

VULNERABILITY IN HAZARD-PRONE MEGACITIES : CASE OF ISTANBUL



NASA Shuttle Radar Topography Mission, 2002 (NASA / GSFC / MITI / ERSDAC / JAROS, + U.S. / Japan ASTER Science Team, 2000)

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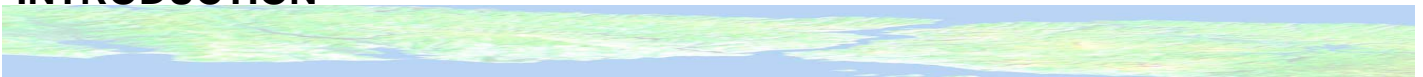
Graduate School of Architecture, Planning and Preservation

Summer Academy for Social Vulnerability

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INTRODUCTION



Megacity Vulnerability

Global Trends

Informal – Formal

Istanbul – Urban Context

Developing Vulnerability

Social and Spatial Inequality

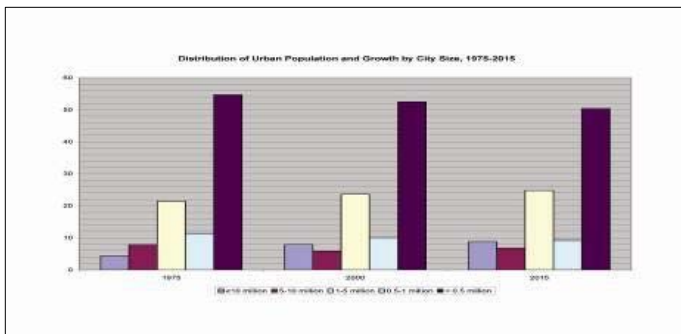
Istanbul – Earthquake Risk

Hazard and Risk Assessment

Urban and Risk Management



Natural hazards and world's most populous cities by 2015: Mega-cities and cities over five million people. (Adapted from *World Map of Natural Hazards*, <http://www.munichre.com>, 2006)



Distribution of urban population by city size, 1975-2015 (Data from United Nations Population Division 2002)

Global Trends in Urban Vulnerability

- Urbanization:** >50% of world population live in urban areas
- Large & Megacities:** Increase in number of people living by 2015
- Hazards:** >75% of 100 large cities are exposed to hazards
- Location:** Low- and middle-income countries
- Megacities:** <25% are in high-income countries
- Global Forces:** Climate change, Globalization



Informal living on the hills of Istanbul: Self-built houses in Pendik (2004)

Informal

- Location
- Building Materials
- Infrastructure
- Municipal Services
- Land Titles
- Social Exclusion
- Urban Poverty



Informal living on the hills of Istanbul: Self-built houses in Beykoz (2002)



Shoring of balconies in vacation homes in Spain (2003)

Formal

- Construction Practices
- Control/Code Violation
- Corruption
- Choice/Disregard
- Capitalist Market



Space reconfigurations in Istanbul (2004)



Social and Spatial Inequality in Istanbul
Slums in Fener (1995) and a Gated Community in Beykoz (2005)



The Megacity Istanbul

Globalizing Metropolis

+10 million population – 12.5% of Turkey

Cultural and educational center

Economic heart of Turkey

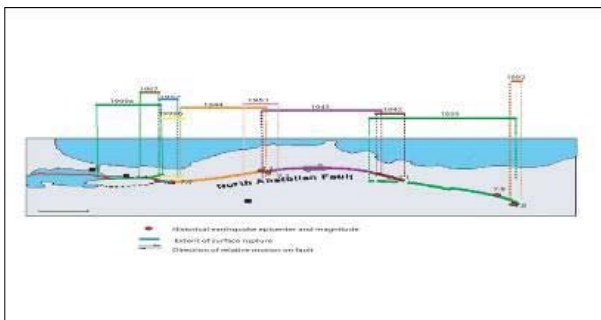
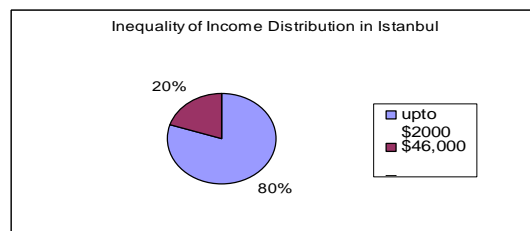
42% of national tax revenues

75% of real estate and financial institutions

High internal migration: 500.000/year

High annual growth rate: 3.5%

High concentration of informal settlements: 60%



Historic Progression of Earthquakes on North Anatolian Fault (Courtesy of USGS)

August 1999 Marmara Earthquake

Fatalities: 18,000 people

Injuries: 50,000 people

Direct and Indirect Economic Loss:

\$5 to \$12 billion

(world's highest relief cost 1992-2003)

Share of affected cities in GDP: 34.7%

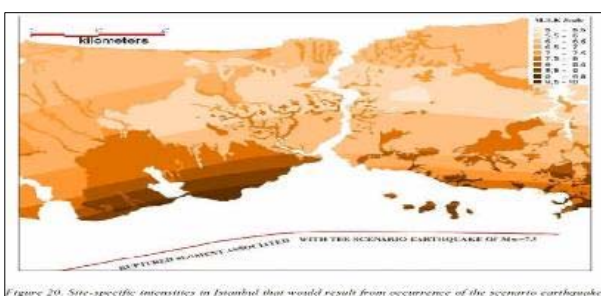


Figure 20. Site-specific intensities in Istanbul that would result from occurrence of the scenario earthquake.

Intensity distribution after a Mw=7.5 Earthquake (Map by Mustafa Erdik et al. 2001)

Earthquake Hazard Assessment

M. 7 + earthquake probability

32 +/- 12 % in 10 years

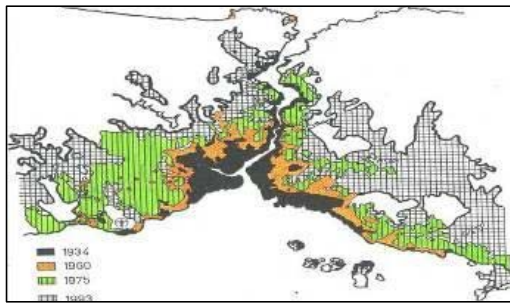
62 +/- 15 % in 30 years (Parsons et al.2000)

M. 7.5 scenario earthquake predictions

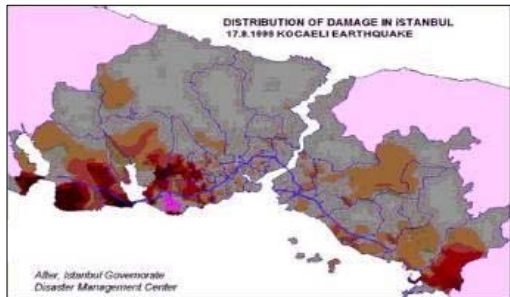
Casualties: 30,000 to 40,000 people

Shelter needs: +600,000 households

Building damage loss: \$12 billion



Istanbul Urban Development 1934 – 1993



Distribution of Damage after August 17, 1999 Earthquake in Istanbul (Map by Istanbul Governorate Disaster Management Center)

Developing Vulnerability

- 1936 -1950:** Henri Prost's Plans
(Focus: Roads, Boulevards, Public Squares)
- 1940s:** First squatter (gecekondu) building activity
- 1949:** 3200 Squatters in Zeytinburnu
- 1950s:** Menderes Planning Activity
(Focus: Roads, Boulevards, Public Squares)
- 1965:** 24% population living in periphery
- 1972- 80:** Istanbul urban development project.
Promote development between lakes ignoring geological studies.
- 1976:** Start of squatter amnesty laws
- 1996:** 1980 master plan revised. Planning activity included geological studies.



Selected districts in project (Adapted from NEHRP Soil Classification Map for Istanbul 1997)

	Istanbul (Total)	Kadikoy	Zeytinburnu	Avcilar
Population (2000)	10,000,000	~ 665,000	~ 245,000	~235,000
Annual Growth Rate	% 33	% 2	% 40	% 61
Population Density (p/km²)	1928	16,625	20,639	6025
Rank of District GDP (1996)		3rd	6th	14th
Unemployment Rate	% 12.7	% 6	% 6.8	% 7.4
Higher Education rate	%11	% 23	% 4	% 7
% of insurance purchase	%38	%64	%31	%49
Rate of Projected Heavy Damage to Number of Buildings (JICA 2002)	% 7.7	%4.16	% 13.22	% 14.08



Photos from districts in study, Zeytinburnu, Kadikoy, Avcilar (2004)

Urban Poverty (economic and non-economic)

+

Uncontrolled & Unsustainable Urbanization and Development
(control, code, corruption, construction...)

+

Substandard Urban Administration (complex, chaos,
mismanagement, technical and financial resources...)

=

Vulnerability in the Urban Realm