

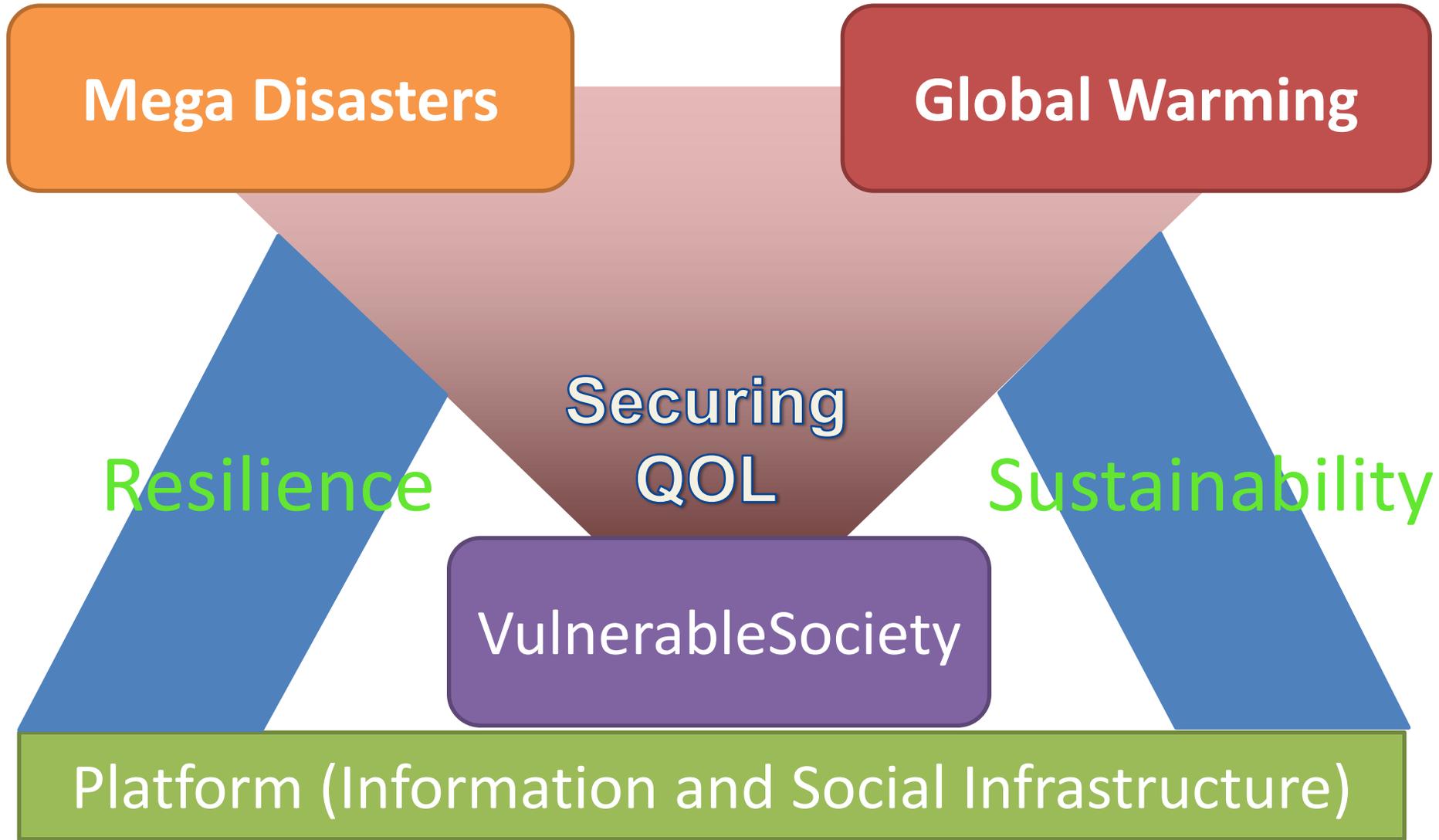


7th Regional EST Forum in Asia
23-25 April 2013 Bali
MOT Indonesia, MOE Japan and UNCREC -

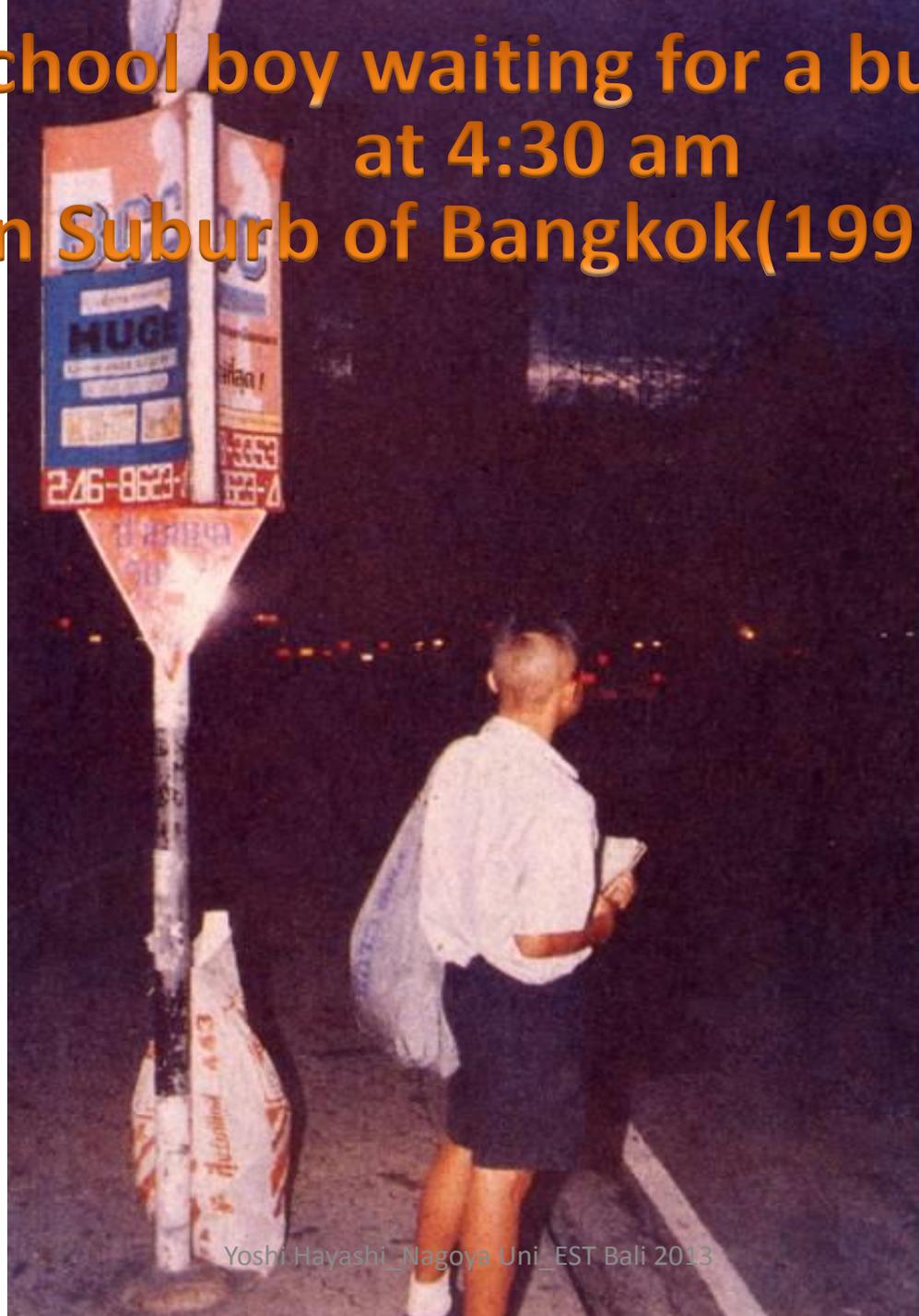
**Building Resilient Cities and Community
through EST Measures
– Policies, Programmes and Infrastructure –**

Yoshitsugu Hayashi
Professor, Nagoya University
Chair of Scientific Committee, WCTRS

*Resilience and Sustainability are
twin Characteristics to support the Society*



School boy waiting for a bus at 4:30 am in Suburb of Bangkok(1993)



Bangkok Post
4 Sept 1993

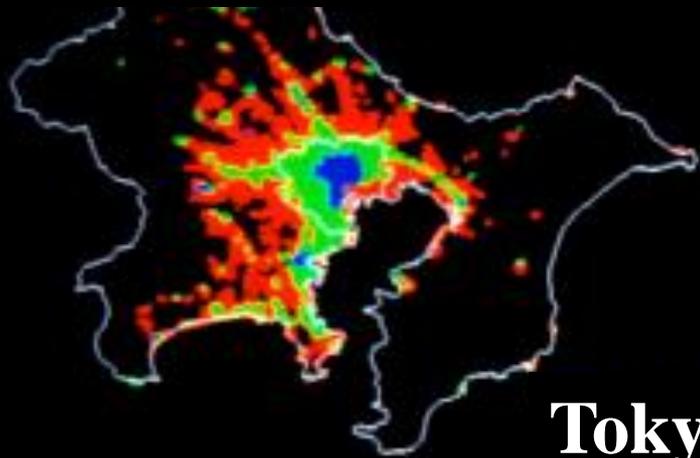
Yoshi Hayashi_Nagoya Uni_EST Bali 2013

Slower than walkers in Sukunvit Rd., Bangkok 8hr+ Commuters > 10% (1993)

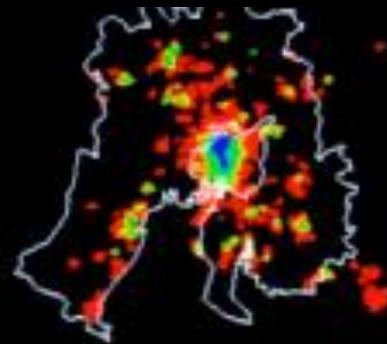


Photo by Yoshitsugu Hayashi(1993)

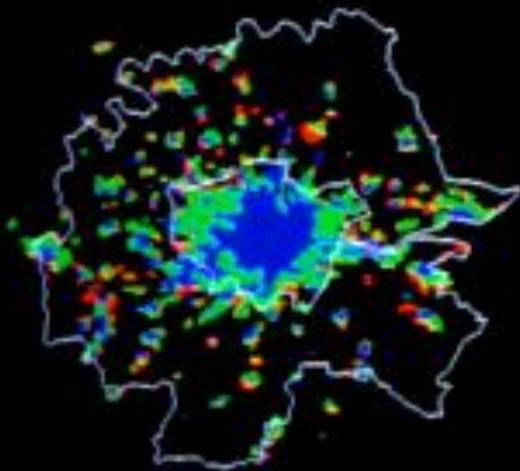
Change in Built-up Areas



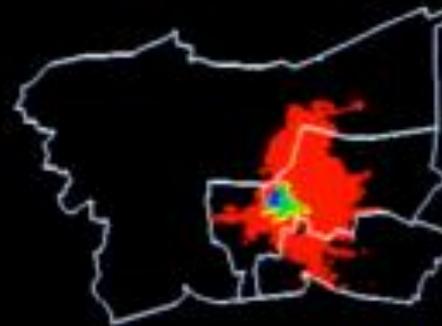
Tokyo



Nagoya



London



Bangkok



All housings and buildings swept in Sendai
by 3.11.2011 Tsunami (once in 1,000 years)

The Great East Japan Earthquake

Photo by Yoshitsugu Hayashi

A photograph of a rural landscape. In the foreground, there are several trees, some with pink blossoms and others with yellow flowers. A white house is visible on the left side. The background shows a green hillside with more trees and a clear sky. The text "Beautiful Country Side" is overlaid in the center in a yellow font.

Beautiful Country Side

Going down to low land...



Photo by Yoshitsugu Hayashi

Crash of buildings in Kesen-numa caused by 3.11.2011 Tsunami



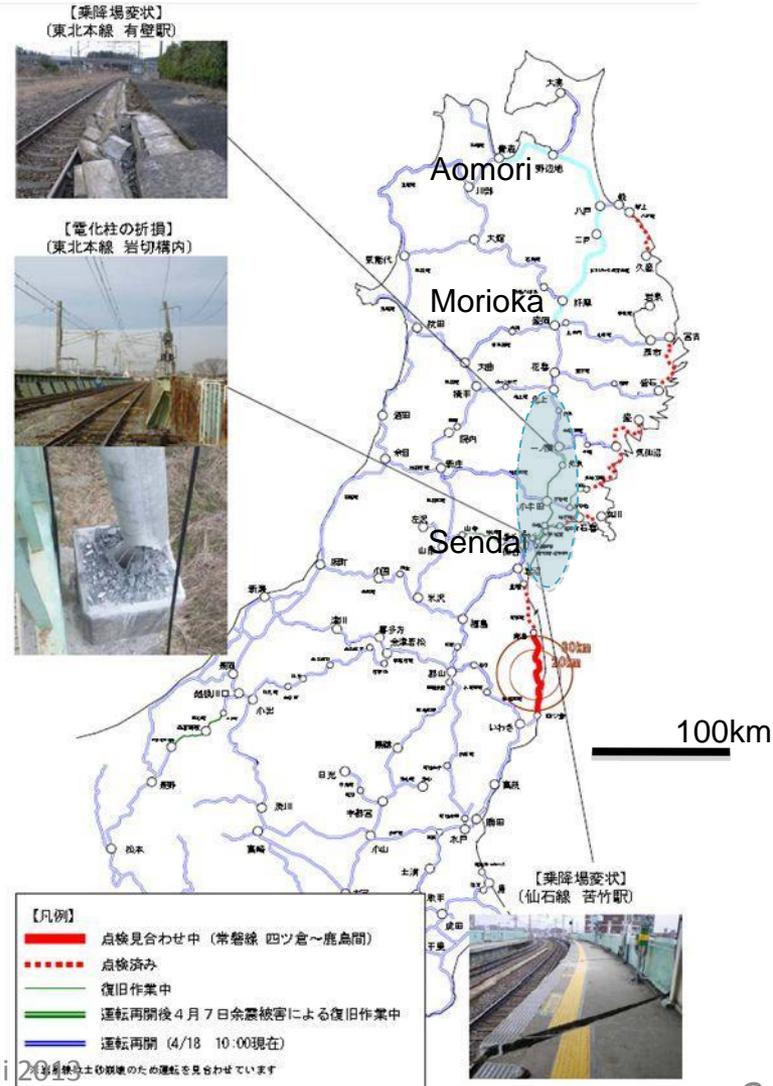
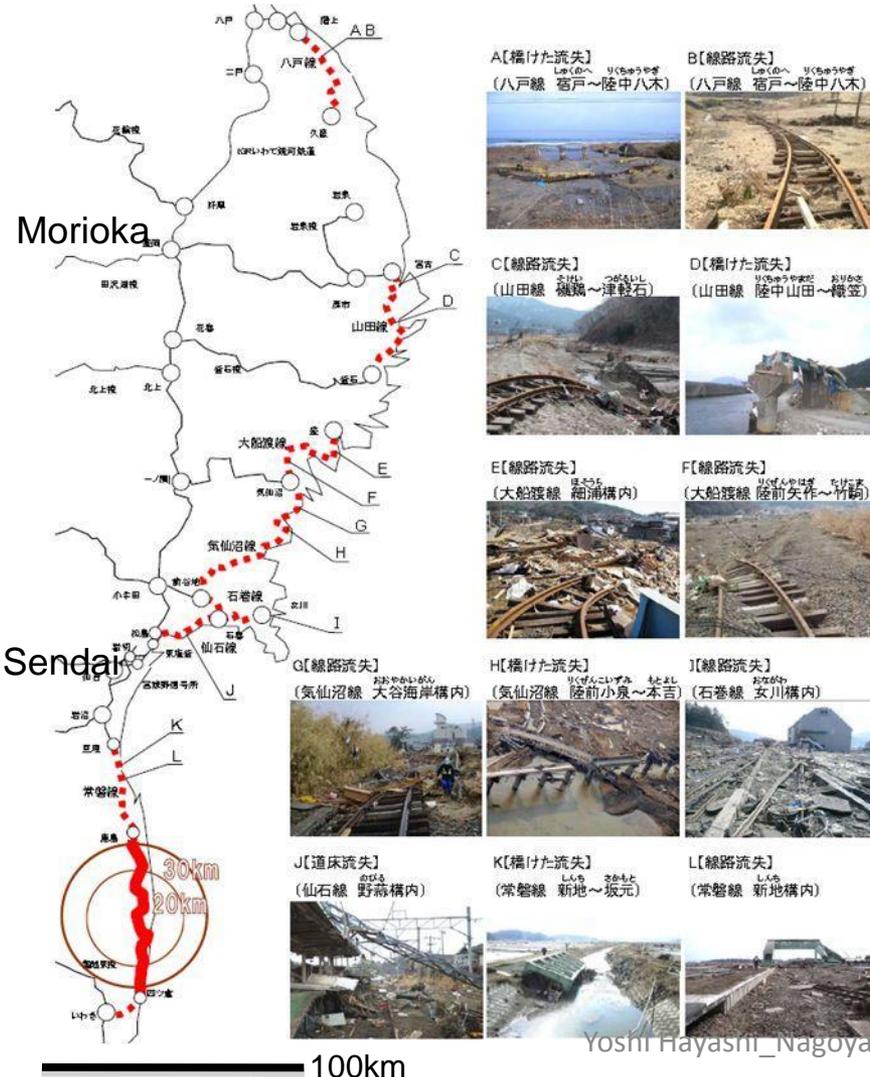
Photo by Yoshitsugu Hayashi

Damage to local railways

Closure just after the earthquake

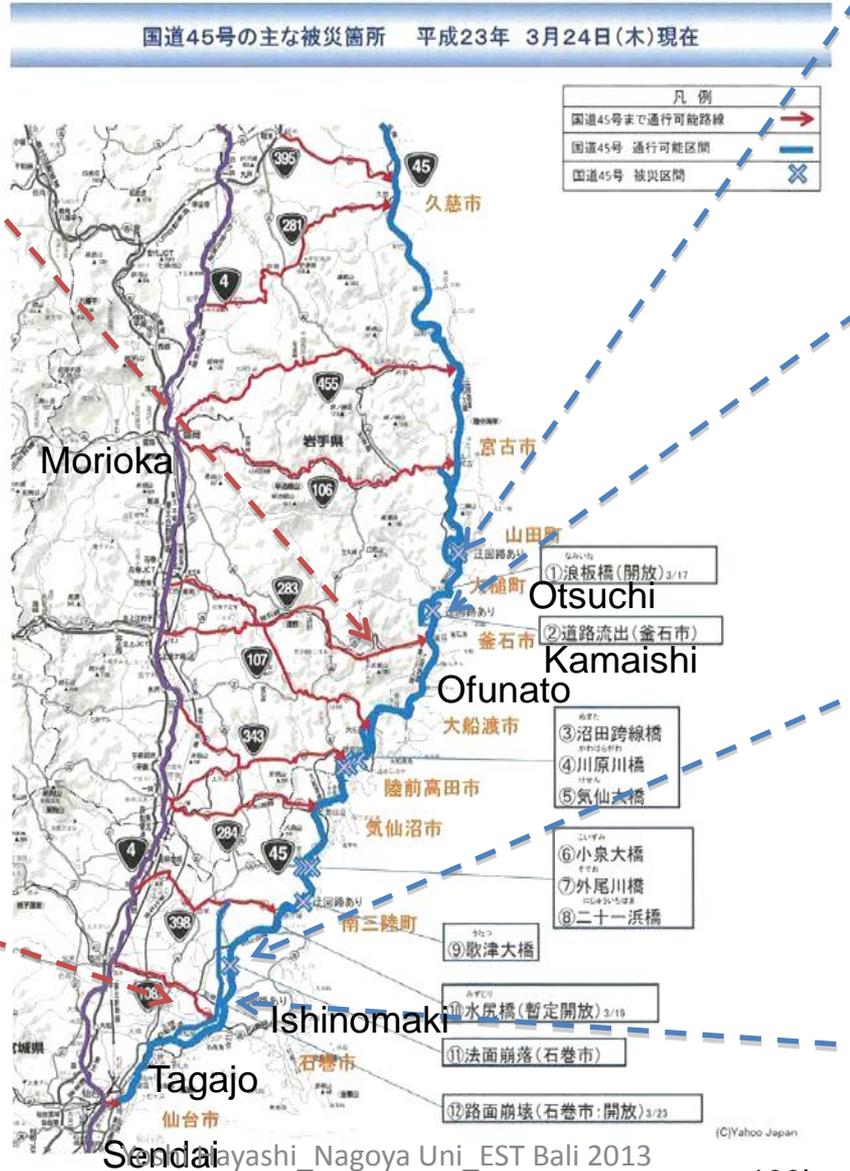
Tsunami (coast)

Earthquake (inland)



Damage to local roads

Many coast areas lost road access



①国道45号 浪板(226)橋 (岩手県大槌町) L=25m



②国道45号 道路流出 (岩手県釜石市)



⑪国道45号 法面崩落 (宮城県石巻市)



⑫国道45号 路面崩壊 (宮城県石巻市)



(source: Tohoku Regional ...)

A drifting boat blocked a street in Kesen-num
caused by 3.11.2011 Tsunami



Photo by Yoshitsugu Hayashi

Damage to High-Speed Railways (HSR: Shinkansen)

Closure just after the earthquake:
Tohoku, Akita, Yamagata Lines

No derailment problem

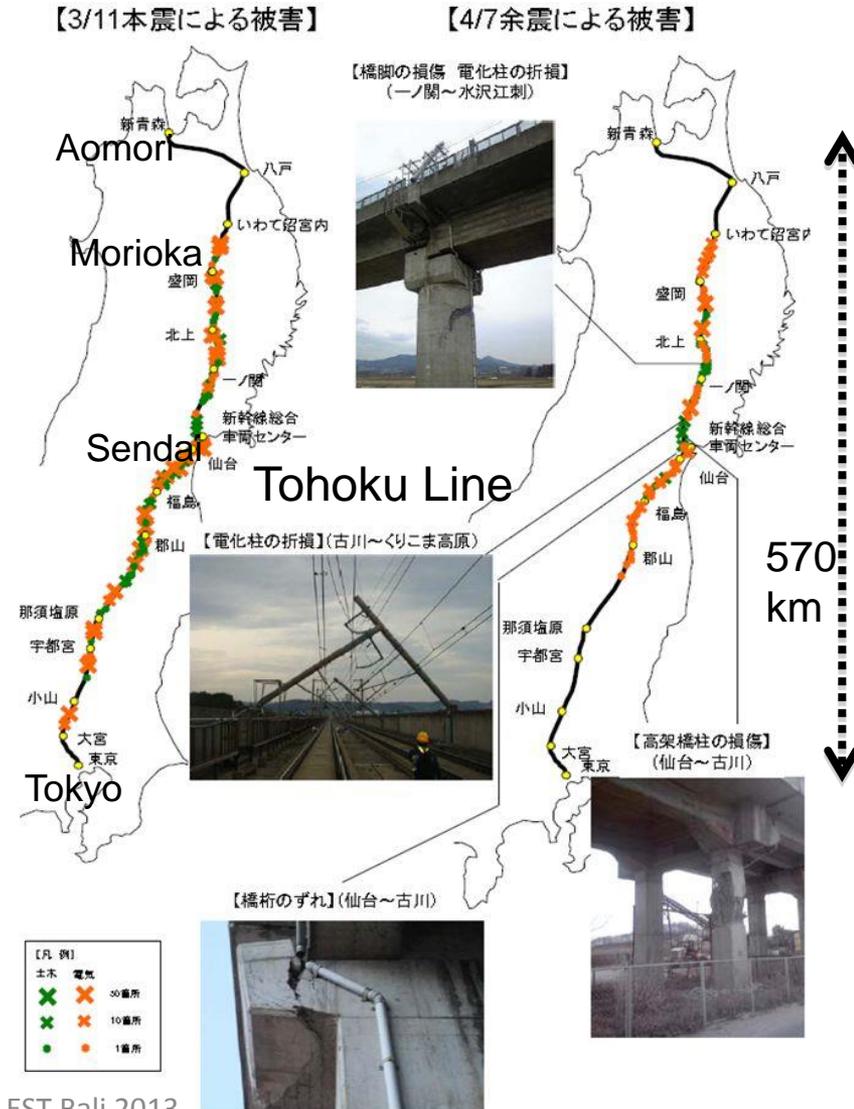
HSRs are designed to automatically slow down earlier than the main shock with the sensor of the initial tremor

(UrEDAS: Urgent Earthquake Detection and Alarm System)

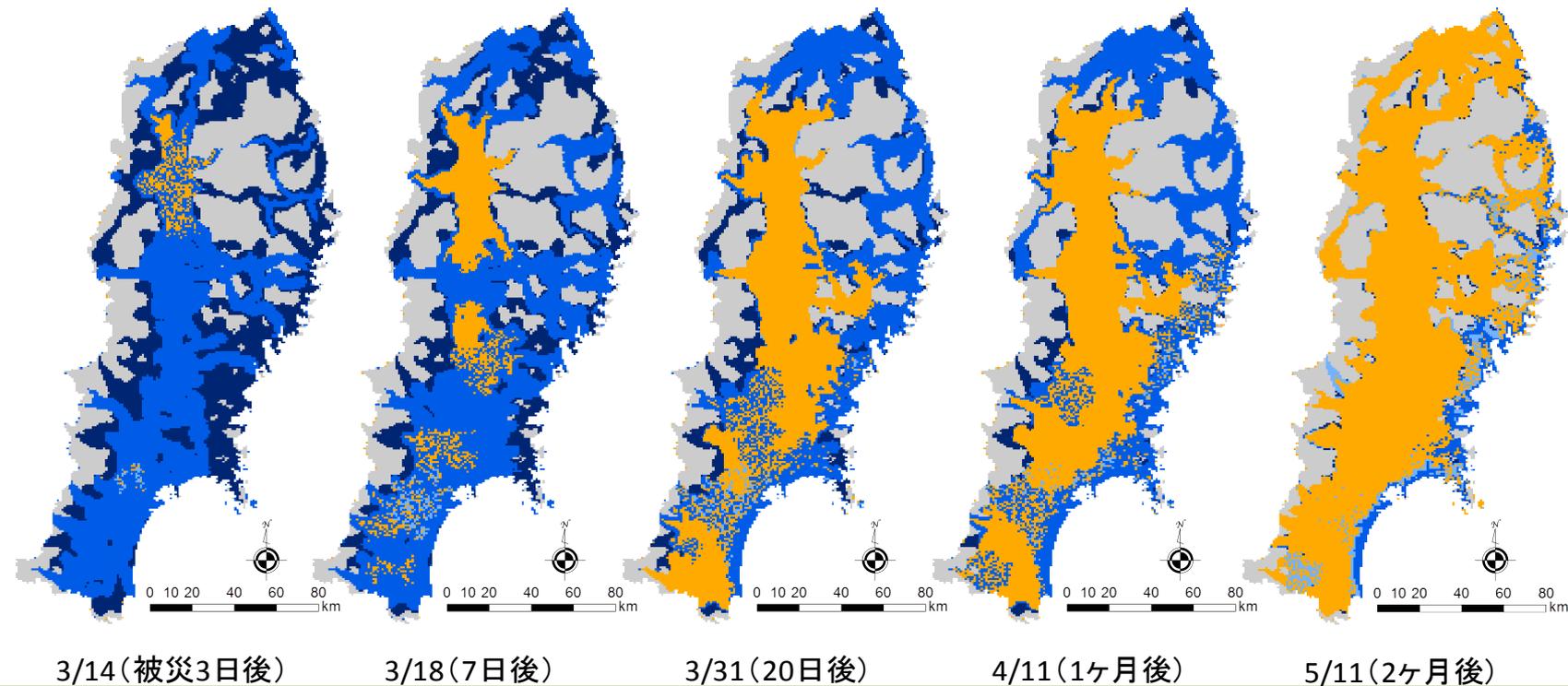
JR Sendai Station (14 March)



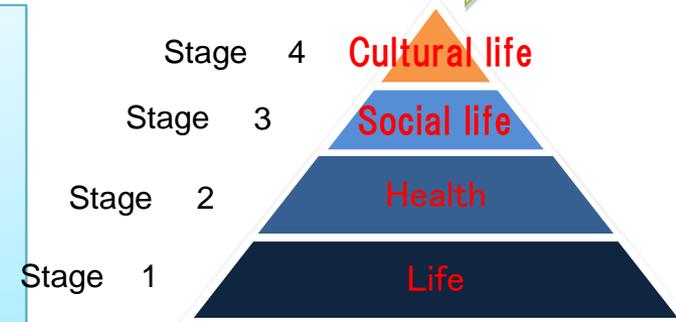
Yoshi I. Esri, Nagoya Uni_EST Bali 2013



Resilience: QOL Transition after Earthquake

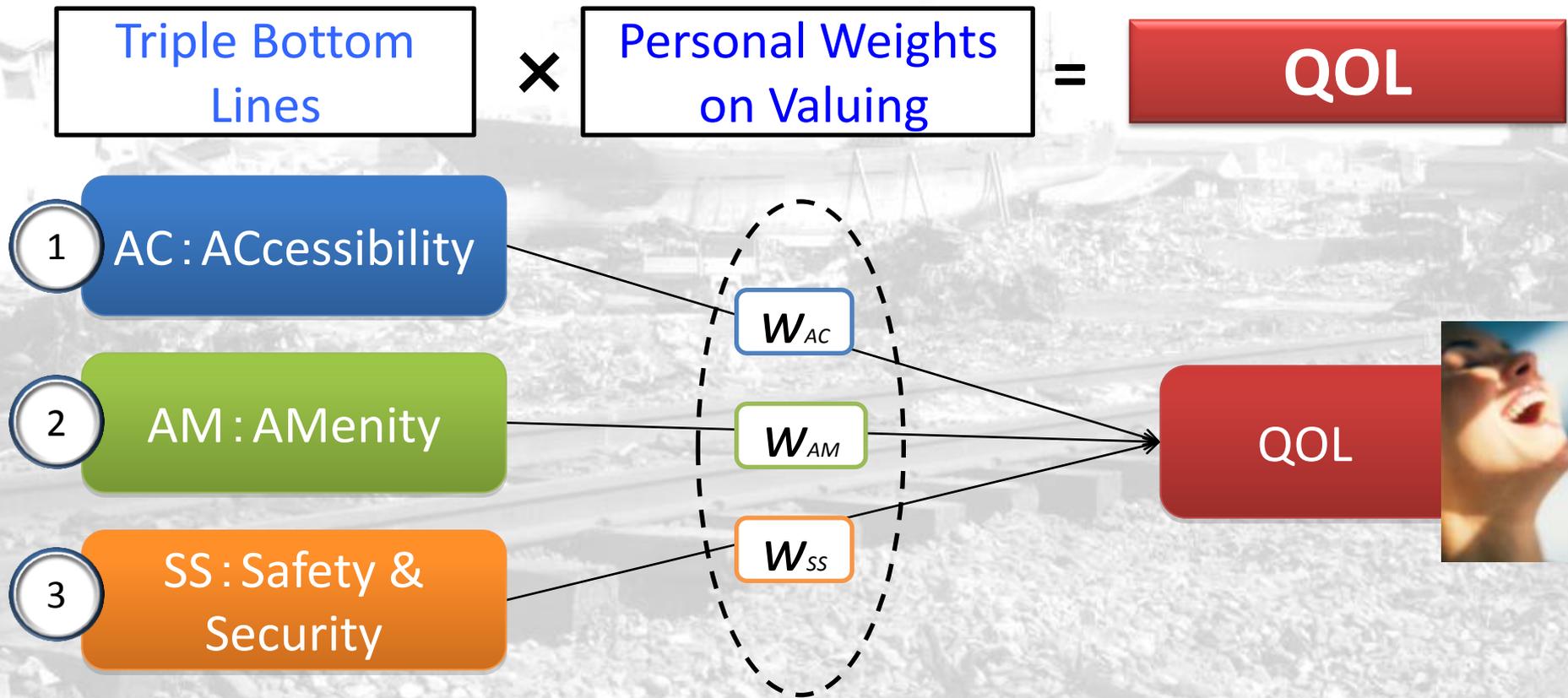


- QOL indices are recovered from coast towards inner areas, after roads and facilities were re-open
- Areas of QOL stage 2 are bigger than flooding areas from tsunami at 3/31 and 4/11



What is QOL ?

Well-Being consisting of Triple Bottom Lines



An aerial photograph showing a large area of flooding. The water is murky and turbulent, covering a significant portion of the landscape. In the foreground, there are some trees and a road. In the background, there are buildings and a large parking lot filled with cars. The text is overlaid in the center of the image.

**Recognizing
the Great East Japan Earthquake
as *Natural* and *Social* Disasters**

Yes in Hayashi - Nagoya - Wm. Aki-ball 2011

Source: New York Times Homepage <http://www.nytimes.com/>

Changes in *Nature* and *Social Acceptability*

Climate Change /
Earth Crust Movement

Nuclear Family/ Ageing/
Urban Sprawl

Increasing Natural
Disaster Risk

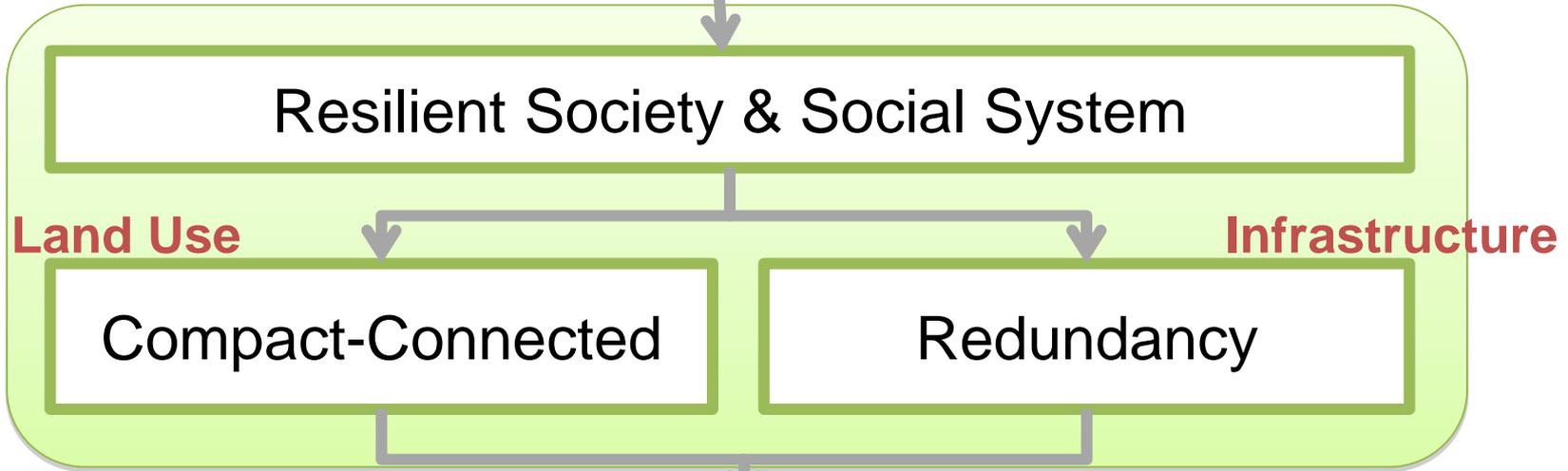
Community without
Cooperations

higher

Miss-match!

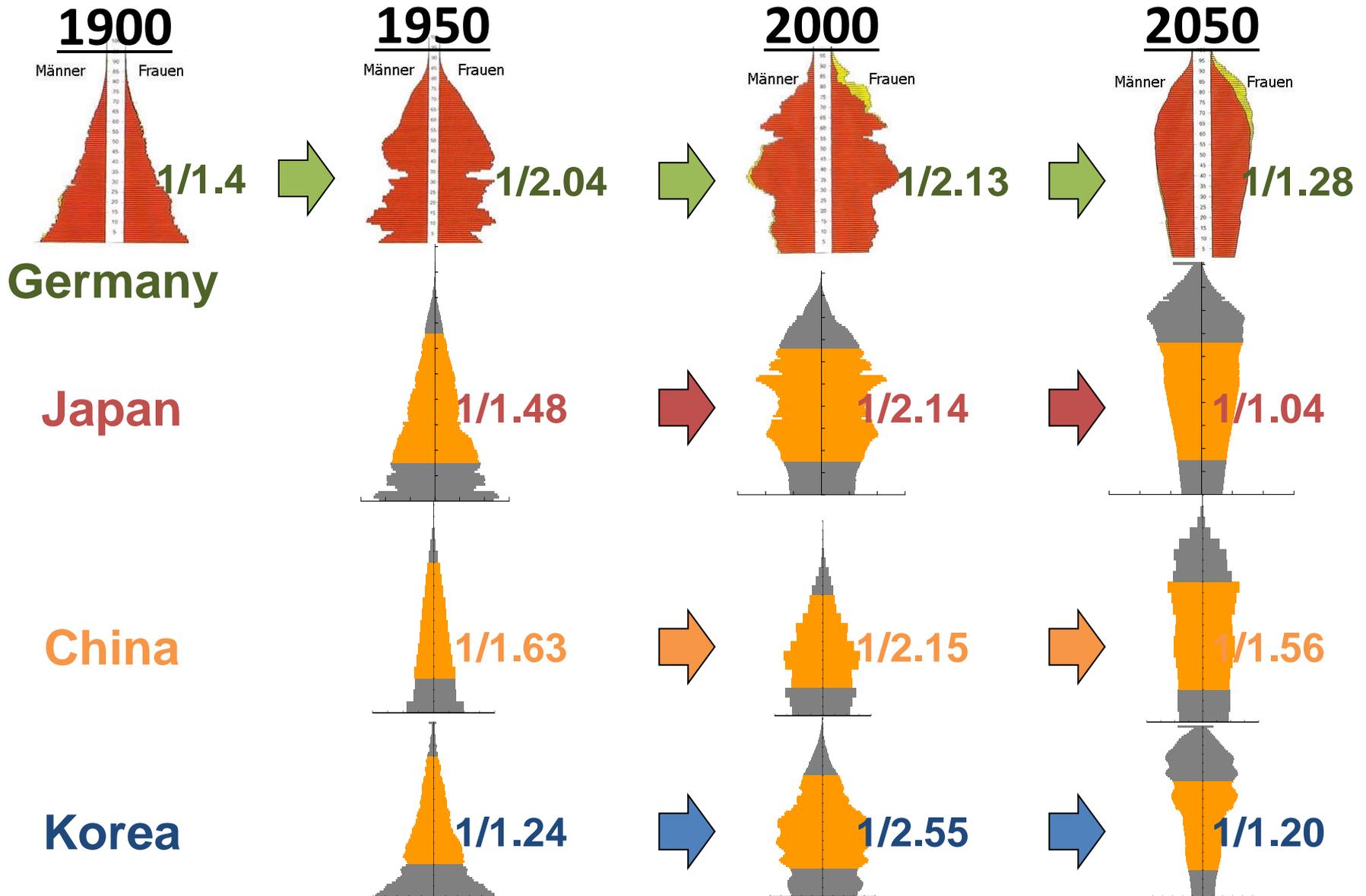
weaker

Increasing **Vulnerability** in Future Generation



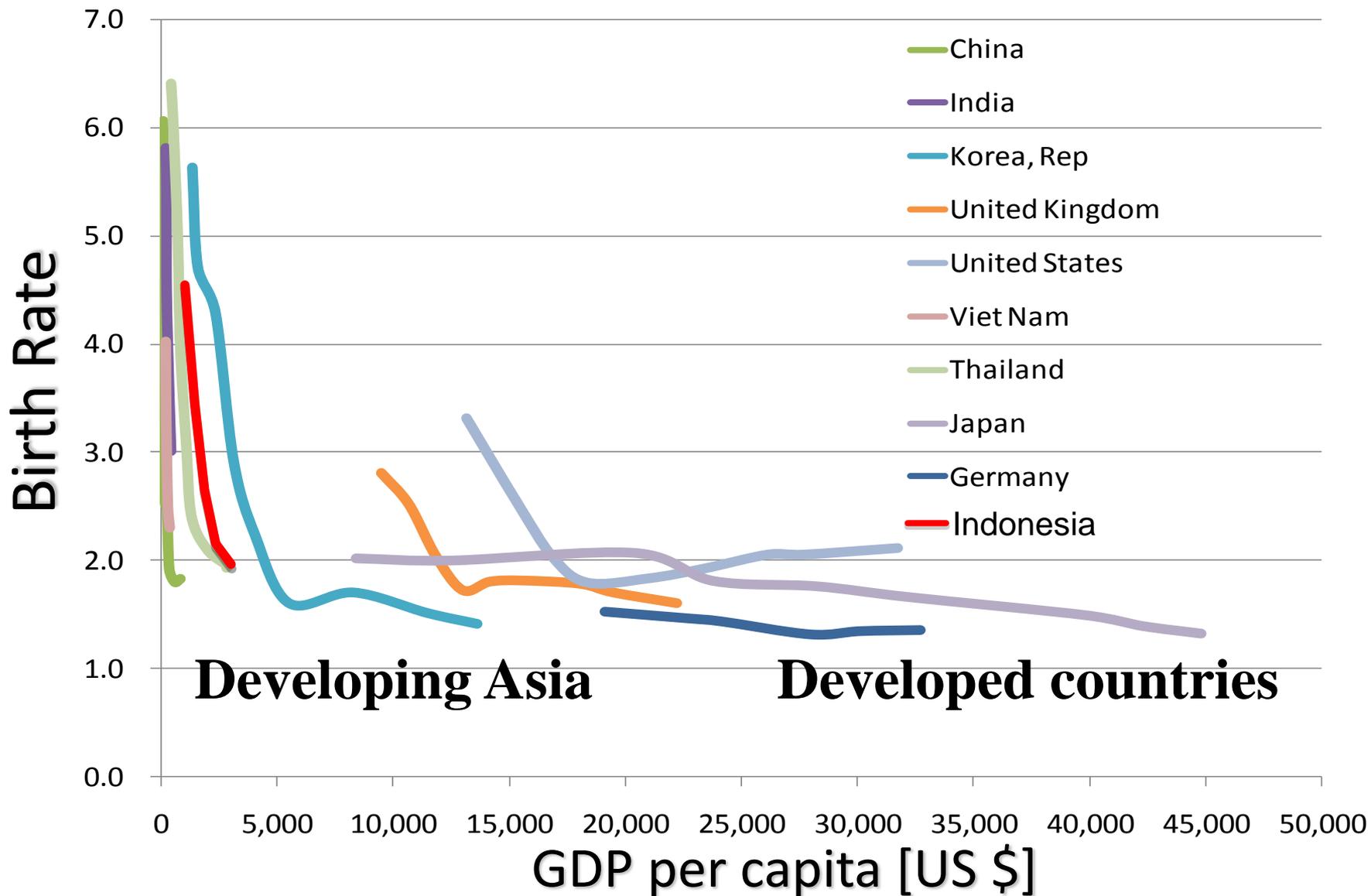
Maintain and improve the level of QOL

Aging (Growth → Maturity → Shrink)



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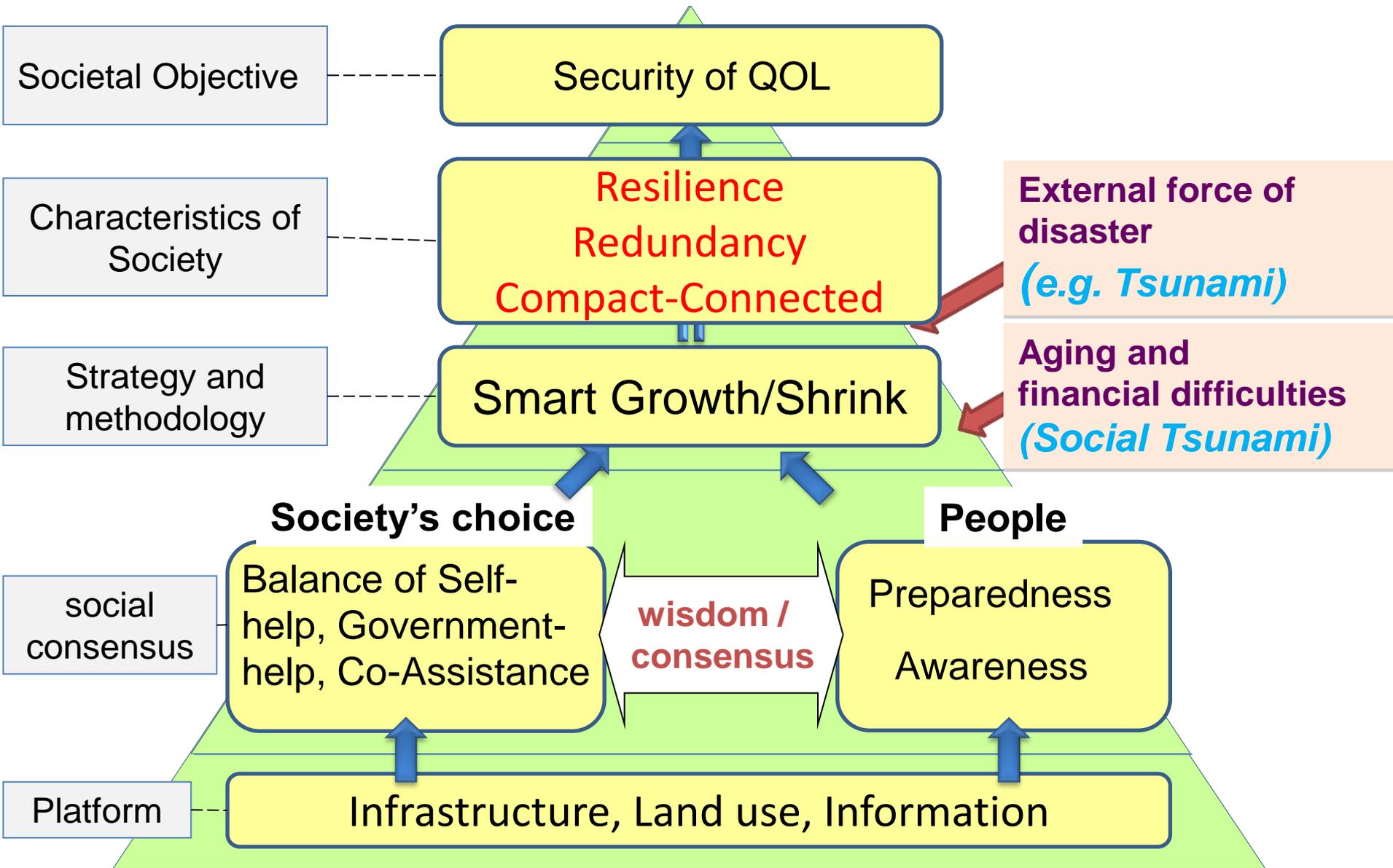
Vulnerability of Asian Society: Aging



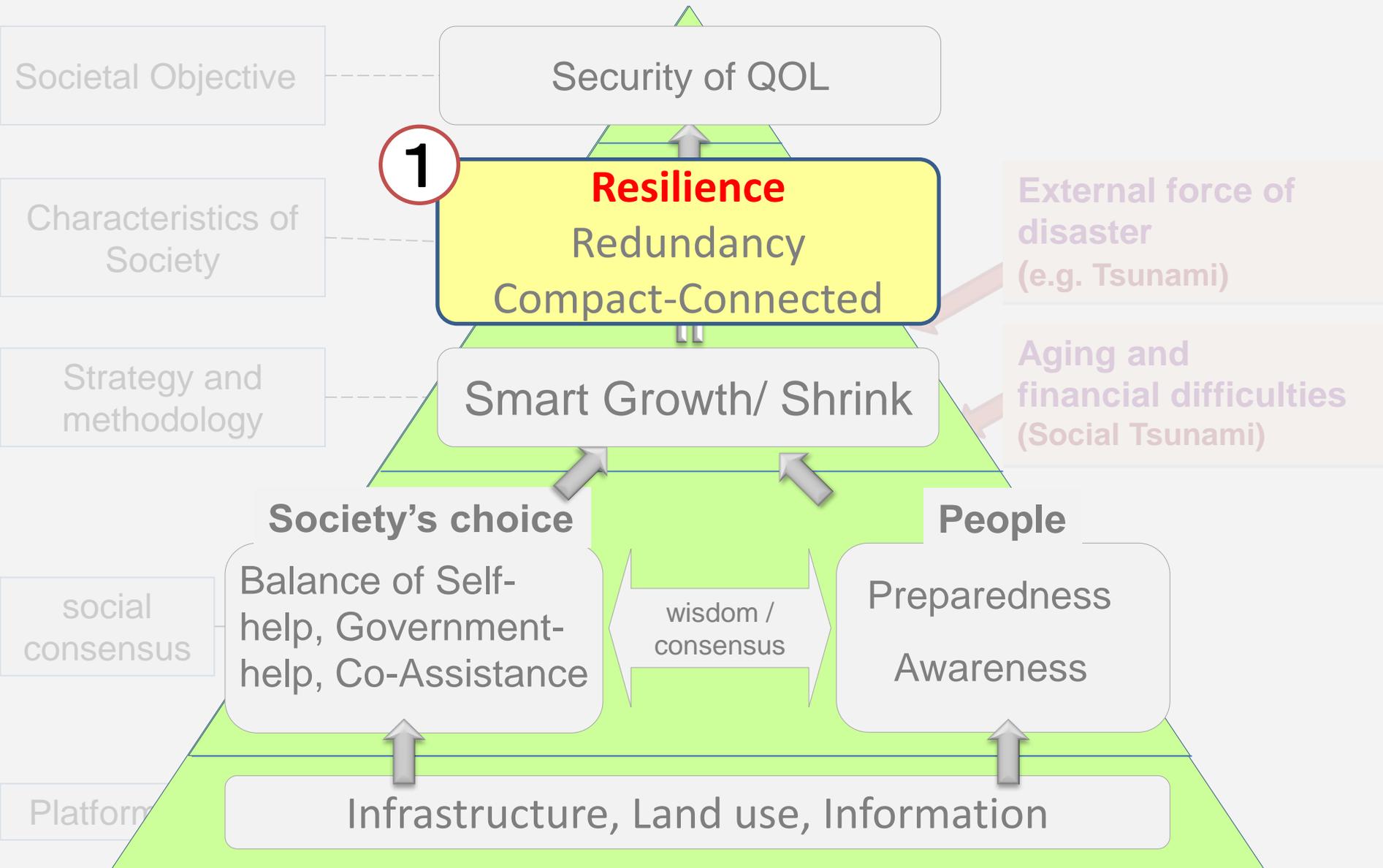
An aerial photograph showing the aftermath of a tsunami. The landscape is a vast, flat expanse of brown mud and debris, with scattered remains of buildings and structures. In the background, there are green mountains and a body of water. The text "Requirements for Resilient Cities and Community" is overlaid in yellow.

Requirements for Resilient Cities and Community

Resilient Cities and Community



Resilient Cities and Community



Seawalls in Taro, Miyako resilient?

Old levee (avoid)



New levee (directly opposing) → broken

Tsunami



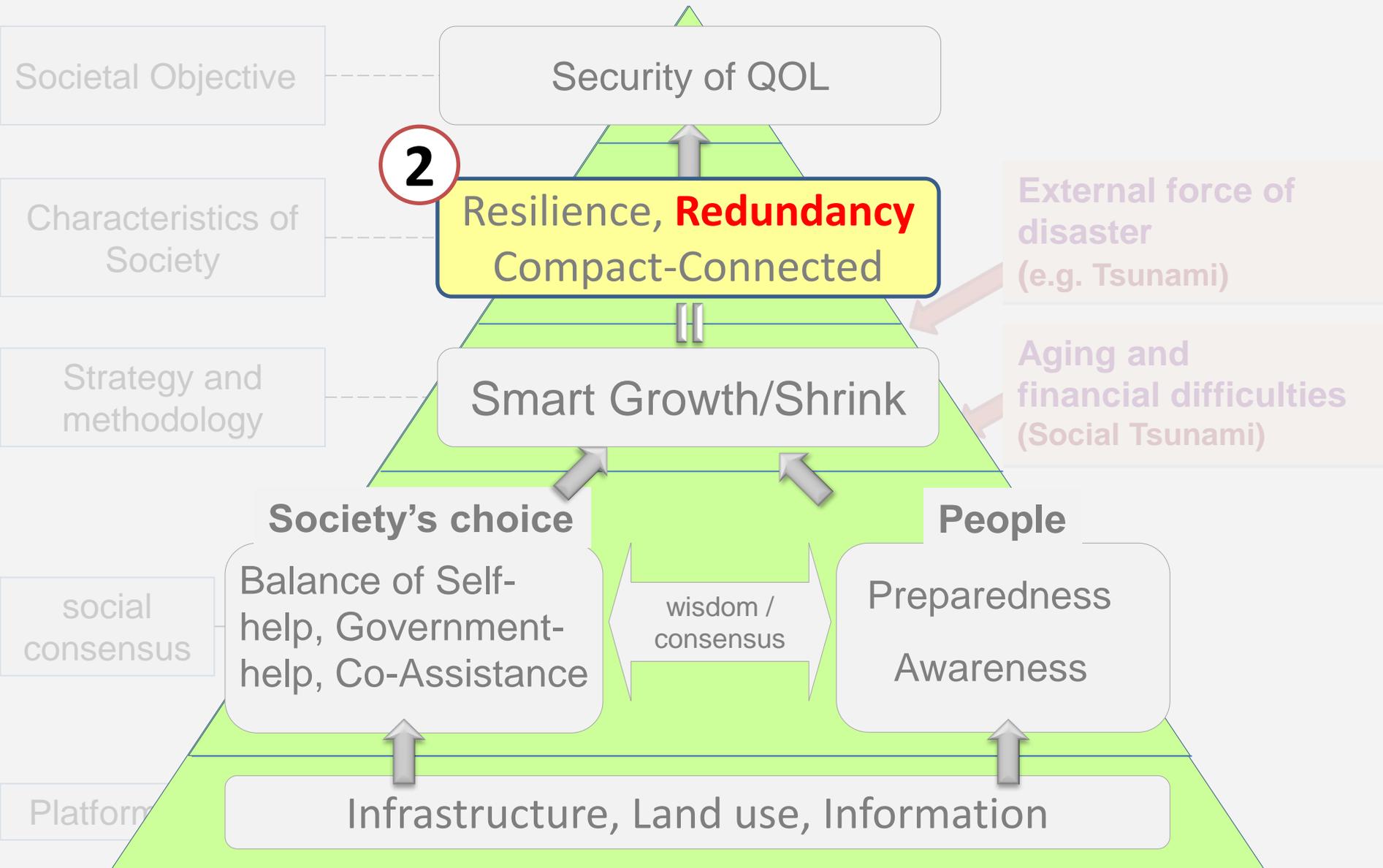
Eastern Sendai Motorway played a second levee

Eastern Sendai Motorway

Importance of infrastructure Alignment



Resilient Cities and Community



Failure of emergency mode

(Heavy traffic jam in Route 43
at the Great Hanshin-Awaji Earthquake)

Rescue team could not pass
(Failure of soft measure)

Collapsed Expressway
(Failure of hard measure)



Source: MLIT, JAPAN

Yoshi Hayashi, Nagoya Uni, EST Bali 2013

Source : Kobe city

Failure of redundancy

(Express way network in Tohoku area)

Closure just after the earthquake (15:50 11 March)

Crack

(3) 東北自動車道 福島坂元IC～国見IC 土工部損傷状況 (3月12日撮影)
路面に亀裂と剥打ちが発生。



Bump

(2) 仙台東部道路・仙台港北IC～仙台東IC間 橋梁ジョイント損傷状況 (3月12日撮影) 橋梁の継ぎ目部分が斜めにずれて段差が発生。



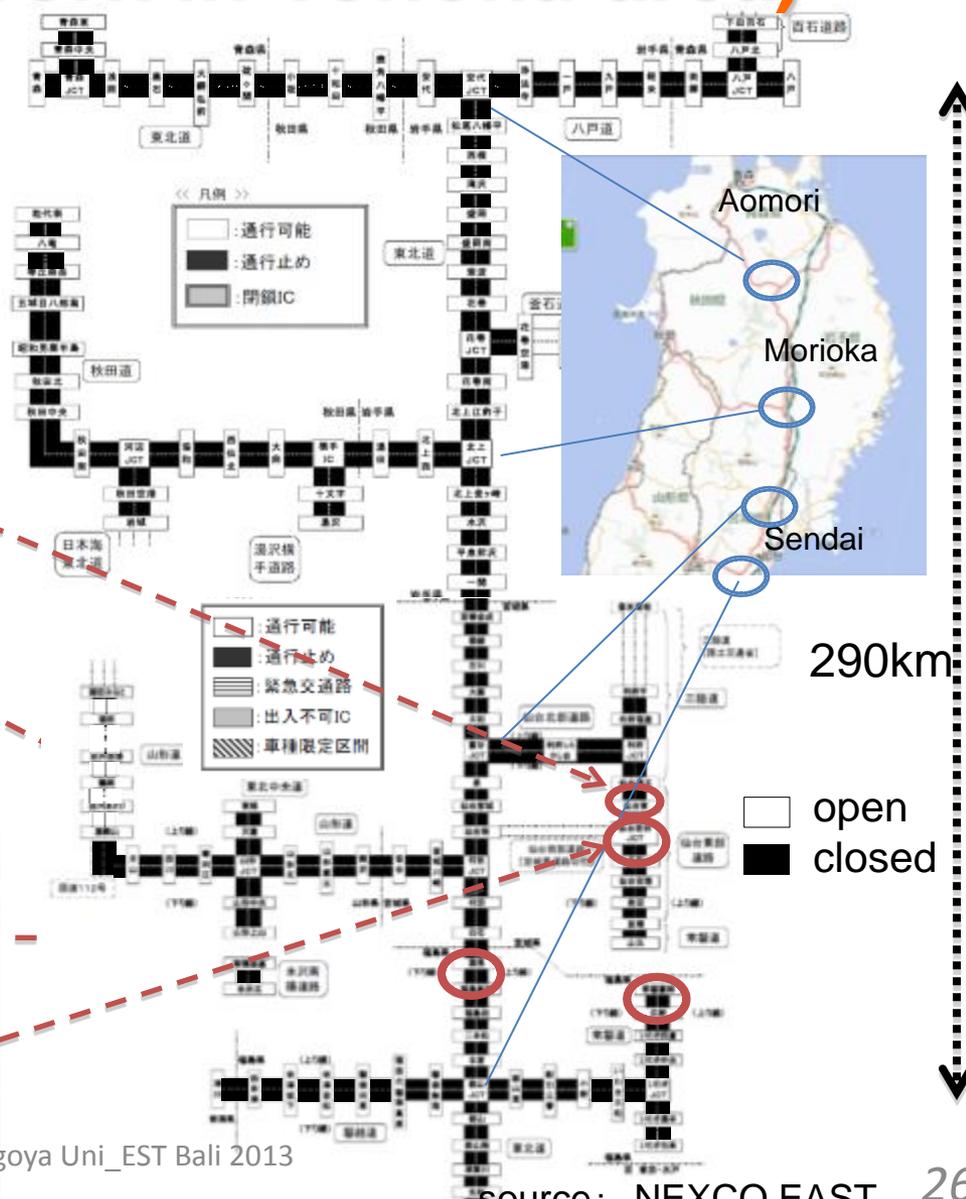
Subsidence

(4) 常磐自動車道 広野IC～常磐宮岡IC 土工部損傷状況 (3月12日撮影)
路面に陥没による段差が発生。

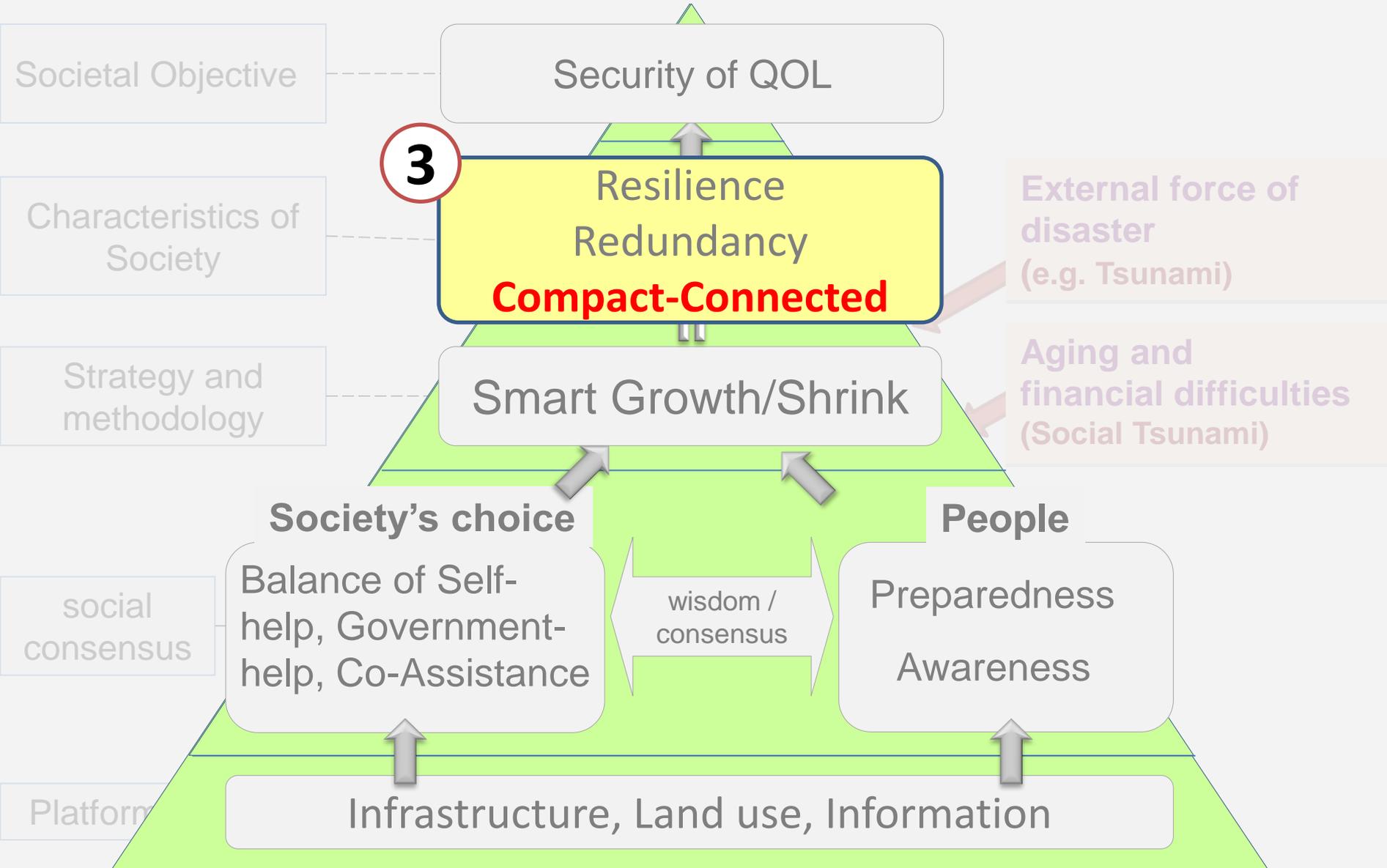


Debris

(1) 仙台東部道路・若林JCT 上下線ランプにおける被害状況 (3月12日撮影)
津波によって押し流された堆積物が上下線ランプに流入。



Resilient Cities and Community



Long term evacuation (case of move to higher ground)

Yoshihama,
Minamisanriku



No victims

Moved to a Hill

Tsunami flood area

Regeneration of social bonds(Shanghai)



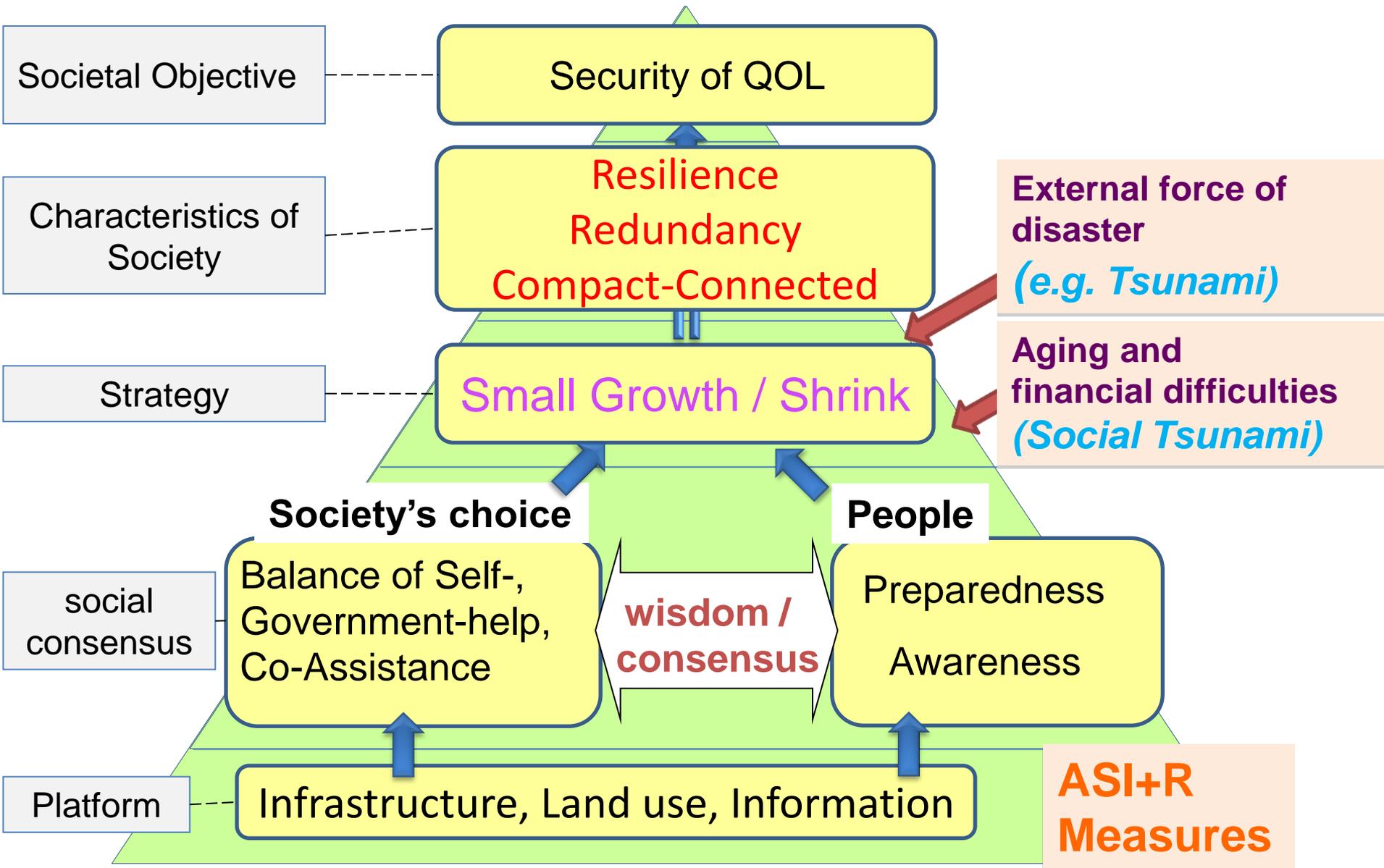
EST Strategy – Policy/Techno Instruments

CUTE Matrix		Strategy		
		Avoid	Shift	Improve
		Reduce traffic demand	Reduce emissions per unit transported	Reduce emissions per kilometer
Instruments	Technology	<ul style="list-style-type: none"> ■ Pedestrian Ort Dev't ■ Bicycle Ort Dev't ■ Transit Ort Dev't 	<ul style="list-style-type: none"> ■ Integrated Public Transport System (BRT+ParaTransit) ■ Highly Competitive Railway 	<ul style="list-style-type: none"> ■ LEV, EV ■ Alternative Energy ■ Advanced Infra- Tech ■ Logistic Efficiency
	Regulation	<ul style="list-style-type: none"> ■ TDM ■ Parking Regulation ■ Compact/Mix Land Use 	<ul style="list-style-type: none"> ■ Bus/Tram Priorities ■ Non-MT ■ Smarter Modal Evolution 	<ul style="list-style-type: none"> ■ Emission Standard ■ Top Runner Program ■ Eco-Drive
	Information	<ul style="list-style-type: none"> ■ ICT ■ Telework ■ Smart Choices for Workplace and Schools 	<ul style="list-style-type: none"> ■ Awareness Campaign 	<ul style="list-style-type: none"> ■ Knowledgebase ■ ITS ■ Labeling of Vehicle Performance
	Economic	<ul style="list-style-type: none"> ■ Fuel Tax ■ Road Pricing ■ Car Charge / Fee ■ Location Subsidy 	<ul style="list-style-type: none"> ■ Fuel Tax ■ Road Pricing ■ Car Charge / Fee 	<ul style="list-style-type: none"> ■ Fuel Tax ■ LEV Preferential Tax

(ASI+) Disaster Resilient Strategies

- Standardization
- Back-up
- Co-benefit
- Connectivity
- Smart Growth / Shrink

Resilient Cities and Community



Earth (Community) is like a narrow “Cliff Top”

Environmental
Capacity

Collapse of cliff
= Excess human
activities causing
the
environmental
deterioration

-> Preserving the cliff
= Sustainability

-> Recovery form dropping
= Resiliency

