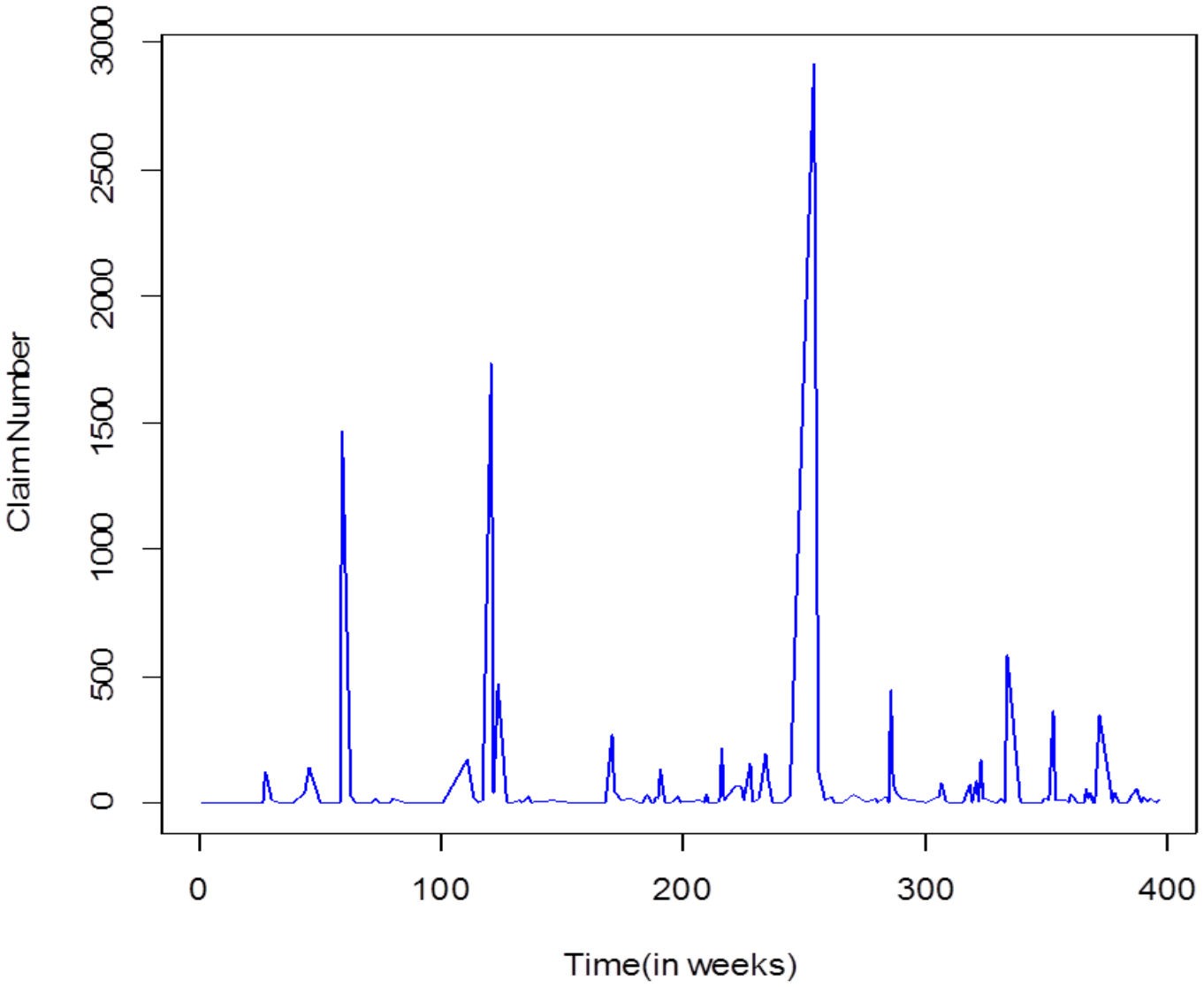
- **Insurance can be a major tool to mitigate disaster losses.**

Insurance

- Effective way of mitigation
- **Risks are insured if:**
  - They can be named/defined
  - quantitative

Kaynak: Kunreuther (1998)

- In most of the developed countries, there exist well-developed insurance culture
  - USA, France, Norway, New Zealand, Japan
- One of the best practices:
  - The Turkish Catastrophe Insurance Pool (TCIP/DASK) 3P/ PPP in an emerging economy


Claim Number
0
500
1000
1500
2000
2500
3000
0
100
200
300
400
Time(in weeks)

Wrap-up

The Black Swan

Taleb, N.N. (2007). *The Black Swan: The Impact of the Highly Improbable*. New York: Random House.

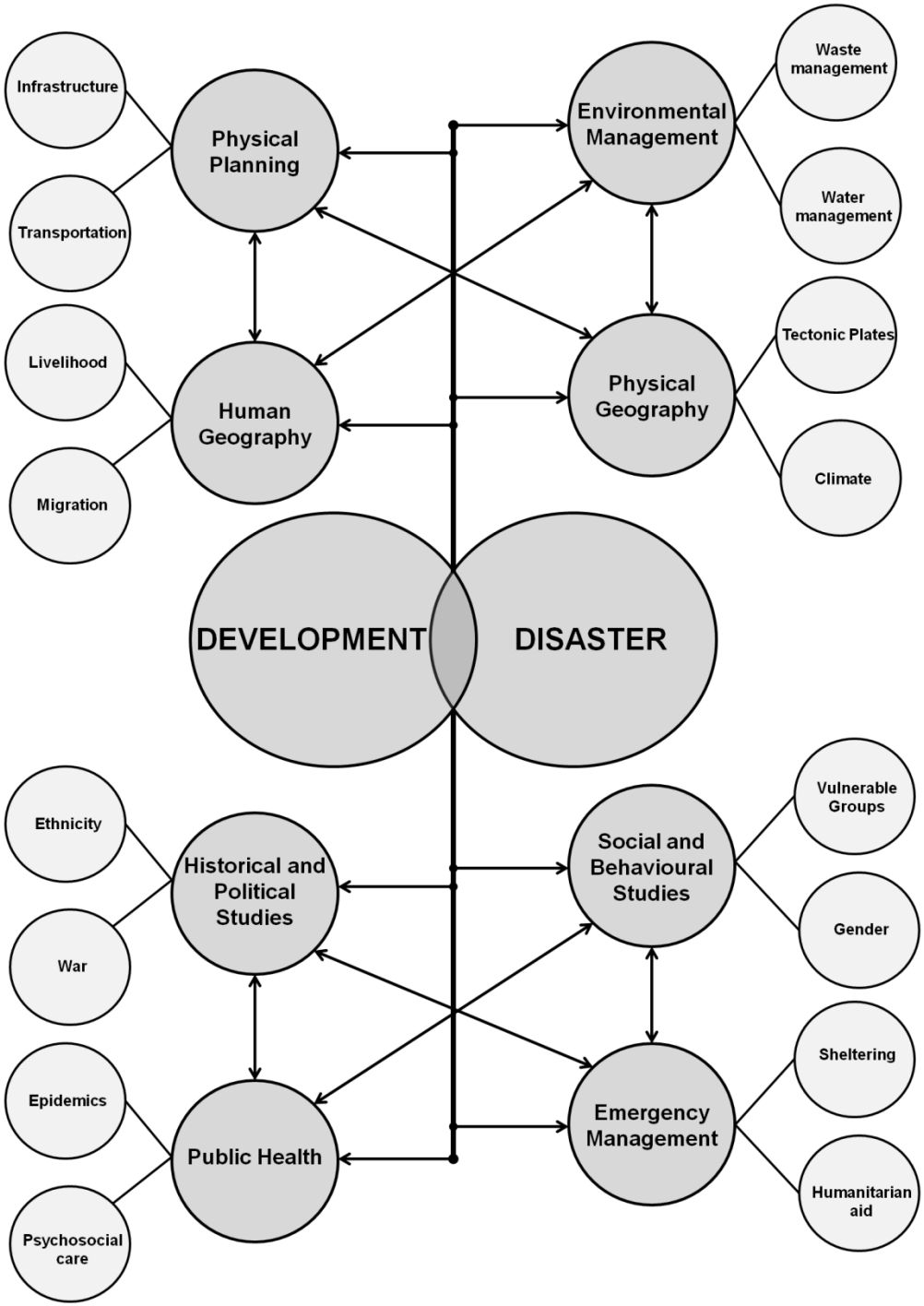
- Comes as a surprise
- Major impact

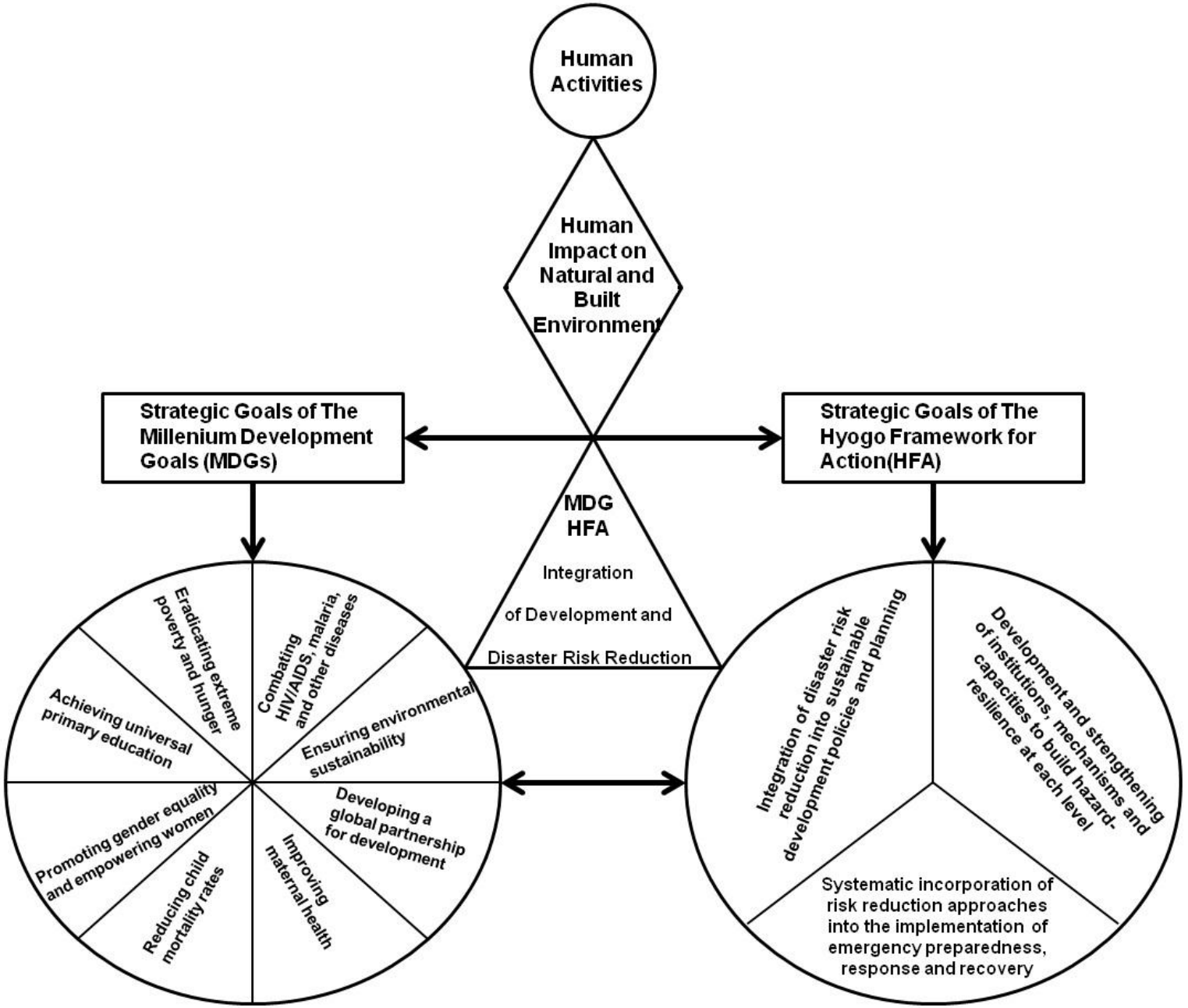
Integrated Contemporary Disaster Risk Management

- Mitigation/Planning/Response/Recovery
- Many sectors are affected: Industry, Education, Health, Justice, Construction, Environment…
- Bottom-up / Decentralised OR Top-down / Centralised
- An event changes all!
- Disasters or / and Development?

Very crucial

- Robust and Sustainable Statistics / Data Collection
- Vulnerability and Hazard Analysis by using Data
- Model and estimate --- all models change in time!
- State / Private sector and NGOs act together


Infrastructure
Transportation
Physical Planning
Livelihood
Migration
Human Geography
Environmental Management
Waste management
Water management
Physical Geography
Tectonic Plates
Climate
DEVELOPMENT
DISASTER
Ethnicity
War
Historical and Political Studies
Epidemics
Psychosocial care
Public Health
Social and Behavioural Studies
Vulnerable Groups
Gender
Emergency Management
Sheltering
Humanitarian aid


Human Activities
Human Impact on Natural and Built Environment
Strategic Goals of The Millenium Development Goals (MDGs)
Strategic Goals of The Hyogo Framework for Action(HFA)
MDG
HFA
Integration
of Development and
Disaster Risk Reduction
Eradicating extreme poverty and hunger
Combating HIV/AIDS, malaria, and other diseases
Achieving universal primary education
Ensuring environmental sustainability
Promoting gender equality and empowering women
Developing a global partnership for development
Reducing child mortality rates
Improving maternal health
Integration of disaster risk reduction into sustainable development policies and planning
Development and strengthening of institutions, mechanisms and capacities to build hazard-resilience at each level
Systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery

Thank You!

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References

1- Swiss Re Sigma Publications

2- The New Yorker, December 3, 2012.

3- The University of Wisconsin Disaster Management Center

4- Benson and Clay, ‘Understanding the Economic and Financial Impact of Natural Disasters’, the World Bank, 2004.

5- The Sendai Report, GFDRR, 2012.

6- Own research work