Integrated Application of Earth Observations for Disaster Risk Reduction

The international cooperation project and how it supports the SFDRR monitoring

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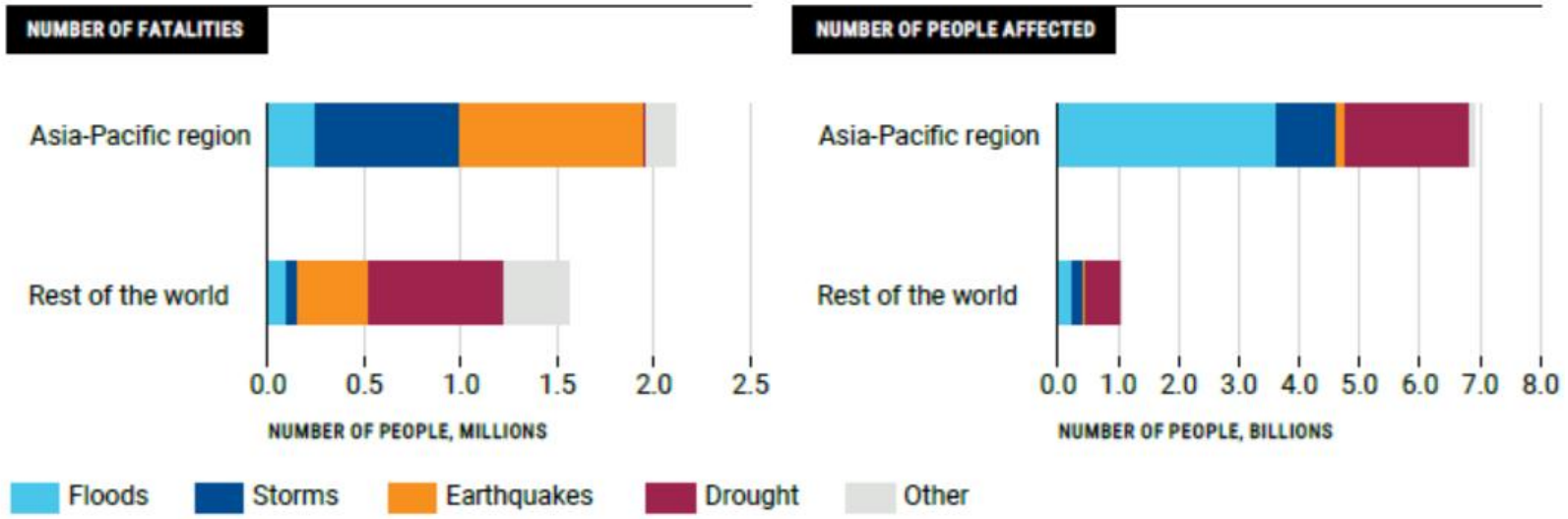
CONTENTS

Background-Demand

Natural disasters are a common challenge facing all countries in the world. Asia is the most serious affected region of high risk of disasters and heavy losses.

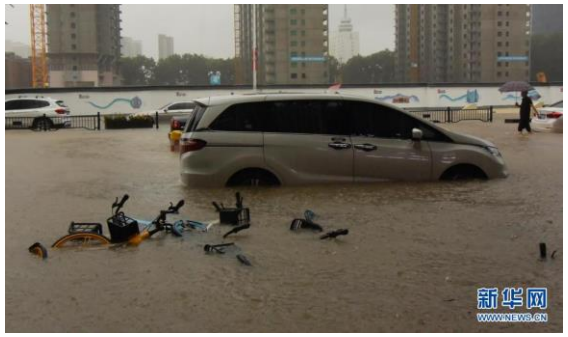
In China, according to statistics, natural disasters affected 94.9 million people, 792 people are missing or lost life in the past three quarters of 2021. (Source: website of Ministry of Emergency Management, PRC)

FIGURE 1-1 Number of fatalities and people affected in the Asia-Pacific region and the rest of the world, 1970–2020



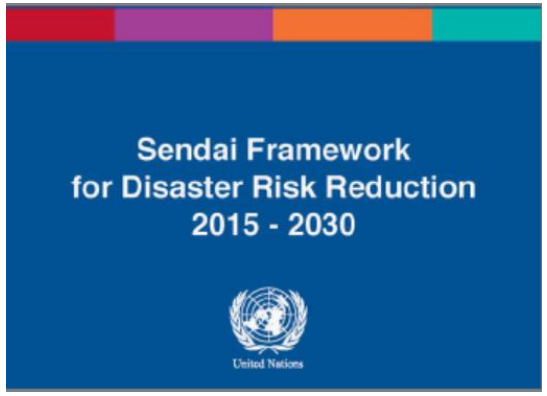
Source: Data from EM-DAT – The International Disaster Database. Available at https://www.emdat.be/ (accessed on 4 May 2021).

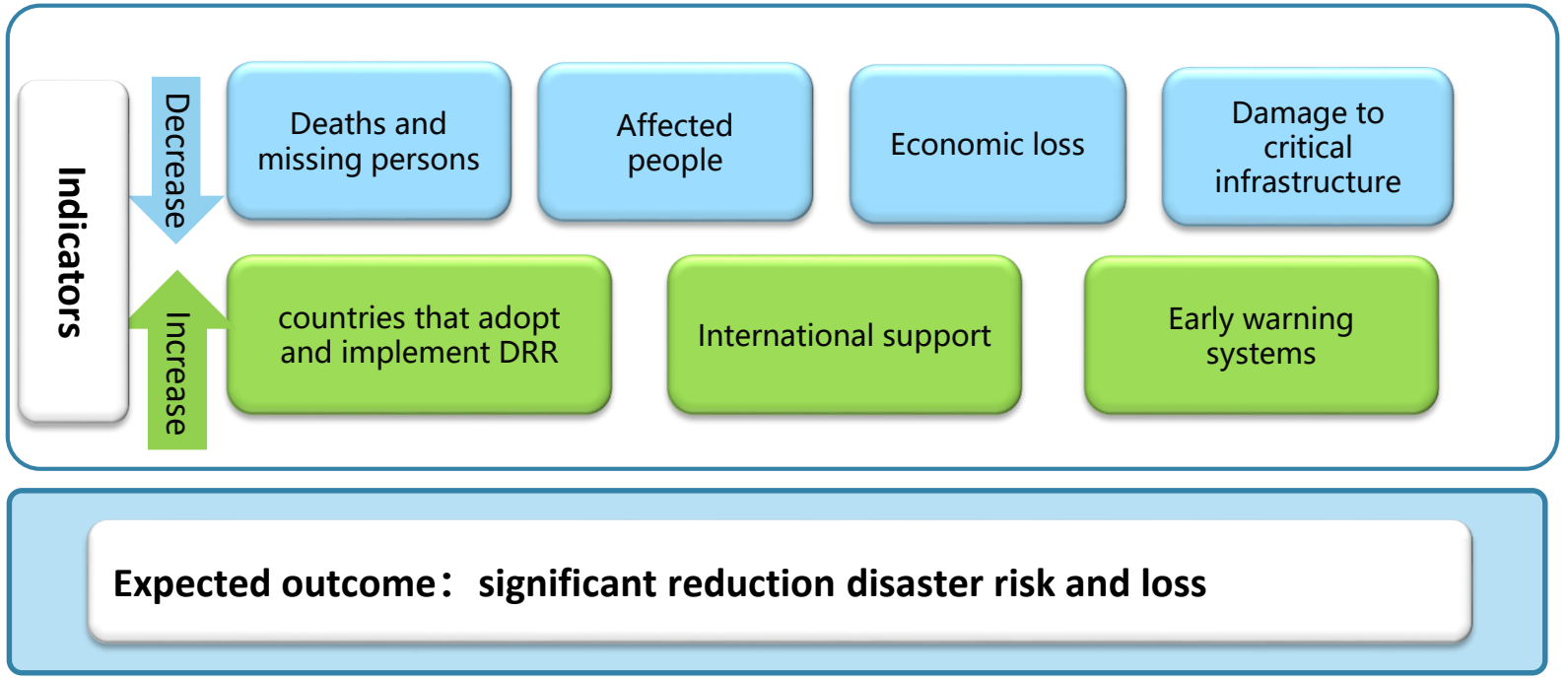
Source: Asia-Pacific Disaster Report 2021 | ESCAP (unescap.org)



Background-Demand

Sendai Framework for Disaster Risk Reduction 2015-2030 was endorsed by member countries of UN as one of the most important global frameworks, and disaster reduction becoming a priority area for international cooperation.

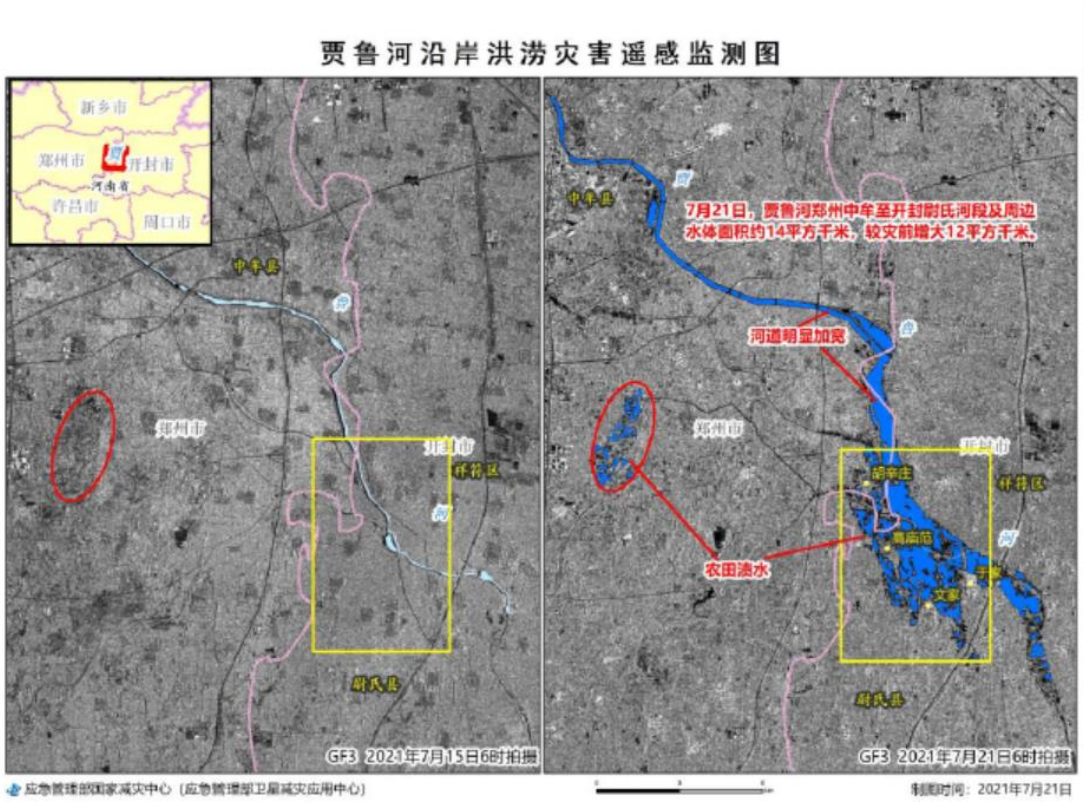


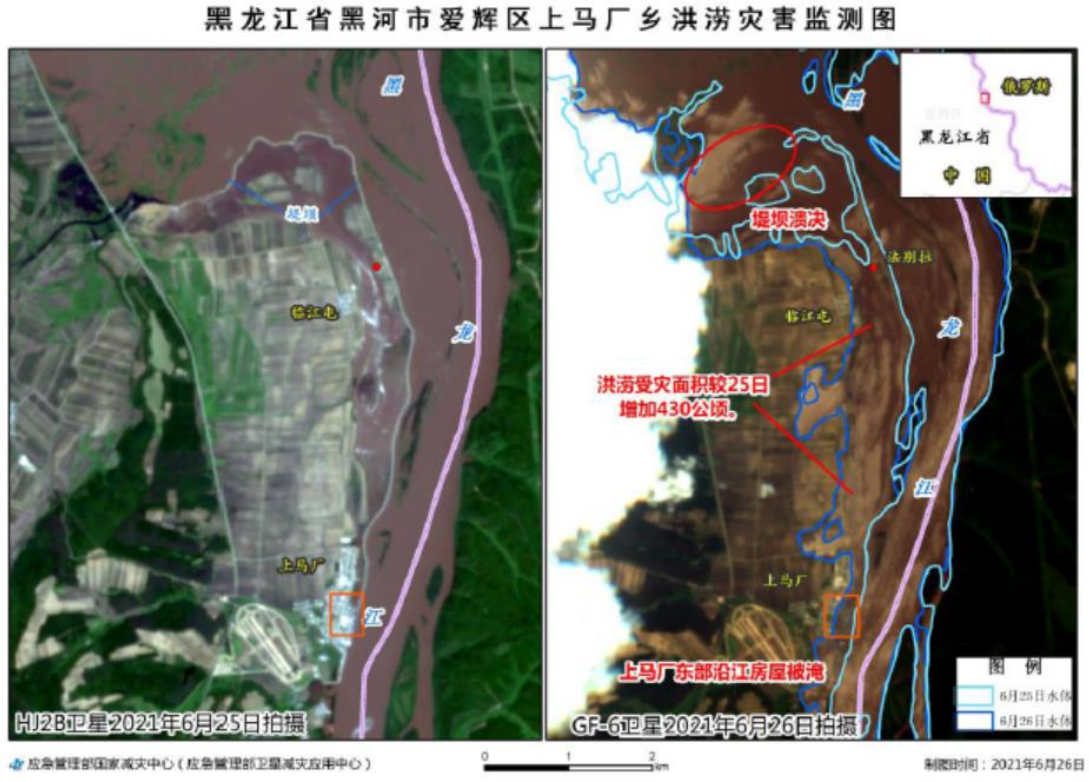


Source: Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR

Background-Capacity of Space-based technology

Space-based technology play an important role in supporting disaster risk reduction, response and relief efforts. At present, EO data acquisition, processing, product development, and related service mechanism have been developed and operational to support the entire process of disaster management.





Background-Cooperation basis

Chinese EO satellites and the main parameters for Charter

Satellite	Sensor	Resolution
CBERS-02B	CCD	20m
	Wide field imager(WFI)	258m
SJ-9A	Multi-spectural camera	2.5m(Pan)
		10m(Multi-spectual)
GF-1	Multi-spectural camera(PMS)	2m(Pan)
		8m(Multi-spectual)
	Multi-spectural camera(WFV)	16m
GF-2	Multi-spectural camera(PMS)	0.8m(Pan)
		3.2m(Multi-spectual)
GF-3	SAR	1-500m
GF-4	Multi-spectural camera	50m(VNIR)
	camera(Geostationary Orbit)	400m(MWIR)

Disaster Monitoring Satellite 2A and 2B

Multi-spectral CCD(16m), hyper-spectral imager and infrared camera

Objectives

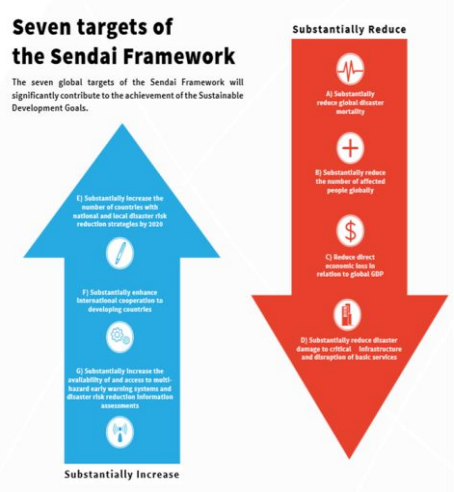
Project：Integrated Application of Earth Observations for Disaster Risk Reduction

(Collaborate with UN-SPIDER, Funded by MOST, PRC)

Form an index system of using earth observation to support Sendai framework

Form an approach of index monitoring

Strengthen capacity of institutional capacity at national level



- **An index system**
- **An technical system**
- **Application platform**
- **Demonstration application in 3 countries**

Source: Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR

Expected outcome

An index system

- 3 types of disaster, flood, typhoon and earthquake
- 5 target indexes, dead and missing persons, people affected by disasters, direct economic losses, damage to infrastructure, and evaluation on disaster risk monitoring and early warning application

An technical system

- element extraction based on artificial intelligence
- Assessment of loss indicators for disaster reduction

Application platform

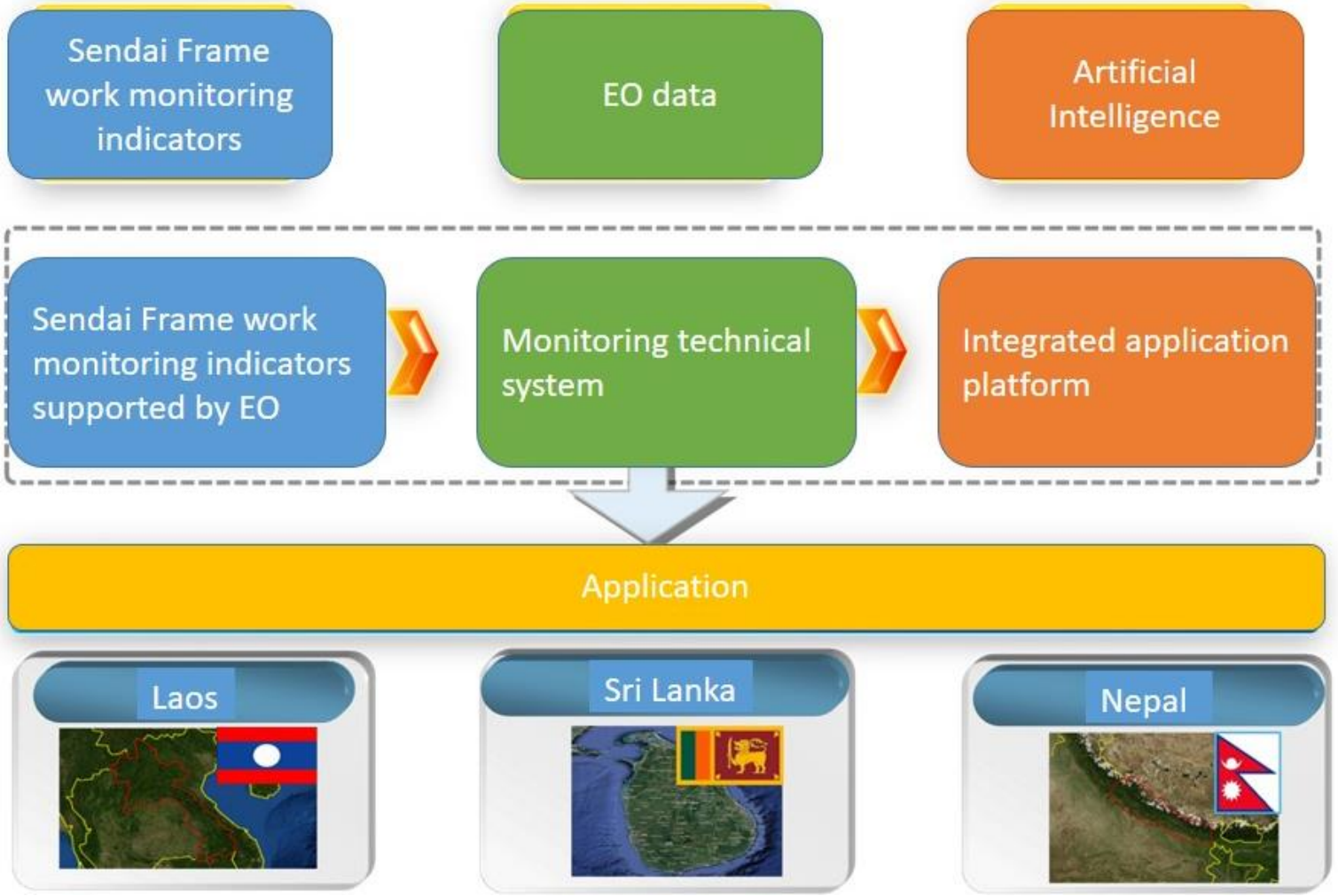
- 12 types of data collection and 5 integrated methods
- 2/3 dimensional display and comprehensive analysis

Demonstration application in 3 countries

- Laos, Sri Lanka and Nepal

Approach

Project:
Integrated Application of EO technology for Sendai Framework for Disaster Risk Reduction



Approach

Research on monitoring indexes of using earth observation to support Sendai framework

（1）Demand and capacity analysis

（2）Index optimization

Research on technical system

（3）Element extraction using AI technology

（4）Comprehensive analysis using big data

（5）Deduction for incomplete data

Establish an application platform

（6）Data aggregation and model integration

（7）Application system development

Demonstration application

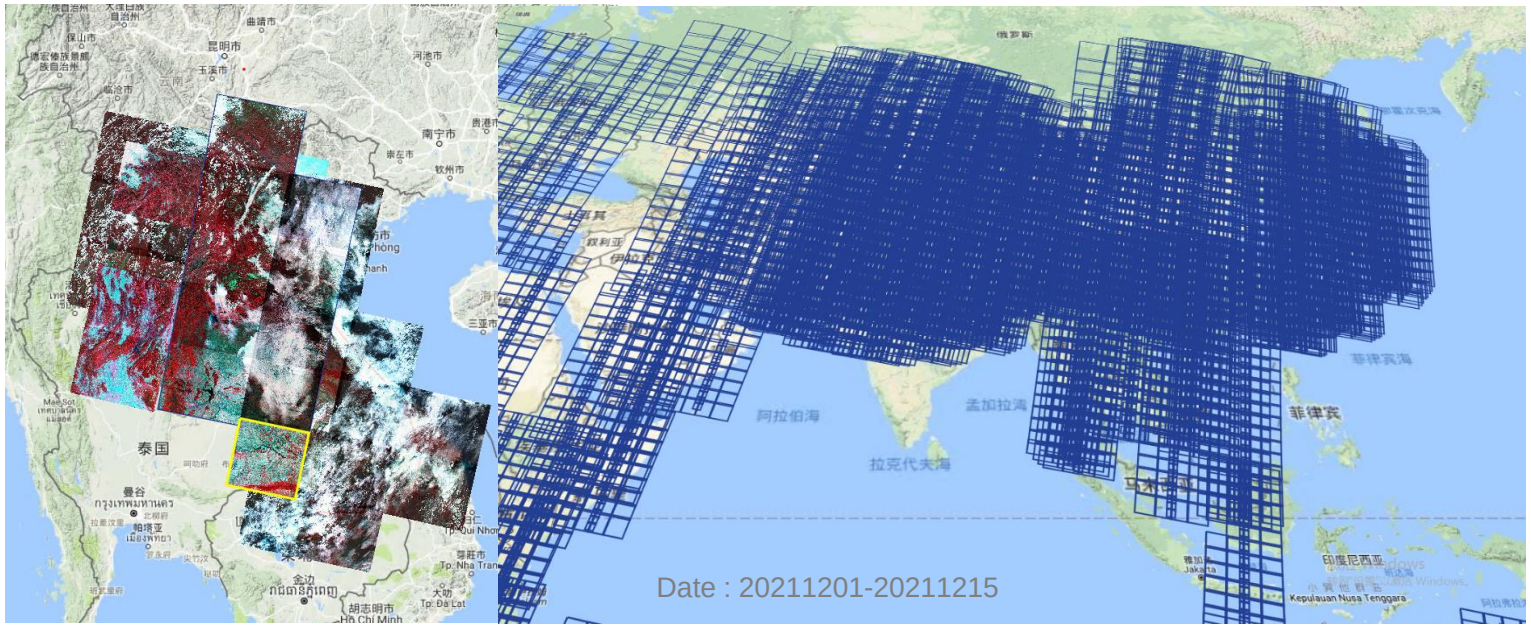
（8）Flood risk and loss index monitoring(Laos)

（9 ）Typhoon risk and loss index monitoring (Sri Lanka)

（10 ）Earthquake loss index monitoring (Nepal)

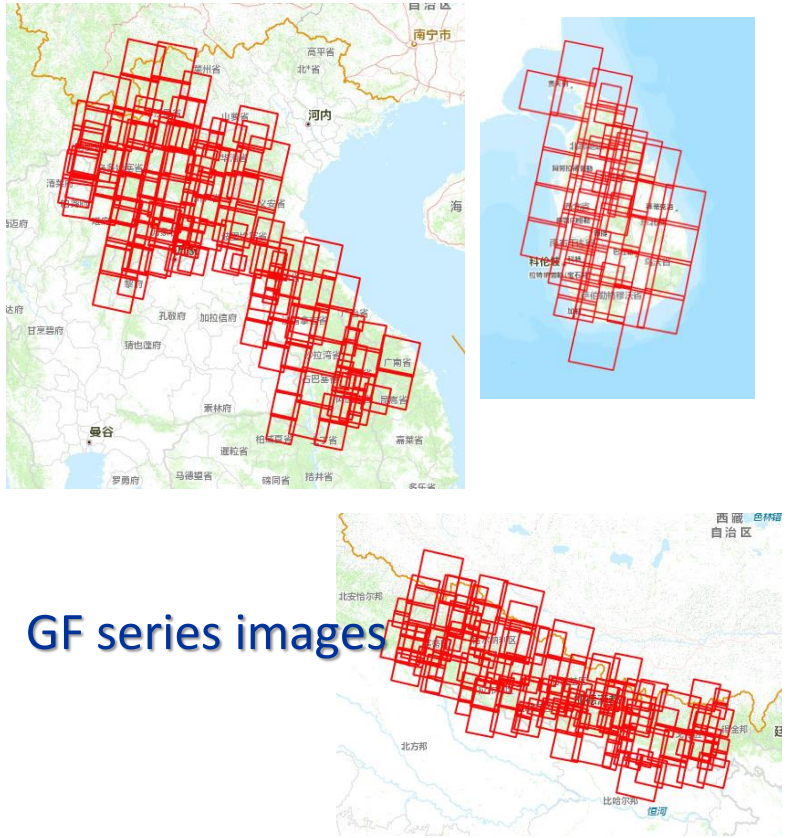
Work basis

-- Data: **EO data; other open source data**



Disaster Monitoring Satellite 2A and 2B

Multi-spectral CCD(16m), hyper-spectral imager and infrared camera



GF series images

Work basis

--EO technology for SFDRR **Index analysis:** available EO resources; form an index system of using EO to support Sendai framework

Index sequence	Name of Index	Typhoon	Earthquake	Flood	Support	Remark
B-3a	Number of damaged dwellings attributed to disasters	✓	✓	✓	Yes(Direct)	
B-3	Number of people whose damaged dwellings attributed to disasters	✓	✓	✓	Yes(Indirect)	B3=B3a*AOH，AOH=Pop/No.Family
E	Countries with national and local disaster risk reduction strategies by 2020				No	

… …

Work basis

--**Elements:** Extraction of 10 elements using AI from EO images for damage and loss assessment

--**E 1:** Structures

--**E 2:** Vegetable greenhouse

--**E 3:** Farmland

--**E 4:** Forest

--**E 5:** Oil tank

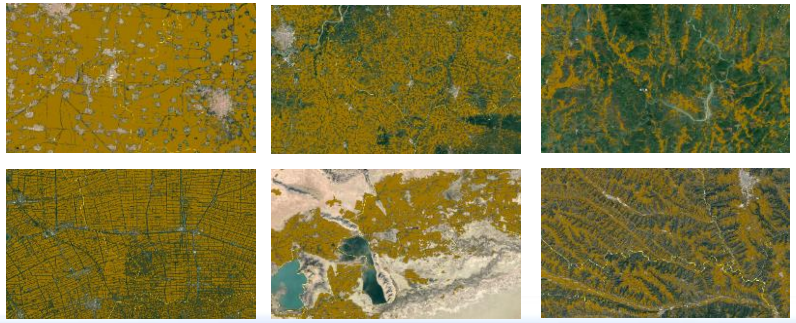
--**E 6:** Coal-fired power plant

--**E 7:** Outdoor track-and-field ground

--**E 8:** Airport

--**E 9:** Bridge

--**E 10:** Hydropower station



Work basis

--**Prototype**: Design for service platform

Next step

Collaborate with UN-SPIDER to leverage **Integrated Application of Earth Observations for Disaster Risk Reduction** and support SFDRR indexes monitoring

Thank you