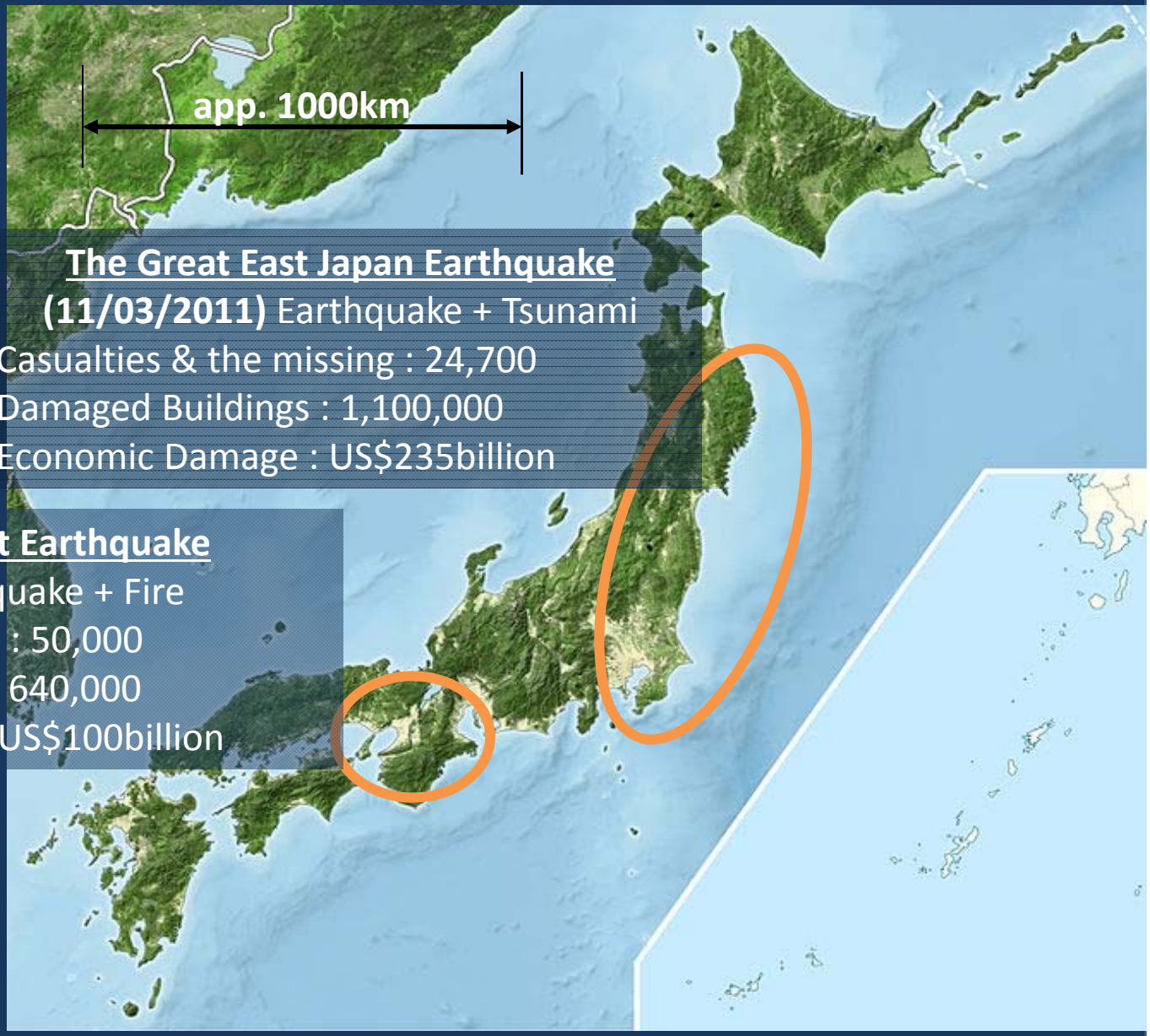
JAXA A/I M4/18
Recovery Observation
- Sentinel Asia -

Michio Ito (Mr.)
Satellite Applications and Operation Center (SAOC)
Japan Aerospace Exploration Agency (JAXA)
ito.michio@jaxa.jp

JAPAN

Area :
App. **380,000 sq.km**
Population :
App. **128,000,000**
Islands :
App. **6,850**
GDP :
US$6,000billion



The Great East Japan Earthquake
(11/03/2011) Earthquake + Tsunami
Casualties & the missing : 24,700
Damaged Buildings : 1,100,000
Economic Damage : US$235billion

Hanshin-Awaji Great Earthquake
(17/01/1995) Earthquake + Fire
Casualties & Missing : 50,000
Damaged Buildings : 640,000
Economic Damage : US$100billion

The Hanshin-Awaji Great Earthquake(1995)

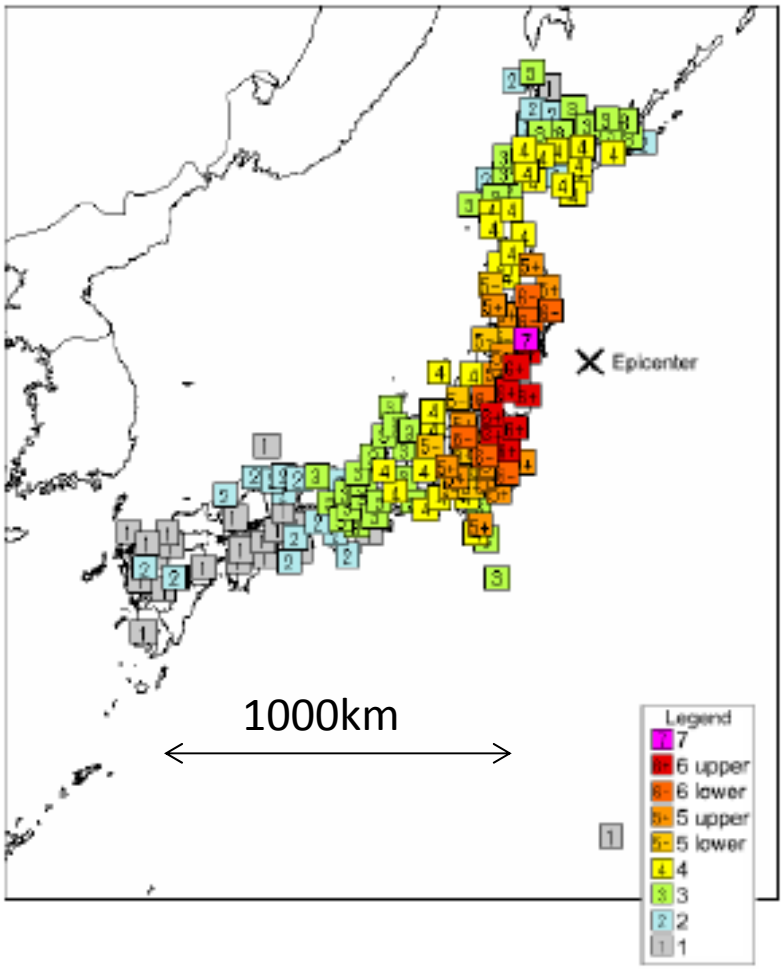
- **5:46AM(JST), 17 January 1995, M7.3, North of Awajishima Island, Hyogo Prefecture, 16km depth epicenter**
- **Death: 6434, Injured: 43792, Missing: 3, Number of evacuated people: 316678**
- **Totally Collapsed Buildings: 104,906、Half Collapsed Buildings 144,274、Partially damaged buildings: 390,506**
- **Fire damaged :8969 families**
- **Road damage :7245 points、Bridge damage 330 points、Railway damage 774points、Landslides 347**
- **Estimated economic cost damage: a order of US$100billion**

The Great East Japan Earthquake (2011)

- **14:46 JST 11 March 2011. M9.0 70km east of Oshika Peninsula, 30km depth epicenter.**
- **Death:15,883, Injured: 6,144, missing: 2,676 (As of 12 Sep. 2012)**
- **Totally collapsed building:129,225, half collapsd:254,204 partially damaged 691,766**
- **Level 7 melt dawn of Fukushima Daiichi nuclear power plant and Residents within 20km radius of the nuclear power plant evacuated.**
- **The WB estimated economic cost damage was US$235billion, making it the costliest natural disaster in world history.**

The 2011 off the Pacific coast of Tohoku Earthquake

Distribution of JMA Seismic Intensity

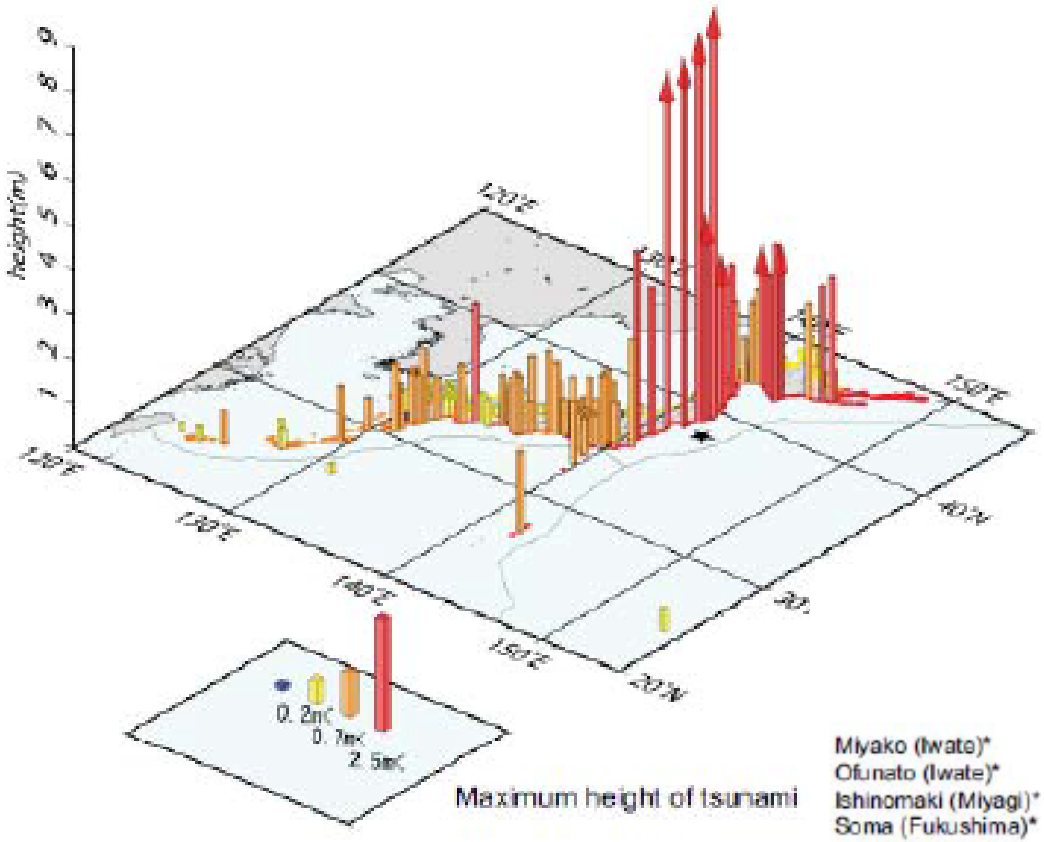


http://www.jma.go.jp/jma/en/Activities/intsummary.pdf

The 2011 off the Pacific coast of Tohoku Earthquake

Observed Tsunami

http://www.jma.go.jp/jma/en/2011_Earthquake/2011_Earthquake_Tsunami.pdf



Maximum height of tsunami

Observed Tsunami (time and height)

	First tsunami	Maximum height of tsunami
Miyako (Iwate)*	March 11, 14:48 JST +0.2m	March 11, 15:26 JST +8.5m<=
Ofunato (Iwate)*	March 11, 14:46 JST -0.2m	March 11, 15:18 JST +8.0m<=
Ishinomaki (Miyagi)*	March 11, 14:46 JST +0.1m	March 11, 15:25 JST +7.6m<=
Soma (Fukushima)*	March 11, 14:55 JST +0.3m	March 11, 15:51 JST +9.3m<=
Oarai (Ibaraki)	March 11, 15:15 JST +1.8m	March 11, 16:52 JST +4.2m
Kamaishi (Iwate)*	March 11, 14:45 JST -0.1m	March 11, 15:21 JST +4.1m<=
Mutsu (Aomori)	March 11, 15:20 JST -0.1m	March 11, 18:16 JST +2.9m
Nemuro (Hokkaido)	March 11, 15:34 JST slight	March 11, 15:57 JST +2.8m
Tokachi (Hokkaido)*	March 11, 15:26 JST -0.2m	March 11, 15:57 JST +2.8m<=
Urakawa (Hokkaido)	March 11, 15:19 JST -0.2m	March 11, 16:42 JST +2.7m

* Maximum height of tsunami cannot be retrieved so far due to the troubles.
Actual maximum height might be higher.

10-year recovery plan of Miyagi Prefecture, Japan

2011-2013 restoration phase

Restore infrastructure and livelihood

2014-2017 regeneration phase

Regenerate economic and social activities

2018-2020 Development phase

Develop and revitalize more resilient health, social and economic structure

2011.3

2012.3

2013.3

http://dailynewsagency.com/2013/03/08/japan-two-years-post-tsunami-3n9/

What is recovery from the damage?

- Restoration of the facilities and infrastructures
- Redevelop and revitalize the health, social, economic, natural and environmental fabric
- Building more resilient cities and communities

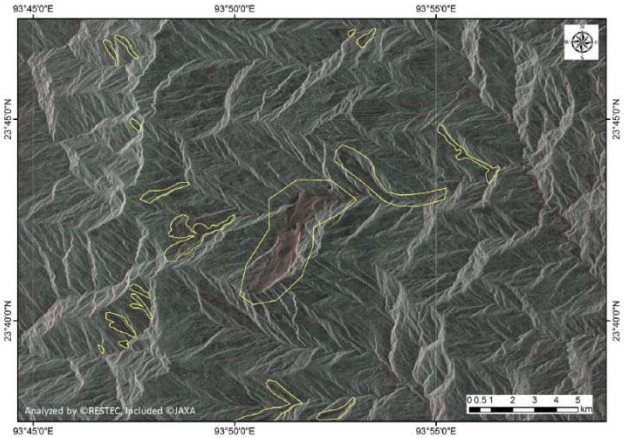
How can Sentinel Asia support recovery operation from space?

- Periodic satellite **monitoring** of long term **restoration process** of the damaged city or the area
  - Open Street Map such as **Google Earth** can be harnessed (**No need** to be supported by **Sentinel Asia**)
- Provide geographic information of disaster affected area for redevelopment and revitalization (**Sentinel Asia** Applicable)

(Continued)

- To provide geographic hazard information to support **recovery planning** and/or hazard mapping
  - Archived data of emergency observation can be used (**Sentinel Asia** Applicable)

Sentinel Asia observed landslides in Myanmar in August 2015

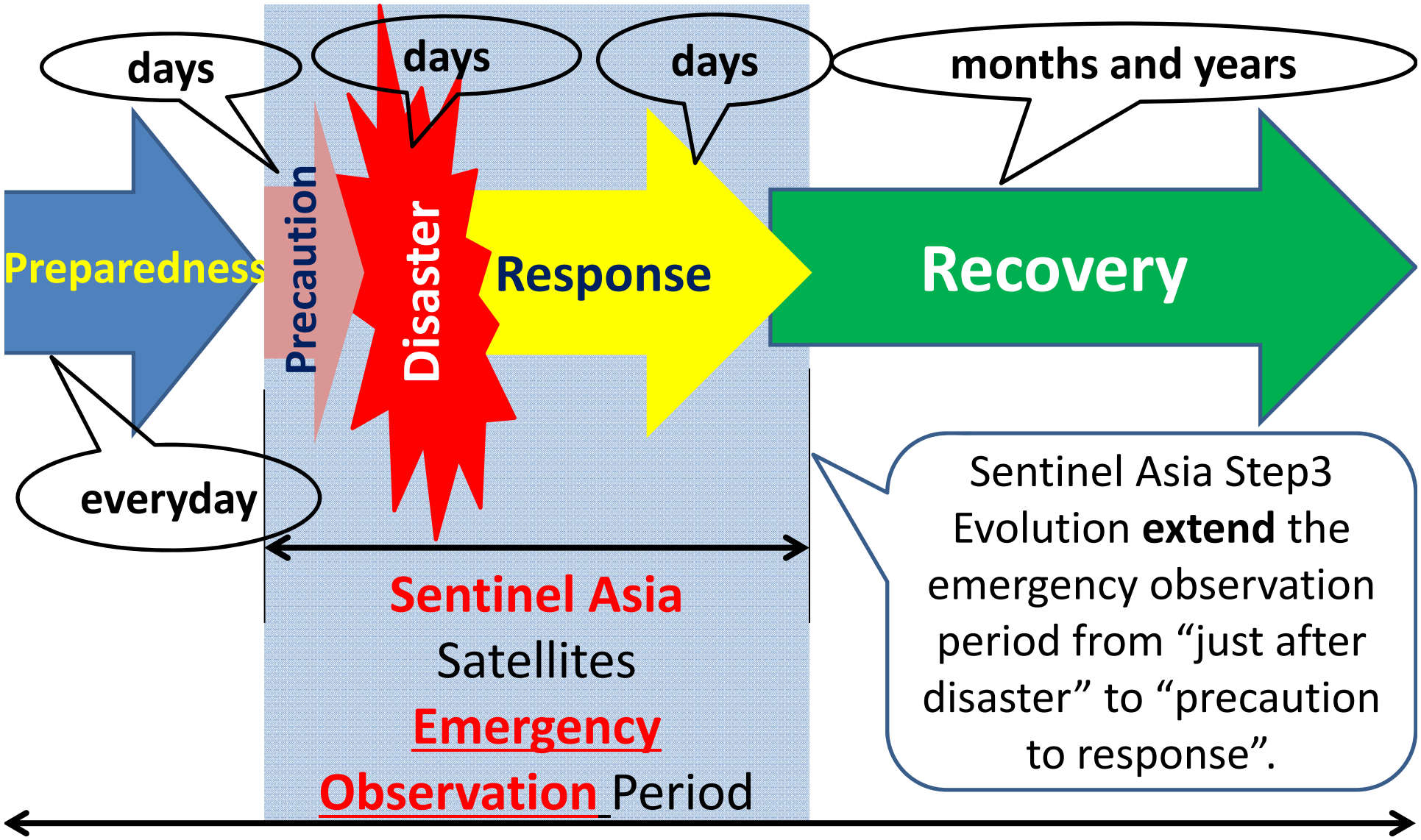


(example)

ALOS-2 PALSAR-2 observation detected 52 landslides in Chin state

Ministry of Social Welfare, relief and Resettlement of the Republic of the Union of Myanmar is developing resettlement hazard map using the provided information

Sentinel Asia Emergency Observation Strategy



Sentinel Asia supports full cycle of disaster management

Thank you very much for your kind attention !