Integrated Application of Earth Observations for Disaster Risk Reduction

National Disaster Reduction Center of China

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6 Remote Sensing for Türkiye Earthquake
Natural disasters are a common challenge facing all countries in the world. In China, according to statistics, natural disasters affected 95 million people, 691 people are missing or lost life in 2023. (Source: website of Ministry of Emergency Management, PRC)
What is the Sendai Framework?

- **Adopted** at the Third UN World Conference on Disaster Risk Reduction (March 18, 2015)
- **Endorsed** by the UN General Assembly (May 15, 2015)
- 15-year, voluntary, non-binding agreement with 4 Priorities for Action and 7 Global Targets

**Background - Sendai Framework for Disaster Risk Reduction**

**What is the Sendai Framework?**

**Scope:** The SFDRR applies to risk of small and large, frequent & infrequent, sudden & slow disasters caused by natural or manmade hazards across all levels.

**Expected outcome:** To substantially reduce existing disaster risk & losses in lives, livelihoods also economic, social, env, assets of persons business, community or country.

**Goals:** Prevent and reduce existing disasters through multiple measures to prevent, reduce hazard exposure & vulnerability to disasters & increase preparedness for response & recovery. Thus strengthen resilience.

Source: [Sendai Framework for Disaster Risk Reduction 2015-2030 | UNDRR](https://www.unisdr.org/)

What is the Sendai Framework?

**Priority 1: Understanding disaster risk**
Policies and practices for DRR should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment.

**Priority 2: Strengthening disaster risk governance to manage disaster risk**
Disaster risk governance at the national, regional and global levels is of great importance for an effective and efficient management of disaster risk.

**Priority 3: Investing in disaster risk reduction for resilience**
Public and private investment in DRR are essential to enhance the economic, social, health & cultural resilience of persons, communities, countries, their assets, as well as environment.

**Priority 4: Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction**
Strengthed disaster preparedness for response, recovery, rehabilitation and reconstruction are critical to build back better.

**Reduce**
- Mortality/
global population
  - 2020-2030 Average < 2005-2015 Average
- Affected people/
global population
  - 2020-2030 Average < 2005-2015 Average
- Economic loss/
global GDP
  - 2030 Ratio < 2015 Ratio
- Damage to critical infrastructure & disruption of basic services
  - 2030 Values < 2015 Values

**Increase**
- Countries with national & local DRR strategies
  - 2020 Value > 2015 Value
- International cooperation to developing countries
  - 2030 Value > 2015 Value
- Availability and access to multi-hazard early warning systems & disaster risk information and assessments
  - 2030 Values > 2015 Values

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

Sendai Framework and 2030 Agenda: Common Indicators

- Number of deaths, missing persons and persons affected by disaster per 100,000 people
  - Goal 1. Target 1.5
- Direct disaster economic loss in relation to global gross domestic product (GDP)
  - Goal 11. Target 11.5
- Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services
  - Goal 11. Target 11.b
- Number of countries with national and local disaster risk reduction strategies
- Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030
  - Goal 13. Target 13.1
Background—Sendai Framework for Disaster Risk Reduction

Sendai Framework Indicators

- Develop **INDICATORS** to measure global progress in the implementation of the Sendai Framework—Seven global targets and thirty-eight global indicators

<table>
<thead>
<tr>
<th>Target A</th>
<th>STATUS: Ready for validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metadata</td>
<td>Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2015-30 compared to 2005-2015.</td>
</tr>
<tr>
<td>A-1</td>
<td>Number of deaths and missing persons attributed to disasters, per 100,000 population</td>
</tr>
<tr>
<td></td>
<td><strong>2017</strong></td>
</tr>
<tr>
<td></td>
<td>0.1092</td>
</tr>
<tr>
<td>A-2</td>
<td>Number of deaths attributed to disasters, per 100,000 population</td>
</tr>
<tr>
<td>A-3</td>
<td>Number of missing persons attributed to disasters, per 100,000 population</td>
</tr>
</tbody>
</table>

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

Geospatial technology application for monitoring the SFDRR 2015-2030

- Space-based technologies
- Geospatial technologies
- Geographical Information Systems (GIS)
- Remote sensed earth observation

Par: 24c, 24f, 25c, and 25g
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.
Supported by the Ministry of Science and Technology, NDRCC launched a project "Integrated Application of Earth Observations for Sendai Framework for Disaster Risk Reduction", which goes in line with GEO priority activities and AOGEO new cross-cutting project “Integrated Priority Study (IPS)".
Objectives


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

- **Sendai Frame work monitoring indicators**
- **EO data**
- **Artificial Intelligence**
- **Sendai Frame work monitoring indicators supported by EO**
- **Monitoring technical system**
- **Integrated application platform**

Application

- Laos
- Sri Lanka
- Nepal
Demand and capacity analysis
Index optimization
Element extraction using AI technology
Comprehensive analysis using big data
Deduction for incomplete data
Data aggregation and model integration
Application system development
Flood risk and loss index monitoring (Laos)
Typhoon risk and loss index monitoring (Sri Lanka)
Earthquake loss index monitoring (Nepal)
Data: EO data; other open source data

Disaster Monitoring Satellite 2A and 2B
Multi-spectral CCD(16m), hyper-spectral imager and infrared camera
Outcome of the project

Outcome: formed a set of results including indicators, data, models, systems and products based on the Sendai Framework for disaster reduction.

① Index system
- Target 1: Dead and missing persons
- Target 2: Affected population
- Target 3: Direct economic Loss
- Target 4: destroyed and damaged infrastructure
- Target 7: Disaster risk monitoring and early warning

② Dataset
- Remote sensing images
- Basic geographic information
- Thematic product

③ Models
- Element extraction
- Risk assessment
- Loss assessment

④ Application platform
- Product production and analysis
- Product Service platform

⑤ Application
- 3 countries
- Three typical disaster scenarios
- Five categories, 22 products
Outcome of the project

-- Index system

1. SFDRR index selection and classification
2. Decouple and Re-couple
3. Index to essential variables
4. Final output index system
### Outcome of the project

---

**Index system**

Step 1: SFDRR index selection and classification

<table>
<thead>
<tr>
<th>Tier</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>Independent indicator directly supported by EO, that is, by inputting EO data as well as other sources of basic data into the evaluation method, the value of the indicator can be obtained. Compound indicator that are indirectly supported by EO, that is, it needs to be calculated through the use of independent indicators, basic data, and specific algorithms provided by the UNDRR [22]. Indicator cannot be supported by EO, that is, post-disaster data and information need to be collected by such means as filed surveys rather than by EO.</td>
<td>Indicator B-3a: Number of dwellings/houses damaged attributed to disasters</td>
</tr>
<tr>
<td>Tier II</td>
<td></td>
<td>Indicator D-1: Damage to critical infrastructure attributed to disasters</td>
</tr>
<tr>
<td>Tier III</td>
<td></td>
<td>Indicator B-2: Number of injured or ill people attributed to disasters</td>
</tr>
<tr>
<td>Tier IV</td>
<td>Indicator that does not need to be supported by EO, that is, data and information acquirement and indicator evaluation can be completed before the disaster, and no post-disaster evaluation work is needed.</td>
<td>Indicator G-1: Number of countries that have multi-hazard early warning systems</td>
</tr>
</tbody>
</table>
Outcome of the project

-- Index system

Step 1: SFDRR index selection and classification

<table>
<thead>
<tr>
<th>Tier</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>Independent indicator directly supported by EO, that is, by inputting EO data as well as other sources of basic data into the evaluation method, the value of the indicator can be obtained. Compound indicator that are indirectly supported by EO, that is, it needs to be calculated through the use of independent indicators, basic data, and specific algorithms provided by the UNDRR.</td>
<td>Indicator B3a: Number of dwellings/houses damaged attributed to disasters</td>
</tr>
<tr>
<td>Tier II</td>
<td>Indicator that, in addition to the direct indicators supported by EO, is calculated using the data and basic information of other indicators.</td>
<td>Indicator D1: Damage to critical infrastructure attributed to disasters</td>
</tr>
<tr>
<td>Tier III</td>
<td>Indicator that does not need to be supported by EO, that is, data and information acquisition and indicator evaluation can be completed before the disaster, and no post-disaster evaluation work is needed.</td>
<td>Indicator B2: Number of injured or ill people attributed to disasters</td>
</tr>
<tr>
<td>Tier IV</td>
<td>Indicator that is calculated using the data and information acquisition and indicator evaluation can be completed before the disaster, and no post-disaster evaluation work is needed.</td>
<td>Indicator G1: Number of countries that have multi-hazard early warning systems</td>
</tr>
</tbody>
</table>

![Chart showing the distribution of indicators by tier.]

**Respondents (Articles, reports)**

**SFDRR Indicators**

**Question 1:** What is the type of the indicator?

<table>
<thead>
<tr>
<th>Option 1: Independent</th>
<th>Option 1: Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promise A</td>
<td>Promise B</td>
</tr>
</tbody>
</table>

**Question 2:** Can the indicator involve indicators evaluated with pre-disaster information?

<table>
<thead>
<tr>
<th>Option 2.1: Yes</th>
<th>Option 2.2: No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2.3: Yes</td>
<td>Option 2.4: No</td>
</tr>
</tbody>
</table>

**Question 3:** Can the indicator involve indicators supported by EO?

<table>
<thead>
<tr>
<th>Option 3.1: Yes</th>
<th>Option 3.2: No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 3.3: Yes</td>
<td>Option 3.4: No</td>
</tr>
</tbody>
</table>

**Result 1:** Unnecessary

**Result 2:** Directly supported

**Result 3:** Indirectly supported

**Result 4:** Unsupported
Outcome of the project

-- Index system

Step 2: Decouple and Re-couple

<table>
<thead>
<tr>
<th>EV Classes</th>
<th>DEFs</th>
<th>DIFs</th>
<th>Influences on DABs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean-related Fisheries production area</td>
<td></td>
<td></td>
<td>Disruption of productive activities</td>
</tr>
<tr>
<td>Mountain land</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water-related Aquaculture production area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetarian-related Crops, forests, green infrastructures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction-related Dwellings/houses, productive assets, critical infrastructure, fixed infrastructures of culture heritage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DIFs -disaster-inducing factors
DABs -disaster-affected bodies
DFEs -disaster-formative environments
Outcome of the project

-- Index system
Step 3: Index to essential variables
Outcome of the project

-- Index system

Step 4: SFDRR Indicators Supported by EO

EVs of the ocean-related class

EVs of the water-related class
Outcome of the project

-- Index system

Step 4: SFDRR Indicators Supported by EO

EVs of the vegetarian-related class
Outcome of the project

-- Index system

Step 4: SFDRR Indicators Supported by EO

EVs of the construction-related class
## Outcome of the project

### Basic data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEM</td>
<td>ALOS PALSAR DEM</td>
<td>tif</td>
<td>NASA Earthdata</td>
<td></td>
</tr>
<tr>
<td>Remote sensing images</td>
<td>Landsat OLI</td>
<td>tif</td>
<td>USGS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sentinel-2A/B</td>
<td>tif</td>
<td>European Space Agency (ESA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GF-1/6</td>
<td>tif</td>
<td>NDRCC</td>
<td></td>
</tr>
</tbody>
</table>

### Basic geographic data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Administrativ e data</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Residents</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>National park</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Economic zone</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ecological function zone</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Terrain/Elevation</td>
<td>shp</td>
<td>NASA Earthdata</td>
<td></td>
</tr>
<tr>
<td></td>
<td>River</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Precipitation</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
</tbody>
</table>

### Environment data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard data</td>
<td>Earthquake information</td>
<td>shp</td>
<td>USGS China Earthquake Networks Center</td>
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</tr>
<tr>
<td></td>
<td>Landslide</td>
<td>shp</td>
<td>Generated from this project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dammed Lake</td>
<td>shp</td>
<td>ฉบับ</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slope</td>
<td>ALOS DEM Hillshade</td>
<td>tif</td>
<td>NASA Earthdata</td>
</tr>
<tr>
<td></td>
<td>Land use</td>
<td>GLC10 LULC</td>
<td>tif</td>
<td><a href="http://data.ess.tsinghua.edu.cn/fromglc10_2017v01.html">http://data.ess.tsinghua.edu.cn/fromglc10_2017v01.html</a></td>
</tr>
<tr>
<td></td>
<td>Glacier</td>
<td>2000, 2015, 2020</td>
<td>shp</td>
<td>Generated from this project</td>
</tr>
<tr>
<td></td>
<td>Glacial lake</td>
<td>2010, 2020</td>
<td>shp</td>
<td>Generated from this project</td>
</tr>
</tbody>
</table>

### Exposure data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Population</td>
<td>tif</td>
<td>LandScan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bridge</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Airport</td>
<td>shp</td>
<td>OpenStreetMap</td>
<td></td>
</tr>
</tbody>
</table>

### Affected data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected data</td>
<td>Statistic data of disaster</td>
<td>xlsx</td>
<td>The Central Bureau of Statistics of Nepal</td>
<td></td>
</tr>
</tbody>
</table>

### Risk data

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Format</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk data</td>
<td>Risk of glacial lake</td>
<td>shp</td>
<td>Generated from this project</td>
<td></td>
</tr>
</tbody>
</table>
**Outcome of the project**

-- Database: EO data; **Extracted key elements**, other open source data

-- E 1: Houses  
-- 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
Use Chinese satellite data, extracted 10 typical elements such as airport, bridge, coal-fired power plant, farmland, and oil storage tank is extracted by deep learning method.

10 elements for SFDRR index monitor for Nepal, Laos and Sri Lanka
Outcome of the project

-- Application: Laos

Data
Outcome of the project

-- Application: Laos
## Outcome of the project

### -- Product system

<table>
<thead>
<tr>
<th>Target of SFDRR</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Products Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target A</td>
<td>A</td>
<td></td>
<td></td>
<td>Products of number of deaths and missing persons</td>
</tr>
<tr>
<td>Target B</td>
<td>B</td>
<td>B-3</td>
<td>B-4</td>
<td>Products of number directly affected people</td>
</tr>
<tr>
<td>Target C</td>
<td>C</td>
<td>C-2</td>
<td></td>
<td>Products of Direct economic loss assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2Aa</td>
<td></td>
<td>Number of hectares for damaged or destroyed aquaculture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2C</td>
<td></td>
<td>Direct economic loss of crops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2Ca</td>
<td></td>
<td>Number of hectares for damaged or destroyed crops</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2Fi</td>
<td></td>
<td>Direct economic loss of fishery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2Fia</td>
<td></td>
<td>Number of hectares damaged or destroyed fishery</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2Fo</td>
<td></td>
<td>Direct economic loss of forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-2FoA</td>
<td></td>
<td>Number of hectares damaged or destroyed forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-3</td>
<td></td>
<td>Direct economic loss for damaged or destroyed productive assets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C-3a</td>
<td></td>
<td>Number of damaged or destroyed productive assets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Target of SDFWDRR</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Products Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target D</td>
<td>D</td>
<td>D-1</td>
<td></td>
<td>Number of destroyed or damaged critical infrastructure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D-2</td>
<td></td>
<td>Number of destroyed or damaged health facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D-3</td>
<td></td>
<td>Number of destroyed or damaged educational facilities</td>
</tr>
<tr>
<td>Target G</td>
<td>G</td>
<td></td>
<td></td>
<td>Products of disaster risk and early warning</td>
</tr>
</tbody>
</table>
Outcome of the project

- Application: Laos
Analysis of the dam-break flood in Laos on July 23, 2018
Outcome of the project

-- Application: Laos
Analysis of the dam-break flood in Laos on July 23, 2018
Outcome of the project

-- Application: Laos
Analysis of the dam-break flood in Laos on July 23, 2018
Outcome of the project

-- Application: Laos
Analysis of the dam-break flood in Laos on July 23, 2018
Outcome of the project


Death toll in Bagmati district, Nepal (25 April 2015 earthquake)

People Affected in Bagmati district, Nepal (25 April 2015 earthquake)

House Damages in Bagmati district, Nepal (25 April 2015 earthquake)
Case: Tropical cyclone (Burevi) (2020.11-30—12.05)

Historical case

<table>
<thead>
<tr>
<th>Cyclone</th>
<th>Casualty population assessment</th>
<th>Actual casualties</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nargis</td>
<td>12人</td>
<td>9人</td>
<td>3人</td>
</tr>
<tr>
<td>Ockhi</td>
<td>23人</td>
<td>27人</td>
<td>4人</td>
</tr>
<tr>
<td>Burevi</td>
<td>1人</td>
<td>2人</td>
<td>1人</td>
</tr>
</tbody>
</table>

Dead and missing people

Affected people

Legend

- Cyclone Burevi
- Sri Lanka administrative region
- Province
- District
- Divisonal Secretariat (DS)
- Jaffna District
- DS of Jaffna District
- Jaffna DS
Outcome of the project

Direct Economic Loss

Loss assessment for forest

Loss assessment for crops

Loss assessment for critical infrastructure

Loss assessment for fishery

Aquaculture pond extraction and disaster loss assessment
Outcome of the project

-- Application Platform
1. **Data and Products** support for Disaster Management using Space based technology
2. **Support** UN-SPIDER of using the output of this project for SFDRR indexes monitoring
3. **Other application** of using Space based technology
On 6 February 2023, two earthquakes with magnitude 7.8 and 7.5 heavily affected south-eastern Türkiye.

The official announcement made on 5 April said that the number of people who lost their lives is 50,399, and the number of injured stands at 107,204.

Produced over 30 mapping products during the emergency period.
Remote Sensing Monitoring for Türkiye Earthquake

Emergency Response Steps

1. Obtain USGS shake map, set areas of interest
2. Launch the emergency sharing and acquisition mechanism for civil and commercial satellites, make observation plans
3. Search for pre-event remote sensing images of AOIs, release pre-earthquake products
4. Obtain available satellite data after the earthquake, interpret and analyze
5. Release post-earthquake products

Provide information support for international rescue missions

• **High spatial resolution optical imagery (< 2m)**
• Totally obtained 57 satellite images from 7 to 13 February.
• More than 1400 buildings/blocks with visible collapse or severe damage were found within the monitoring range.
Remote Sensing Monitoring for Türkiye Earthquake

- **Kahramanmaras**
  - Collapsed buildings are mostly high-rise buildings and exhibit concentrated distribution characteristics
  - A large number of temporary camps in stadiums and playgrounds
At around 16:00 on February 8th, the Chinese rescue team arrived in Antakia and carried out rescue work in neighborhoods such as Inonu, Urgen Pasa, and Demirbuken.

From satellite images, it can be seen that the collapsed buildings are mainly over 6 floors, with a large amount of soil and rock accumulation.
Thank you

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