ST CATHERINE’S MONASTERY, SINAI: A VIEW FROM ABOVE

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ABSTRACT

This poster presents a case study from the Endangered Archaeology in the Middle East and North Africa (EAMENA) project, analysing landscape change in the St Catherine’s Monastery area in Sinai (Egypt) for heritage management purposes. Using multitemporal remote sensing data from the visible and near-infrared spectra alongside 19th-century Ordnance Survey maps, it reconstructs a detailed picture of landscape change over the last century and a half. This allows us to highlight areas that should be prioritised for archaeological study and preservation. Existing protection and preservation strategies focus on so-called ‘flagship’ sites (such as the monastic enclosure), routinely sparing remnants of a more mundane and recent past, such as 19th-century historic orchards.

INTRODUCTION

The EAMENA project (www.eamena.org) is a remote sensing project based at the Universities of Oxford, Lancaster and Durham that is creating a large dataset of archaeological sites in some 20 countries in North Africa and the Middle East, from Mauritania to Iraq, with its primary focus on the documentation and protection of sites and landscapes that are at risk of recent changes in land cover, such as building activity and agricultural expansion.

The EAMENA project draws extensively on remote sensing data, including open-source satellite imagery available via Google Earth and Bing Maps - to identify sites and monitor their condition. Information from remote sensing is routinely combined with information from modern and ancient maps, archaeological surveys and ground photo. St Catherine’s Monastery (Fig. 1) was founded in the 6th century AD and is the oldest Christian monastery still in use for its initial function (Ten Harkel et al. 2018). Since the first millennium AD, it has had an important destination for religious tourism, which saw a marked increase in the 19th and 20th centuries. The St Catherine Area also comprises the surrounding landscape with numerous sites of archaeological and religious significance, and has been declared a UNESCO World Heritage site (no. 954).

METHODS

The EAMENA remote sensing methodology involves the visual analysis of satellite imagery to identify sites and to monitor any changes and threats over time. Its main data source is Google Earth Pro, whose Time Slice function allows for a multitemporal perspective (Fig. 2). In the case of the St Catherine’s Monastery case study, the available imagery ranged between 1869 and 2018.

To ‘travel’ back in time, this could be augmented with aerial photos from the 1950s and 1960s (donated to the project by some of the site’s current inhabitants, photographs: Bewley and Fradley 2017) (Fig. 3) and the Ordnance Survey Mapping carried out in the 1860s by the British Royal Engineers (Wilson and Palmer 1869) (Fig. 5). Features of archaeological interest were clipped from the OS map in Google Earth Pro. Further analysis was carried out in QGIS.

A more recent view of the modern land cover could be obtained from Sentinel-2 images from 2018, downloaded from the Copernicus hub. Although the resolution is not fine enough for archaeological site identification, the Near-Infrared wavelengths are useful for identifying vegetation. This is useful because it highlights the major threats affecting archaeological sites in the Middle East and North Africa.

RESULTS

Visual comparison of the satellite imagery from Google Earth Pro and a RAF ariel photograph from 1951 of St Catherine’s (Fig. 4-A) shows that the monastic enclosure, with its historic buildings, remained largely unchanged over this 65-year period. It also shows, however, that a new access road to the monastery was constructed in the period between 1951 and 2005 to accommodate the increase in religious tourism. This raises the question to what extent this increase in travel to the UNESCO World Heritage site has impacted on the surrounding landscape, in particular in terms of historic settlement and agriculture. To gain a better understanding, more detailed analysis was carried out of a wider area (Fig. 4).

Fig. 4 compares the land cover of the area surrounding the monastery in 1889 (based on the 1889 OS map) and 2005 and 2016 (based on satellite imagery from Google Earth Pro). It shows a substantial increase in built-up and cultivated land between 1889 and 2005, with additional expansion between 2005 and 2016. This can be explained by the additional economic potential of the area as a result of increased tourism. The largest built-up area in the centre left of the image is the modern town of St Catherine, one of Egypt’s newest towns.

Thus, although the monastic World Heritage site of St Catherine itself is adequately protected and therefore preserved, elements of its wider historic landscapes, such as orchards - important for our understanding of the socio-economic networks that supported the monastery community before the increase in tourism - are potentially under threat or already damaged by rapid population increase and settlement expansion. A sustainable heritage management approach must be implemented (Ten Harkel et al. 2018), but a full understanding is required of the date and current condition of the various landscape elements.

Here, remote sensing data, especially when combined with other data, can provide valuable insights. Fig. 5 takes a detailed look at a group of orchards in a wadi (seasonal watercourse) to the south of the modern town of St Catherine, contrasting the 1889 OS map with satellite imagery from 2013. This simple exercise allows us to conclude that the three southern orchards date back to the 19th century, whereas the northernmost (indicated by the Datura amygdaliformis) is of more recent date.

Finally, Fig. 6 again takes a broader look at the landscape, overlaying the outline (in yellowish green) of the orchards mapped on the 1889 OS map onto an image generated from Sentinel-2 data in 2018 (false-colour infrared, bands 8, 4 and 3), showing areas of vegetation in red. The coincidence between the two indicates that all the orchards that were in use in the 19th century are still in use today, and that a substantial increase in vegetation land cover seems to have taken place since, potentially endangering the preservation of the historic orchards.

DISCUSSION

Modern-day tourism has an extensive impact on archaeological landscapes. Although ‘flagship’ sites such as St Catherine’s are protected from any kind of real-time heritage management institutions like UNESCO, there is often a lack of focus on their wider landscape setting. This is especially the case for remnants of a more recent past, which are often considered to be too ‘modern’ to deserve special attention, let alone protection.

If we want to gain knowledge about the way in which communities like the one at St Catherine’s engaged with their surroundings and about the lands of socio-economic networks that were in place, it is vital that we shift our focus to the wider landscapes. In the case of the St Catherine Area case study, this provides additional challenges because of the continued use of historic landscape features (in this case orchards) by present-day Bedouin communities. These are living landscapes, preserving remnants of a deeper past that are at risk of disappearing as a result of their continuous use and exploitation.

In order to understand and protect these landscapes, and preserve knowledge for future generations, it is essential to develop a deeper understanding of the various elements and processes that shape them. This is especially true for remnants of a more recent past, which are often considered to be too ‘modern’ to deserve special attention, let alone protection.

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CONCLUSION

This approach showcased in this poster is interdisciplinary, combining historic map analysis with visual interpretation of remote sensed images (arbores as well as satellite imagery) to analyse the landscape of St Catherine’s Monastery in Sinai (Egypt) from a multitemporal perspective. Remote sensing data from the visible and near-infrared spectra, in combination with 19th-century maps, has been used to make a detailed multitemporal analysis of land use in this remote landscape. This methodology allows us to identify sites of historic and archaeological interest, as well as areas where rapid or more sustained changes in land cover are taking place. Remote sensing data provides a valuable datasets, as it allows for rapid and low-cost analysis and can be successfully applied even when it is impractical to visit the area in person.

REFERENCES


