AN ASSESSMENT OF THE CHANGING LANDSCAPE IN AN ISLAND STATE.

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Abstract
Malta, an island state of 315.59 km^2 is situated at the centre of the Mediterranean basin. The high population density of 1274 persons/ km^2 which increases drastically with the arrival of over 1 million tourists annually, induces considerable demands on the local limited resources. Issues related to the conservation of archaeological sites, the protection of endemic endangered species, the exodus of the farming community, the rejuvenation of the tourism sector and building development are among the most debatable points in land-use conflicts. The footprint of new development has altered the landscape considerably, and the built up area has increased from 4.5% in the mid-1960s to 23 % by 2001. Rural areas, and even geomorphologically and ecologically sensitive sites such as valley systems, are considered potential areas for building development. A number of valleys have been terraced and the main water channel surfaced over, in order to construct residential units and commercial areas, thus increasing the risk of flooding and mass movement. In view of future sustainable landscapes, this paper discusses causes of the changing landscape patterns, and proposes possible planning procedures that may be applied to safeguard the cultural and natural landscapes and which nevertheless respect the needs of a changing Maltese society. The elaborate mosaic of the landscape pattern requires a holistic management plan that takes into consideration all the variables that influence the state of the environment. Specific case studies illustrate that various factors influence the landscape to a varying degree. Hence to safeguard the heterogeneous characteristics of the built environment and the bio-physical aspects of the territory one should discuss the landscape as a system.

Introduction
The Maltese islands are situated at the centre of the Mediterranean basin (36^{o}N, 14^{o}35' E). The total land area is 315.59 km^2 (Malta - 245.728 km^2, Gozo - 67.08 km^2) and the population adds up to 392,296 (1). The maximum length of the shoreline of Malta is 196.80 km, and that of Gozo is 56.01 km.
The Maltese landscape may be considered as a cultural landscape that is strongly intertwined with the natural heritage. This is the result of over 7,000 years of human dominance on the territory. Hence, the landscape of the Maltese islands is mainly characterised by its proximity to the sea as a result of the small size of the island. One does not find extensive forests but small patches of wood land surrounded by terraced fields over low hills and valley sides. Churches dominate the inland townscapes whereas high buildings and tourist complexes shadow the littoral urban skyline, overlooked by historic fortified structures. The landscape consists also of karst topography, cliffs, valleys, sand dunes and shallow coastal waters, that support the typical Mediterranean habitat with a rich biodiversity due to the different species that have affinities with those of Northern, South Eastern and Western Mediterranean as a result of the strategic position of the islands at the centre of the Mediterranean basin.

The Rural Environment.
Ramla Valley in the island of Gozo may be considered as an example of the typical rural environment of the Maltese islands. As indicated in Fig. 1, the valley consists primarily of terraced fields along the valley slopes, leading to the sea. In an area of just 3.5 km^2, one finds;

- an extensive area of cultivated land which is suffering from degradation due to the increasing abandonment of the agricultural land leading to neglect of terraces and rubble walls that is causing an accelerated soil erosion;
- the reclamation of terraced fields, converting traditional agricultural land into vineyards operating modern methods of agricultural production to obtain optimum produce for commercial purposes;
- hunters and trappers hides taking over the abandoned agricultural land to plant alien vegetation as acacia species that alter the soil pH;
- riparian environments surrounded by garrigue and maquis elements together with the best example of coastal dunes in the islands;
- various sites of archaeological and historical importance, including the *Ggantija* Neolithic temples, the Bronze Age remains at *in-Nuffara*, remains of a Roman villa, and remains of defensive constructions built by the Knights of the Order of St. John.

- extending settlement footprints invading the plateaux, along ridges and sloping argillaceous terrain of the valley, and a high potential for the construction of a tourist complex to exploit the high landscape value of the site;
- the presence of sources of fresh water springs, giving rise to place names in the valley, such as *Ghajn Hosna* and *Ta' l-Ghejjun,* indicating the importance given to agricultural activity in the fertile valley, (*ghajn* meaning a source, a spring being a source of fresh water).

This scenario highlights the challenging task of planners who have to address existing and potential land-use conflict as a result of the rapid change in the territory.

Fig. 1. Ramla Valley, Gozo.

Building Development in Malta

The massive transformation of the Maltese landscape took-off in the 1960s as a result of the boom in the construction industry. The government addressed the inconveniences of the housing shortage problem by targeting an increase in the availability of affordable housing through the construction of housing estates and by providing building plots. The government could build housing facilities through the acquisition of rural land. Between 1966 and 1979, in mainland Malta only, 16.4km^2 of rural land was taken up for urban use, mainly for housing but also for road construction. (2) Consequently, many settlements experienced urban sprawl, especially with the introduction of the Home Ownership Scheme in the early 1980's, when young couples could afford plots of land with an average floor space of 300m^2 at a cost of just Lm250 (ca.590 Euro), to build their own residence.

Many of these new residential zones were beyond or distant from the existing urban concentration, extending consequently the settlement even further. This trend led to the general urbanisation of the island, thereby eliminating the rural boundaries causing the coalescence of settlements and undermining their physical distinctiveness. The extents of the built-up area increased from 4.5 % in the mid-1960s to 23 % by 2001(3).

However, one should note that the extent of the built-up area is not related solely to housing. The improvement in the standard of living and increasing numbers of people, including tourists, obviously increased the demand on space, water and electricity services amongst others. Hence, the country embarked in major infrastructural projects including an improved road network, hospitals, reverse osmosis plants, and a new power station. All of these projects had a considerable impact on the environment. However, with the establishment of the local planning agency, in 1992, now known as MEPA (Malta Environment and Planning Agency) and the coming into force of the Structure Plan the rate of building extents decreased significantly. Whereas the rate of loss of arable land to construction between 1971 and 1986, was of 200 hactares/annum, this decreased to 80 hactares/annum between 1986 and 2001 (4).

Settlements therefore expanded extensively over a few decades, mainly as a result of the housing estates and the building plots granted through the Home Ownership scheme for residential development. The settlement of Mosta in central mainland Malta expanded between 1967 (Fig. 2) and 1998 (Fig. 3) (5). This increase in built up area contrasts with the relative slow expansion of the village in previous decades. The expansion of the urban areas, has not been limited to flat land, but occurred also in valleys often in spite of less favourable conditions.

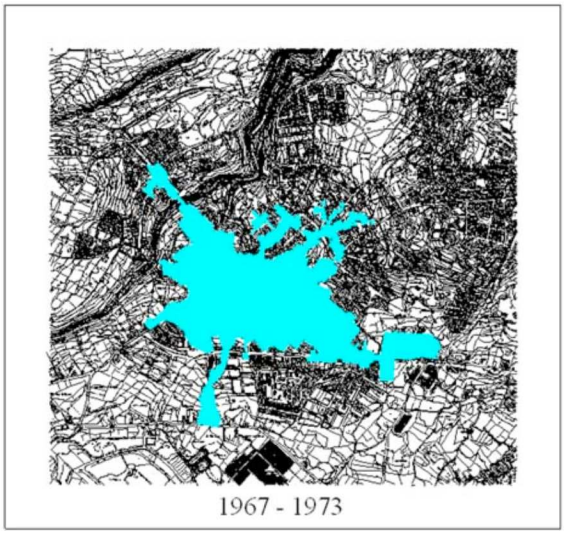

Fig. 2. Mosta 1967 – 1973.

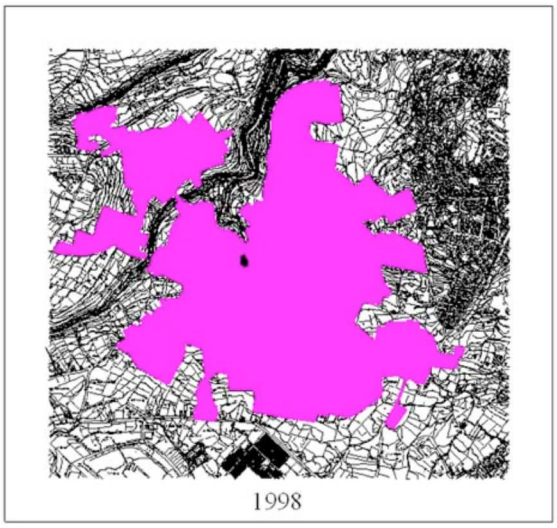

Fig. 3. Mosta 1998.

Building Development in Valleys
In many valleys in Malta, development has encroached also along the valley slopes and valley beds. Such development has expanded in many areas over the years, both in the Inner harbour densely populated region, and also in other parts of the islands, that were characterised by the rural environment prior to building development.

A typical case study is the Msida Valley system, in a dense urban area of Malta. A major arterial road that leads from the central region of mainland Malta to Marsamxett harbour on the eastern coast, forms part of the valley channel. It leads through a number of settlements including Birkirkara which is the most populated town in Malta. An extensive commercial zone is actually found in the valley proper.

At Msida, where the valley drains into the sea, apart from the residential and commercial buildings one finds the hub of the traffic circulation in the inner harbour region, which is the most densely populated area in the Maltese islands. Precipitation is characterised by torrential episodes, that is heavy rainfall in a short time span. Consequently, flooding of these sites is a major issue, particularly since the road serves as the valley bed. After heavy rains, chaos prevails in spite of the various infrastructural projects that have been implemented to address this situation. The worse flooding episode in the last years occurred on the 15th September 2003, and affected various other localities where buildings encroached down along the slopes and beds of the valleys.

In four decades, the entire valley, of Ghajn Zejtuna was transformed, with the construction of villas on the surrounding plateaux, along the ridges and also over its argillaceous slopes. Its toponomy has changed to *Santa Maria Estate*, and little evidence suggests the original topography of the valley, its water course, vegetation or past agricultural activities and traditions. The encroachment of building development in Ghajn Zejtuna is illustrated in Fig. 4 (Aerial Photograph 1957) and Fig 5. (Aerial Photograph 2004). Unfavourable ground conditions and argillaceous terrain, often lead to structural defects and instability of slopes.

Tourism
Since Independence in 1964, tourism was considered as the main source of income to the islands. By the end of the 1960s, Malta had 101 hotels with over 7,500 beds. (6). The tourist flow then was of about 186,000 foreign visitors per annum. Construction of tourist facilities mainly affected the north-eastern coastal areas with its accessible geomorphology both from land and from sea In the 1970's the number of tourists increased but this led to extensive infrastructural problems since the country was not yet ready to host such an intake of visitors. This situation backfired since the number of tourists eventually declined, especially from the British market that represented 76% of incoming tourists (7). This scenario was addressed by arresting any tourism related development.

By the late 1980's, this approach was reversed since, apart from the general upgrading of the infrastructure, new permits were given only to 5 or 4 star hotels. By the turn of the century Malta offered 41,000 hotel type beds, together with about 5,000 beds in self-catering accommodation. Between 1990 and 2004 about 5% of the 1km coastal buffer area was developed. (8). This indicates

the significant pressures coming mainly from tourism and the recreation industry. Fig. 6 and Fig. 7 indicate the change in land use from 1957 to 2004 at one of the major touristic site, St. Julians. The littoral shown in the Figures, besides residential development, hosts at least five, 5 star hotels, apart from other accommodation facilities, catering establishments and entertainment outlets in the area.

Fig. 4. Ghajn Zejtuna – 1957.

Fig. 5. St Marija Estate (Ghajn Zejtuna) – 2004.

Moreover, in the last few years the number of visitors declined. While new 5 star hotels are being constructed, taking up large extents of garrigue, other 5 star hotels are being simultaneously converted into residential units. This scenario is leading to a strong public reaction opposing the fact that more land is being taken up for the tourist sector. Examples include the construction of a yacht marina in association with a project of a multinational hotel group, and a proposed golf course meant to take up a considerable extent of arable land and unique garrigue.

Fig. 6. St Julians – Pembroke; 1957.

Fig. 7. St Julians – Pembroke; 2004.

Attitude towards the environment.
The organization of NGO's to oppose major projects, especially those that encroach on the rural environment, indicate that the Maltese are becoming more aware of their natural and cultural heritage. Education, an increased standard of living, better road networks and increased car ownership

helped Maltese society to rediscover the rural environment. In the long term this led to a change in attitude, a rediscovery of rural artifacts as *'sejjieh'* rubble stone to decorate dwellings and the gentrification of village cores throughout both Malta and Gozo. The countryside is now considered an area for leisure activities, with the organization of ramblers associations, birdwatchers and picnickers amongst others. A study carried out by MEPA on the public perception of landscape value indicates that rural landscapes are more valued than built up areas. Sites with varied topography, coastal features and lush vegetation are the most appreciated (9). The Maltese public has to appreciate that their typical Mediterranean landscape, cannot be associated with abundant vegetation and abundance of surface water. Hence safeguarding the natural, unbuilt landscape does not entail the importation of foreign landscapes that invariably create more pressure Malta's very limited water resources.

Water
The extensive sprawl of built up areas and roads limits the amount of land area that allows water percolation to recharge the aquifer. About 56% of water production in Malta is extracted from ground water reserves (10). The over pumping of water from the aquifers is leading to severe salinisation problems. This was investigated through soil tests carried out on 75 samples taken from across Ramla valley. The results indicate that in spite of the proximity of the area to the sea, salinisation is mostly intensive in cultivated areas, along the Xaghra (western) slopes that are less exposed to the prevailing Majjistral (NW wind), than the Nadur (Eastern) slopes (11). The sand dunes on the northern part of the beach further indicate the influence of the prevailing wind on the Nadur side of the valley. Moreover, the results indicate that there is no distinct pattern in the soil samples conductivity related to altitude, even though one would expect that salinisation is higher in low-lying areas. This pattern confirms that soil salinisation in Ramla valley is related to the over extraction of water also for agricultural practices, rather than geomorphological processes .

The Property Market.
The space available for further development is reduced due to the establishment of limits to development areas and extents. This is reflected in price of property. According to local leading estate agents between 2002 and 2004 the price of an apartment rose by 25 % whereas that of a terraced house by 20 %.(12) According to the National Statistics Office the average price of property increased by 14 % between 2003 and 2004 (13). The high population density, the limited land area and the increase in land and property value indicate a great competition on the use of land. Paradoxically, in 1995, 23 % of homes all over the islands were vacant. The existing rent laws discourage owners and occupants to rent dwellings, hence contributing further to this situation. About 65% of the rented stock is rented at Lm100 (c.236 Euro) annually (14).

As a result of the high property value, the general trend is to maximize to the full parcels of land available for development according to planning policies. This is changing the skyline of the urban areas, particularly along the coast with an increasing density of the urban fabric. The coastal areas traditionally characterised by small summer houses, are generally being transformed into new upmarket residential areas, with associated upgrading of the infrastructure, landscaping and embellishment.

Conclusion
The ever-changing landscape is evidence of the fast changing demands of Maltese Society and of the economic development of the Island State. Each landscape element; geophysical, ecological or anthropological, is interrelated. A change in one aspect may disrupt an equilibrium, and hence a discussion of one element cannot exclude the others. The landscape value is not limited to the aesthetic scenic beauty, but to its complex setup which includes the ecological and anthropogenic elements with respect to the geomorphologic processes.

As discussed above, the increase in urban area influences the rate of ground water recharge. The improved standard of living is increasing the demand on groundwater resources, which together with agricultural practices is accentuating the problem of soil salinisation. This may be contributing in turn to agricultural land abandonment leading to a lack of maintenance of rubble walls and hence increased rate of soil erosion. This results in an increasing river load and the accentuated possibilities of flooding. The above is just a simple example of how one antropic element can have a ripple effect not only on different sectors, but also on distant landscapes. Isolated landscaping and embellishment projects cannot substitute the need of comprehensive landscape management.

As outlined above, the Maltese scenario is extremely complex due to the different land-use conflicts as a result of the small size of the country, the growing population, its natural and cultural heritage

and associated constraints. Therefore any long-term management plan of the landscape, requires a holistic approach in view of sustainable land uses.

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