Heritage from Space for Peace

United Nations Satellite Centre (UNOSAT)

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United Nations Satellite Centre

Introduction

- Division for Satellite Analysis and Applied Research at the United Nations Institute for Training and Research (UNITAR)
- Operational since 2001, recognized as the United Nations Satellite Centre in June 2021
- Mandate: *“provide United Nations funds, programmes and specialized agencies with satellite analysis, training and capacity development, at their request, as well as to continue supporting Member States with satellite imagery analysis over their respective territories and to provide training and capacity development in the use of geospatial information technologies”*

Offices


UNOSAT HQ, Geneva
UNOSAT
New York office
Bhutan
Bangladesh
Lao PDR
Regional Liaison, Bangkok
Nigeria
Uganda
Regional Liaison, Nairobi
Solomon Islands
Vanuatu
Fiji

Operational Pillars

UNOSAT

Training and Capacity Development

Hands-on technical training, awareness raising and technical backstopping

Satellite Analysis

Satellite imagery derived geospatial products

Applied Research and Innovation

EO, AI, Machine Learning, Big Data Analytics, crowdsourcing

Operational Satellite Imagery Analysis & Mapping Support to Humanitarian Emergencies

UNOSAT

- Provides satellite image analysis during humanitarian emergencies, both natural disasters and conflict-situations.
- 24/7 operational service: team of experience analysts ensure timely delivery of satellite imagery derived maps, reports and data.
- 2021: 315 analyses to partners over 54 countries

Advantages of satellite imagery analysis

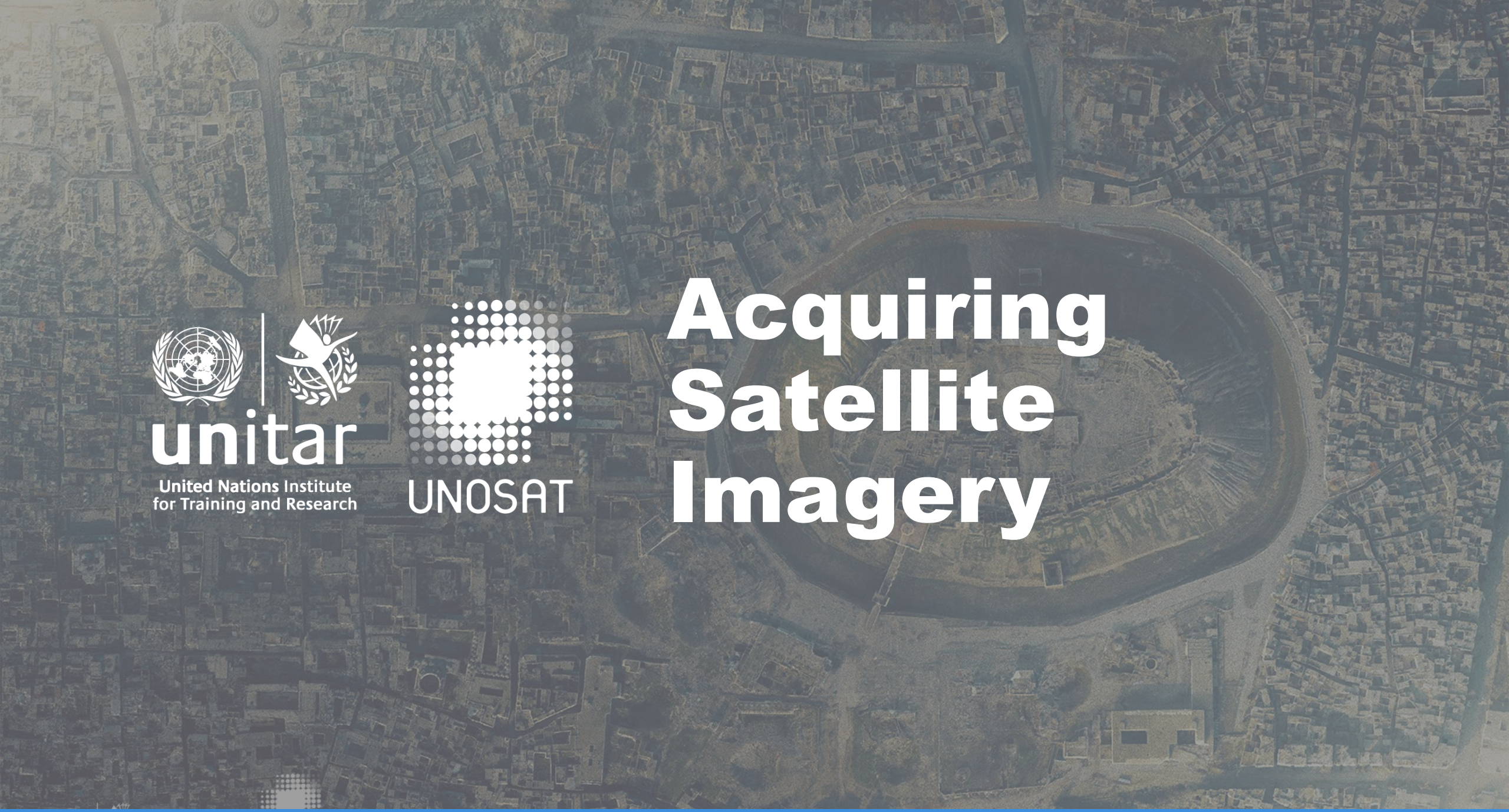
1. Primary and objective information
2. Cover inaccessible areas
3. Near real time
4. Access to historical archives and monitoring
5. Multiple applications: agriculture, environment, disaster management, population movement, conflicts, project monitoring, etc.
6. Improvement of employee safety conditions in the field thanks to fact-based situational awareness.
7. Same information available to all at the same time - improves coordination

GIS advantages

- Gather, manipulate and display geographically referenced information
- Provide comparable information collected systematically at multiple scales
- Easier visual interpretation and detection, high-resolution satellite imagery and wide coverage
- Combine data in near-real time Information: location, scale, disaster severity, affected population, damaged buildings and infrastructure
- Integrate different types of data and foster collaboration between different actors: improve planning, response time and communication

Limitations

- Coverage, accuracy and reliability of the available baseline, population census
- The view only from above: a degree of uncertainty in identifying the characteristics and value of damage
- Time constraints: availability of usable post-event imagery is essential to provide information to the end user in a timely manner
- Data quality requirements: spatial resolution, temporal resolution, spectral resolution, cloud cover
- Availability of and access to accurate, up-to-date spatial data at an appropriate map scale and with global coverage
- Availability of official and authoritative data sets
- Availabilty of financial ressources and predictability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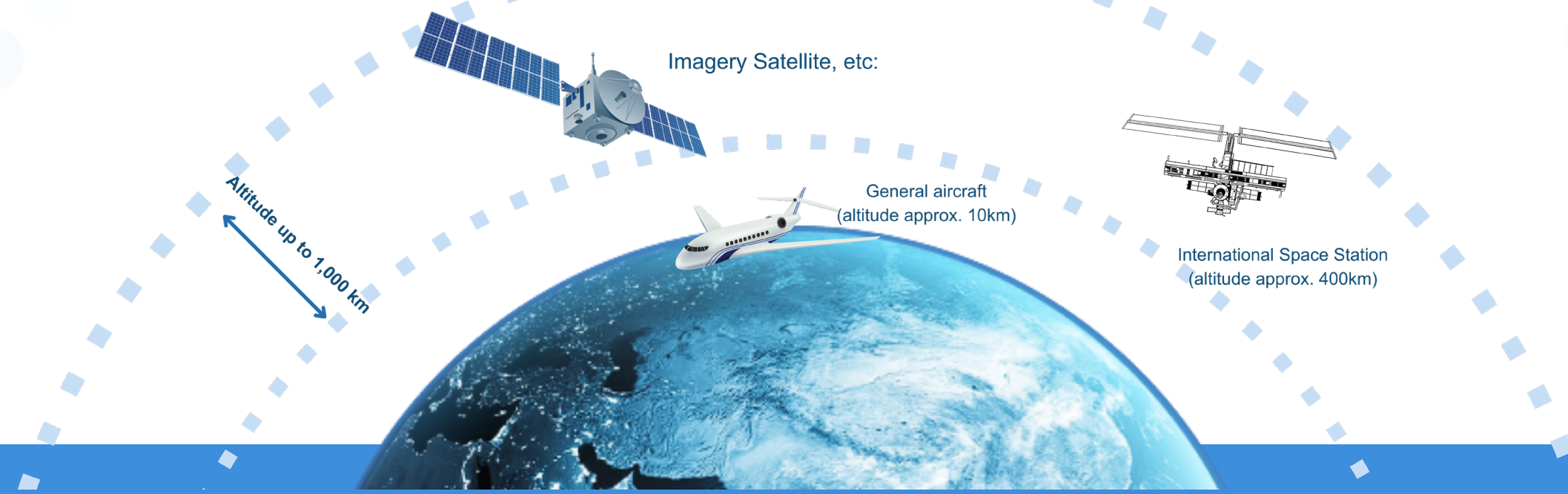
United Nations Institute
for Training and Research
UNOSAT
Acquiring
Satellite
Imagery

Airspace Sovereignty

- **Space Law Principle:** Remote sensing activities shall be carried out for the benefit and in the interests of all countries.
- There is no international agreement on the vertical extent of sovereign airspace, with suggestions ranging from about 30 km = the extent of the highest aircraft and balloons.
- **Air sovereignty** is the fundamental right of a **sovereign** state to regulate the use of its **airspace** and enforce its own aviation law.



Commercial Satellite Image Providers

Our Main Satellite Image Sources

UNOSAT

International Charter: Space and Major Disasters

Open Data Satellites	
Landsat	**Sentinel**
+30 m	+3m
U.S.A	E.U.

Commercial Satellites Active: 19 Constellations						
WorldView	**QuickBird**	**Pléiades**	**Pléiades NEO**	**SuperView**	**GaoFen**	**TripleSat**
+.50cm	+.50cm	+.50cm	+.30cm	+.50cm	+.80cm	+.80cm
USA	USA	EU	EU	China	China	Singapore

Satellite Imagery Licensing

Provider	EULA
NextView	1 license per UN agency
Maxar Technologies Inc.	1 license per user
Airbus D&S	5 licenses per image
CRESDA*	1 license per image

* China Centre for Resource Satellite Data & Application (SuperView and Gaofen-2)

- Since July 2020, the U.S. Department of Commerce eliminated most restrictions on how licensed remote sensing systems may be operated, such as limits on the resolution of imagery, and prohibit the government from imposing additional conditions after a license has been issued. The new rules increase openness and transparency in the licensing process. More: Kyl–Bingaman Amendment - H.R. 3230 (1997)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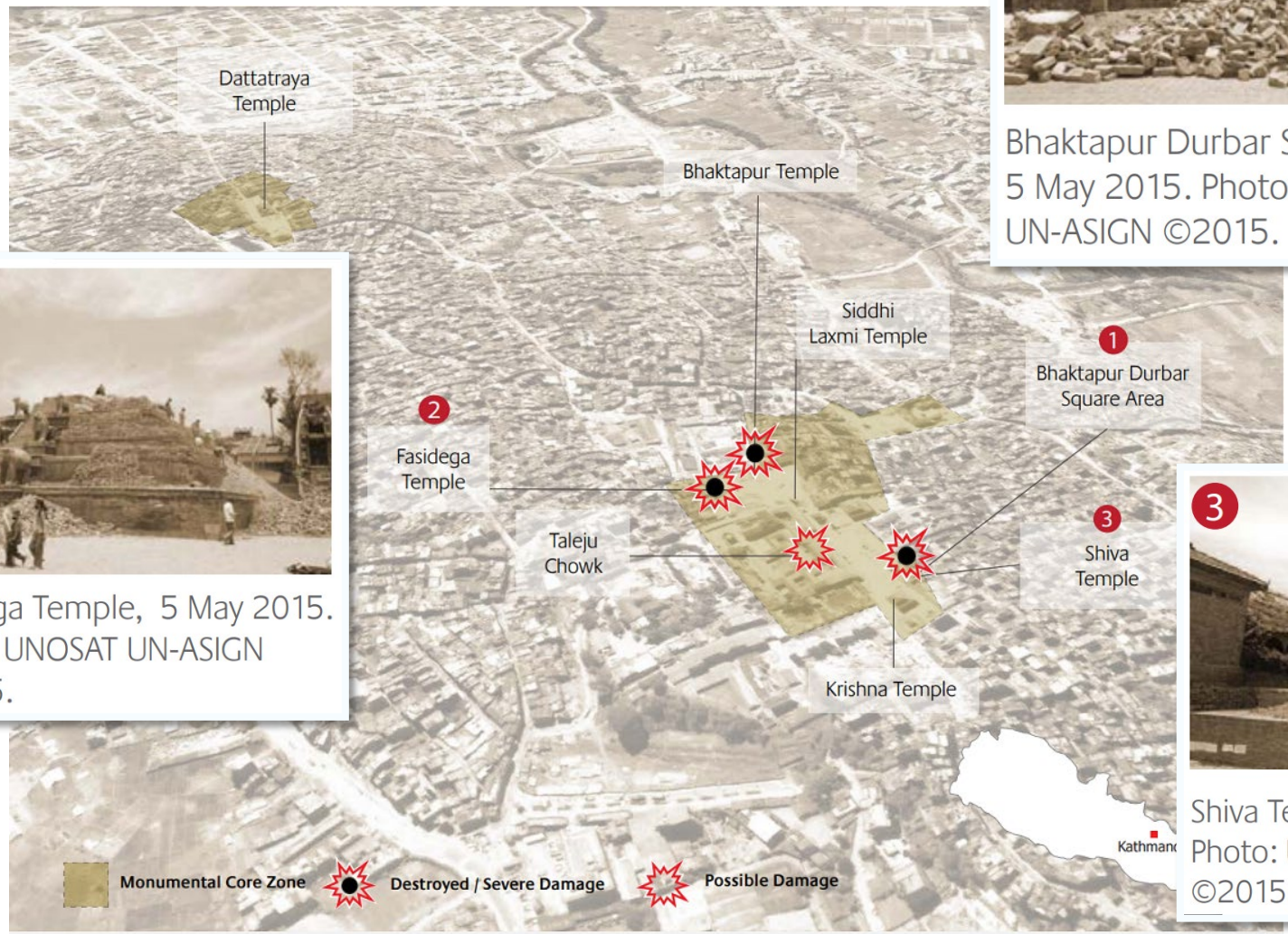
Using satellite imagery for cultural heritage protection

EO for Cultural Heritage protection

- First satellite-derived damage assessment over a cultural heritage site in Georgia in 2008.
- Support to the ICC starting in 2013 with damage assessment of cultural heritage sites in Timbuktu, Mali (Al-Hassan case)
- In 2015, assessment over Nepal and the Kathmandu Valley World Heritage property following the earthquake.
- MoU with UNESCO signed in 2015.
- Extensive work done over Iraq, Yemen, Syria

Earthquake, Nepal

25 April 2015



Source: Digital Globe WorldView 2 ©2016, 3 May 2015. Satellite imagery analysis by UNITAR-UNOSAT.

Bhaktapur Durbar Square, 5 May 2015. Photo: UNOSAT UN-ASIGN ©2015.

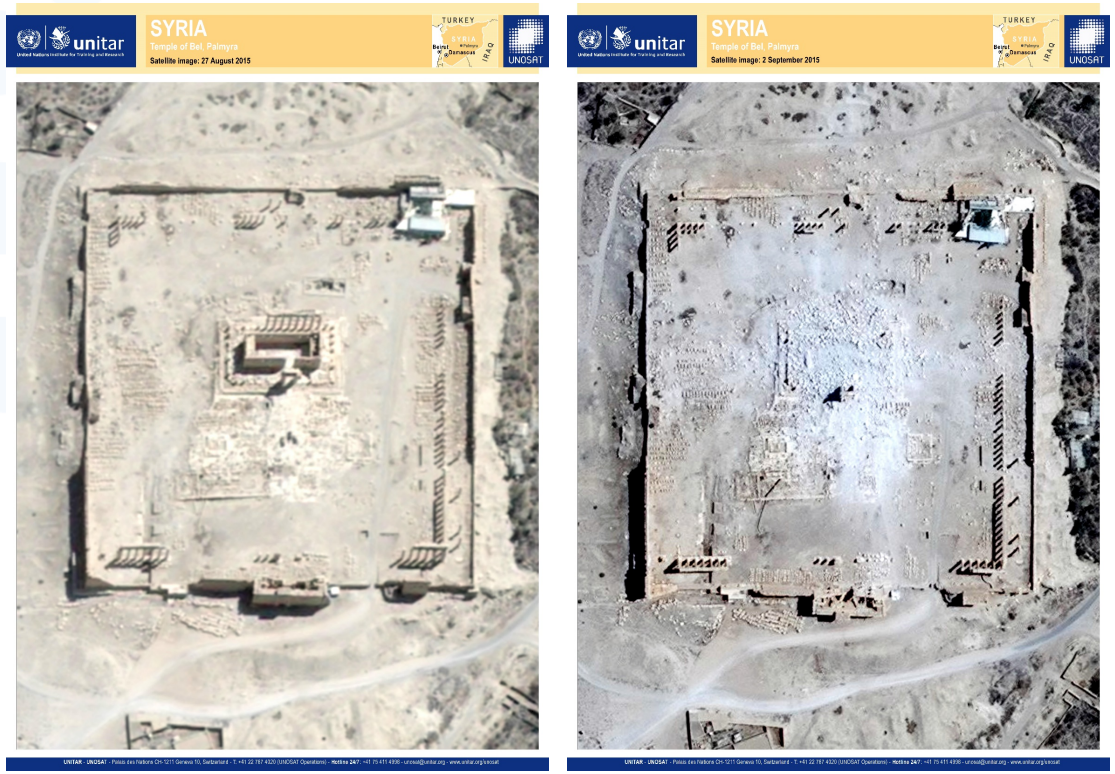
Fasidega Temple, 5 May 2015. Photo: UNOSAT UN-ASIGN ©2015.

Shiva Temple, 5 May 2015. Photo: UNOSAT UN-ASIGN ©2015.

Syria

Temple of Bel

27 August 2015 / 2 September 2015



Citadel of Aleppo

21 November 2010 / 20 February 2017

Satellite-Based Damage Assessment of Cultural Heritage Sites.

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Iraq, Syria, Yemen & Nepal

SYRIA

Since March 2011, Syria's exceptional cultural richness has continuously suffered as a result of the ongoing conflict. Many of its important monuments, including some on UNESCO's World Heritage List, have been severely damaged due to the conflict.

NEPAL

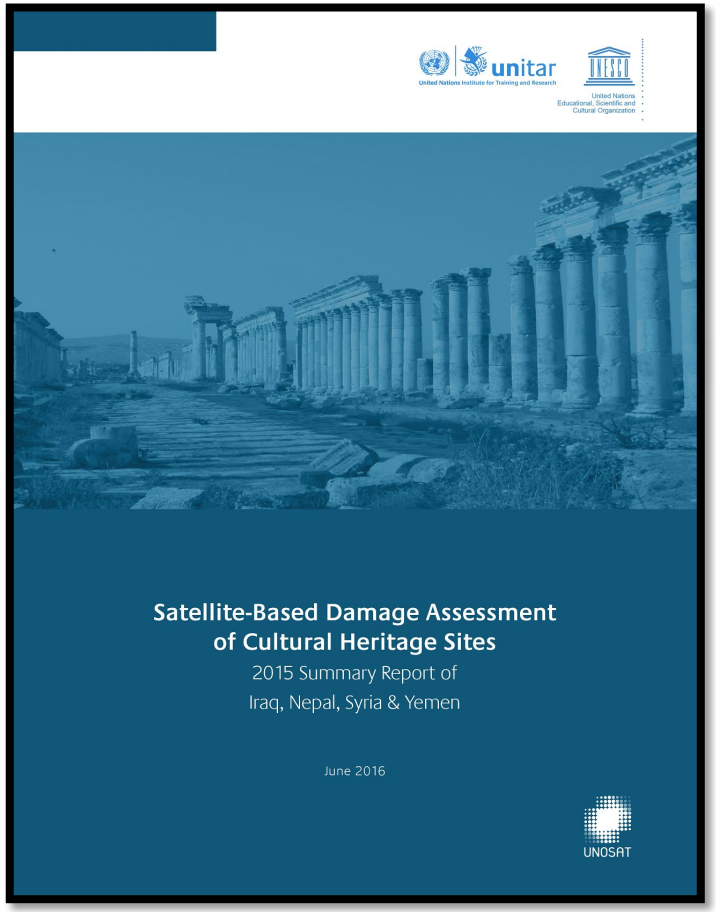
The April 2015 earthquake heavily affected most of the cultural heritage sites in Nepal, in particular within the Kathmandu Valley World Heritage property.

IRAQ

Since early 2003, Iraq's rich cultural heritage, one of the oldest in the world, has been at risk of destruction and looting by various actors.

YEMEN

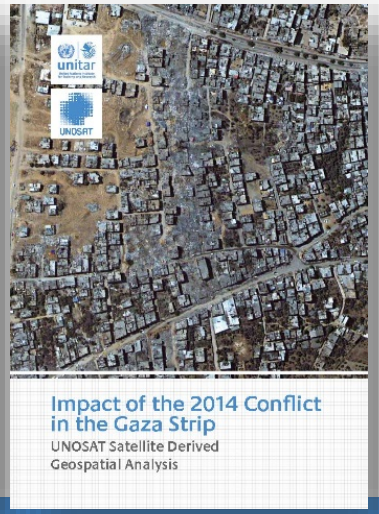
Since March 2015, Yemen's abundant cultural heritage has been put at risk by the ongoing conflict in the country, including a number of sites inscribed on UNESCO's World Heritage List.

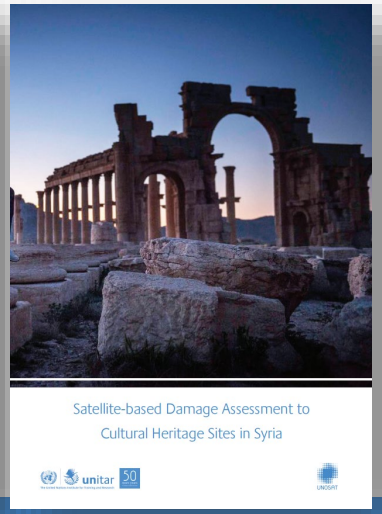


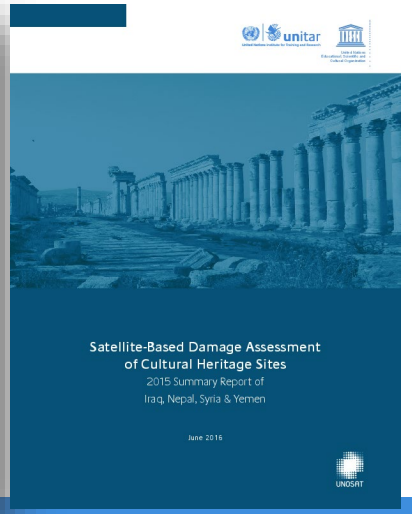
https://en.unesco.org/system/files/full-chs-report_28062016_final.pdf

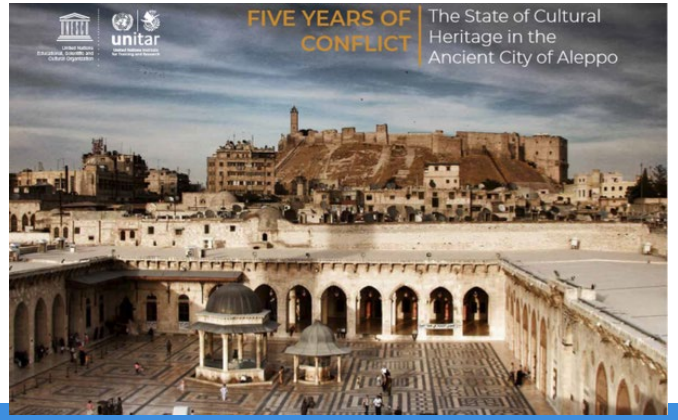
More Publications

- Four years of Human Suffering in the Syrian Conflict
- Satellite Based Damage Assessment to Cultural Heritage Sites in Syria
- Impact of the 2014 Conflict in the Gaza Strip
- Satellite Based Damage Assessment to Cultural Heritage Sites in Iraq, Nepal, Syria and Yemen
- The State of Cultural Heritage in the Ancient City of Aleppo









Satellite imagery analysis for cultural heritage protection

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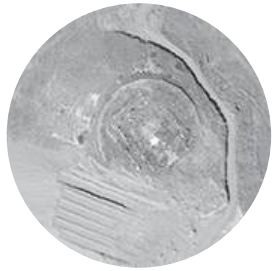
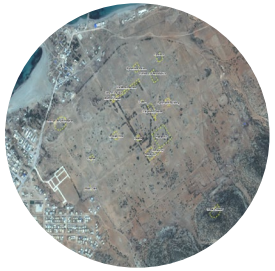
Damage to cultural heritage properties



Activities that can detriment the welfare of the cultural property

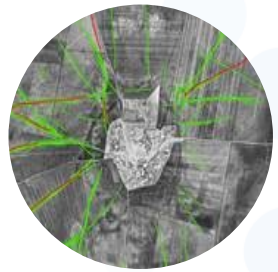


Urban encroachment

Looting activity

Preservation efforts

Deforestation of natural reserve



Ancient routes analysis

Damage Assessment

Palmyra, Syria

Tetrapylon & Theatre

26 December 2016 - 10 January 2017

Urban encroachment

Ptolemain, Libya

Monitoring of urban development in the vicinity cultural heritage site

11 November 2015

Looting Activity

Apamea, Syria

Monitoring of looting activity

16 May 2011 - 15 December 2012

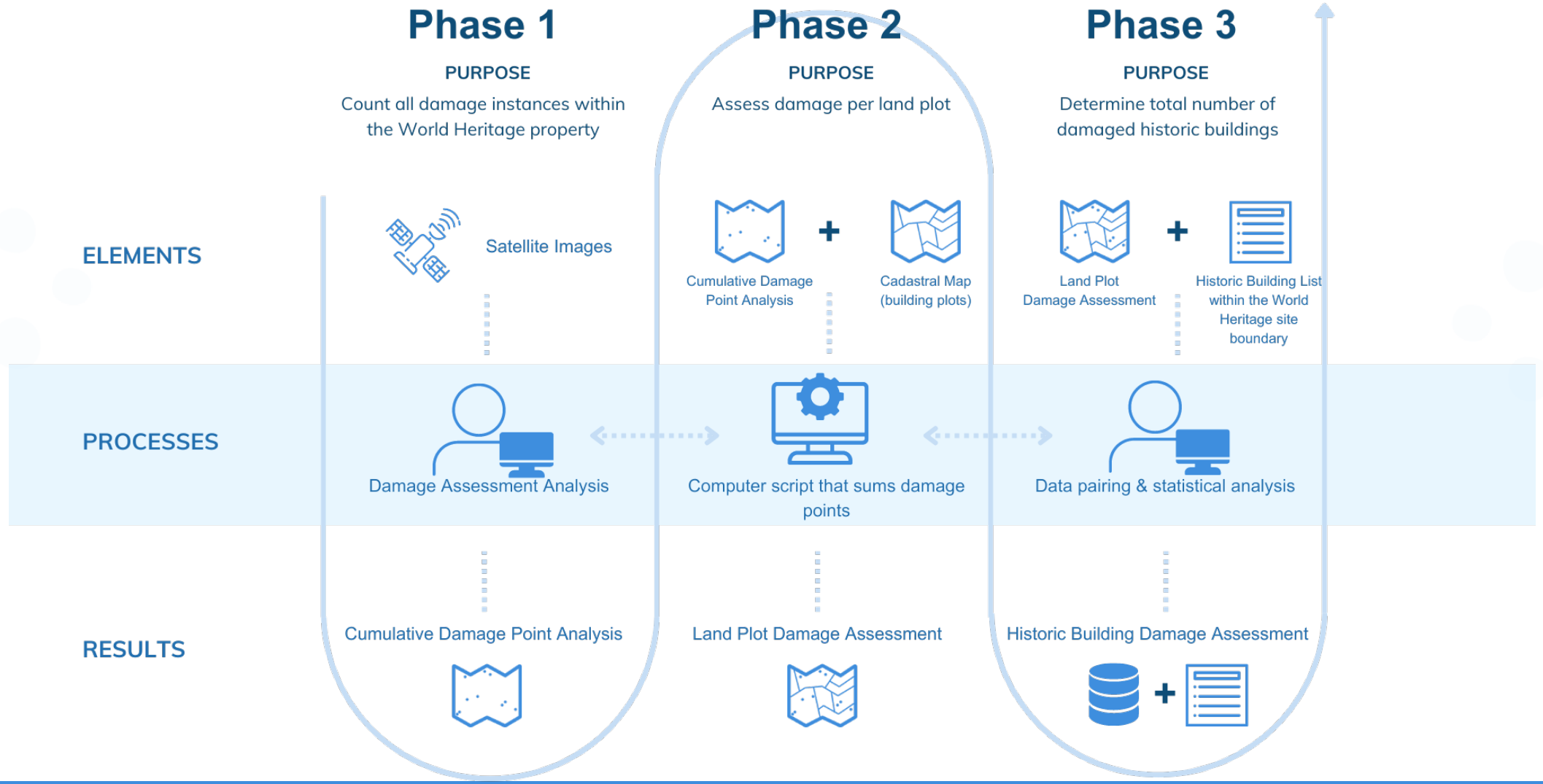
Preservation Efforts

Leptis Magna, Arch of Septimius Severus, Libya

Entombment of cultural property as a protection effort

24 February 2016

Damage Assessment Methodology



Damage Assessment

SATELLITE DAMAGE ASSESSMENT CATEGORIES

Site Destroyed

All or most of the visible key elements of the assessed site have collapsed (80-100 per cent of structure destroyed due to military or civilian activity.

Site Severely Damaged

A significant part of the visible key elements of the site has collapsed or is partially damaged (40-80 per cent of structure damaged) or significant military or civilian activity has contributed to extensive damage at the site.

Site Moderately Damaged

Limited damage observed relating to key elements of the site (5-40 per cent of structure damaged) or where militarw or civilian activity has contributed to damage at the site.

Site Possibly Damaged

Assessed site structures do not appear to be damaged, but debris is visible around key site structures.

HISTORICAL LOSS ASSESSMENT CATEGORIES

Critical Loss

All the main historically valuable elements inside the cultural heritage site are destroyed causing critical loss.

Severe Loss

Many of the main historically valuable elements of the cultural heritage site are severely damaged causing severe loss.

Moderate Loss

Some of the main historically valuable structures inside the cultural heritage site are moderately damaged causing moderate loss.

Minimal Loss

None of the main historically valuable elements of the cultural heritage site are damaged.

Damage Assessment Methodology

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POSSIBLE DAMAGE

Definition:

Assessed building does not appear to be damaged but debris is visible around the building.

What you see on imagery:

Visible debris around the building structure or some small sections of the building are missing.

MODERATE DAMAGE

Definition:

Limited damage observed to the building structure. On many occasions, adjacent to destroyed or heavily damaged buildings.

What you see on imagery:

Ammunition impacts on roof of building or some small sections of the roof missing.

Damage Assessment Methodology

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SEVERE DAMAGE

Definition:

Part of the building structure collapse, such as part of the roof or one or more fallen walls.

What you see on imagery:

Part of the building structure fallen into street and visible debris on one side of the building.

DESTROYED

Definition:

All or most of the building structure is collapsed.

What you see on imagery:

Collapsed or broken roof, walls or pillars destroyed and debris surrounding building.

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