

**ENVIRONMENTAL SIEGE AND SUSTAINABILITY:
LESSONS FROM THE MALTESE ISLANDS**

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ABSTRACT: In this paper I question the vulnerability thesis that underlies the literature of environmental hazards and that stresses the brittleness of the human and built environment. My geographical focus is on the Maltese Islands, located in the Mediterranean Sea, where mechanisms of resilience have evolved over time and appear to be not only neutralizing a suite of threats but using them to advantage. The paper concludes with the presentation of a new conceptual model of hazard response constructed around a resilience thesis.

INTRODUCTION

Although the traditional emphasis among hazards researchers on points of environmental vulnerability has produced useful insights, such an approach neglects issues of resilience and the ability of individuals, communities, and even some nations to thrive under threat. This neglect has resulted in an astigmatic view of human response to environmental risk that has made deficiency and brittleness among people and the built environment appear more pervasive than it may be in reality.

A nation that has high standards of health and literacy, and rising levels of real income, despite apparent chronic vulnerability, can yield valuable lessons concerning mechanisms of resilience. It is important to undertake research to determine the mechanisms that have enabled some countries to thrive under a range of environmental threats, and to identify methods for retaining those successful mechanisms despite rapid socioeconomic change. I argue here that environmental threat can be a powerful creative catalyst, and an impetus for ingenuity and adaptation, rather than being wholly a force for disruption and loss.

The Maltese Islands, located in the Mediterranean Sea, provide an ideal context in which to research resilience because the suite of apparent threats is so diverse and incorporates so many hazards that are historically entrenched. The environmental pressure points that have been borne through time include water scarcity, poor soils, climatic variability, susceptibility to foreign invasion, and geographic isolation. To this list one can add an array of contemporary stressors including a total lack of energy resources, and the depredations of modern tourism. In addition, the archipelago's 316 sq km of land area is now home to 357,000 people, making it the fifth most densely populated nation on earth.

Following the meticulous inventory of Malta's resources by Bowen-Jones (1961, p. 349), it was concluded that "...everything one sees in Malta, other than the major topographical features, is man-made and man-maintained in existence. For this reason, there is an unstable equilibrium that eternally threatens to collapse."

While concurring with that conclusion of precariousness, the remarks of Bowen-Jones can usefully be read alongside those of Rees (1985, p. 396):

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"...natural resources are products of the human mind; their limits are not physical, but are set by human demands, institutions, imagination and ingenuity."

FIELD AREA: THE MALTESE ISLANDS

The Maltese archipelago lies between the European and African continental landmasses, and occupies a sill between the eastern and western basins of the Mediterranean Sea approximately equidistant between Gibraltar and Alexandria, Egypt. Of the five islands, only Malta, Gozo, and Comino are inhabited. Malta is the largest and most populous of the islands and serves as the administrative and commercial center.

Malta's suite of threats are clearly defined for the most part. It includes many hazards that are seen as problematic globally, but which, in the context of a small island, are particularly critical. The following two sections of this paper will first lay out and discuss briefly the major environmental challenges, and then summarize the principal responses to these various challenges.

CHALLENGES POSED: MALTA'S POINTS OF ENVIRONMENTAL PRESSURE

Climate and Water Supply

Malta is subject to dramatic seasonal contrasts. In summer the islands are under the influence of high pressure and the average daytime temperature during June, July, August, and September is in excess of 20 degrees celsius. The average annual rainfall is 560 mm and 70 per cent of the annual total falls between October and March; June, July and August account for only 1.5 per cent of the annual total. Evapotranspiration accounts for 70 to 80 per cent of the precipitation, and only 16 per cent passes into the limestone substratum.

Securing adequate supplies of potable water has been a perennial challenge in Malta. Between 1973 and 1978 the increased use of boreholes caused a precipitous drawdown of the Ghyben-Herzberg lens of fresh water that constitutes the lower aquifer, and there were unmistakable signs of saltwater intrusion (Tricker 1989).

Land and Soil

As with many Mediterranean Islands, there was never any natural endowment in Malta that allowed its people to have an assured future without looking to the outside world (Braudel 1966, pp. 152-153). Although the globigerina limestone of which the islands are largely composed is a particularly valuable building material, it weathers to soil that is thin and coarse, and the islands have always been incapable of yielding sufficient produce to feed the population (Boissevain 1969, p. 6).

Isolation and Dependency

Malta's most celebrated resource is its strategic mid-Mediterranean geographic position coupled with superb natural harbors along the ria coast on the northeastern side of the main island. This resource has generated both prosperity and pain, however, and has prescribed a long history of blockade, resistance, and conquest (Owen 1969, p. 19). From 1000 BC a succession of peoples have occupied Malta, including the Phoenicians, Romans, Greeks, Arabs, and French; from the mid-sixteenth century until 1798, the

islands were administered by the Knights of St. John of Jerusalem; from 1800 to 1964 Malta was a British colony. the strategic value of the land for its various occupiers is suggested by the range of fortifications still to be seen on the landscape.

Through its experience as a garrison outpost servicing occupying forces, Malta was able to develop an industrial base long before any other Mediterranean island or neighboring region (Boissevain and Inglott 1979), but the associated high level of dependency became a handicap when occupying forces withdrew or curtailed military operations. Although the present day government of Malta is well aware of the self-protection inherent in diversity, the degree of dependency remains acute in some areas, most notably in the supply of fuel of which 100 per cent must be imported.

Population

Between 1530 and 1798, the population of the Maltese islands swelled from 20,000 to 100,000. This increase was accompanied by the development of several new towns around the harbor area of present day Valletta. While under British rule, the population again burgeoned under conditions of relative prosperity, and this prompted expansion not only of the suburbs but also of the remoter villages. Population density increased from 361 per sq km in 1842 to 969 in 1956. Present population figures represent a density of about 1,100 people per sq km, and the continued population growth in the latter half of this century has created unemployment difficulties and periodic housing shortages (Boissevain and Inglott 1979).

Rapid Development

The environmental pressures accruing from Malta's rapid pace of development over the past 25 years, such as greater pollution and escalating land prices, are those typical of rapidly industrializing nations around the world. Maltese land area occupied by buildings increased from five per cent in 1957 to 16 per cent in 1985. Particularly conspicuous in the context of a small island is the increase in road building. The 893 km of roadway in 1957, expanded to 1,482 km by 1987 and previously remote areas were brought within any reach of vehicles (Schembri and Lanfranco 1993).

The number of tourist arrivals increased from 20,000 to over 500,000 between 1960 and 1988, placing additional pressures on both land and water. In the Maltese context the influx of tourists poses potential threats to both the groundwater and the littoral zone, two of Malta's most precious resources. In addition, the demands for imported fuel oil will increase as a consequence of increased tourism and of increasing development generally.

CHALLENGES MET: MALTA'S MECHANISMS OF RESILIENCE

Water Supply

In response to the increased demands on scarce water supplies since the 1980s, the Maltese government has made heavy investments in seawater desalination plants and in a water diversion scheme from the island of Gozo to the much more populous main island. Since 1986, the distillation plants have provided a steadily increasing proportion of Malta's water requirements to supplement that supplied from wells, and over 30 per cent of the total now comes from that source (Tricker 1989).

The presence on the island landscape of both desalination plants and the remains of a seventeenth century aqueduct is suggestive of how techniques for managing a scarce resource have

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changed over time. While under the administration of the Knights of St. John of Jerusalem, all houses were required to have a cistern to trap rainwater (Blouet 1967, p. 24). A view from any rooftop today will reveal the continuing utility of such devices. A common tactic of the past less used today is the offering up of prayers for rain.

Land and Soil

Concern for retaining the few true soils to be found in the Maltese Islands has probably been a preoccupation for the inhabitants from the earliest times. As late as this century it was forbidden to erect buildings over *terra rossa* (Houston 1971, p. 640). The continuous struggle for soil has been part doggedness and part ingenuity and ultimately bequeathed a landscape that is essentially *campi artificiale* (Bowen-Jones 1961, p. 350). The most striking characteristic of the islands is the intricate pattern of terraces and dry stone walls. Steep gradients have proved no barrier to these constructions: on the steeper slopes the walls are correspondingly stouter and taller to retain a basic soil cover.

Population

Demographic pressures have long been a feature of life in the islands of the Mediterranean, and many of them have "exported" people since the sixteenth century (Braudel 1966, p. 158). In the case of Malta, emigration has been a principal means of reducing population growth during much of the twentieth century (Blouet 1989, p. 171). With an estimated population doubling time of 99 years, outmigration will probably serve as an increasingly important pressure valve in the years ahead.

In the context of Malta, the population factor generates striking paradoxes and embodies many positive attributes. The characteristic terracing of the land to create tillable soil, for example, presupposes a certain density of population to justify such backbreaking effort. So it may be claimed that, in an indirect way, population pressure is serving the cause of soil retention. Also paradoxical is that the export of people and the creation of a Maltese diaspora has yielded financial inflow from Maltese expatriates (often in the form of donations to the parish church). It has also yielded a greatly expanded world view for the Maltese in general.

Development

Historically, the geographic isolation of Malta has been compensated for by the islands' strategically valuable geographic position. Current initiatives conform to this history and are exploiting geographic position in plans to establish Malta as an offshore banking center and freeport. The post-colonial government of Malta have proved adept at planning for the future, and a generally rising level of prosperity is to be seen in the islands. Industrial production has shown steady growth and, between 1960 and 1985, grew at an annual rate of 5.1 per cent (Antoine 1991). By 1990, 70 per cent of Malta's trade was with the European Community (EC), and Malta has now applied for membership of that organization.

By 1975, receipts from tourism already amounted to 20 per cent of the value for all goods and services and, by 1989, growth in gross domestic product (GDP) was running at an annual rate of 10 per cent, powered in large part by the spending of holidaymakers from overseas. The long history of colonization built a "garrison economy" in Malta, and the experience so gained has been applied to great effect in coping with the latest of Malta's invading forces (Boissevain and Inglott 1979).

CONCLUSION: TOWARD A DELINEATION AND MODELLING OF RESILIENCE

The marks of response, through time, to environmental risk and uncertainty, are still clearly discernible on the Maltese landscape. Techniques for dealing with the perennial hazards of place have proved to be polymorphic in some instances: though the threat has remained a constant over time, techniques of accommodation have changed. The palimpsest of landscape features provides evidence of this, such as the siting of ancient and modern water supply infrastructure; the new walled cities being raised to cope with the tourist invasion; redevelopment of port facilities; and the contrast of land terracing with subdivisions for housing and industry.

Contingency planning is an established part of resource management on Malta and is an important part of that island nation's resilience and ability to thrive under threat. Illustrative of this are the diverse methods of storing and supplying water, with a less than total reliance on a centralized source of supply. Contingency is also evident in attempts to diversify the island economy. At the level of the individual such attempts are revealed through the plethora of part time occupations in which the Maltese engage. For example, although over 80 per cent of the Maltese are urban dwellers, the harvesting of produce from small patches of ground is still an important supplementary source of food for many families. At the level of government, contingency shows through in strategic economic planning and in the maintenance of strong ties to both Europe and the states of North Africa.

The strongest lesson from the Maltese context is the utility of maintaining a multifaceted approach to threat; employing simple techniques alongside the more complex, and always having a fall-back position should original plans fail. Initial findings suggest that a nested hierarchy of actions may be present: rather than simply having a "Plan B", a sequence of fall-back positions are available, possibly with religious faith forming an ultimate backstop.

There are important mechanisms of resilience in operation in Malta that could be applied with considerable benefit, once fully understood, to island microstates elsewhere. To better conceptualize mechanisms of resilience, I am developing a model using the analogy of mooring lines between boat and dock. This seems particularly apt in the context of a small island. Malta's resource base comprises the dock. This dock not only holds all the islands' physical resources, but all the collective memory, amassed over time, that the Maltese have for that place, and all the provisions of livelihood that is provided them. Each Maltese may be conceptualized as one boat tied to the dock. The mooring lines are strong and may be many in number. The lines are made fast in such a way that the boats can rise and fall with the tides and turbulence. The lines may be tied to other boats, in addition to being fastened to the dock. In all cases contingency is built into the moorings; a varying degree of security depending upon conditions.

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