

April 2022



MONITORING HERITAGE AT RISK WITH SENTINEL-2

>>> A few years later

Since 2018, the technical upgrade focused on testing spectral indices to complement the feature detection and spatial mapping for purposes of Cultural Heritage (CH) monitoring. Vegetation indices proved valuable to ease the identification of looted areas. Moisture and flood indices were effective to track the impact of unknown flooding events. Sentinel-1 and COSMO SkyMed radar observations were used in synergy with Sentinel-2 to document impact and damage in CH sites.

Deodato Tapete, Italian Space Agency (ASI)



BENEFICIARIES	Italian Space Agency	National Public Authorities; Academia and research community of affected countries	Local site managers; Local Public authorities for CH conservation	Citizens and society
SERVICES	TIER 1: SERVICE PROVIDER Sentinel-1 Sentinel-2 Copernicus Contributing missions	TIER 2 PRIMARY USER Map products of specific indices such as: Normalized Difference Vegetation Index (NDVI); Moisture Index; Normalized Difference Flood Index (NDFI)	TIER 3 SECONDARY USER Multi-temporal mapping of archaeological looting; Mapping the increase of urban sprawl as a threat to CH sites; Weekly/monthly condition reports and damage maps	TIER 4 END USER BENEFICIARIES Improved public awareness on threats regarding CH; Improved awareness and knowledge on the contribution of satellite-based solutions for CH monitoring and preservation

Value chain definition following SeBS Methodology - <https://earsc.org/sebs>

The space-based solution

This Copernicus-based solution was produced by a scientific entity for other users. Additional types of Copernicus data are now used, such as Sentinel-1 and Copernicus Contributing missions.

The Usage Maturity Level

The solution has transitioned to UML=3. The main reason for this transition is recognised in activities such as additional occasions for training, capacity building and dissemination.

Thematic Area



CULTURAL HERITAGE, TOURISM AND LEISURE

Region of Application



HAMA, SYRIA; AND CYRENAICA, LIBYA

Sentinel mission used



S1, S2

Copernicus Service used



COPERNICUS CONTRIBUTING MISSIONS

Usage Maturity Level



3

Overall benefits

ECONOMIC



No noticeable additional modification/impact on the functioning of the public administration nor on the lives of the citizens since 2018.

ENVIRONMENTAL



No noticeable additional modification/impact on the functioning of the public administration nor on the lives of the citizens since 2018.

REGULATORY



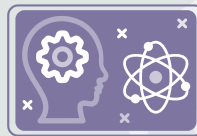
No noticeable additional modification/impact on the functioning of the public administration nor on the lives of the citizens since 2018.

INNOVATION



No noticeable additional modification/impact on the functioning of the public administration nor on the lives of the citizens since 2018.

SCIENCE



- The solution has helped to improve understanding about a specific topic of interest traditionally not related to Earth Observation (EO);
- Increased use of this space-based solution across the academia and research community of affected countries.

SOCIETAL



- There have been improvements in public awareness.

Benefits classification following SeBS Methodology - <https://ears.org/sebs>

Interesting facts...

Solution advancements were disseminated during technical conferences, dedicated workshops involving stakeholders, and ad-hoc training activities with specialists and practitioners. A very interesting fact is that two Massive Open Online Courses (MOOCs) are currently available, as part of the "Fighting Cultural Heritage Crimes. An introduction" an education initiative by Ca' Foscari University of Venice, Italy. All cited initiatives have targeted capacity building so as to ease further user uptake of the method, of the Copernicus satellite technologies and data (and their Contributing Missions), as well as to raise awareness of this space-based solution dedicated to Cultural Heritage at risk.

Outlook to the future

For the future, there is the plan to further disseminate the method proposed and its recent technical upgrades. Also, it is envisaged to develop new use-cases that will ensure replicability of the method. In such activities authors foresee to directly engage heritage stakeholders in order to tackle their specific requirements for single sites.

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