Asia-Pacific
Economic Cooperation

2008/TFEP/WKSP2/014

2007 Planning for Post Disaster Rehabilitation and Reconstruction

Submitted by: China

Study Course on Disaster Emergency Response and Recovery
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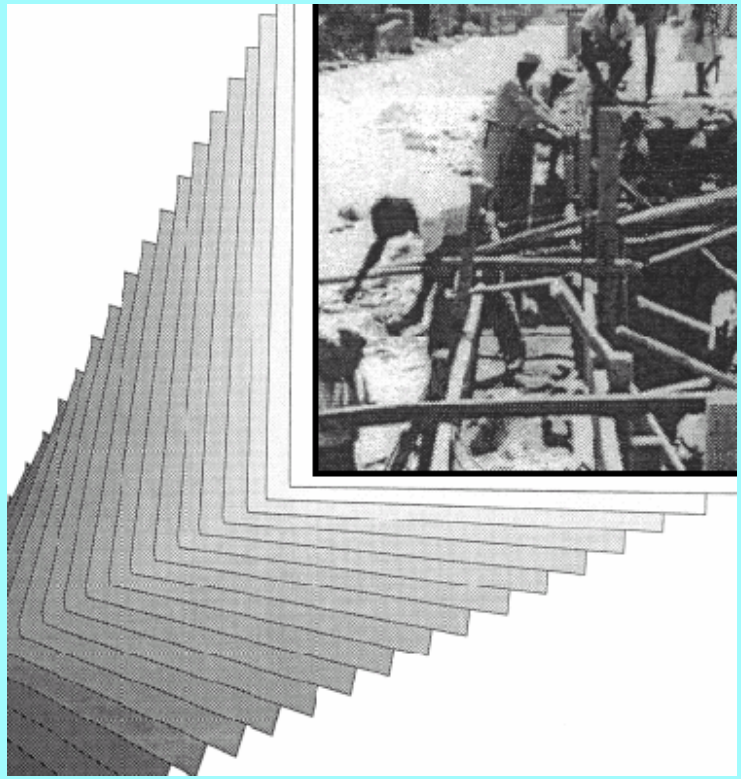

Planning for Post Disaster Rehabilitation and Reconstruction

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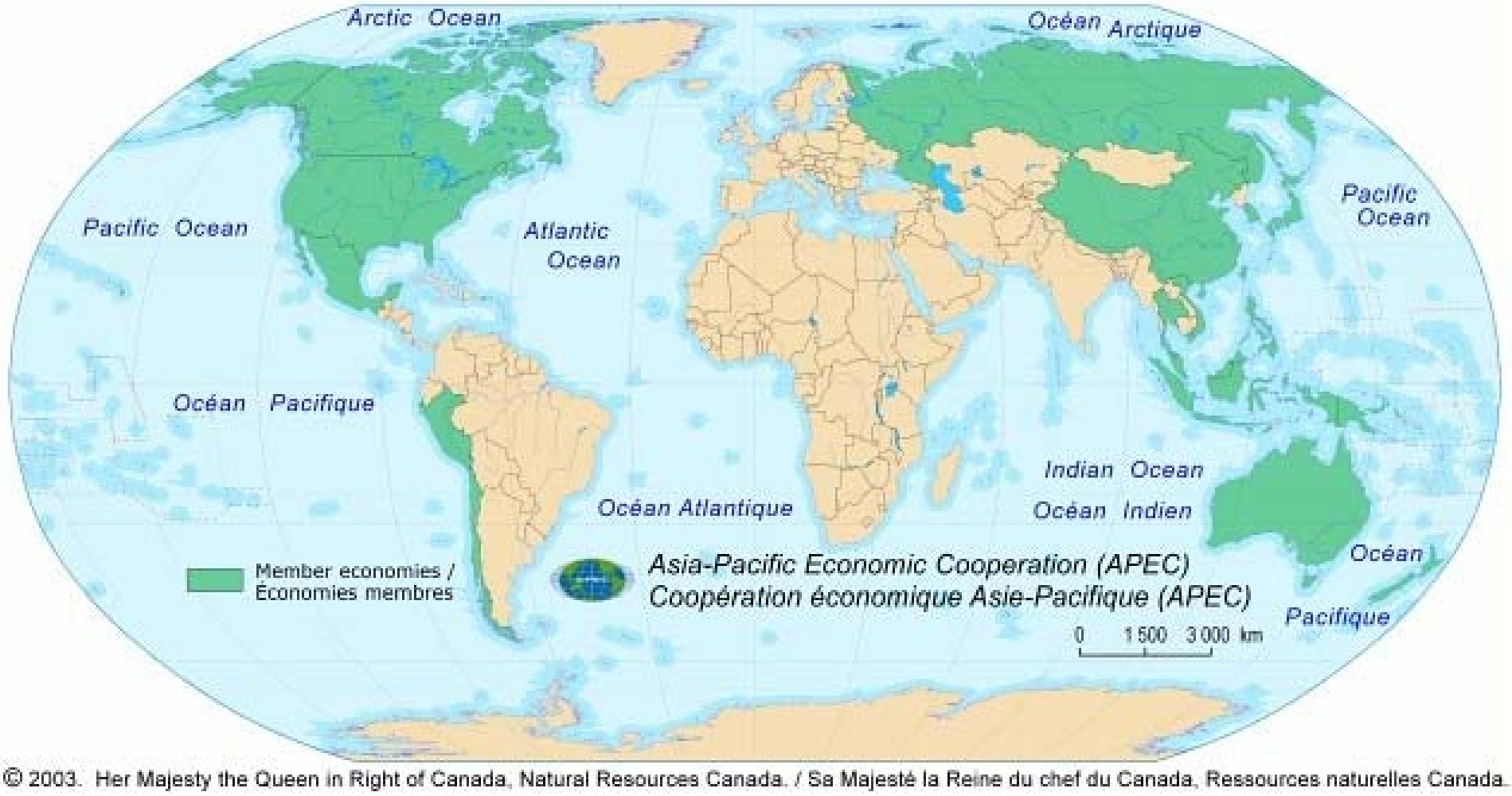
Outline

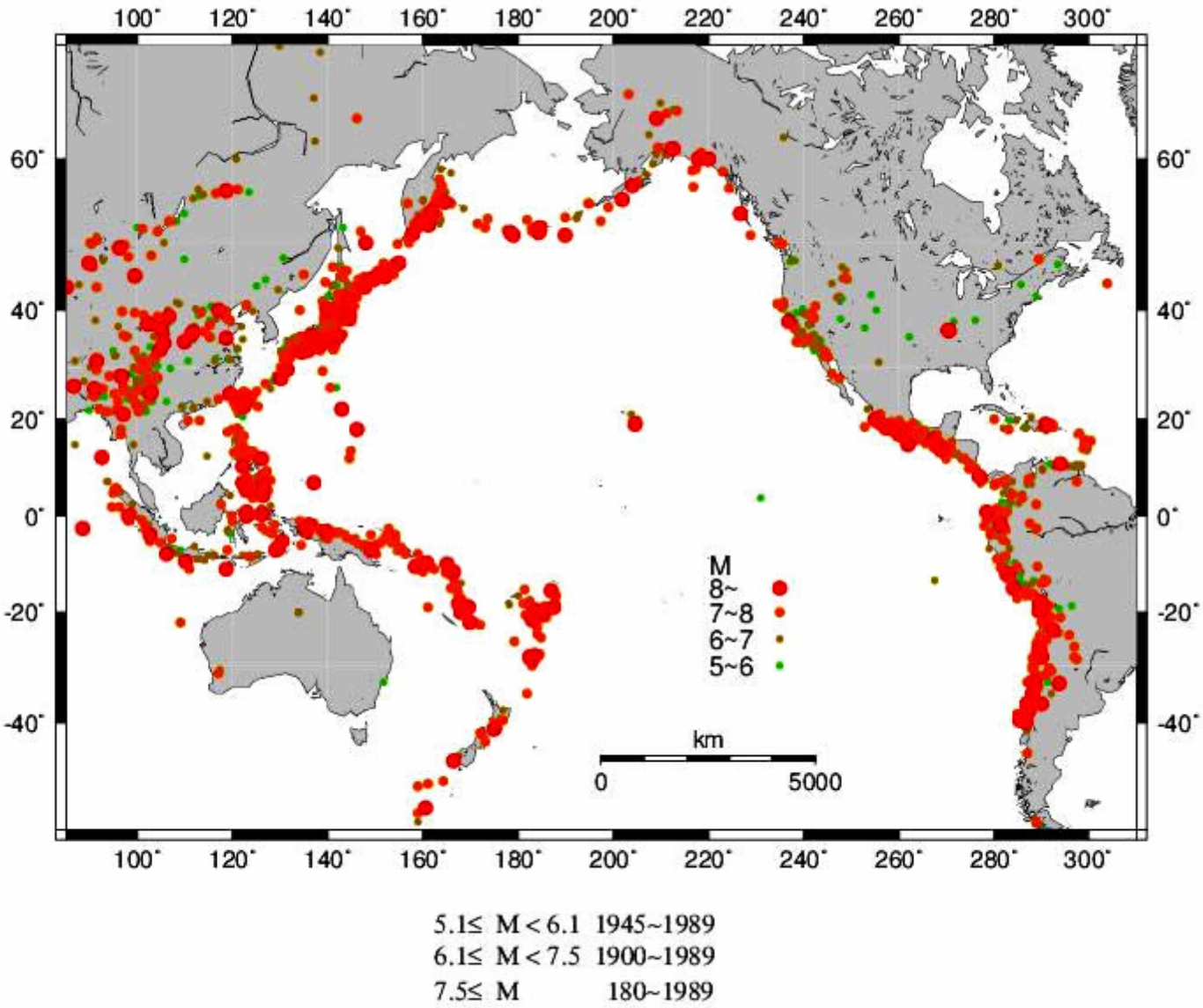
- Seismicity and Earthquake Disasters in the APEC Regions
- Disaster reduction and Post Disaster Reconstruction Model
- Post Disaster Planning and Strategies



Asia-Pacific Economic Coorperation (APEC) has 21 members:

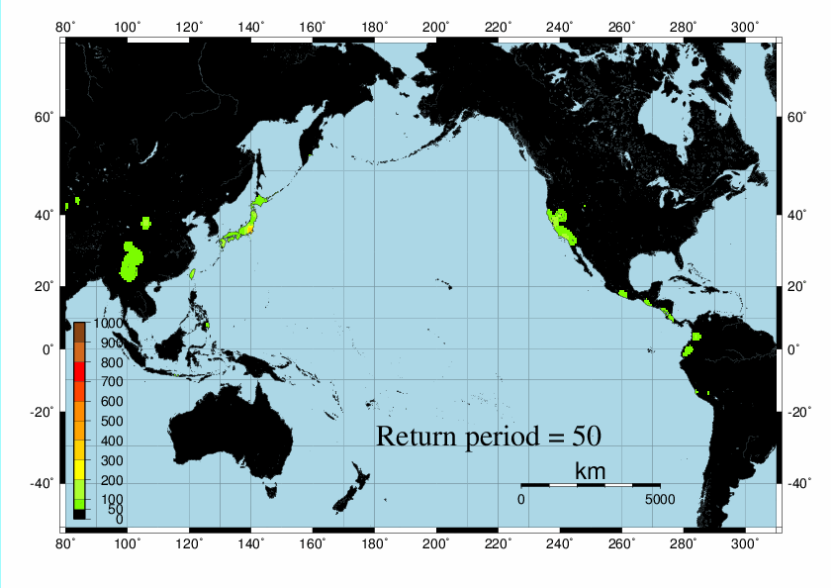
Australia, Brunei Darussalam, Canada, Chile, People's Republic of China, Hong Kong China, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States, Viet Nam.

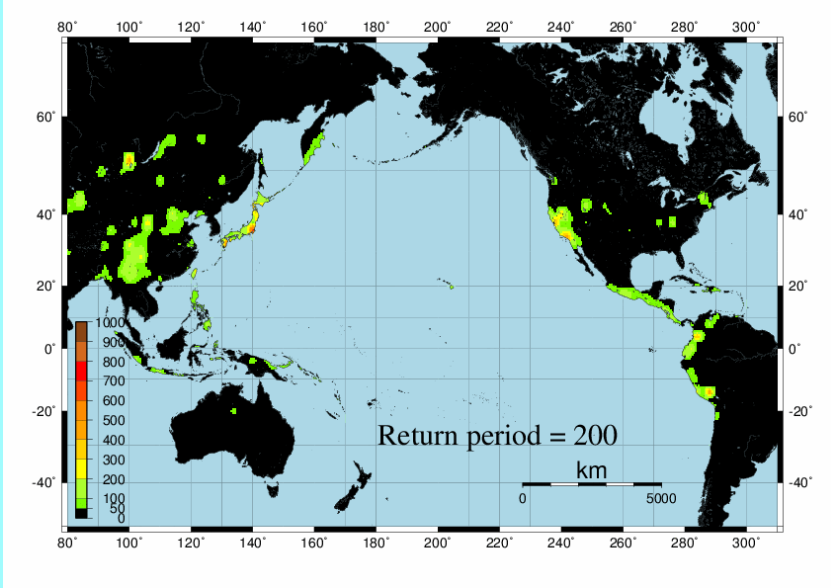
Representatives from 7 of 21 APEC members are invited to attend this course

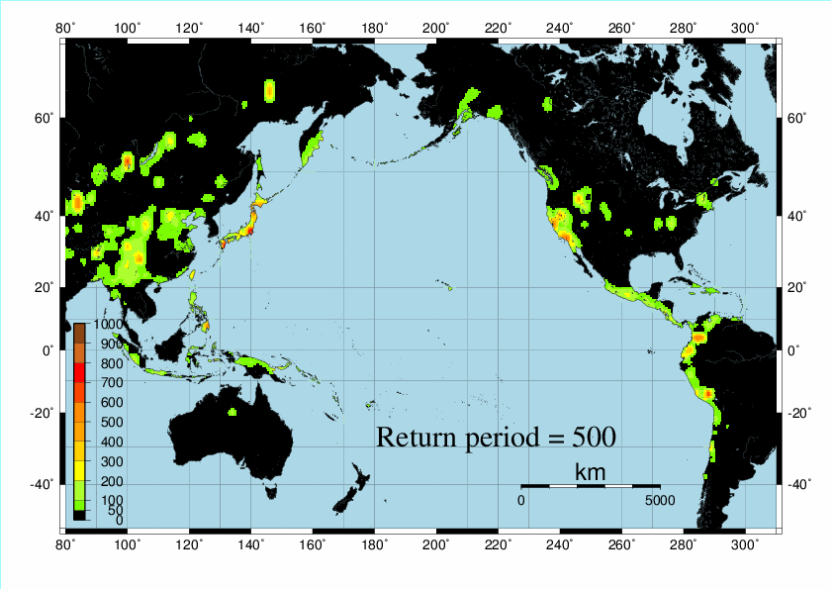


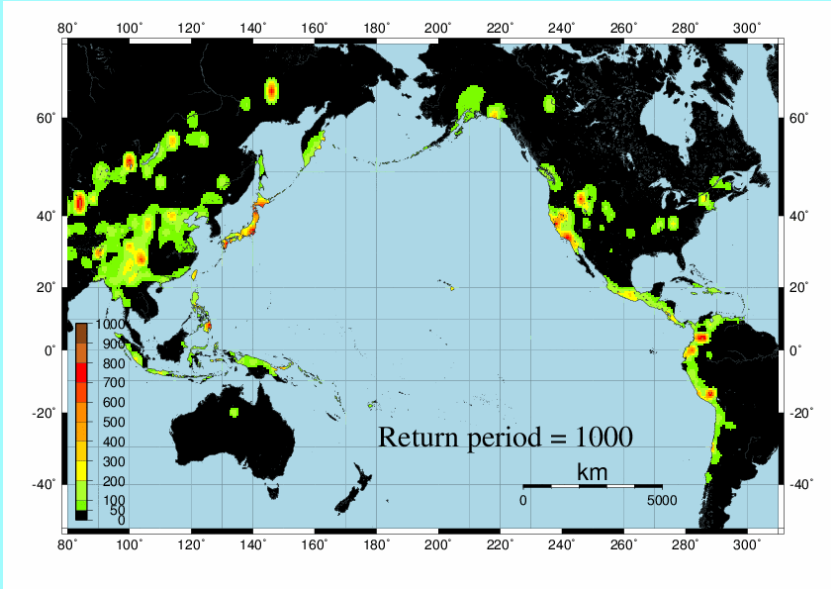
Historical earthquakes in Asia-Pacific Regions

(BC312～ , Output from EqTAP Project, T. Utsu: Table of World Historical Earthquake, 1990.

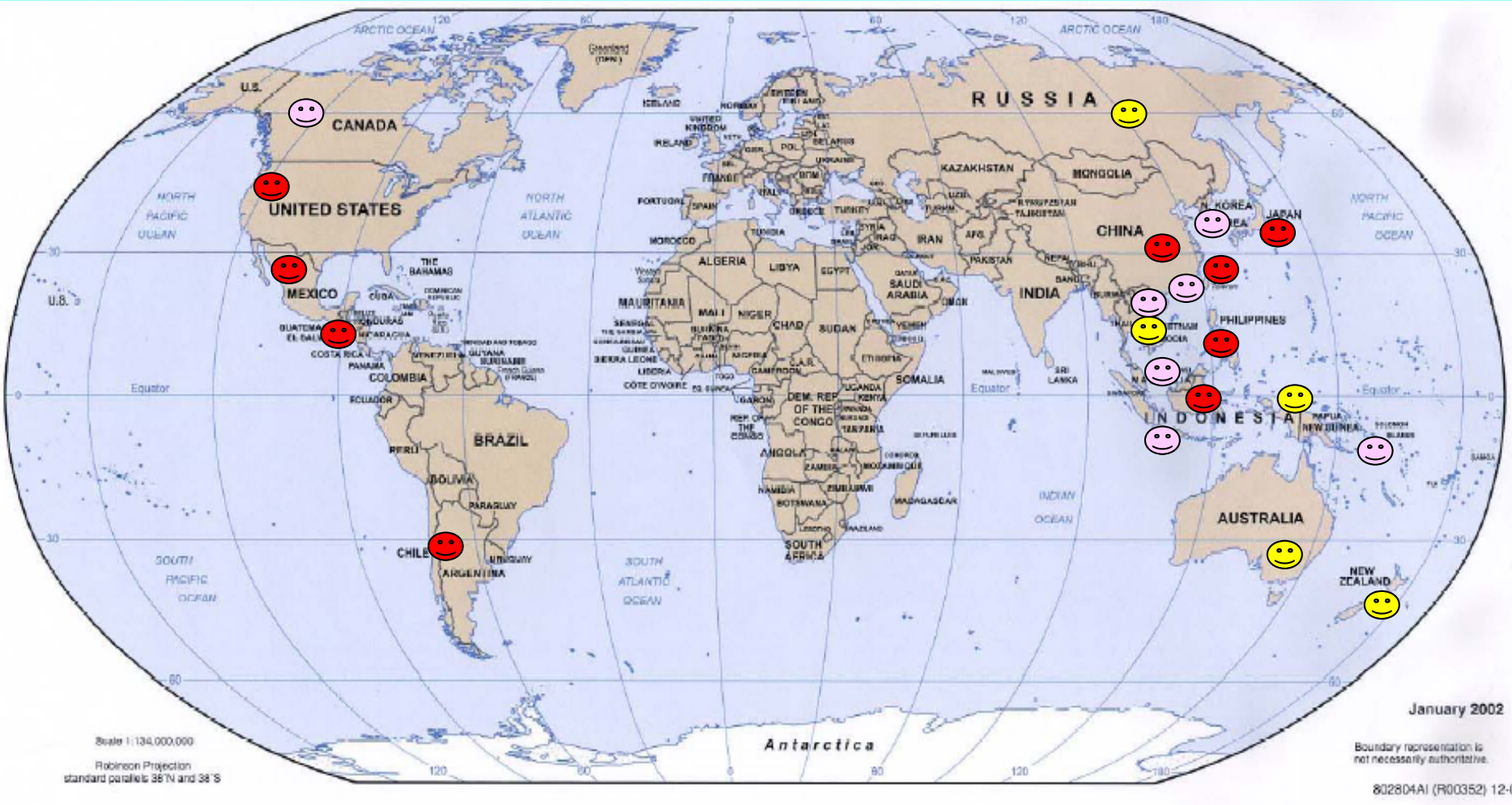








Expected values of peak accelerations in Asia-Pacific Regions
(Output from EqTAP Project）



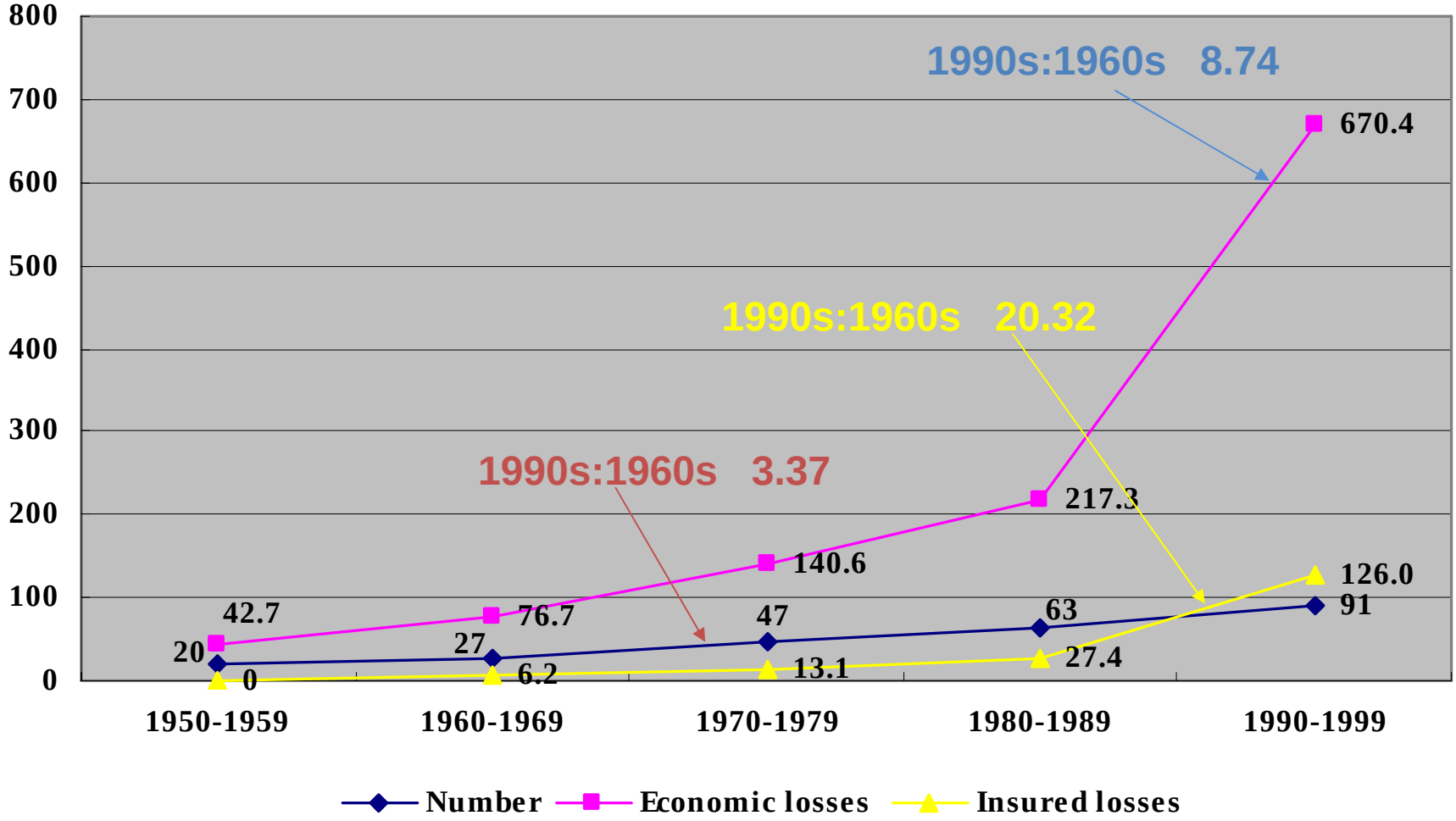
Seismicity	High	Medium	Low
	9	5	7

The seismicity of member economies in the APEC regions

	Seismicity		
	High(9)	Medium(5)	Low(7)
Highly Developed	Japan United States	New Zealand Australia Russia	Republic of Korea Singapore Canada
Developed	Chinese Taipei Chile Mexico	Thailand	Malaysia Hong Kong,China
Developing	P.R.China Indonesia Philippines Peru	Papua New Guinea	Viet Nam Brunei Darussalam

Seismicity in the APEC regions

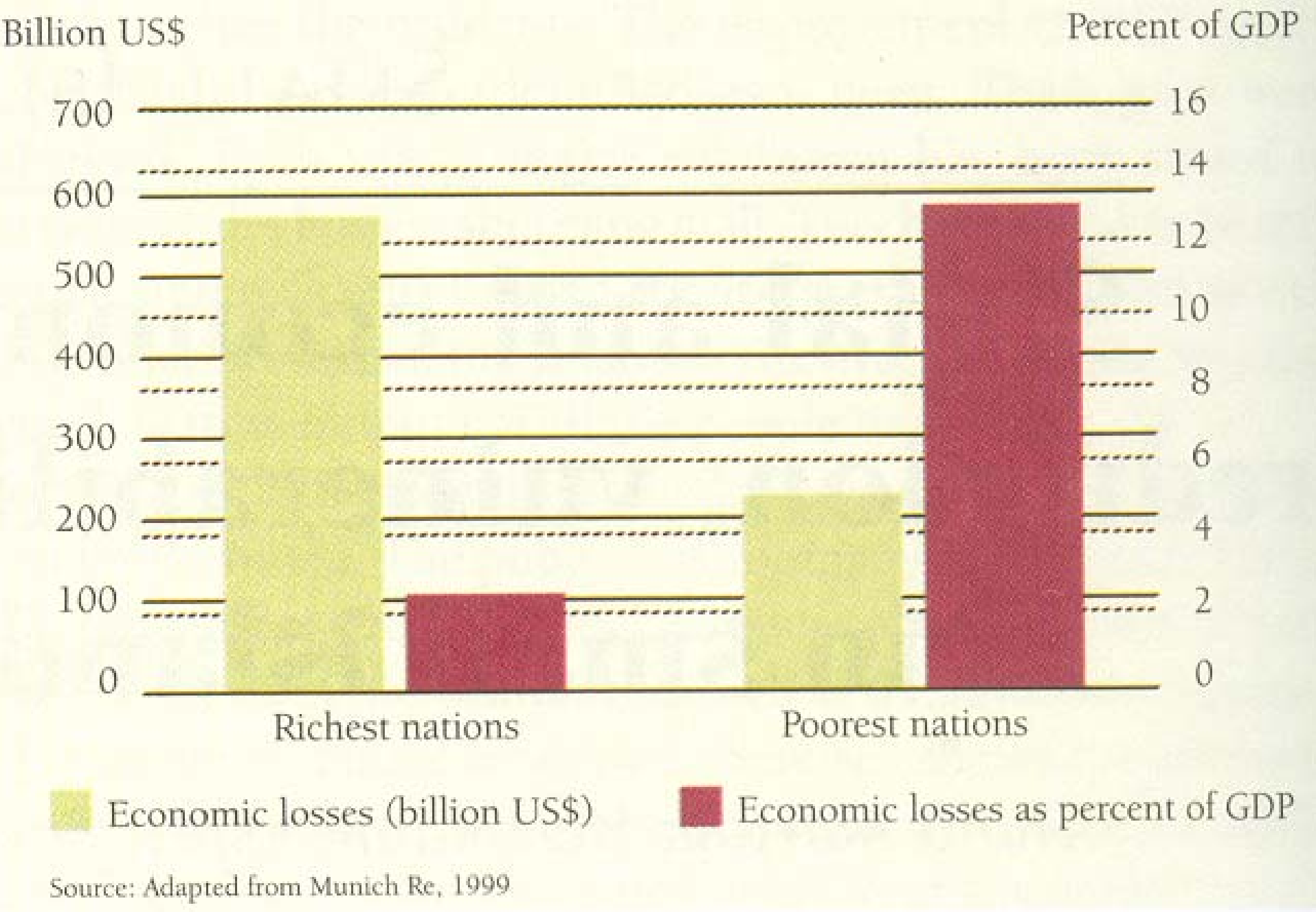
Losses in bn. US$-2003 values and number



Decade comparison of great natural disaster 1950-1999

Source: UN, Know Risk, 2005

Thousands of people are killed, hundreds of thousands are made homeless or a country suffers substantial economic losses



Disaster losses total and as a share of GDP, in the richest and poorest nations, 1985-1999

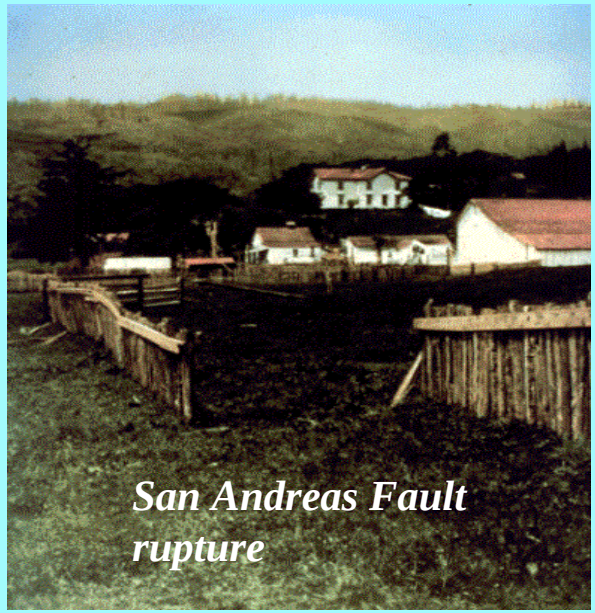
Earthquake disasters in the APEC regions

No	Economies	# of events	Period	Killed	Injured	Homeless	Affected	Damage US (000's)
1	Australia	5	1939-2005	23	256	420	7, 080, 000	10, 913, 000
2	Brunei Darussalam	1	1978-2005	3	0	120	120	0
3	Canada	0	1903-2005	0	0	0	0	0
4	Chile	24	1906-2005	40, 341	66, 056	518, 875	5, 990, 545	4, 407, 070
5	P.R.of China	99	1906-2005	748, 712	220, 041	3, 723, 907	20, 094, 450	7, 775, 200
6	Hong Kong, China	0		0	0	0	0	0
7	Indonesia	80	1907-2005	23, 543	21, 815	280, 405	1, 965, 426	626, 219
8	Japan	43	1900-2005	166, 308	148, 585	253, 452	3, 478, 181	127, 583, 100
9	Republic of Korea	0	1936-2005	0	0	0	0	0
10	Malaisia	0	1965-2004	0	0	0	0	0
11	Mexico	27	1929-2005	10, 677	32, 287	112, 275	2, 556, 577	76, 500
12	New Zealand	5	1918-2005	277	39	0	18, 339	237, 669
13	Papua New Guinea	12	1930-2005	86	271	16, 400	36, 071	10, 875
14	Peru	35	1913-2004	70, 104	154, 336	300, 701	5, 573, 737	605, 100
15	Philippines	21	1905-2005	9, 580	13, 051	3, 985	2, 222, 877	843, 091
16	Russia	7	1992-2005	2, 004	1, 025	28, 240	35, 403	76, 520
17	Singapore	0	1999-2003	0	0	0	0	0
18	Chinese Taipei	9	1906-2005	15, 799	11, 649	123, 000	171, 949	25, 800
19	Thailand	1	1955-2005	0	0	0	0	0
20	United States	34	1900-2005	2, 827	13, 069	20, 239	65, 803	25, 070, 270
21	Viet Nam	0	1953-2005	0	0	0	0	0
Total		403		1, 090, 284	682, 480	5, 382, 019	49, 289, 478	178, 250, 414

Source: EM-DAT: The OFDA/CRED International
www.em-dat.net - Universite catholique de louvair

San Francisco
April 18, 1906

- 700-2500 killed, thousands injured
- First major urban earthquake
- The Great Fire
- First seismographic recording of major event
- Correlation between earthquakes & faults
- Effects on buildings



San Andreas Fault rupture

Concepcion, Chile

May 22, 1960, Ms8.5

- **5700 death, 3 billion damage**
- **The largest earthquake ever recorded**
- **City of Valdivia suffered catastrophic damage**
- **Severe shaking lasted for over 15 minutes**
- **Coastal area subsided**
- **A 10m tsunami was generated**
- **The earth ruptured for 450 miles along the Chile coast**
- **The area of rupture was the size of California**

Hilo, Hawaii: May 23, 1960

Maximum inundation in Hilo (along the Wauioa River) exceeded half a mile.

Maximum wave height at Hilo was 11m(36 feet), 61 people died, US$23 million damage.

May 23, 1960 tsunami. Damage behind the Hilo Theater.

Japan: May 24, 1960

22 hours after the earthquake and 7 hours after the Hilo, Hawaii tragedy

The tsunami killed 200 people in Japan

Anchorage

March 27, 1964, M8.6

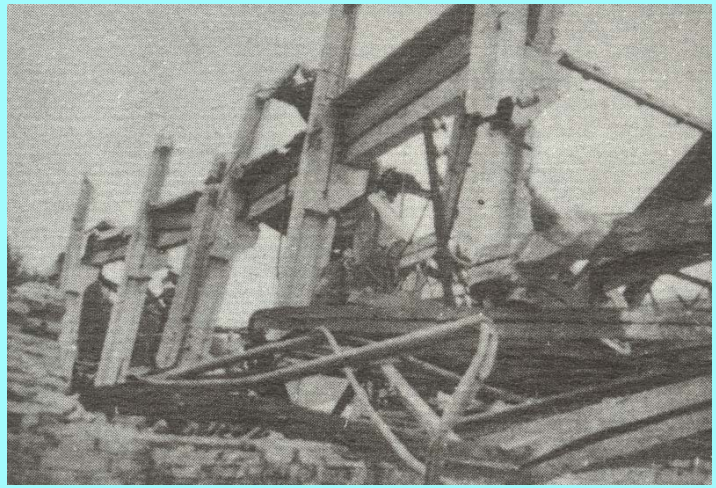
- **800 km-long rupture**
- **Largest earthquake in history of US**
- **Landslide, tsunami, uplift/subsidence**
- **120 deaths due to tsunami**
- **Initiation of US earthquake hazard program**

Coastal uplift/subsidence

Tangshan

July 28, 1976, M7.8

- **242,769 deaths, 164,851 injured,**
- **32.2 million building rooms collapsed**
- **$5 billion damage**
- **Most costly natural disaster in China's history**
- **Effects of 'blind' faults**
- **Impacts of major urban earthquake**



Lunan District, Tanhshan

The Epicenter was reduced to ruins

Soldiers digging for survivals

Slab overlapping of the five story building

Mexico City

Sept 18, 1985 M7.8

- **9,500 deaths, 30,000 injured, 50,000 homeless**
- **$4 billion damage**
- **Severe impacts in center of city (amplification)**
- **Impacts of major urban earthquake**
- **Severe effects on Mexican economy**

Loma Prieta

Oct 17, 1989, M7.1

- **63 killed, 3,757 injured,**
- **2600 buildings, 18,000 homes damaged**
- **12,000 displaced**
- **$16.8 billion damage**
- **Most costly natural disaster in US history**

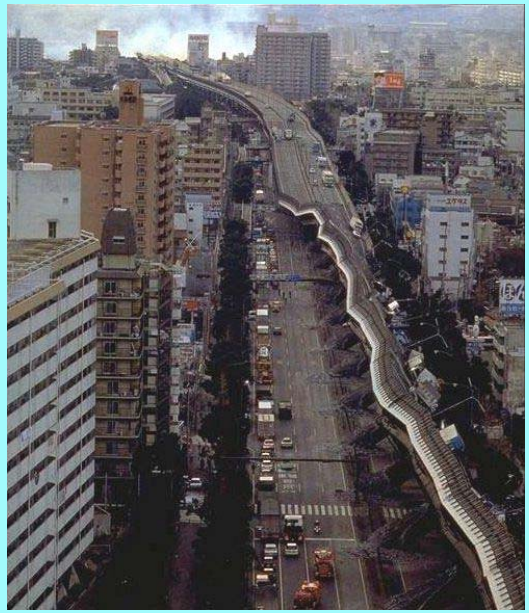
Northridge
Jan 17, 1994, M6.8

- **61 deaths, 1,500 injured,**
- **24,000 buildings damaged**
- **$44 billion damage**
- **Most costly natural disaster in US history**
- **Effects of ‘blind’ faults**
- **Impacts of major urban earthquake**

Kobe

Jan 17,1995 M7.3

- **6,348 deaths, 43,177 injuries**
- **$112 billion damage**
- **Most expensive natural disaster in history!**
- **Major earthquake located in urban center**
- **Effects on transportation system**
- **Amplification in filled la**



Ji-Ji, Taiwan, China

Sept 21, 1999, M7.5

- **2,321 deaths, 8,737 injured,**
- **$9.3 billion damage, 3.3% of GDP**
- **Most costly natural disaster in China's history**
- **Ground surface deformed**

Izmit, Kocaeli, Turkey

Aug 17, 1999, M7.4

- **15,851 deaths, 43,953 injured**
- **$16 billion damage, 7.0% of GDP**
- **Most costly earthquake disaster in Turkey's history**

2004 Sumatra Earthquake and Tsunami, Dec.26, M8.9

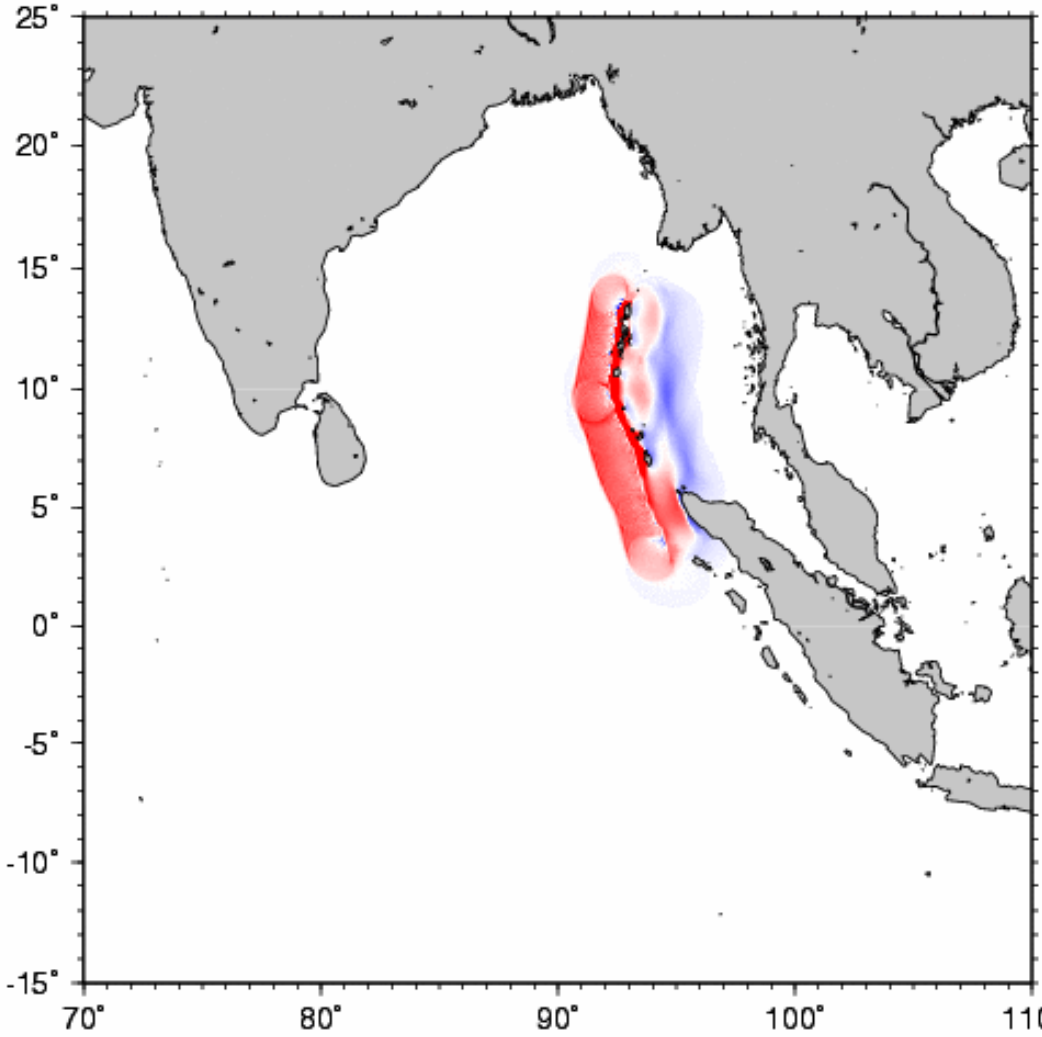
- 265,000 killed and missed
- 500,000 injured
- 350,000 houses & facilities damaged
- 514,150 displaced
- $10 billion damage
- One of the deadliest disasters in modern history

Earthquake was detected to give 3 hours of tsunami notice. Such warning system is available across the Pacific Ocean but not in the Indian Ocean.

Coastal dwellers are educated in the Pacific littoral to get to high ground quickly following tremors and waves but not in the Indian Ocean.

Tsunamis are rarer in the Indian Ocean as the seismicity is less than in the Pacific. Tsunamis are not entirely unknown in the Indian Ocean.

Tsunami in 1883 generated by the Volcanoes at Krakatoa led to a surge of at least 1 m in Sri Lanka.



Summary of the Human Impact of the Earthquake and Tsunami of December 26, 2004

	Casualties[a]				
	Dead	Missing	Displaced	Affected	Health Problems (Number of Cases)
Sri Lanka	30,718	3,858	876,883	15,686	Diarrhea
Indonesia	113,306	7,191	Na	Na	
Maldives	82	26	13,311	100,000	Acute diarrhea (225), viral fever (124), injuries (552), anxiety/shock (152)
Thailand	5,265	4,499	na	na	Acute diarrhea (167), wound infections (163), food poisoning (33), pneumonia (20), malaria (8), dengue (7)
India	15,693	5,900	na	na	
Malaysia	74	6	8,000	299	
Myanmar	90	na	na	45	
Bangladesh	2	na	na	na	
TOTAL	165,230				

[a] As of 9 January 2005; sourced from the UN Office for the Coordination of Humanitarian Affairs, CNN, and Reuters News.

http://www.adb.org/Documents/Others/Tsunami/impact-earthquake-tsunami.pdf

Storm lashes Bangladesh coast

November 19, 2007

DEATH, LOSS

Primary official estimate

Death toll	: 2,299
Death feared	: 10,000
Affected families	: 8.87 lakh
Livestock death	: 2.42 lakh
Crops fully damaged	: 23,000 acres

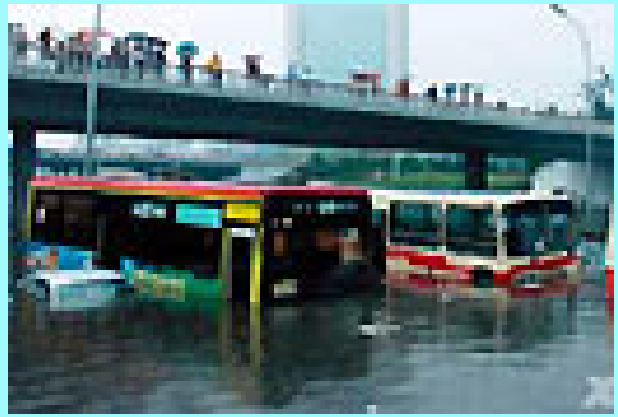
Beijing

Rainstorm, July 10, 2004, Road hydrocele, Traffic paralysis

Drainage system is designed on 5 years of return period (100-300 years for developed countries).

Diameter of drainage pipelines only 1M (3-5 times more in developed countries).

Less daily maintenance, some outfalls were jamed.



Jinan Shangdong

Rainstorm, July 18, 2007

34 died

6 disappeared

142 injured

Depth of Water was more than 1M on the road, hundreds of vehicles were submerged

Ground falling

Chongqing

Rainstorm, July 16, 2007

10 died, 5 missing, 128 injured

10,000 housing rooms were collapsed

2.72 million population effected

Some infrastructures were damaged

Xingtai, Hebei

Rainstorm, July 18, 2007

Depth of Water was more than 1M on the road.

Yantai airport Shangdong

Rainstorm, July 12, 2007

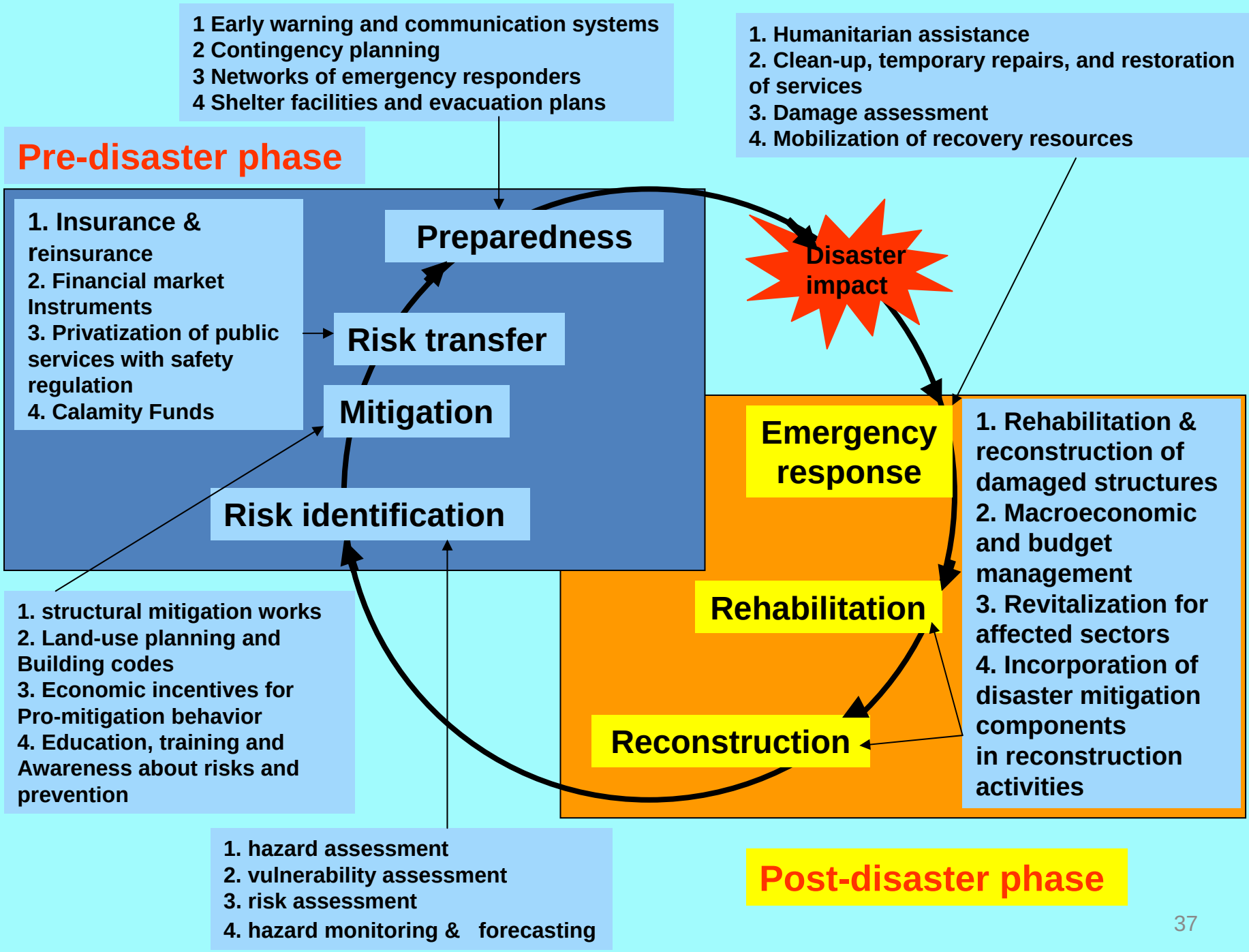
Depth of water was 15-45 cm in parking apron area, 45 scheduled flights were suspended.

Outline

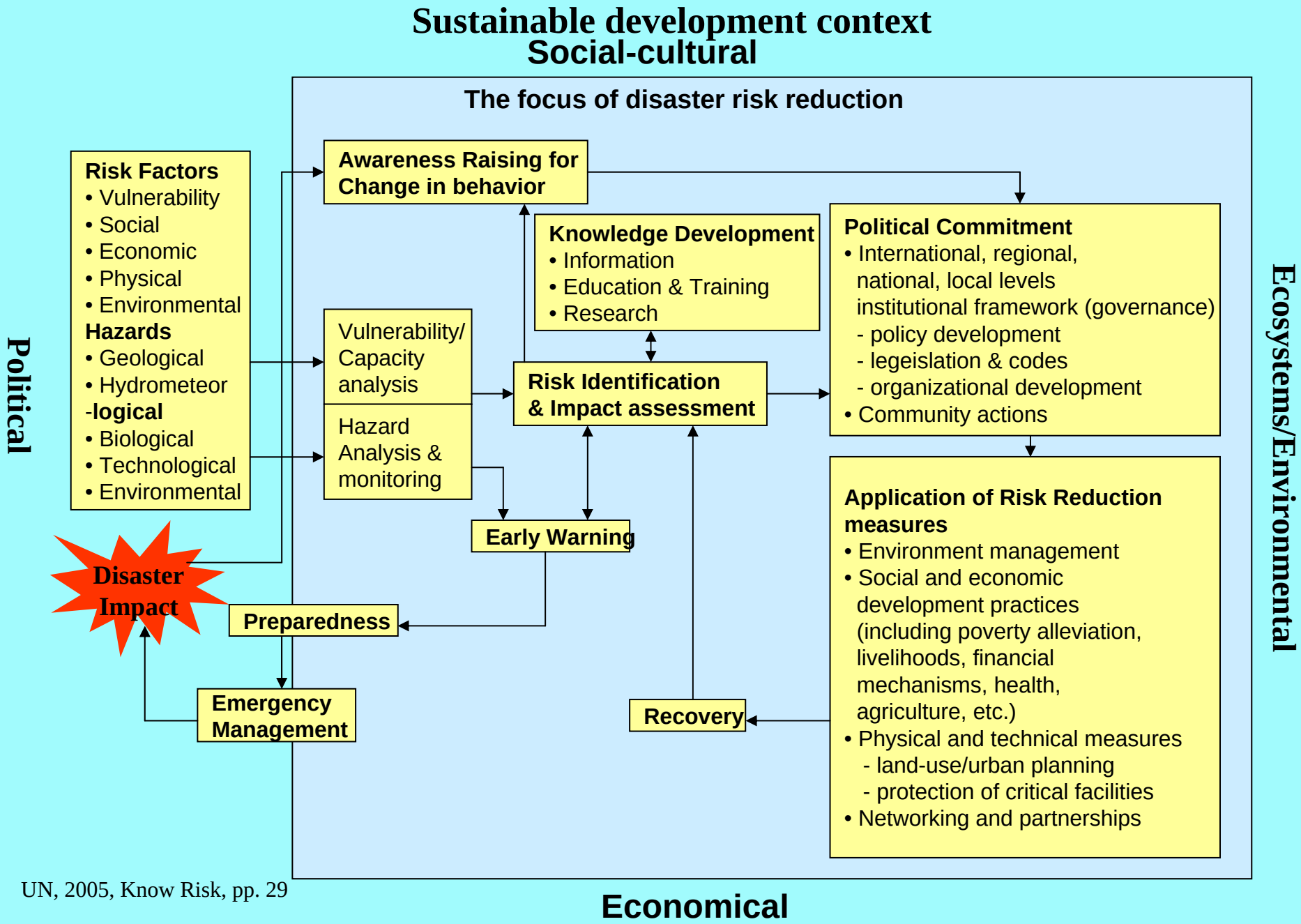
Seismicity and Earthquake Disasters in the APEC Regions

Disaster reduction and post disaster reconstruction model

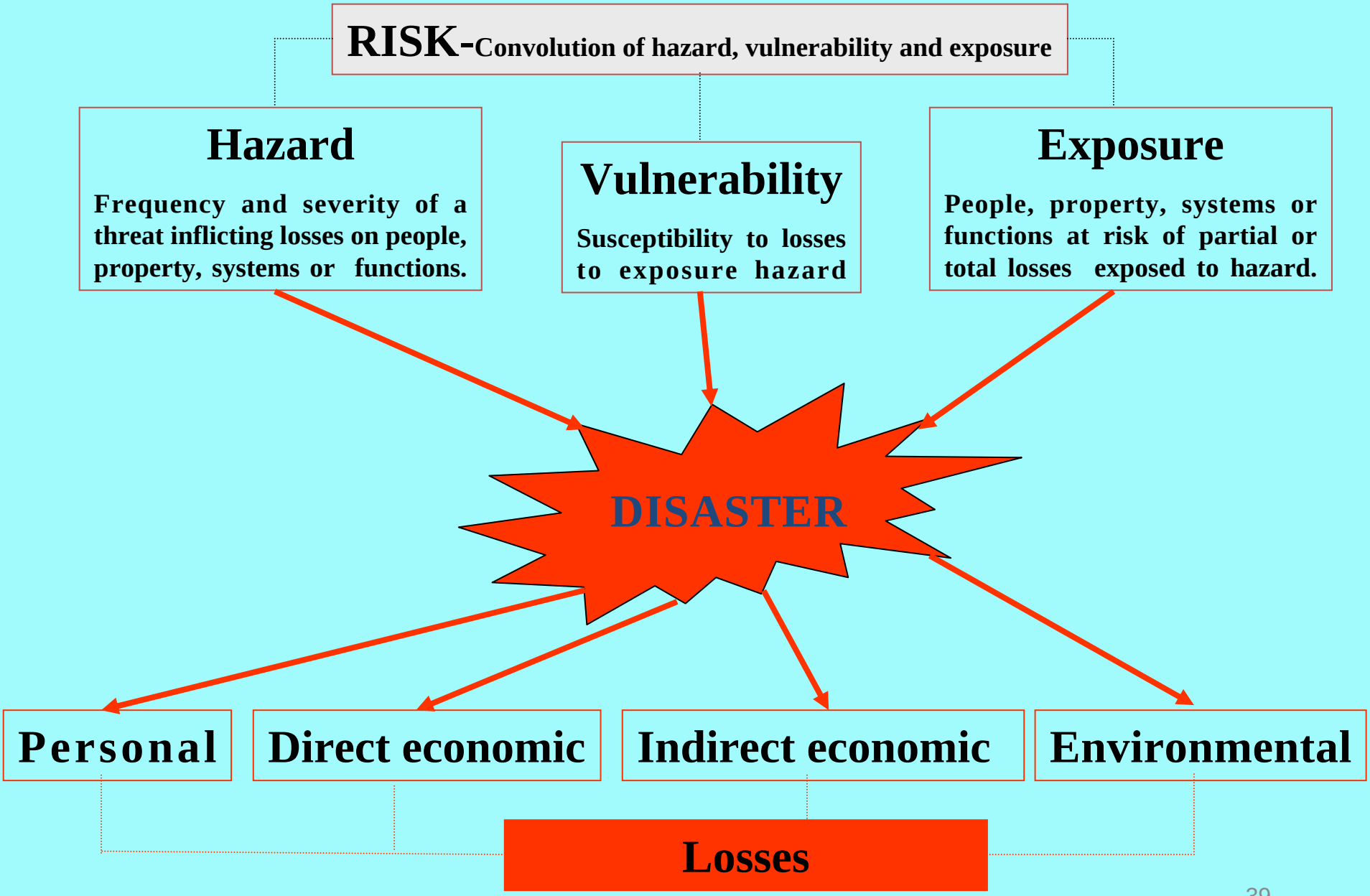
Post disaster planning and strategies


1 Early warning and communication systems
2 Contingency planning
3 Networks of emergency responders
4 Shelter facilities and evacuation plans
1. Humanitarian assistance
2. Clean-up, temporary repairs, and restoration of services
3. Damage assessment
4. Mobilization of recovery resources
Pre-disaster phase
1. Insurance & reinsurance
2. Financial market Instruments
3. Privatization of public services with safety regulation
4. Calamity Funds
Preparedness
Risk transfer
Mitigation
Risk identification
Disaster impact
Emergency response
Rehabilitation
Reconstruction
1. Rehabilitation & reconstruction of damaged structures
2. Macroeconomic and budget management
3. Revitalization for affected sectors
4. Incorporation of disaster mitigation components in reconstruction activities
1. structural mitigation works
2. Land-use planning and Building codes
3. Economic incentives for Pro-mitigation behavior
4. Education, training and Awareness about risks and prevention
1. hazard assessment
2. vulnerability assessment
3. risk assessment
4. hazard monitoring & forecasting
Post-disaster phase

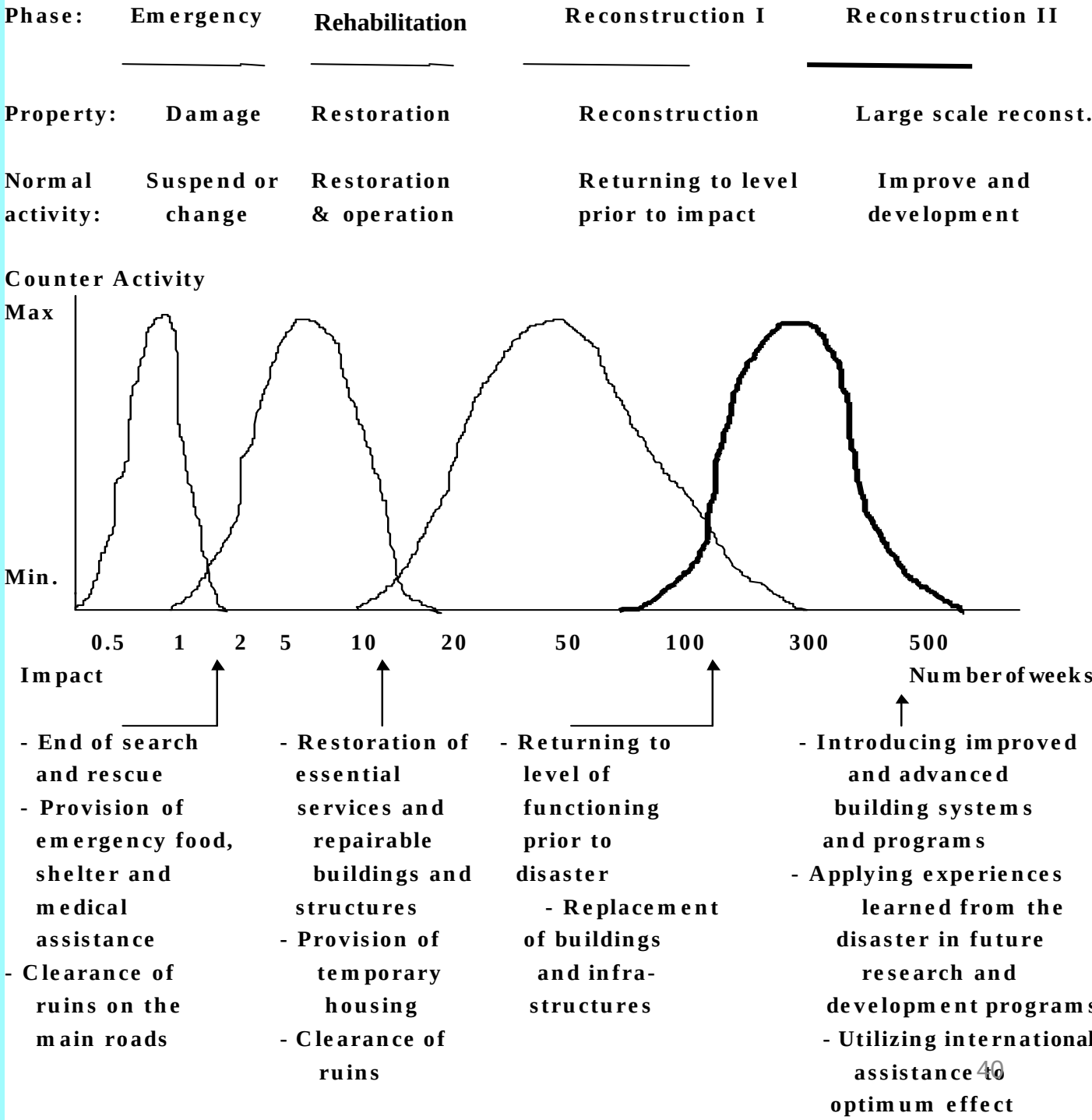
Framework for Disaster Risk Reduction



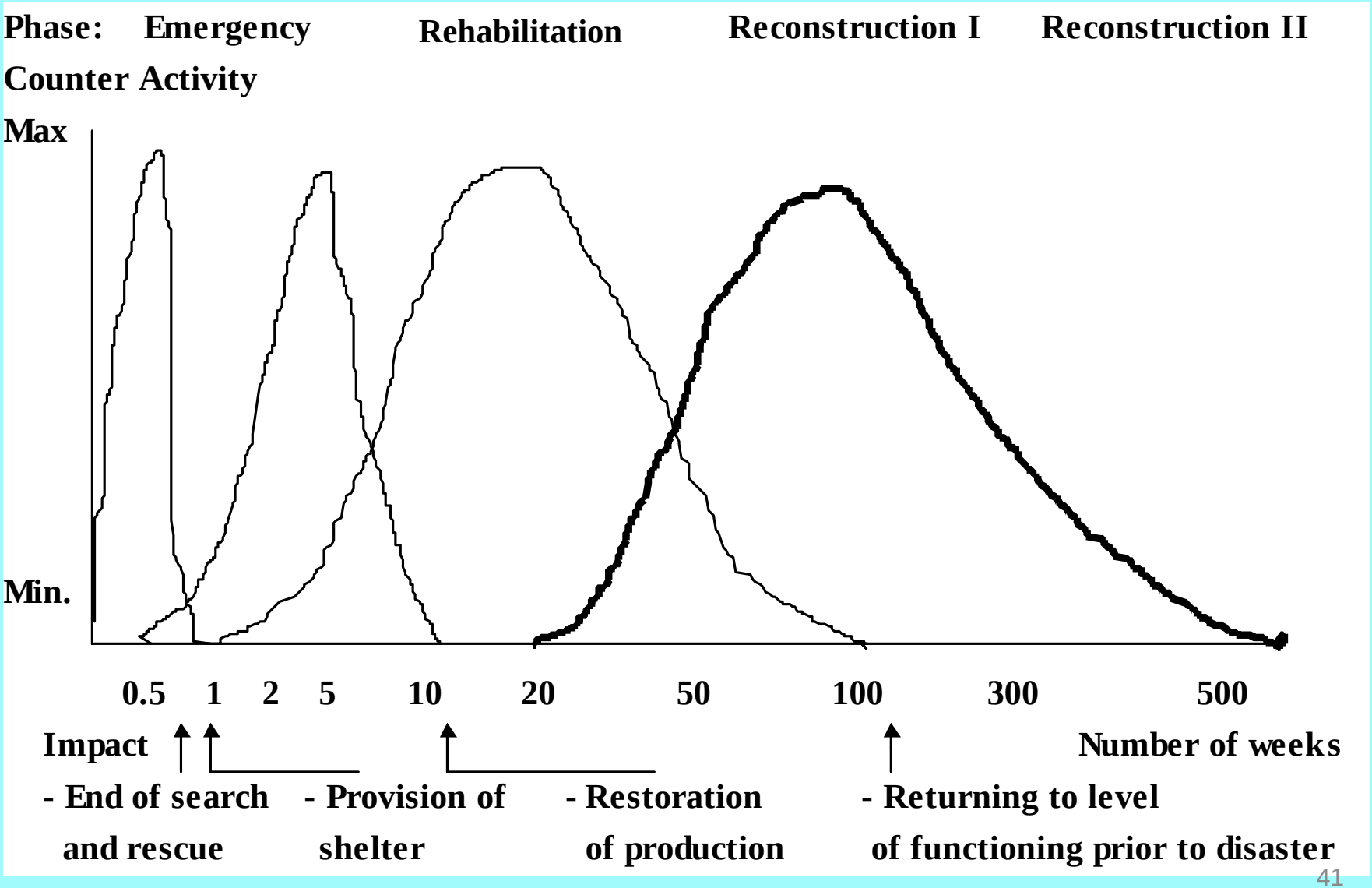
UN, 2005, Know Risk, pp. 29


RISK-Convolution of hazard, vulnerability and exposure
Hazard
Frequency and severity of a threat inflicting losses on people, property, systems or functions.
Vulnerability
Susceptibility to losses to exposure hazard
Exposure
People, property, systems or functions at risk of partial or total losses exposed to hazard.
DISASTER
Personal
Direct economic
Indirect economic
Environmental
Losses

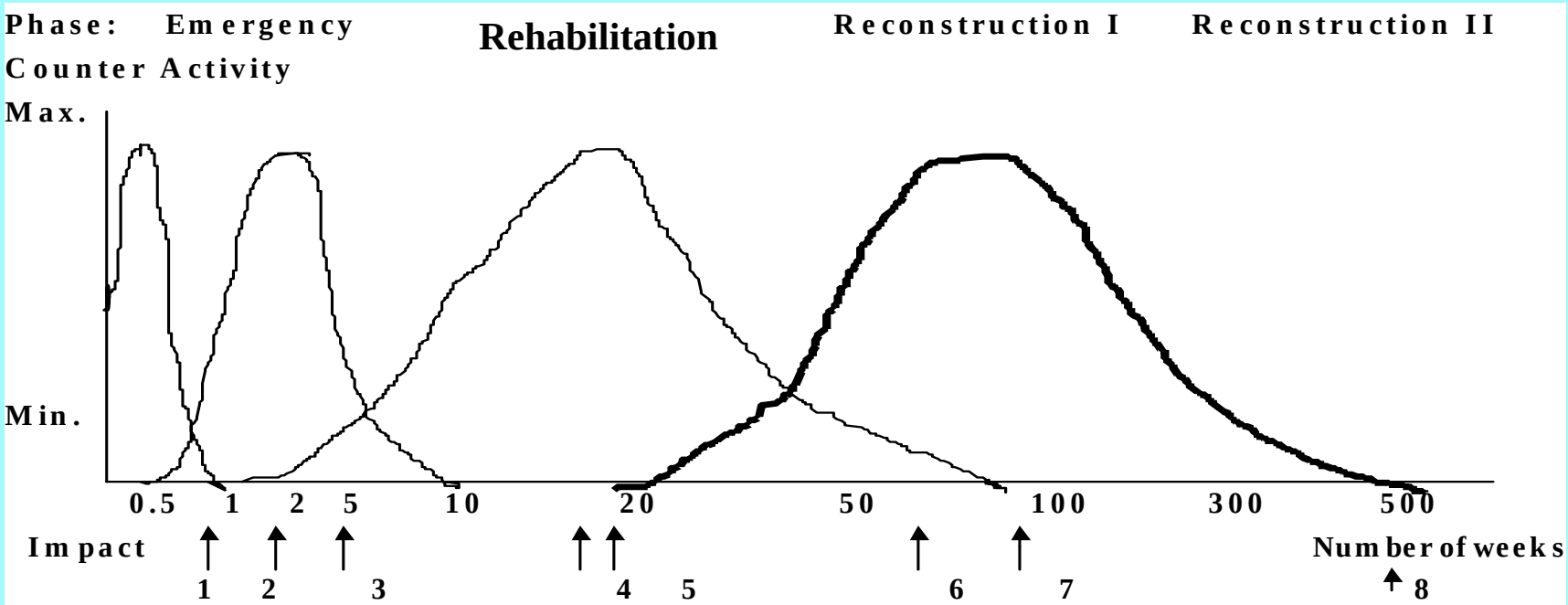
Typical Post-earthquake Reconstruction Activity Model



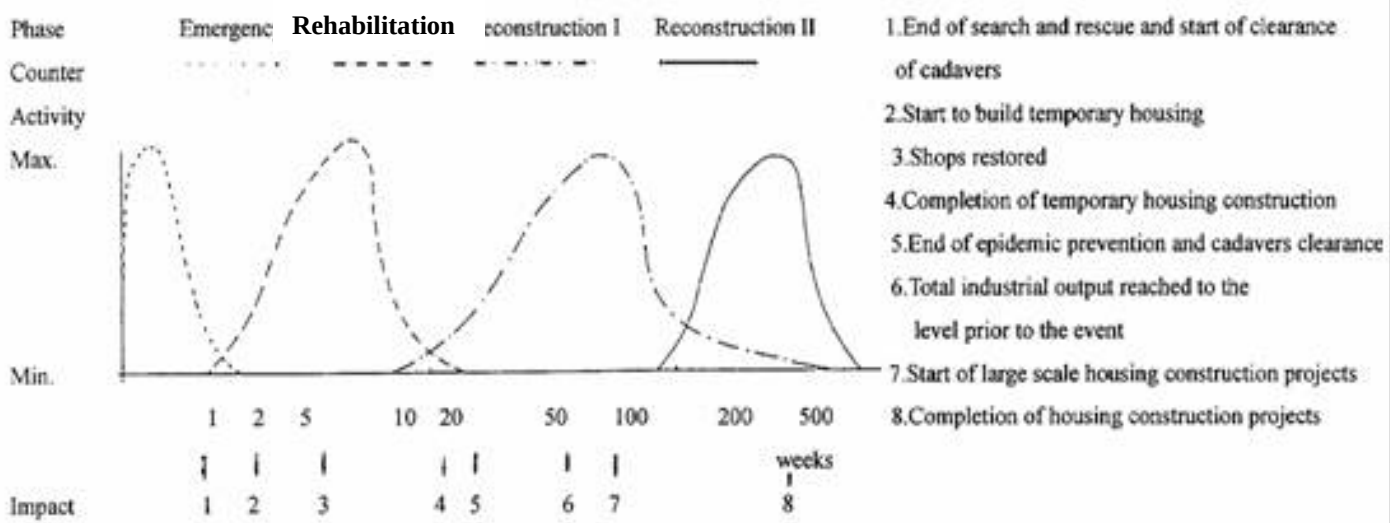
Post-earthquake Reconstruction Activity Model for 1975 Haicheng, China, Earthquake



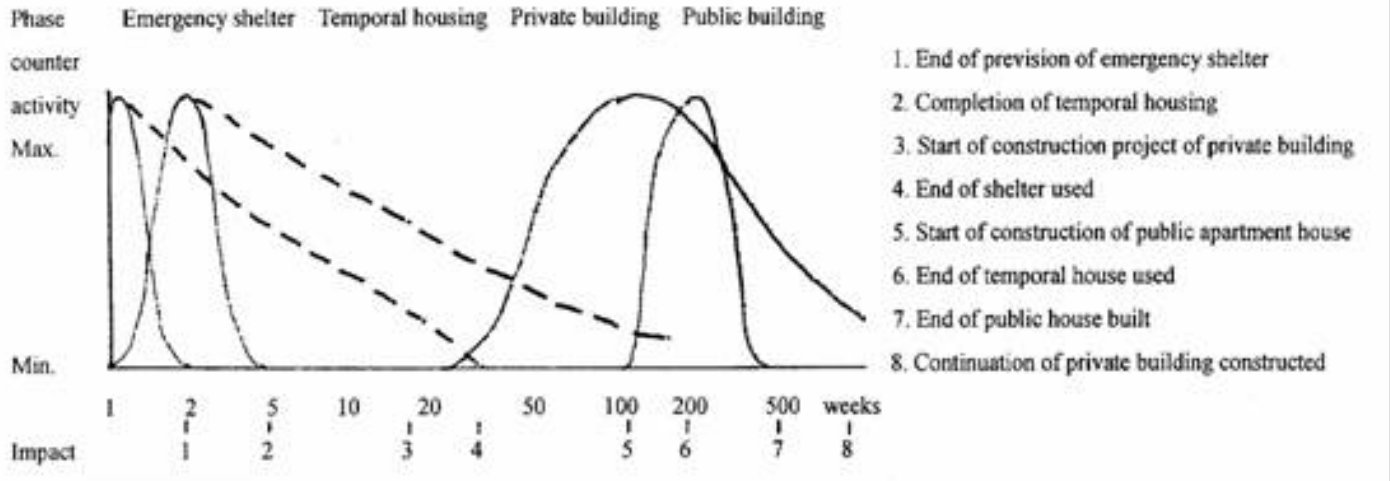
Post-earthquake Reconstruction Activity Model for 1976 Tangshan, China, Earthquake



1 End of search and rescue and start of clearance of dead body
2 Start to build temporary housing
3 Shops restored
4 Completion of temporary housing construction
5 End of epidemic prevention and clearance of dead body
6 Total industrial output reached to the level prior to the event
7 Start of Large scale housing construction projects
8 Completion of housing construction projects



Post-earthquake reconstruction activity model for the 1976 Tangshan earthquake

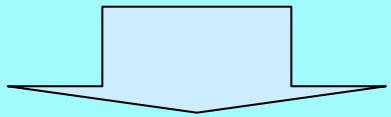


Post-earthquake reconstruction activity model for the 1995 Hyogoken-Nanbu Earthquake

Source: Ye Yaoxian and Teizo Fujiwara, 1998, Post-Earthquake Conflict for Urban Aseismic Planning Comparing the 1976 Tangshan Earthquake and the 1995 Hyogoken-Nanbu Earthquake, Proceedings of the 10th Earthquake Engineering Symposium, Vol.3, P.3581-3586, Yakohama, Japan

Pressures faced immediately after a disaster

- **Economical, social, psychological and political pressures foster rehabilitation and reconstruction as rapidly as possible. The overriding concern is with immediate needs, not with future disasters.**
- **The immediately passed bitter experience and the concern in significant reduction in future risk foster improving safety in rehabilitation and reconstruction. The survivors hope to build and repair buildings and structures much better to withstand damage from future disasters.**

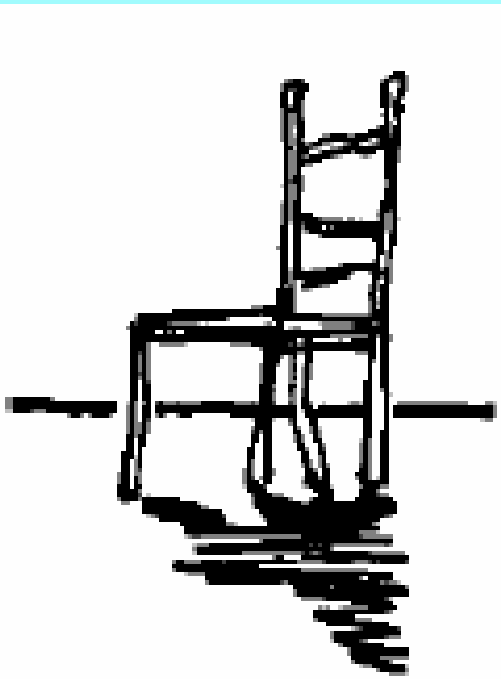


The correct and rational decision making for rehabilitation and reconstruction including land-use planning, housing construction, priority of recovery of economic sectors and resources arrangement, are the key to solve the pressures faced immediately after a disaster.

Rehabilitation

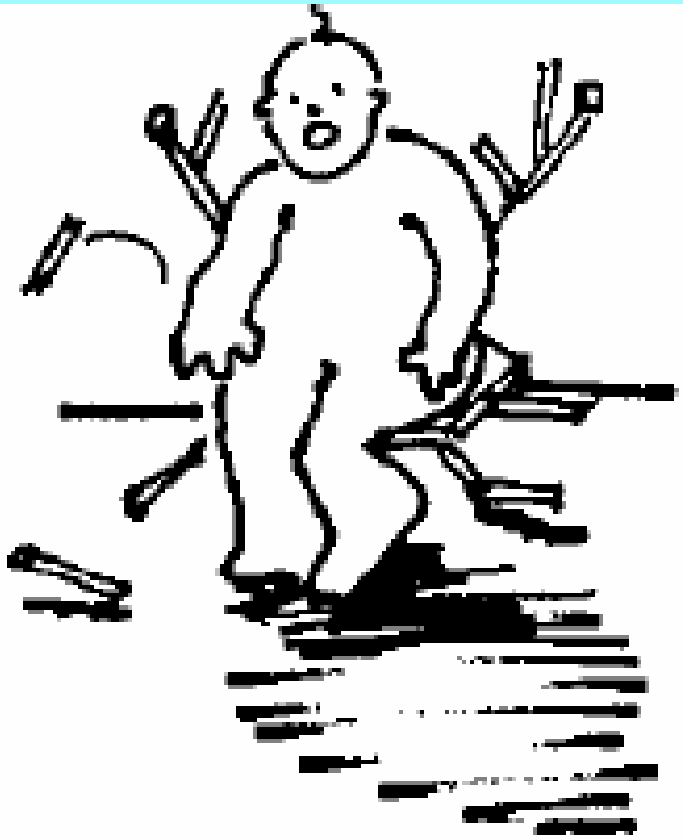
Actions taken in the aftermath of a disaster to enable basic services to resume functioning, assist victims self-help efforts to repair physical damage and community facilities, revive economic activities and provide support for the psychological and social well being of the survivors. It focuses on enabling the affected population to resume more-or-less normal (pre-disaster) patterns of life. It may be considered as a transitional phase between immediate relief and more major, long-tern development.

Source: UNDP/UNDRO module Overview of Disaster Management



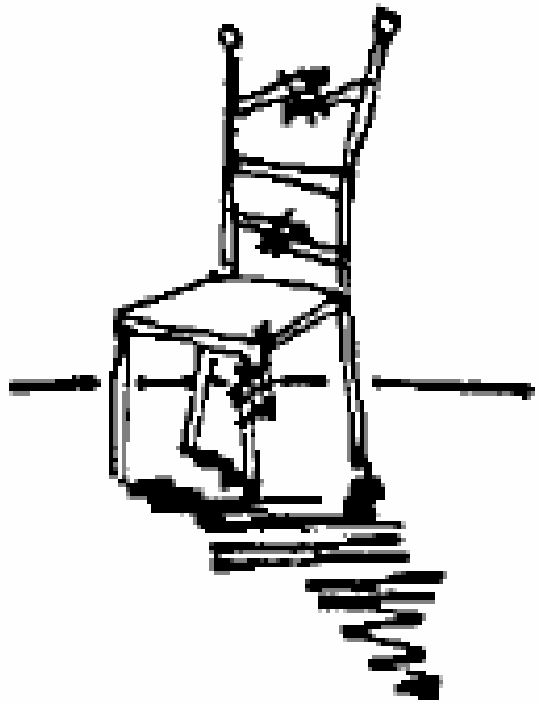
1

chair



2

disaster



3

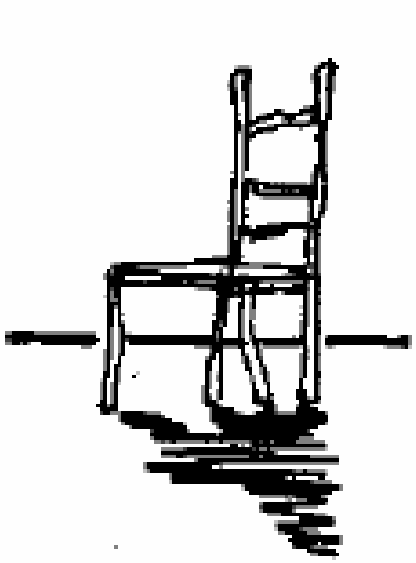
rehabilitation

Reconstruction

Full restoration of all services, and local infrastructure, replacement of damaged physical structures, the revitalization of economy and the restoration of social and cultural life.

Reconstruction must be fully integrated into long-term development plans, taking into account future disaster risks and possibilities to reduce such risks by incorporating appropriate measures. Damaged structures and services may not necessarily be restored in their previous form or location. It may include the replacement of any temporary arrangements established as part of emergency response or rehabilitation.

Source: UNDP/UNDRO module Overview of Disaster Management



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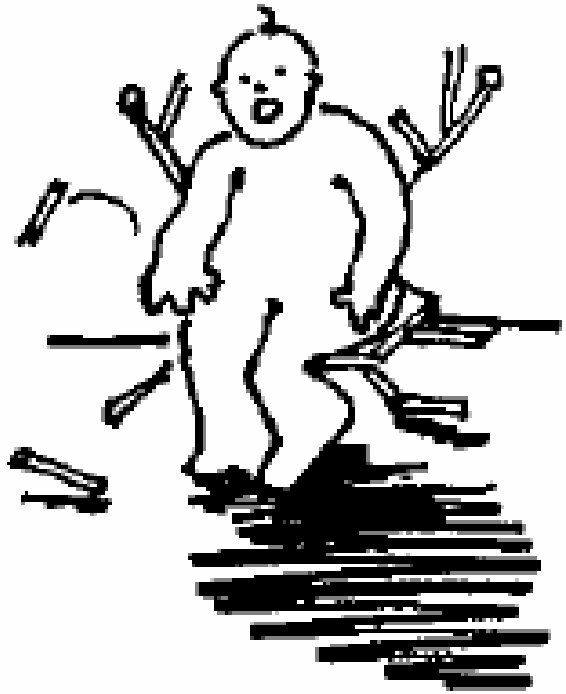
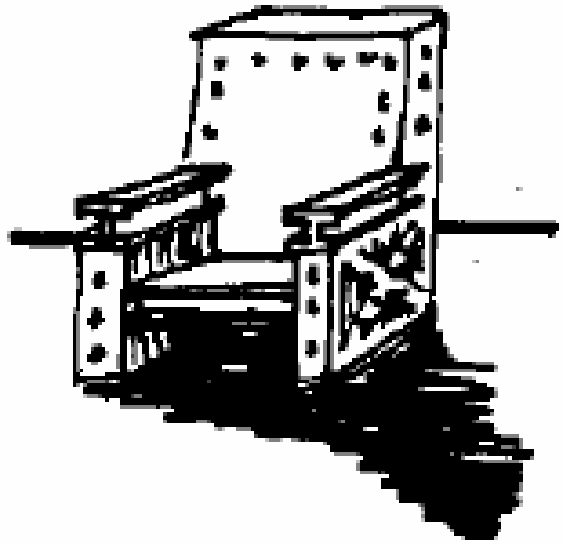


2

disaster



3

reconstruction

Recovery

Actions taken during the period following the emergency *phase*, which encompasses both rehabilitation and reconstruction.

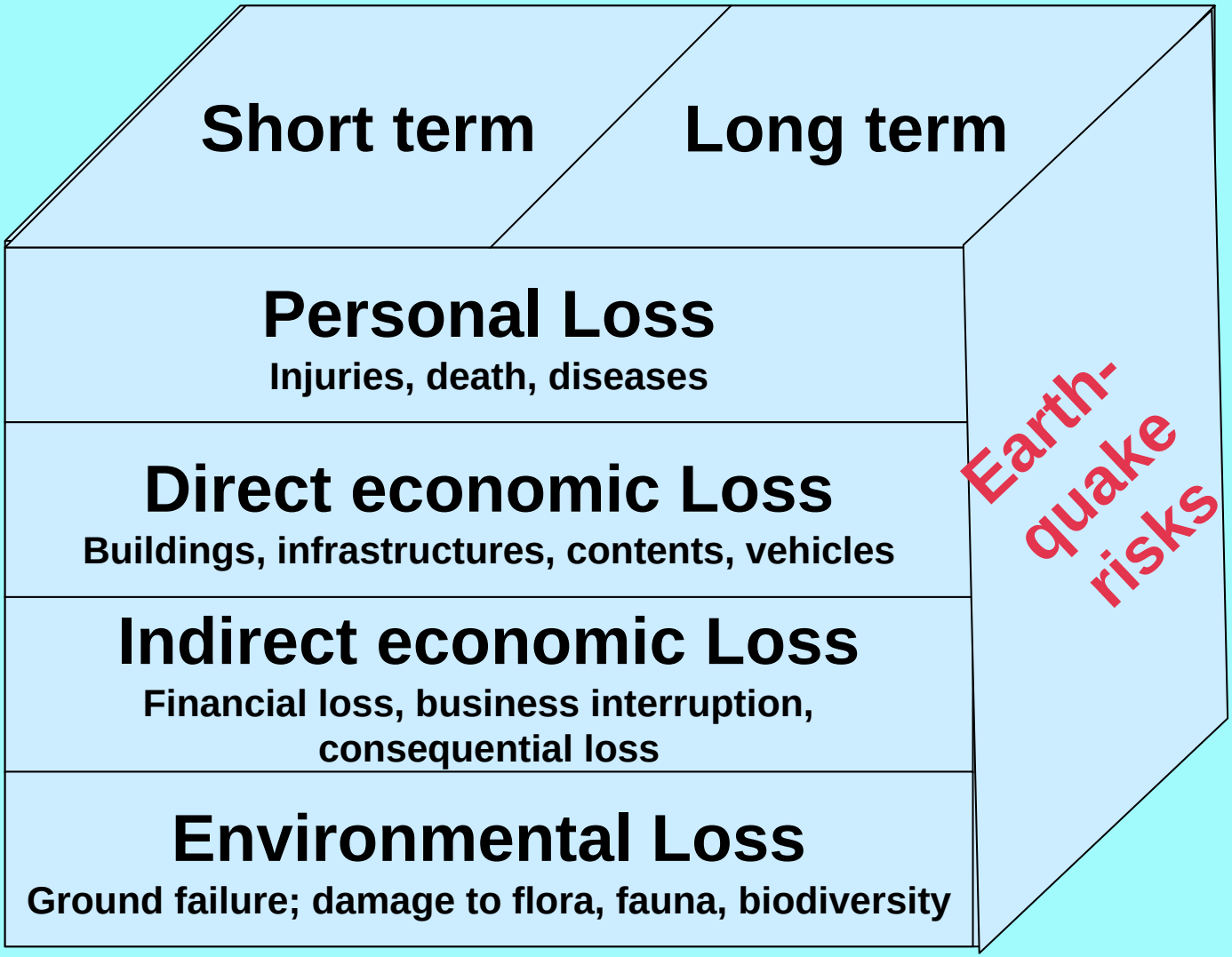
Source: UNDP/UNDRO module Overview of Disaster Management

Outline

Seismicity and Earthquake Disasters in the APEC Regions

Disaster Reduction and Post Disaster Reconstruction Model

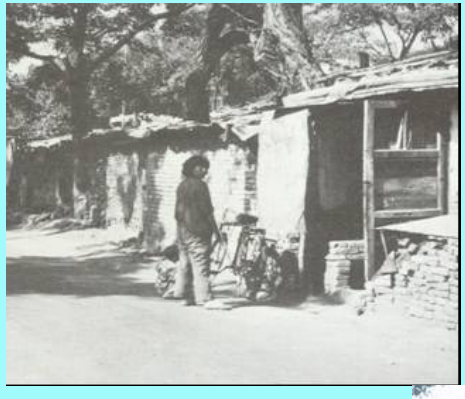
Post Disaster Planning and Strategies


Short term
Long term
Personal Loss
Injuries, death, diseases
Direct economic Loss
Buildings, infrastructures, contents, vehicles
Indirect economic Loss
Financial loss, business interruption, consequential loss
Environmental Loss
Ground failure; damage to flora, fauna, biodiversity
Earth-quake risks

- Shelter and housing
- Evaluation and rehabilitation of damaged buildings and structures
- Industrial sector recovery
- Land use
- Building an informed, trained and prepared community
- Resource balancing

1 Shelter and housing

1976 Tangshan Earthquake



Phase 1 Temporary shack

Phase 2 Simply constructed house

352,000 rooms were

completed before Nov 15, 1976

Phase 3 Semi-permanent house

Phase 4 Permanent house

- 5 years postponed due to increase of scale caused by population increase, rise of housing costs and limitation of budget.

- 11.22 million m2 of building floor area were completed in July of 1986, which consists of 144% of the planned, and accommodated 222,500 households (It was 157,960 before disaster).

Permanent house

Interior wall and slab: Cast in place

Exterior wall: Prefabricated 1

Interior wall and slab: Cast in place

Exterior wall: Brick masonry 2

3

Brick Masonry multi-story building with constructive R/C columns and ring beams

Permanent Housing in Tangshan city

Housing reconstruction in Kobe

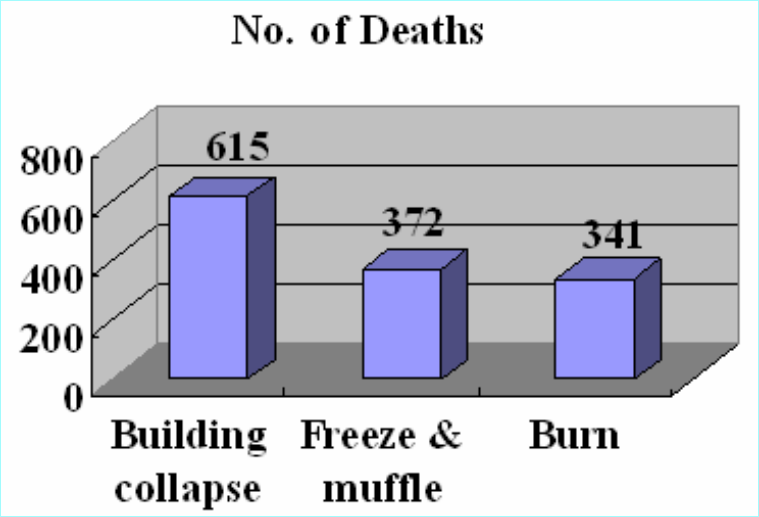
- **Three-year Housing Reconstruction Plan was formulated in August 1995**
- **Rent reduction for lower-income households and special care for the needs of the elderly**
- **For low/middle-income households, a new measure, which lessens the initial burden of rent payments on renters for private-sector housing, was put into effect in October 1996.**
- **Low-interest loan by the Housing Loan Corporation is offered to those who wish to rebuild their own houses.**

Lessons learned

- Ignorance of potential households.
- Unpracticed technical requirements, 10 million Yuan RMB were lost in response to use advanced technology.
- Reconstruction plan was revised timely.
- Establish a powerful headquarters to control all of the rehabilitation and reconstruction process.

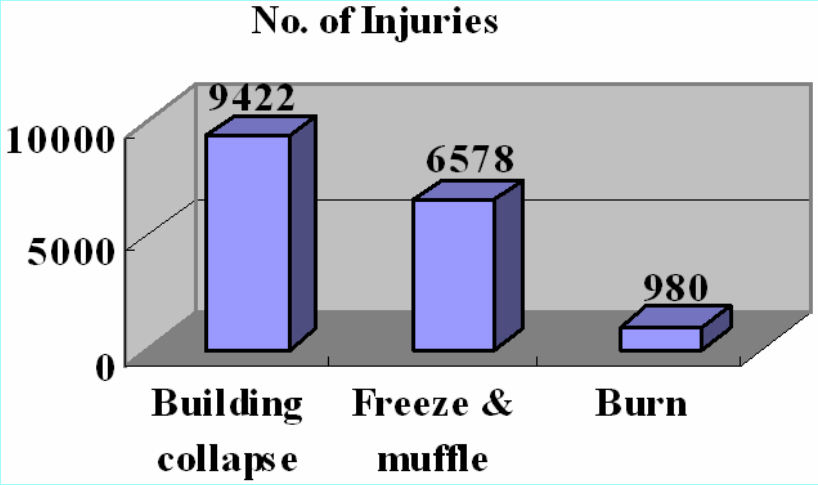
1975 Haicheng Earthquake

- severe winter time
- shelters were made of wood & rice straw
- no any heating devices



Total deaths 1328

713 after earthquake
53.7%



Total injured
16,980

After quake 7558
44.5%

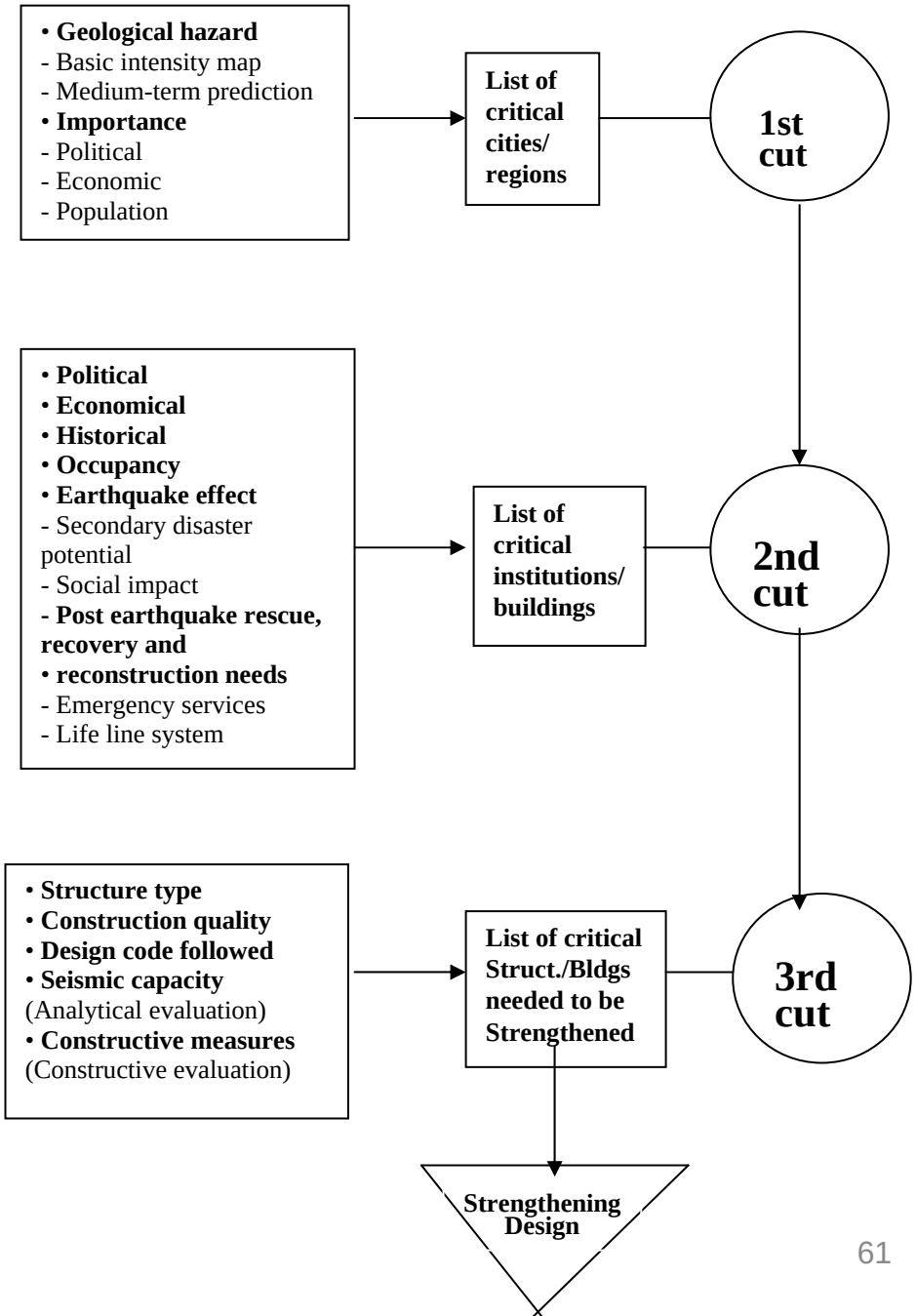
Typical temporary housing units consist of stacked box-like structures. Residents share kitchen and bathroom facilities.

2 Evaluation and rehabilitation

HAZARD, IMPORTANCE ECONOMICS

IMPORTANCE ECONOMICS

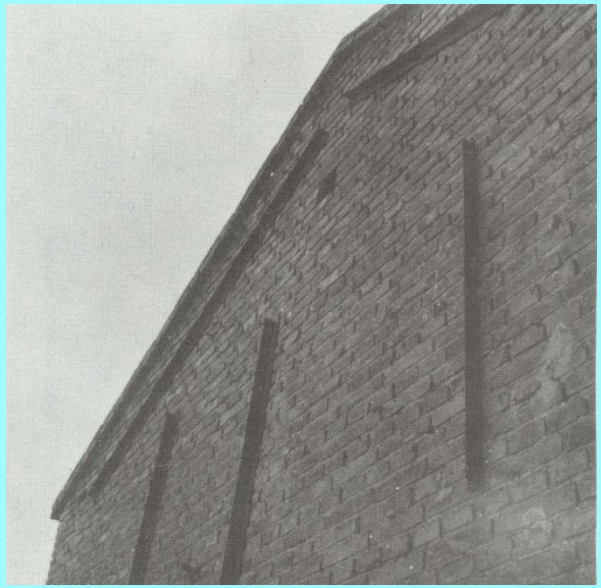
VULNERABILITY, ECONOMICS



“Three cuts”

Retrofitting process

Retrofitting following 1976 Tangshan Earthquake



Retrofitting must consider

- **their life span**
- **Increasing resistant capacity for whole building**
- **should never just strengthen damaged items or even only strengthen the building without comprehensive analysis**

Factors impeded implementation of retrofitting program

1 Absence of damaging disaster and the memory of bitter life happened in the past disaster faded from people's mind.

2 Low credibility of disaster threat and inability to define the threat in precise enough terms so that people believe that they will be affected.

3 Ignorance of relevant authoritative regarding the nature and magnitude of the disaster due to lack of awareness.

4 Fear of disturbance of productive activities.

5 Fear of disturbance of housing activities.

6 Costs of retrofitting buildings are still unknown, but generally are much higher than incorporating disaster resistant requirements into new construction and retrofits offer little in the way of near-term market benefits.

7 Difficulties in determining the appropriate safety level.

8 Difficulties in analyzing the buildings to be retrofitted, because for many old buildings the original and modified drawings are not available.

9 Limitation of financial resources.

3 Priority of Industrial Sector Recovery

It is necessary to identify priority for recovery of economic sectors because financial resources are limited.

Tools

- **System dynamics method**
- **Analytical hierarchy process method**

System Dynamics Method

- **Problem identification**
- **Making causality feedback drawings and set up model frame**
- **Making system flow chart by using system dynamics symbols**
- **Setting up DYNAMO equations, compiling system program by using DYNAMO language and testing on the computer**
- **Drawing up possible solutions**

Source: Ye Yaoxian, 1998, Reconstruction Decision Making Following A Strong Earthquake, "Earthquake Prognostics Strategy", Edited by Andreas Vogel et al., EPICenter, Berlin

Rehabilitation options following 1976 Tangshan, China, earthquake

Option	Metal-lurgic	Elec-tric	Coal	Che-mical	Me-cha-nical	Bldg. mate-rial	Fo-rest	Food	Tex-tile	Paper ma-king	Other
1	5.0	37.2	37.3	2.7	5.9	3.1	0.4	1.6	4.0	0.6	2.2
2	6.0	30.0	30.0	3.0	6.0	3.0	0.5	7.0	10.0	2.3	2.2
3	10.0	26.5	26.5	8.0	10.0	3.0	0.5	7.0	10.0	2.3	2.2

1 similar to practical one after earthquake

2 investment in light industry ↑, in heavy industry ↓

3 investment in light industry ↑, properly ↑ in mechanical, metallurgic, chemical

Option	Total output value, TOV	Recovery percentage, RP	Tax & Profit, TP	TP/TOV	TOV/Real estate value	Water consump-tion	Electricity and land consumption
1	311.8e3	132.4	58.52e3	18.77	7.42	＜1.0	＜1.0
2	409.8e3	174.0	72.36e3	17.66	9.76	＞ 1.0	1.0
3	469.2e3	199.2	81.12e3	18.14	10.54	1.2	＞1.2

Analytical hierarchy process method

- **Problem identification**
- **Structuring judgment Matrix**

A_k	B_1	B_2	…	B_n
B_1	B_{11}	B_{12}	…	B_{1n}
B_2	B_{21}	B_{22}	…	B_{2n}
…	…	…	…	…
B_n	B_{n1}	B_{n2}	…	B_{nn}

B_{ij} = relatively important value of B_i to B_j for A_k

- **Arrange in importance order for hierarchy**

$$BW = \lambda_{\max} W$$

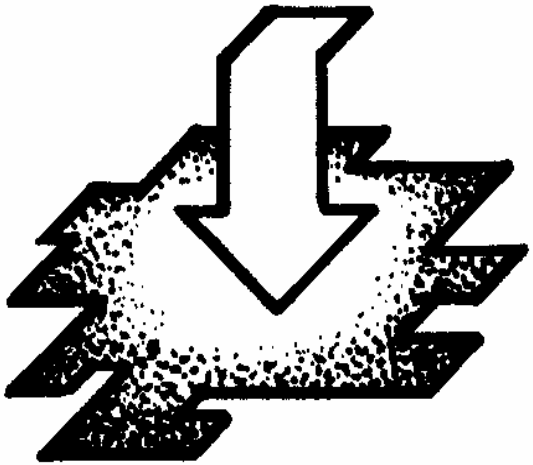
- **General arrange in importance order for hierarchy**
- **Checking consistency**

Source: Ye Yaoxian, 1998, Reconstruction Decision Making Following A Strong Earthquake, "Earthquake Prognostics Strategy", Edited by Andreas Vogel et al., EPICenter, Berlin

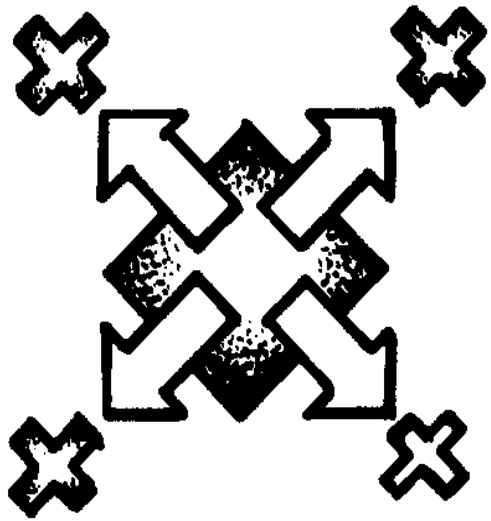
Results from Analytical hierarchy process method for Tangshan case

- Rehabilitation and reconstruction of life line systems, such as water supply, power supply, communications etc., shall be put in the first place.
- More attention shall be paid to job generation and housing construction
- Attention shall be paid to recover most effective industrial sectors.

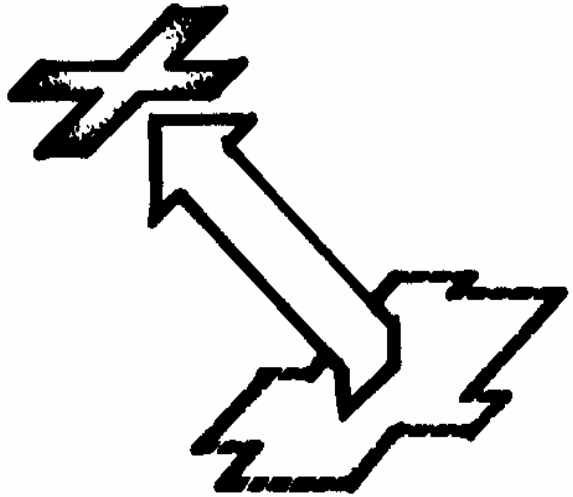
4 Land Use



Rebuild at original place



Satellite town



Relocation

Solutions for Post Disaster Reconstruction Planning

Land use solutions

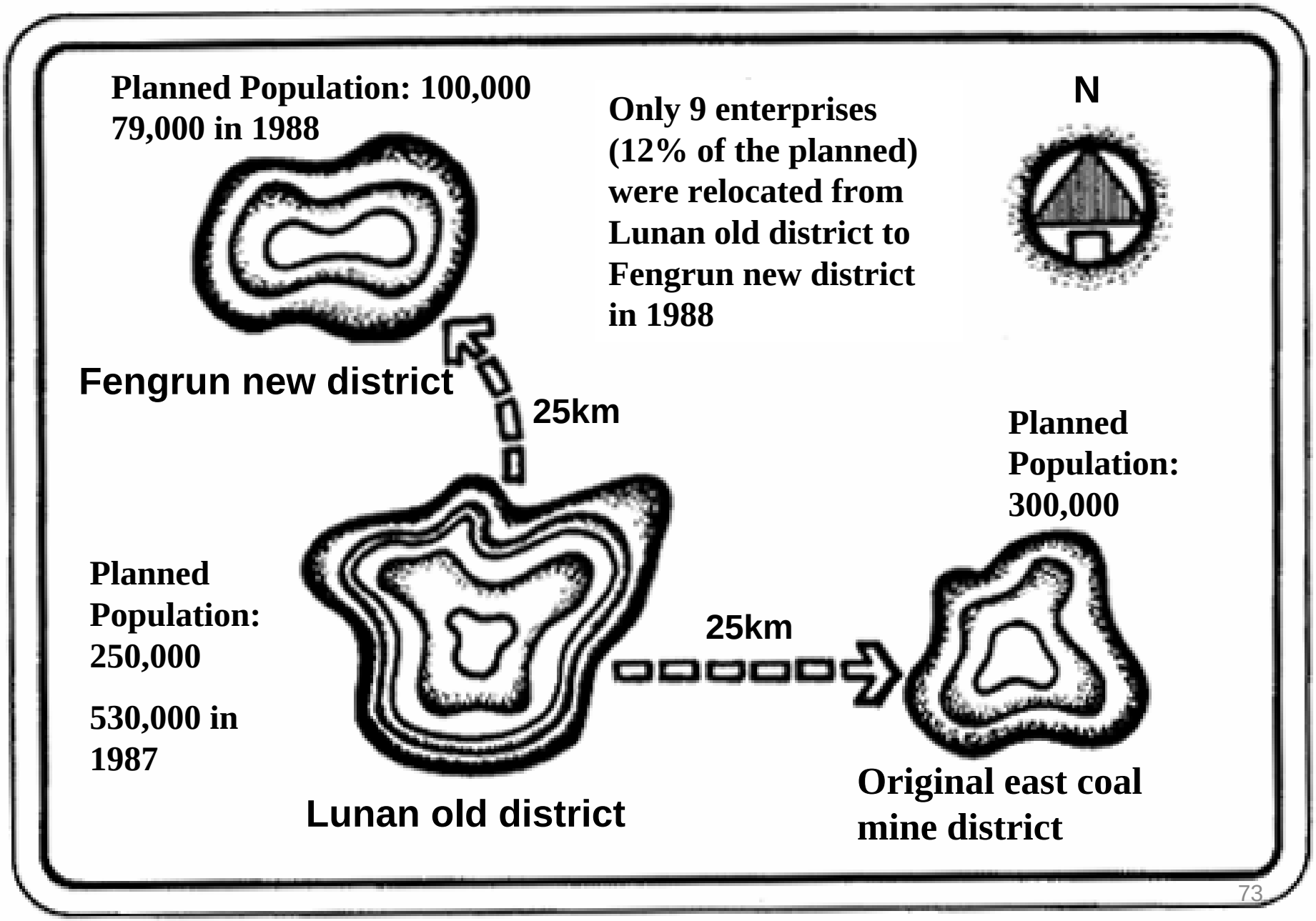
1 Rebuild at origional place should be put in the first priority

2 Partially rebuild at the origional palce, partially move to close neighbouring place

3. Renounce the origional place and move to a new place is a more expensive and more difficult solution. It can be adopted on the following conditions:

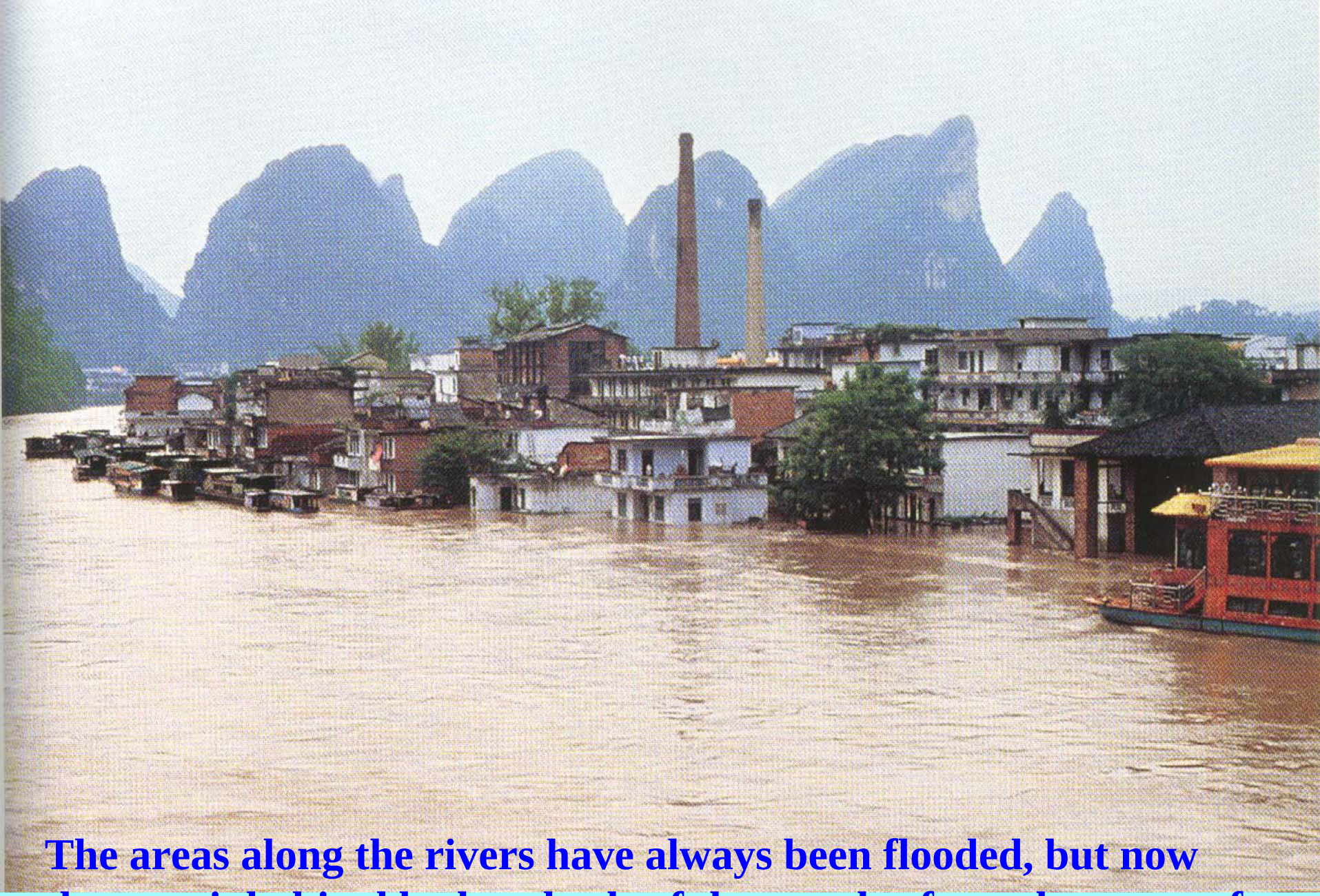
- It is very difficult to take measures to mitigate future disasters
- Inhabitants are willing to relocate
- Economically feasible

Tangshan • 1980



Jingjiang Detention Basian in China

The detention basins are effectively used to direct the excessive flow over the design flood. During the 1954 great flood of 100-years frequency occurred in the Yangtze River, it prevented about 30,000 of fatalities.



The areas along the rivers have always been flooded, but now they are inhabited by hundreds of thousands of people, many of them even living in specially designed polders.

5 Building an informed, trained and prepared community

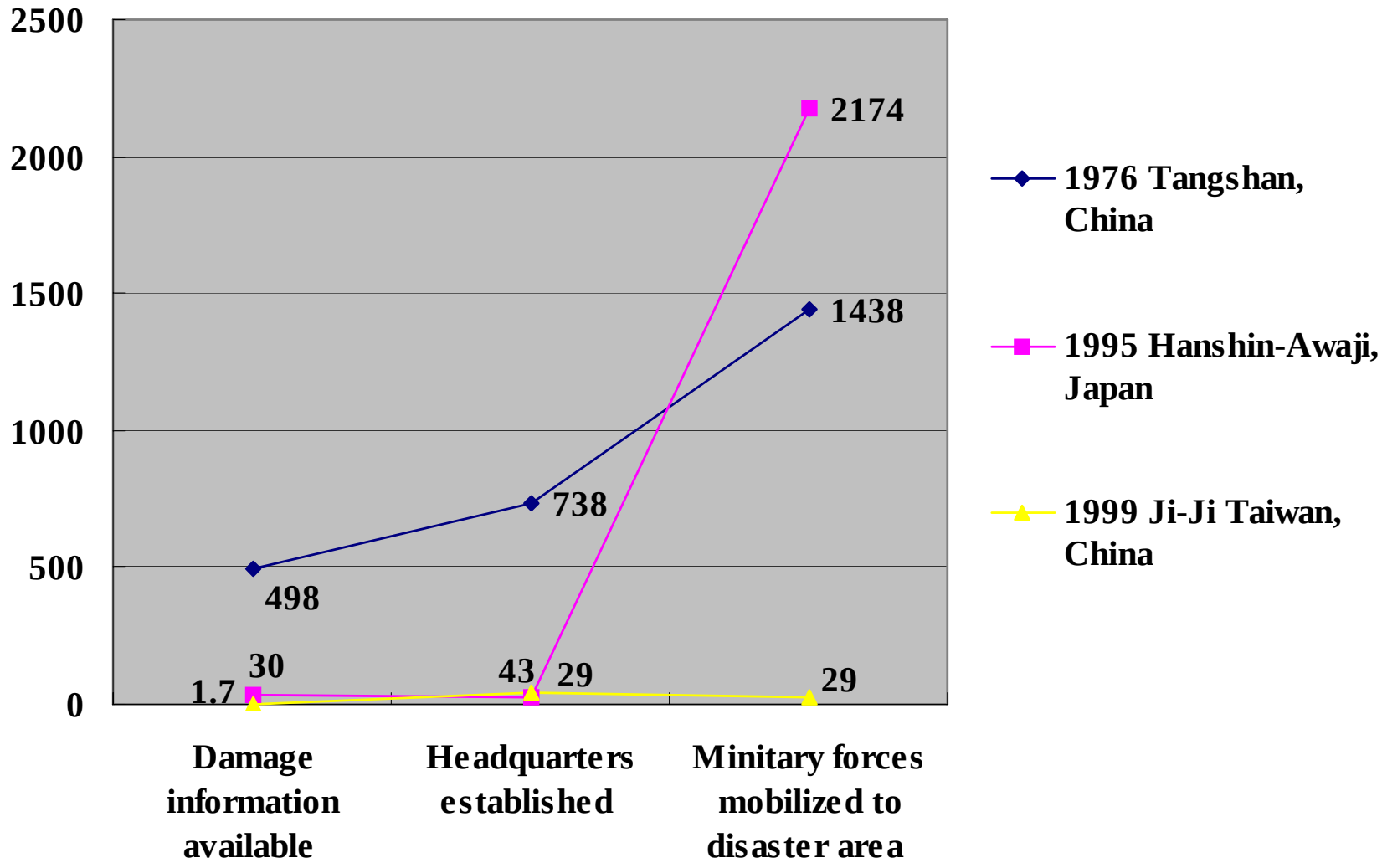
Cases in damage information management

(1)Damage information was not available at all and even experts did not know any thing about the disaster, such as in the case of 1976 Tangshan China Earthquake and 1999 Izmit Turkey earthquake;

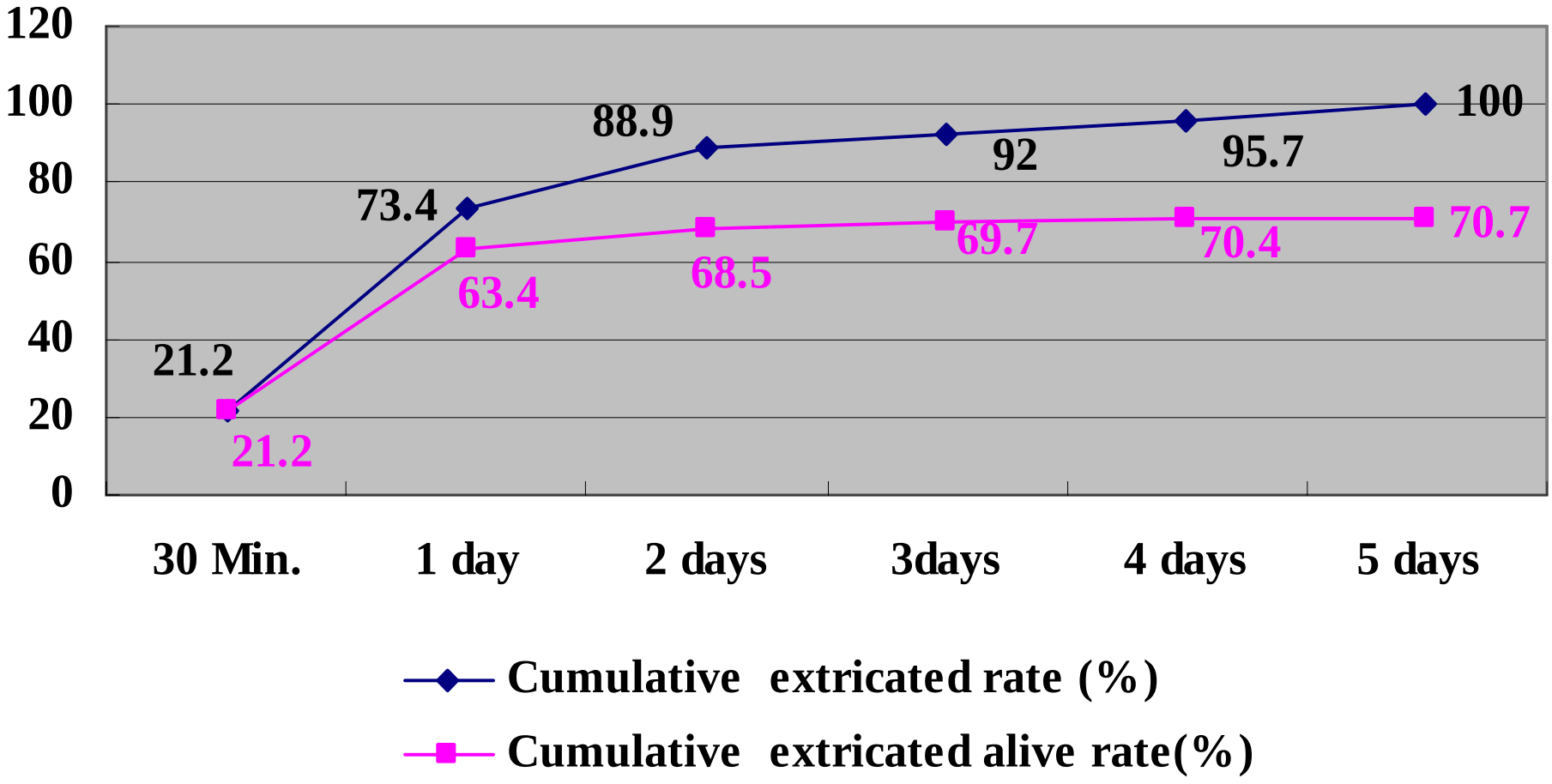
(2)Damage information is available at least partially, but it did not reach the right decision makers and stakeholders promptly. The 1995 Hanshin-Awaji Earthquake was precisely the case

(3) Damage information was available and it reached the respective personnel promptly, such as the case of the 1999 Ji-Ji Taiwan China Earthquake.

Time in minute after the earthquake

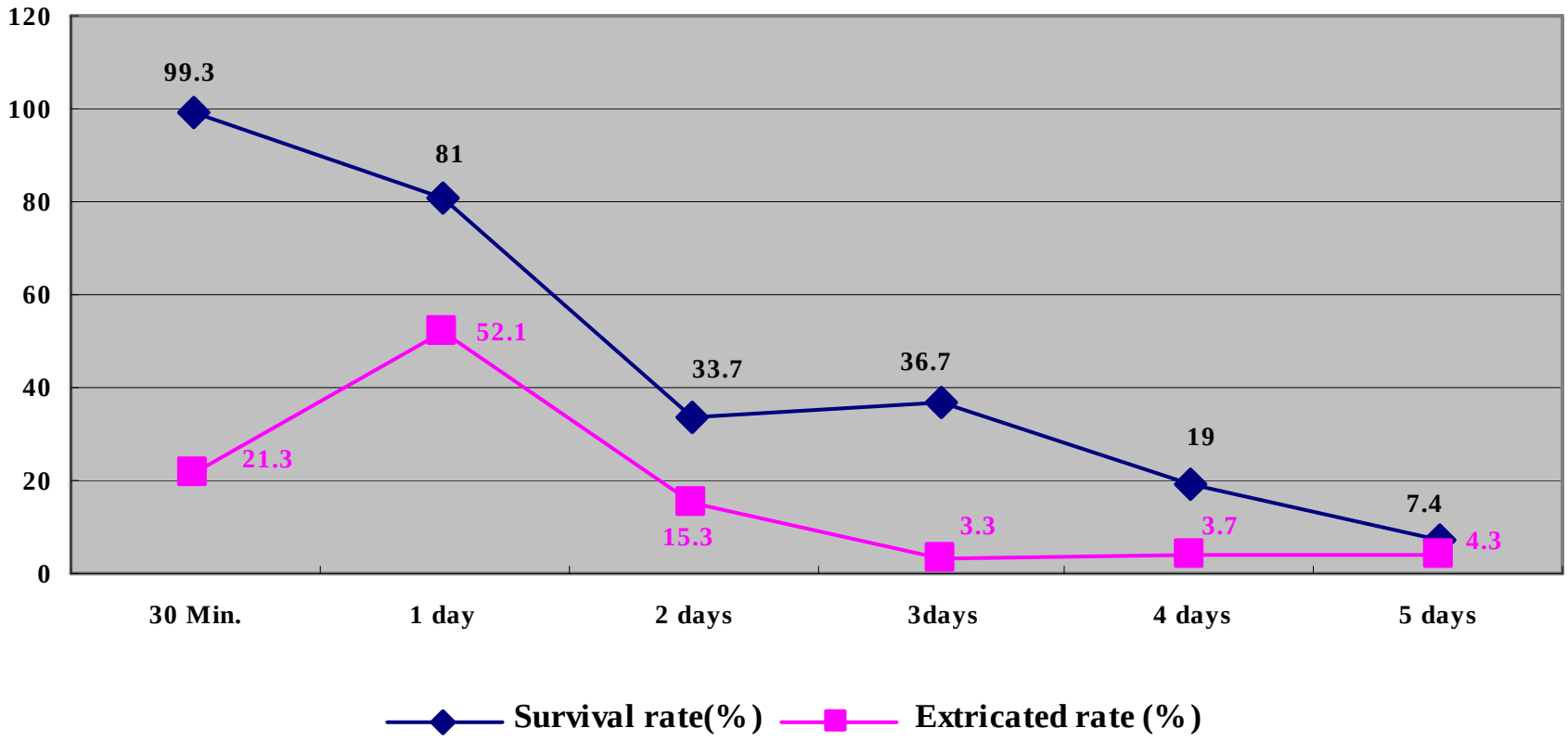


Difference between 100 seconds and 100 minutes can be the difference between life and death!



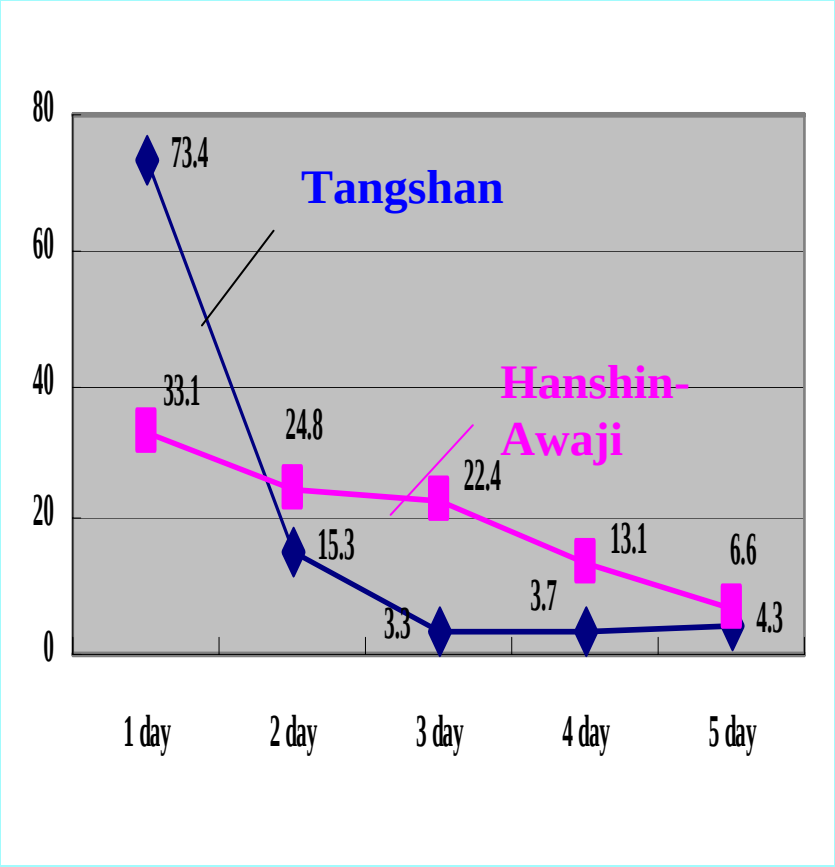
July 28, 1976 Tangshan China earthquake

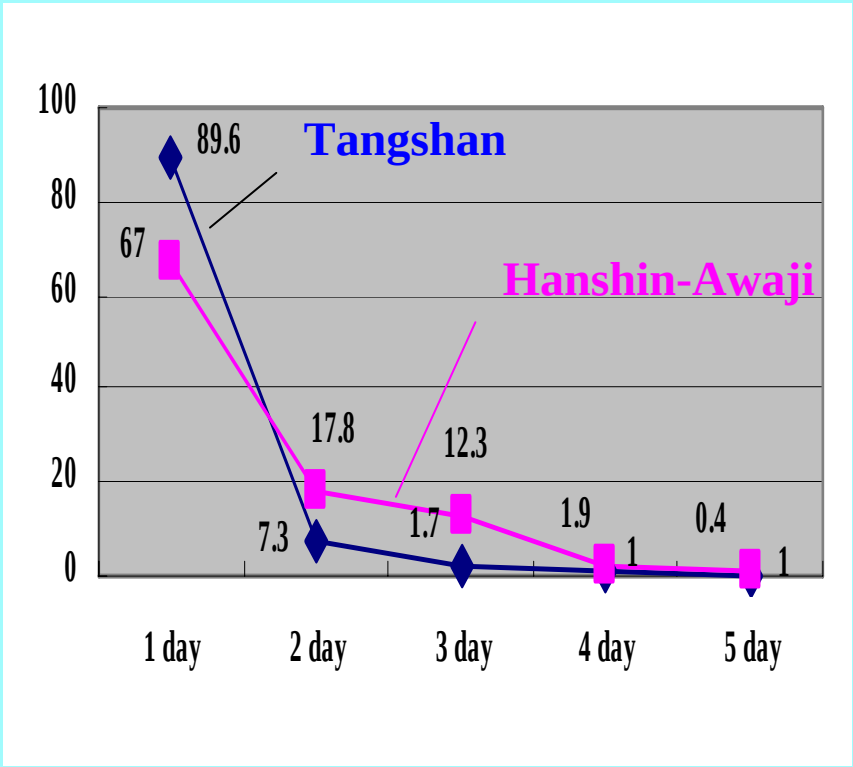
Survival and extricated rate (Tangshan, 1976)



Extricated and surviving numbers by rescue time for 1976 Tangshan and 1995 Hanshin-Awaji earthquakes

Rescue time	Extricated number		Surviving number	
	1976 Tangshan	1995 Hanshin-Awaji	1976 Tangshan	1995 Hanshin-Awaji
1 day	7849	604	6774	486
2 day	1638	452	552	129
3 day	348	408	128	89
4 day	399	238	75	14
5 day	459	121	34	7
Total	10693	1823	7563	725



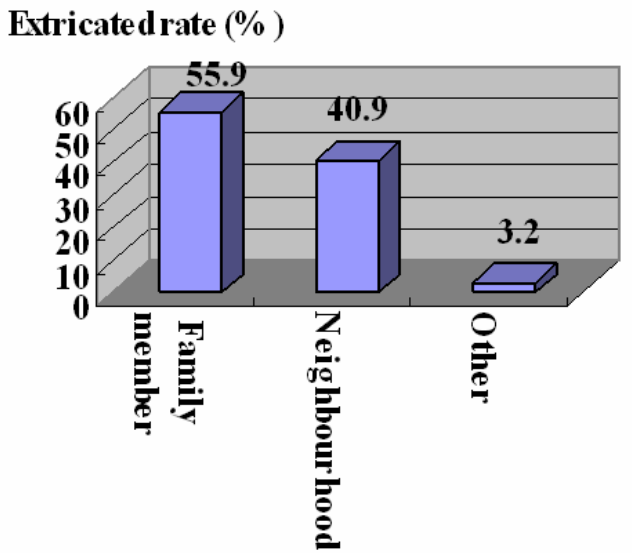


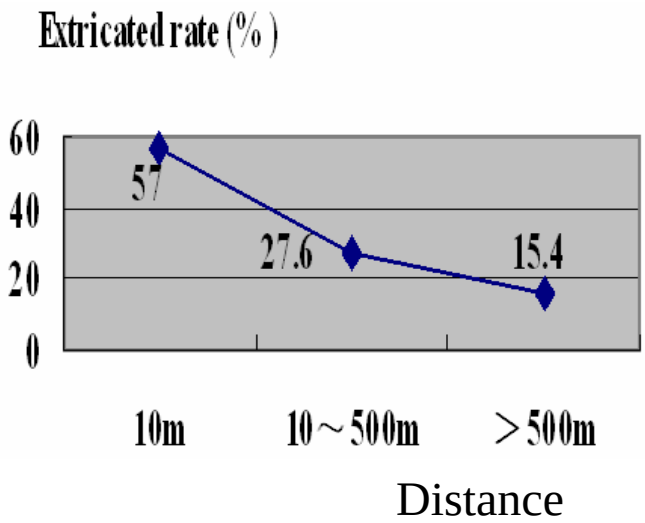
(a) Extricated rate (%)

(b) Surviving rate (%)

Extricated rate (%) and surviving rate (%) vs. rescue time for 1976 Tangshan and 1995 Hanshin-Awaji earthquakes

1976 Tangshan





- **600,000 people that consist of 86% of the city's total urban population of 700,000 were trapped**
- **Among them 22% were rescued by themselves and 58% by local residents and troops stationed at Tangshan city**
- **Troops in Tangshan city, which consist of 20% of the total rescue troops, extricated 96% of the total rescue number by troops**

- **Local self-rescue**
- **Informed, trained & prepared community**

6 Resources Management

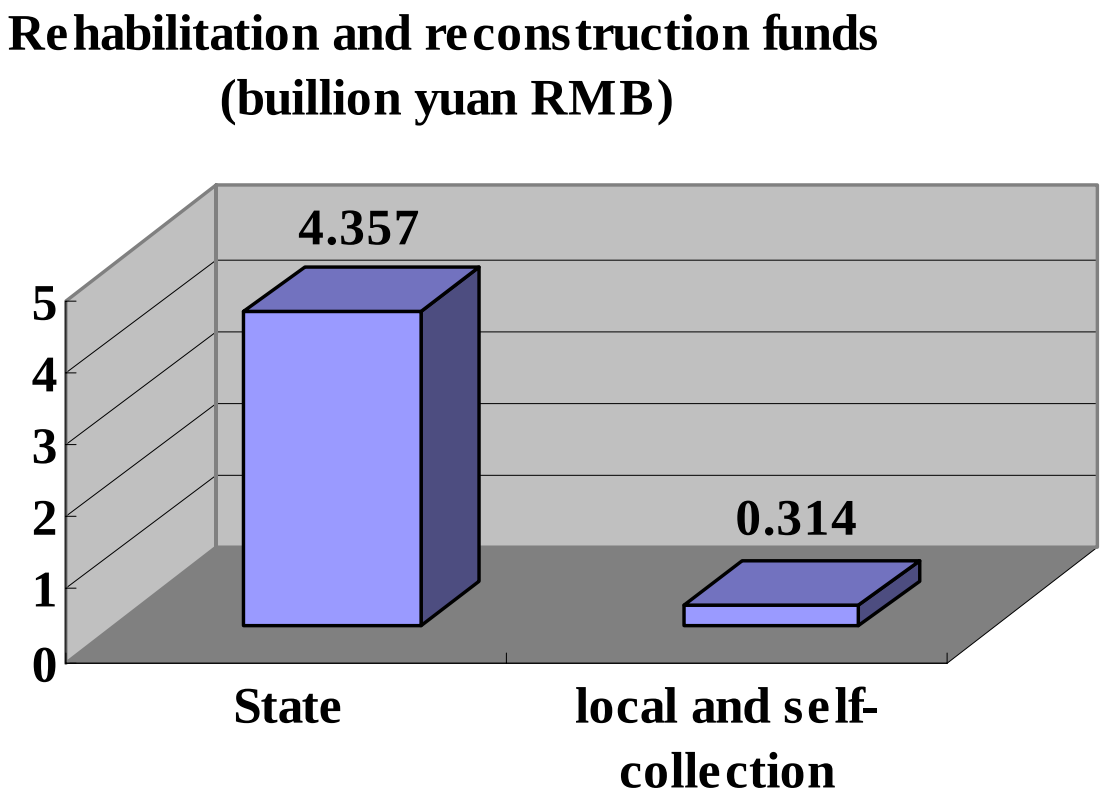
Balancing needs with resources available is critical at stages of post-disaster rehabilitation and reconstruction. While the relief period may attract large national and international inputs, rehabilitation and reconstruction may not benefit from such attention.

1976 Tangshan, China, earthquake

Reconstruction was in the period with central planning economy. The national economy was on the verge of collapse. The whole China was in an isolated society. After the earthquake, the UN and many countries expressed their willing to aid, however, the Chinese government didn't accept any international and foreign aid because they determined to follow the principles of "Rebuild one's homeland through self-reliance".

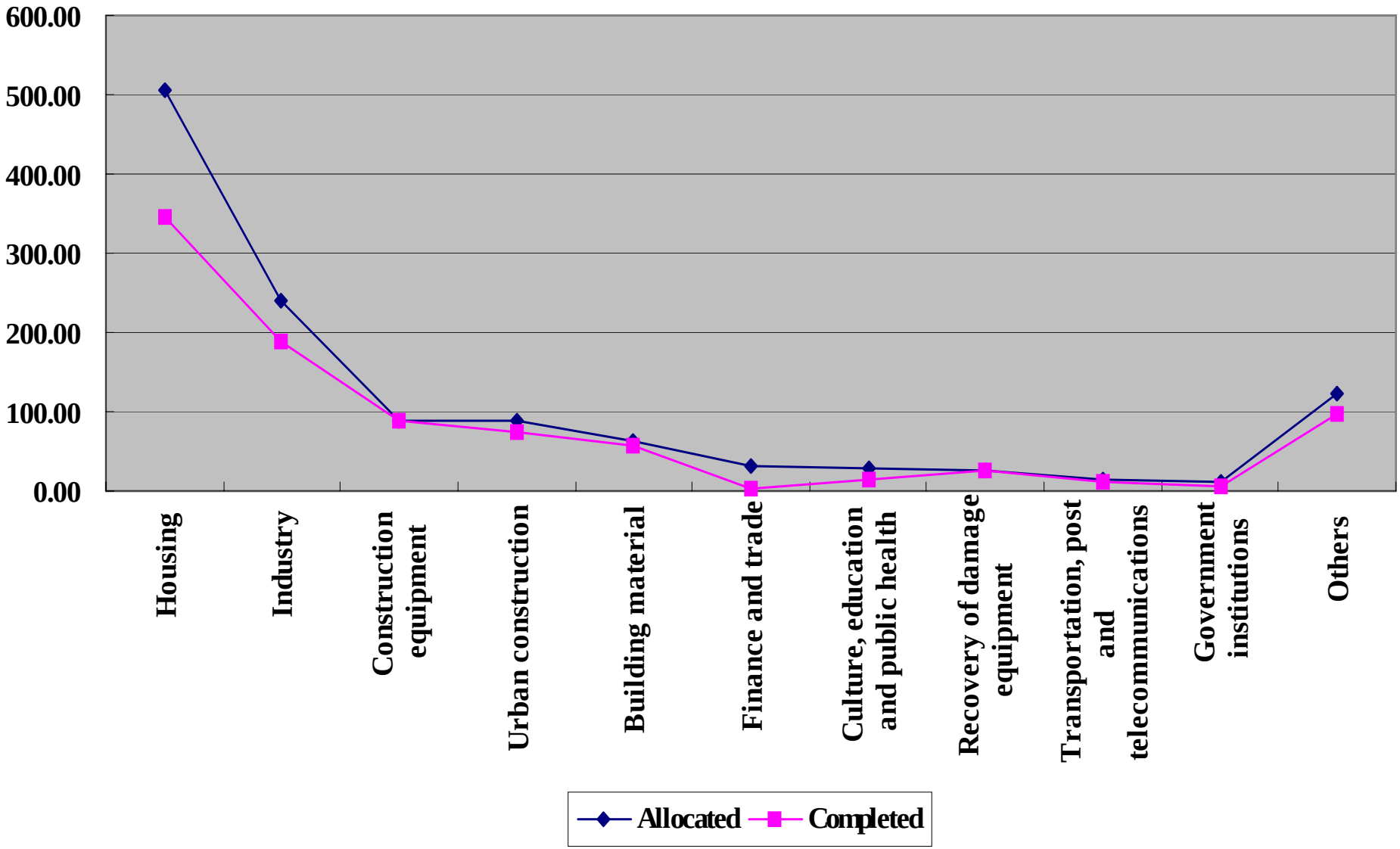
In October of 1976, the residents in Tangshan city were not allowed to build houses by themselves, which means building private houses was prohibited.

Building houses by individuals were allowed in 1981. In addition, the residents were allowed to buy completed residential buildings. In this way, a financial resource insufficiency for housing construction was solved.



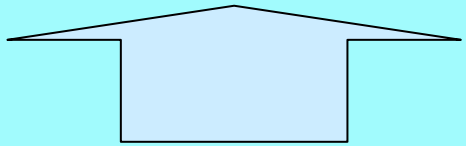
Rehabilitation and reconstruction funds mainly came from the State, and the remaining from local government, collective institutions and individuals.

Million Yuan



Allocated and completed reconstruction funds for Tangshan rehabilitation and reconstruction in 1978-1980 in million Yuan RMB

Delay in use of allocated funds before 1980



- **Too much change in the planning of old urban district**
- **Delaying in development of the planning for new district-the Fengrun District which was not integrated with the original County Town**
- **Difficulty in development of the East Coal Mine District due to lack of basic data for planning, such as there was no topographic map, and the number, scale and location of public buildings were not identified**
- **Surveying work was not well organized**

Reconstruction funds were pretty tight at later years due to reducing state reconstruction funds allocation.

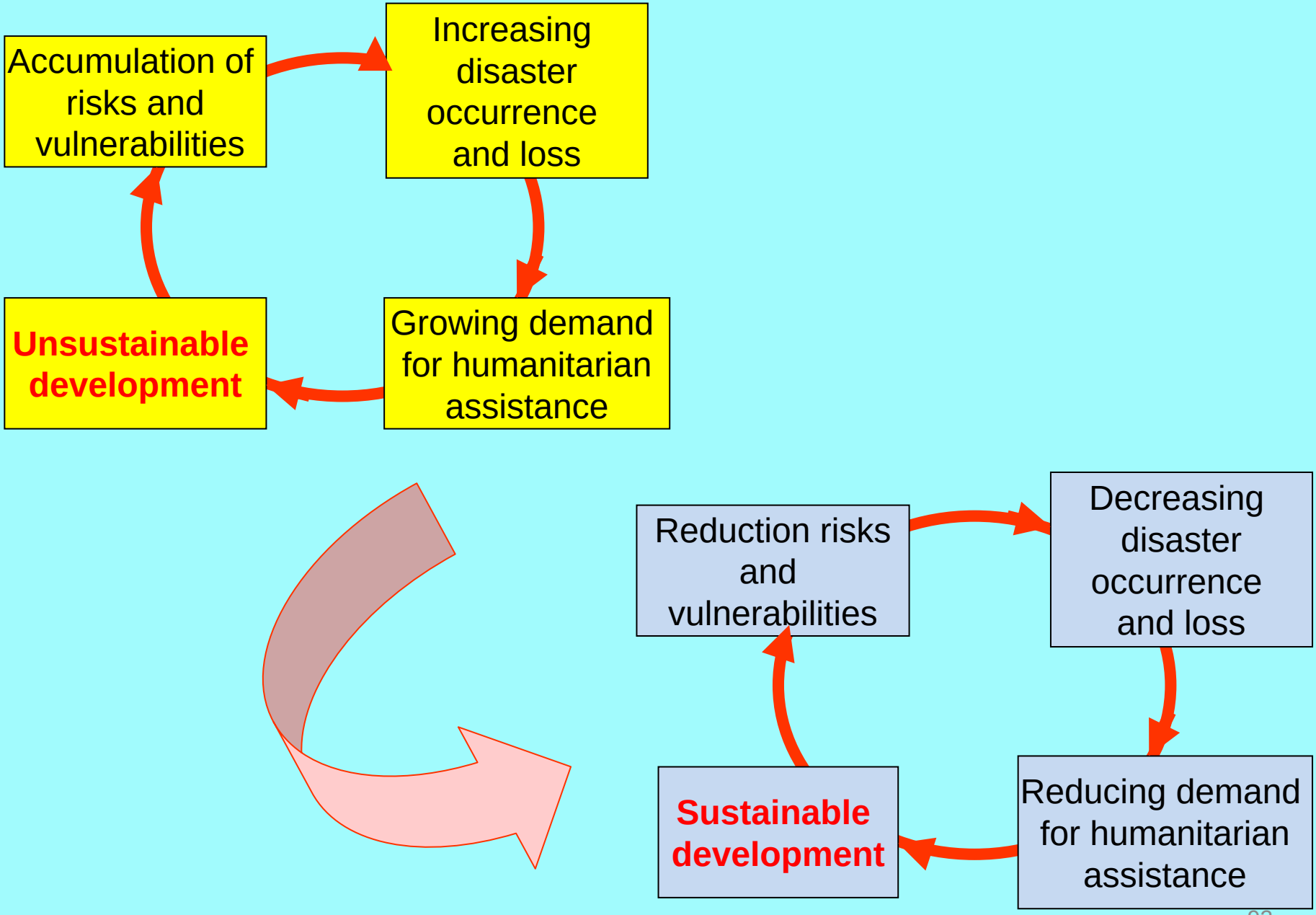
1989 Datong-Yangyuan, China Earthquake

The World Bank loan following the 1989 Datong-Yangyuan earthquake in the boundary of Shanxi and Hebei Provinces powerfully accelerated the post-earthquake reconstruction. It follows that accepting international assistance and foreign aid are a good way for acceleration of post-earthquake reconstruction.

1995 Hanshin-Awaji, Japan Earthquake

- **Ten-year Kobe Revival Plan (KRP) was established by the city in June 1995 and the aim of the KRP is to revive the city by fostering communities, and strengthening the economy and culture by using a multi-stakeholder decision making process.**
- **Significant participation of residents in community building. Strategically adopted communities as the driving units of the KRP because after a disaster, community groups can respond much more effectively to immediate needs than a central government can.**

• **Established Disaster-preventive and Welfare Communities (DWCs) to implement the disaster management plan. Units are divided by elementary school districts, which generally hold about 10,000 people. Formulation of the community Building Basic Ordinance. Units are expected to collect public comments, check durability of structures and host disaster simulation events.**


Accumulation of risks and vulnerabilities
Increasing disaster occurrence and loss
Growing demand for humanitarian assistance
Unsustainable development
Reduction risks and vulnerabilities
Decreasing disaster occurrence and loss
Reducing demand for humanitarian assistance
Sustainable development

Duration of some activities following the earthquakes

Activity	Duration (week)	
	1976 Tangshan Earthquake	1995 Hanshin-Awaji Earthquake
Search and rescue	1	1
Completion of temporal housing	18	5
Power supply	5 - 2years + 2	1
Communication	5	2
Water supply	16	1 year + 13
Train	12	31
Highway	16	37
Start of construction of public apartment house	100	100
Completion of public housie built	480	400
Completion of reconstruction	500	400

More effective prevention strategies would not only save tens of billions of dollars, but hundreds of thousands of lives as well. Funds currently spent on intervention and relief could be devoted to enhancing equitable and sustainable development instead, which would further reduce the risks of disaster.

Building a culture of prevention is not easy, however. While the costs of prevention have to be paid in the present, its benefits lie in the distant future. Moreover, the benefits are not tangible; they are the disasters that do not happen. So we should not be surprised that preventive policies receive support that is more often rhetorical than substantive.

Koffie Annan，Report of the Secretary-General on the work of the Organization，
General Assembly Official Records Fifty-fourth Session Supplement No. 1 (A/54/1


謝謝
Thank you
ありがとうございます
どうもありがとう
СПАСИБ
Grazie
Jaspajarama
Danke
obrigada
Mahalo
khawp khun