

The Environmental and Cultural Heritage Impact of Tourism Development in Petra - Jordan

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Abstract

The expansion of tourism in Petra following the Middle East peace process in the early nineties has resulted in a frenzy of infrastructure and urban expansion never witnessed before. Poor planning and unchecked growth led to serious problems. Several conservation plans had been created before and after the peace between Jordan and Israel. However the implementation of such plans was never completed due to their ambitious requirements and taxing financial demands. The paper illustrates the use of remote sensing and GIS to study the environmental and cultural heritage impacts of Tourism Development.

Introduction

No one argues the importance of the development of tourism for the benefit of indigenous populations around historically important sites. However, Sustainable Tourism requires the implementation of tourism development plans without infringing on the integrity of cultural heritage sites. Thus there is a right way for tourism development and there is a wrong way. Unfortunately, in Petra the development of tourism and its infrastructure has gone astray in more ways than one. In the aftermath of the signing of the peace treaty between Jordan and Israel in Wadi Araba (1994), Jordan was literally caught with the lack of an appropriate plan for tourism development to meet the rising demand with the sharp increase of tourist arrivals. Sure there was a Master Plan prepared by UNESCO [1] for the conservation of the Petra site and its monuments, and Petra had already been placed on the World Heritage List, but unfortunately, as with many plans prepared by foreign experts, the scheme was too ambitious and required huge resources that Jordan could not afford to raise. With the increasing tourism pressure, a frenzy of unchecked development, and the establishment of hastily put together tourism infrastructure development took place. This paper focuses on the negative impacts of tourism development while recognizing the importance of reaping the benefits of tourism especially in the poverty stricken region surrounding Petra. The paper also illustrates the use of GIS in assessing environmental and cultural heritage impacts of tourism.

1. The Region of Petra

The monuments of Petra were carved from the cliffs surrounding a plateau, of roughly 850 meters elevation above Sea Level. The sandstone formations

at this level are of Cambrian origin. At slightly higher elevations, white Ordovician sandstone formations are found. Some of Petra's monuments were carved at this level as well. Outside Petra and on top of the Ordovician layer lie mostly limestone formations that contain several water sources that fed the ancient city through a system of canals and clay pipes. In addition the Nabataean harvested water using dams, cisterns, and wadi (valley in Arabic) barriers as well as agricultural terraces. The steep limestone formations that rise to about 1400 meters above Sea Level are known as the Sharat Mountains. To the East of Petra lies Wadi Musa Village, which witnessed considerable urban expansion and tourism development in the nineties. To the North and directly overlooking the site, a village, Um Sayhoun, was built in 1983 following a plan by a World Bank project, to house the Bedul tribe that used to live in the caves of Petra. North to Um Sayhoun, a Neolithic site was discovered as well as a small group of rock carved monuments (Ordovician) known as Bheida or Mini Petra (also Little Petra). To the east of Bheida, a rural or suburban area has been utilized for agriculture with dams and terraces as well as extensive defense structures that lie high on the tops of the Sharat formations. Further North, a thick Oak forest (the Hisheh forest) represents the scarce but healthy vegetation that exists in the region. Thinly distributed in the higher areas of the region, Juniper Phoenicia trees are found to the North and South of Wadi Musa. A modern road connects Wadi Musa to Um Sauhoun and Bheida and the road continues West to Wadi Araba, and East to the Hisheh forest. A modern road to the South of Wadi Musa leads to Al Taybeh village. In the Map below, the villages are shown together with the above mentioned roads. The points in green are archaeological sites that have been surveyed by the JADIS project, an effort implemented by the American Center for Oriental Research (ACOR Amman) and the Jordanian Department of Antiquities. It is quite obvious that cultural heritage sites are not restricted to Petra and are widely spread around it as well.

2. Urban and Tourism Infrastructure Expansion/Development and their Impacts.

One of the earliest projects aiming at the conservation of the Petra site was a World Bank funded project implemented by the National park Service of the United States. A major conclusion of the project was that the Bedouins who inhabited the caves of Petra had to be relocated if any protection and improvement of the site was to be achieved. Unfortunately, the site chosen by the Jordanian authorities directly overlooked Petra and soon ugly concrete structures were to be seen from inside of Petra. With the large population growth characteristic of the traditional Arab society, the village expanded haphazardly, and attempts by authorities to control this sometimes led to civil unrest and even violence. What is worse is that a number of inhabitants built two or three storey buildings and converted them to low cost hotels, specially serving foreign archaeological excavation teams. Built

in 1983, the village is still a sore spot that causes scenic pollution. Children from the village are in the habit of leaving school and climbing down the slope to sell worthless trinkets to tourists, but sometimes even illegally acquired ancient artifacts.

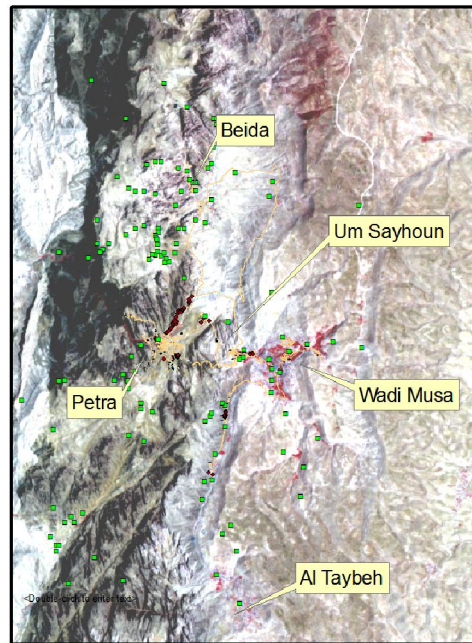


Figure 1: Map of the Region.

In the eighties only two hotels were known in Petra, the Government Rest House and the Forum. Both were built in a discrete manner using stone that fitted reasonably well with the natural environment. In the early nineties several new and modern hotels started cropping up on the Al Taybeh Road. They directly overlooked the Petra site and some of them could be seen directly from the archaeological site again infringing on the natural and geologic beauty of the site. After the signature of the peace treaty it became necessary to start planning for the high numbers of tourist arrivals expected. A Petra Regional Authority was created to develop the region and lay out land use plans aimed at protecting the archaeological site. Earlier on, the UNESCO Master plan laid out an Archaeological Park Boundary. However, the work of the Authority was often challenged by property owners who considered it their right to reap the economic benefits of neighbouring an important site such as Petra. To the present day, it is still difficult to strike the proper balance between the economic needs of property owners and the protection of the site. In 1996, once again the World Bank supported a

Master Plan [2] for the development of infrastructure to serve the expanding tourism sector. Among other things The Wadi Musa -Al Taybeh road was widened. Little consideration was given to the conservation of the site and while an environmental impact study was conducted, some serious outcomes resulted from implementation of the project. For example, the cuts made into the flanking hills of the road to widen it, resulted in some loss of Juniper trees. The percentage of lost trees was not very high, but what is worse is that all the soil and rubble of the excavations was dumped into the western cliffy side of the road thus changing the terrain and risking carrying over the rubble to Petra itself during the rainy season. It is ironic that the development plans were laid out and implemented with large funding, while a Petra Conservation Plan supported by the Bank was prepared several years later, and very little funding was invested into its implementation. Furthermore, the plan ended up establishing a Petra Archaeological Park Authority. The plan was too ambitious for the Authority to implement, considering that the financial resources necessary for any meaningful control of tourist activities and conservation of the site were never provided. Nor is the Jordanian Government providing any substantial funds for this authority. In fact, the budget of the authority does not even reach 1% of the total yearly revenues made from entry tickets to the site.

The boom in tourism attracted investors from the richer parts of Jordan, as well as abroad. Real estate speculators started buying land from the indigenous population and even invested in smaller hotels or restaurants. In addition, some of the local land owners managed to establish businesses, such as small hotels, restaurants, coffee shops, and even travel agencies and tourism services (guides, camel rides to the desert, etc.). It also became common for some families to offer their homes for bed and breakfast. As a result, there developed a big boom in the construction business as well as an expansion of the road network. Urban expansion went unchecked. Ugly concrete and sometimes modern stone buildings started ruining the beautiful landscape that was Wadi Musa. Even attempts to paint the concrete with a pinkish colour failed to blend well with the natural setting. What is worse is that the expansion of concrete and asphalt areas increased the risk of seasonal flashfloods, as the disappearance of soil, so necessary to retain moisture and reduce flow, increased. This problem has been addressed by the Ancient Nabataeans by building a tunnel to the North of the main gorge entrance of the city, the Siq. The government following the death for several French tourists in the early sixties reopened this tunnel, and for a while this measure was sufficient to protect the Siq. Naturally, in the nineties this was no longer enough. Several measures were taken to face this risk, and only time will tell if the problem has been completely eradicated.

While expanded urbanization posed its own threats such as the increased demand for the scarce water resources, inappropriate services also made matters worse. Solid waste disposal was solved by moving the disposal site

to a remote area. However, up to the nineties sewage disposal was achieved through individual septic tanks, that caused increased threats to the ancient monuments. Population growth and urbanization naturally made matters worse. The French Electricite de France Company (1993) made a proposal that suggested the construction of a sewage treatment plant to the West of Petra. This necessitated the construction of an underground tunnel to carry the necessary piping right under Petra. The tunnel was justified by the fact that it would lower the water table under the monuments of Petra. The concept was considered too risky and expensive, and lost to a USAID supported project, that seems to have solved the problem. The sewage disposal system that resulted collects the effluent in a low elevation region near the entrance of Petra, and pumps it out of Wadi Musa to a higher region several kilometers to the North of Beidha. As a safety factor in the design, the project allowed for two sturdy pumps, one acting as a reserve in case of failure of the other. Unfortunately, an important aspect was ignored. An underground rainwater disposal system should have been installed alongside the sewage system. Considering the long and expensive excavations that took place, this would have saved lot of expense that could have avoided several serious flashfloods that occurred in later years. One aspect of the project that was well addressed was the Cultural Heritage impact. Archaeologists worked for most of the duration project in order to conduct salvage works for important sites. In open areas, the piping system was diverted to avoid damage to ancient sites, many of which were being discovered for the first time. Unfortunately, in Wadi Musa itself, this was not possible and here only documentation and extraction of ancient artifacts was resorted to where the path of the piping system and the excavations for it crossed an important ancient site [3-5]. Another project in which considerable attention to ancient remains was given, was the construction of a hotel based on an abandoned “turn of the nineteenth century” village known as Khirbet Al Nawafleh. The project aimed at the restoration of the old village houses and refurbishing them in a modern fashion to make them usable as hotel rooms. An ancient site was about to be destroyed. However Jordanian archaeologists, who were documenting the site and trying to conduct salvage operations, managed to convince the investing company to salvage the whole site and integrate it within the hotel construction [6-9].

Finally the construction of a modern Archaeology and Tourism Faculty Building, in the Middle of Wadi Musa near the entrance to Petra, by the Al Hussein University in Maan was a blow to the concept of Conservation, considering that this faculty was established to teach archaeology, tourism, and conservation. The building took away land that has long been considered a protected area, being the only spot that was left green in that vicinity.

3. The use of GIS and Remote Sensing to Determine the Impacts and their Extent

It is well established that GIS and Remote Sensing have become standard tools for spatial analysis and evaluation of environmental impacts. To a lesser extent, they have also been used to study cultural heritage sites. In the remaining part of this paper we will focus on the use of these tools in Petra and its immediate vicinity. An important application of such technologies is the follow up of the evolution in time of environmental and geologic parameters. In figure 2 three satellite images from different times are included. The 1968 images clearly show a small community in Wadi Musa and no housing or construction whatsoever in Um Sayhoun. The 1986 image shows the new community in Um Sayhoun and the expansion in housing in

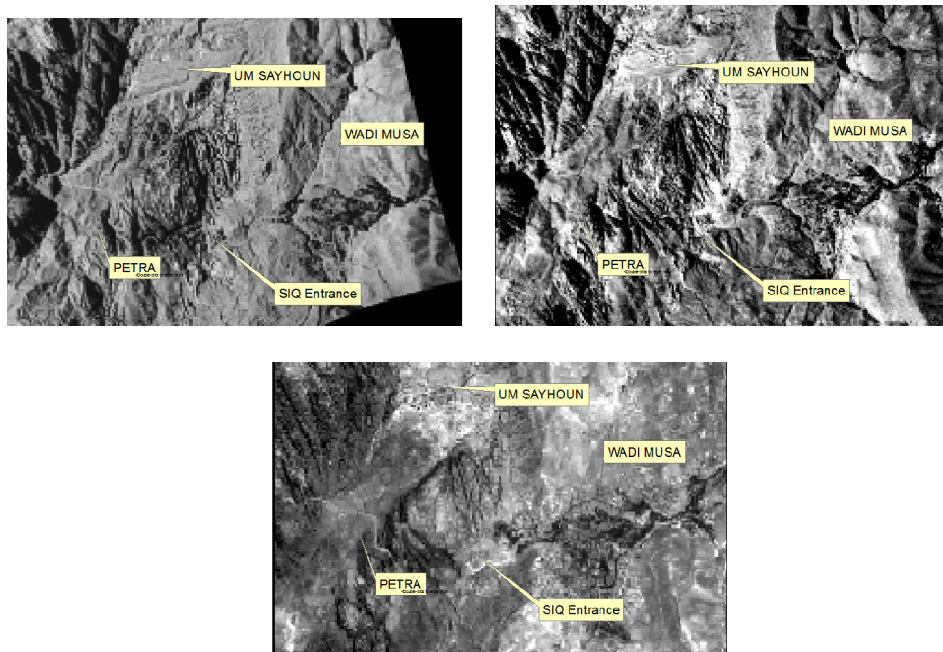


Figure 2: Top left is a US 1968 satellite image; right is a Russian 1986 image; bottom is an IKONOS 2002 image.

In Wadi Musa. Figure 3 and 4 give an even closer look at the sites. The increased urbanization is very clear in Wadi Musa. On the other hand figure 5 shows clearly the dense Juniper Phoenicia tree formations flanking the Taybeh-Wadi Musa road. If zoomed in, the image offers the opportunity to count the exact number of trees in a particular area. Juniper trees were removed to expand the road. Ironically, the building in figure 5 belongs to the Petra Regional Authority, which was entrusted with sustainable development of the region. The building is a sore spot as it overlooks the Petra entrance and constitutes a scenic pollution, which can be easily seen from the streambed entering into Petra.

Landsat Imagery is a Multispectral satellite imagery system that utilizes IR

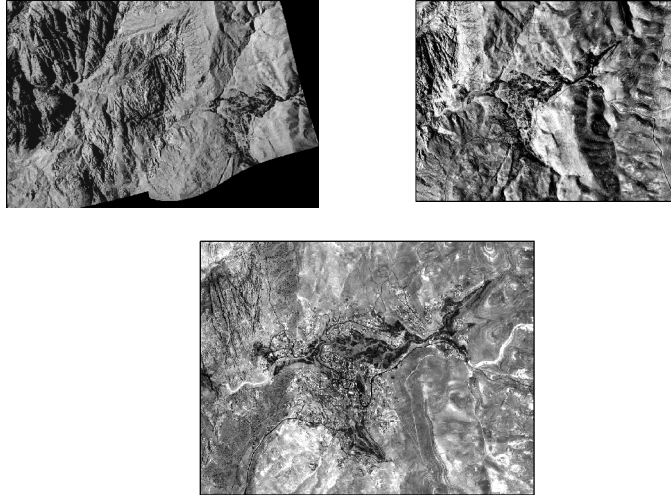


Figure 3

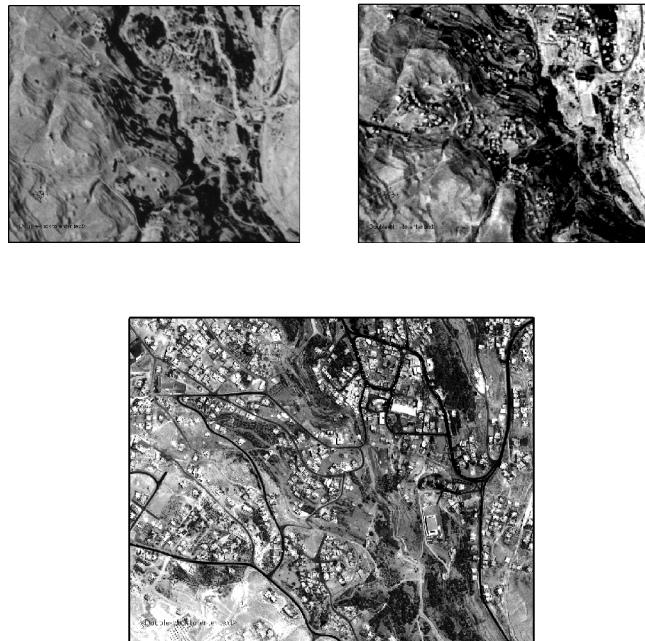


Figure 4: A very close look



Figure 5: Dense Juniper trees flanking the Taybeh Road

sensitive sensors in addition to visible cameras. Since Chlorophyll in plants absorbs IR radiation the images easily detect plants. Thus this remote sensing facility is capable of identifying vegetation and distinguishing healthy from unhealthy trees. To simplify this process the original images are classified using a model called Tassel Cap treatment. The advantage of this treatment is that in addition to vegetation it is easy to detect housing as concrete appears in a special colour. Sometimes white rocky regions also give the same colour. In figure 6, a 1994 (left) and 2003 (December on the right) Tassel Cap images are shown. In figure 7 another type of treated imagery (Hydro) shows information similar to the Tassel Cap imagery. The light blue colour in Tassel Cap images is due to vegetation. In the 1994 image a thin light blue line in the center left is due to a streambed that has running water due to a permanent water source. The colour is due to the fruit trees that the Bedouins (Bedul) have planted alongside the stream flanks. At the top center there is a bright rather large light blue spot that is due to the presence of another water source (Dibidbeh source) in an abandoned village from Ottoman times. The almost triangular light blue region in the right center is due to the lush vegetation of irrigated fruit groves of Wadi Musa village. A dark wine red colour in this area is due to the concrete buildings of the village. Dry streambeds with lot of soil moisture also show healthy vegetation. The 2003 image, while showing different colours still shows vegetation in light blue. Housing is dark blue to dark red. Comparison of both images clearly shows urban expansion at the expense of the vegetation in Wadi Musa. The Dibidbeh source with scarcer and dwindling water output can hardly be seen. A closer look at Wadi Musa in both

images in figure 8 reinforces the conclusion about urban expansion. Juniper trees are

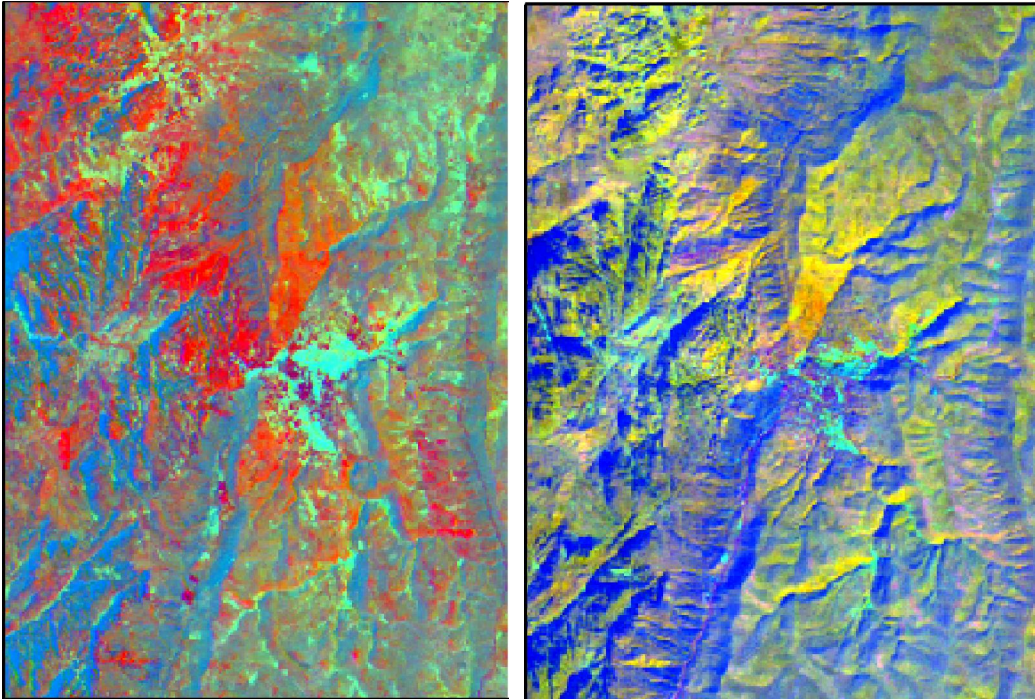


Figure 6: Tassel Cap image from Landsat satellite images. Left side is from 1994, and right one is June 2003.

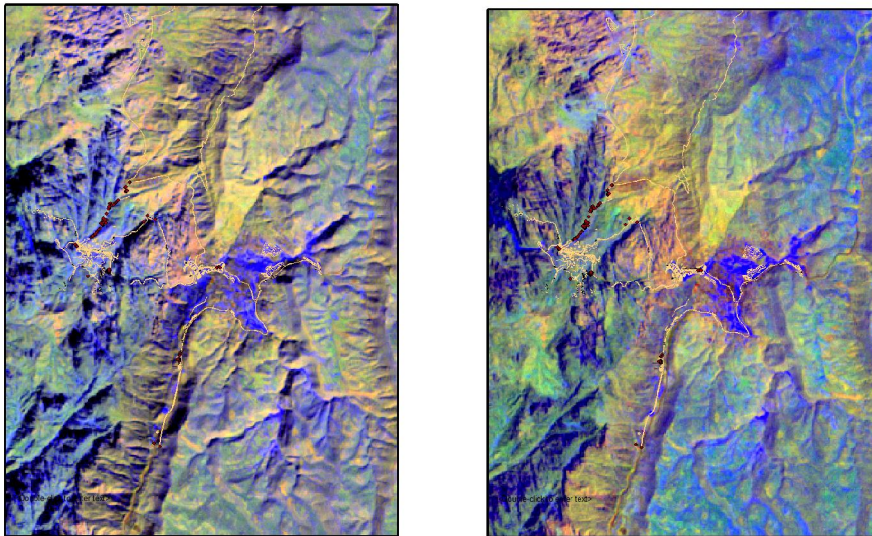


Figure 7: Hydro treated landsat images. Left June 2003, right is December 2003

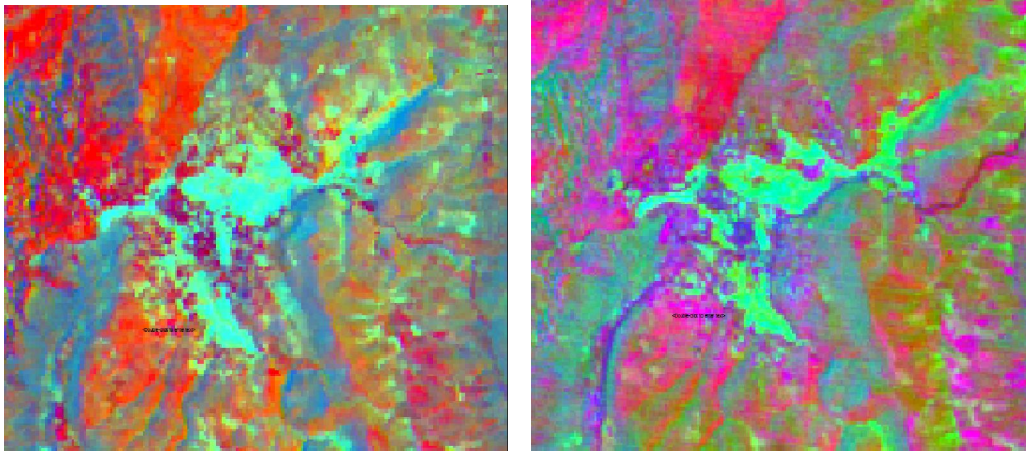


Figure 8: Closer look at the 1994 and 2003 Tassel Cap images

shown as either darker off blue or off green left of the Taybeh Road and elsewhere. The 2003 image on the right shows a decrease in the Juniper area compared to 1994. In order to project into the future figure 9 shows the whole area again. Light orange lines are asphalt or dirt roads. The thick green line is the Archaeological

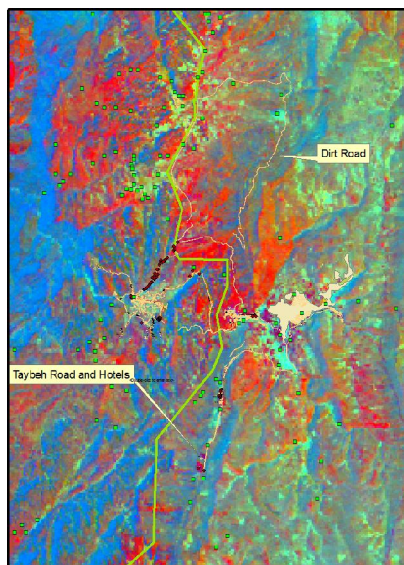


Figure 9: Predicting the future

Park Boundary. From the points surveyed by the Jadis Project (shown as green points representing archaeological sites) it is clear that many such sites have been excluded from the Park. While till now most of the development has taken place in the South of Wadi Musa, with several hotels built on the Tayybeh Road, the area between Um Sayhoun and Bheida (especially towards Dibidbeh source) is quietly being eyed for development. Recently, the Government bestowed ownership of land in this region to some of the local Bedouins, and investors from Amman are looking for this land and hope to buy it. Note that this region has many archaeological remains that still need to be studied. The author happens to be asked for his opinion by several people seeking advice about buying land in the Bheida region. Are we going to see pressure in the future to asphalt the dirt road to Dibidbeh source? Will there be more hotels built in that scenic area that overlooks some of the most beautiful natural scenery in the Petra region? Is the Government going to act soon to plan this region and avoid the mistakes and pitfalls of the Tayybeh Road, or are we going to wait till it is too late, when the private sector starts dictating the future and the pace of development in that region? Just to remind you figure 10 shows Um Sayhoun's concrete buildings overlooking some of the finest ancient facades of Petra.



Figure 10: Um Sayhoun as seen from Petra below with some of the important Facades

4. Conclusions

Obviously there is a right way to develop a sensitive region and there is a wrong way. No one denies the advantages and positive impacts of tourism

development. This paper does not mean to lay blame or send out accusations. Rather it states some facts that could help in avoiding future pitfalls. It does focus on the negative aspects but implicitly the positive aspects are not ignored. The negative impacts can be summarized as follows:

- a- Loss of Green Cover: Irrigated Groves, Flora in tourist paths and hence Fauna. Some loss of Juniper
- b- Loss of Scenic Views Taybeh Road, Um Seyhoon. Dumping of soil
- c- Sceptic Tanks cause seepage of water to Monuments. The sewage treatment plant and its pressurized piping system caused destruction of many archeological finds. Only salvage operations were possible in certain areas, and the archaeological sites could not be preserved intact and had to go.
- d- Poor land use plans: Haphazard Rush for Development
- e- Pressures on Water Resources to cater to hotels and tourists
- f- Many houses in Wadi Musa are built on top of Archaeological sites
- g- Water sources drying up.
- h- Increased Flashfloods in winter due to Asphalt and Concrete in Wadi Musa: Threat of life, property, and monuments.
- i- Possibility of pollution of water sources and eventual air pollution.
- j- Theater threatened by tourist stepping on it. Free mobility of tourists in sensitive places. Risk to tourists in dangerous places is also a problem.

What are the necessary measures to improve future planning. We believe that considerable research in the following areas is needed:

- a- Cultural and Environmental Resource Management
- b- GIS And Remote Sensing: Monitor and Manage
- c- Pollution Control
- d- Risk Management in Land Use Planning
- e- Tourism Statistics and their analysis
- f- Carrying Capacity of Sites
- g- Protection and Conservation of Environmental and Cultural Resources

However research alone is not enough. It is necessary that the relevant Government authorities support this research and do their utmost to benefit from its results.

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