Damage Assessment using Optical Data

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SUPARCO Role in Disaster Monitoring

During Natural Disasters, SUPARCO provided technical support to various national Organizations NDMA, PDMAs and International Agencies ICIMOD, UN-FAO etc.
Contents

• Damage Assessment  Overall Approach

• Flood Damage Assessment
  • Crop Damages
  • Buildings/Settlements
  • Irrigation Network
  • Road/Rail Network

• Earthquake
  • Buildings/Settlements

• Landslide
  • Landcover
  • Buildings
  • Roads

• Forest Fire
  • Forest Types
  • Landcover
Rapid Damage Assessment Overall Approach

Historical Data Collection

Data conversion and standardization

Pre Flood
SPOT – 4 & 5

Post Flood
SPOT – 4 & 5 Aqua & Terra

During Flood
SPOT – 4 & 5 Aqua & Terra

GIS Layer

Templates for dissemination of maps

Rapid Damage Assessment

Detailed Damage Assessment

Daily Flood extent

SPOT – 4 & 5

Aqua & Terra

GIS Layers

Daily Flood extent

SPOT – 4 & 5
FLOOD
Flood Damage Assessment

• Flood Extent Extraction - Normalized Difference Water Index (NDWI)
• Elements at Risk – Crops, Houses/Built up, Roads and Water Infrastructure
• Change Detection
• Spatial Analysis Attributes/Statistical Calculation
• Rapid Damage Maps
Recommended Practices for UN-SPIDER Flood Mapping and Damage Assessment
This map shows the current situation of Kabul River. The analysis indicates an increase in river flows in the river course which has affected settlements in DistrictsCharsadda and Nowshera, Khyber Pakhtunkhwa. The analysis is performed using Satellite Imagery of SPOT6 (1.5 m) acquired on 28 August 2022.

This analysis is yet to be validated in the field.
This map shows the updated flooding situation in Districts D.G Khan and Rajanpur, Punjab. The pre-post analysis shows inundation due to heavy rainfall. The pre-post analysis is performed using MODIS (250m) imagery acquired on 20 & 27 July 2022 respectively.

This analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency and Disasters (SACRED) on 27-July-2022.
Monsoon Flooding Situation Analysis
03 Sep 22

This map shows the latest inundation situation in Balochistan & Sindh. Analysis indicates possible inland inundation and flooding in the area. The pre-post analysis is performed using Sentinel-2 imagery acquired on 04 Aug, 29 Aug and 03 Sep 2022, respectively.

This map is generated at Space Application Centre for Response in Emergency and Disasters (SACRED) - SUPARCO, on 03 Sep 2022.
This map shows the updated situation of flash flooding in Balochistan Province, as seen on latest satellite imagery of MODIS (250 m) satellite acquired on 13 Jan 2022. Pondage water has been reduced as compared to previous imagery.

This analysis is yet to be validated in the field.

This map is generated at Space Application Centre for Response in Emergency and Disasters (SAGRED) on 14 January 2022.
Monsoon Situation Analysis - River Sutlej
Affected Landcover

This map shows affected landcover (selected classes) due to flooding in River Sutlej. Analysis was carried out using Satellite based cumulative flood extent and SUPARCO's landcover database.

This analysis is yet to be validated in field.

This map is generated at Space Applications Centre for Response in Emergency and Disasters (SACRED) on 11 September 2023.
Monitoring of Erosion along River Indus, Layyah, Punjab
Damages caused by Floods/Rains 2022 - Buildings

Pre - 01 Jun 2022
Post - 28 Aug 2022

Pre - 01 Jun 2022
Post - 28 Aug 2022
Flooding in River Swat – Bridge Damages

Collapsed Bridge on N-35

Hub River Bridge on N-25 Lasbella
Damages caused by Floods/Rains 2022 – Road/Bridges

Pre - 01 Jun 2022

Post - 28 Aug 2022

Pre - 01 Jun 2022

Post - 28 Aug 2022
Small Dam Breaches in Balochistan

Sherjan Khada Dam, Loralai, Balochistan

Dam Breach - Qilla Abdullah, Balochistan
Flooding in Swat River at Munda Headwork
Recommended Practices for UN-SPIDER Knowledge Portal

FLOOD HAZARD ASSESSMENT

FLOOD MAPPING AND DAMAGE ASSESSMENT

DROUGHT HAZARD ASSESSMENT
EARTHQUAKE
An earthquake of 5.9 magnitude with 09 km depth struck Harnai District and adjoining areas of Balochistan, on 07 Oct 2021 at 0301hrs local time (UTC). The epicenter was located at approx. 15 km NE of Harnai City. This map shows the epicenter and instrumental intensity of the earthquake. The intensity of earthquake was strong to moderate.

This map is generated at Space Applications Centre for Response in Emergency and Disasters (SACRED)-SUPARCO on 07-10-2021.
Earthquake 2015 Damage Assessment, Buner, KP
An earthquake of 5.9 magnitude with 15 km depth struck Harnai District and adjoining areas of Balochistan, on 07 Oct 2021, at 0301hrs local time (PKT). The epicentre was located at approx. 15 km NE of Harnai City. Analysis indicates multiple partially/completely damaged structures in the affected area. This analysis was performed using very high resolution Pleiades (50 cm) satellite imagery acquired on 08 Oct 2021. This analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency and Disasters (SACRED)-SUPARCO on 08-10-2021.
An earthquake of 5.6 magnitude with 10 km depth struck Mirpur and Northern areas of Pakistan on 24 Sep 2019 at 16:02 hrs. The epicenter was located at Khari Sharif, District Mirpur. Analysis indicates, there are 334 partially/completely damaged structures in District Mirpur and Bhimber. Analysis also shows distribution of 451 tents in the affected area. This analysis was performed using pre and post imagery of Pleiades (50 cm) satellites acquired on 29 April 2018 and 30 Sep 2019, respectively. Post-disaster image was provided by International Charter Space & Major Disasters. The analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency & Disasters (SACRED) SUPARCO on 04 Oct 2019.
An earthquake of 5.6 magnitude with 10 km depth struck Mirpur and Northern areas of Pakistan on 24 Sep 2019 at 1602 hrs. The epicenter was located at Khari Sharif, District Mirpur. This map shows the possible damaged road sections along the Mirpur-Jatlan road, next to the upper Jhelum canal. As per the analysis/reports, approx. 14 km section of the road has been damaged. Heavy cloud cover/haze was also observed across the scene. This analysis was performed using pre and post imagery of PRSS-1 (90 cm) and Peaides (50 cm) satellites acquired on 04 Sep and 26 Sep 2019, respectively. The analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency & Disasters (SACRED)-SUPARCO on 26 Sep 2019.
An earthquake of 5.6 magnitude with 10 km depth struck Mirpur and Northern areas of Pakistan on 24 Sep 2019 at 1602 hrs. The epicenter was located at Khari Sharif, District Mirpur. This map shows the locations of shelters/tents spread across the area. The reconstruction on the Mirpur-Jalian road has also been started. This analysis was performed using post-event imagery of Pleiades (50 cm) satellite acquired on 30 Sep 2019. Post-disaster image was provided by International Charter Space & Major Disasters in collaboration with UNOSAT/UNITAR. The analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency & Disasters (SACRED)-SUPARCO on 30 Sep 2019.
An earthquake of 5.9 magnitude with 99 km depth struck Harnai District and adjoining areas of Balochistan, on 07 Oct 2021 at 0300hrs local time. An earthquake of 5.9 magnitude with 15 km depth struck Harnai District and adjoining areas of Balochistan, on 07 Oct 2021 at 0300hrs local time (PMD). This map shows the ground deformation using Interferometric SAR technique. Analysis indicates 24.5 cm Line of Sight displacement (uplift) near the epicenter. This analysis is performed using pre-post Sentinel-1 C band SAR satellite acquired on 28 Sep 2021 and 10 Oct 2021, respectively. This analysis is yet to be validated in the field.

This map is generated at Space Applications Centre for Response in Emergency and Disasters (SACRED)-SUPARCO on 12-10-2021.
TEMPORAL ANALYSIS OF FOREST FIRE - Sherghali

19 May 2022

22 May 2022

23 May 2022

24 May 2022
Balochistan Fire 2022 – Affected LandCover

<table>
<thead>
<tr>
<th>Affected Area</th>
<th>Landcover/Landuse (Hectare)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Forest</td>
</tr>
<tr>
<td>Sherani District, Balochistan</td>
<td>908.1</td>
</tr>
<tr>
<td>Dil Khan District, Khyber Pakhtunkhwa</td>
<td>203.3</td>
</tr>
<tr>
<td>Total</td>
<td>1112</td>
</tr>
</tbody>
</table>

Affected Landcover
- Forest
- Range Landing - Natural Shrubs and Herbs
- Rare Areas with Sparse Natural Vegetation
2.2 Installing the Semi-Automatic Classification Plugin

Landslide
Landslide, Karora, Shangla, Khyber Pakhtunkhwa

Naltar 24-06-2021

Naltar 09-07-2021

Naltar Landcover
This map shows the landslide that occurred near Sahira, Tehsil Havelian, District Abbottabad on 21-Nov-2015. The analysis indicates that the landslide mass covers approx. 7.92 ha area and about 203 m road has been completely damaged. The analysis is performed on 0.5m Pleades Satellite Data acquired on 27-Nov-2015. This map is generated at SUPARCO on 02-12-2015. This analysis is yet to be validated in the field.

Legend:
- Landslide
- River Blockade
- Destroyed Road
- Road
- District Boundary

Map Scale: 1:3000

Map Id: 02-12-2015_LS_01