Agricultural Land Use Capability Description Statement

Thermal Treatment Facility in the ECOHIVE COMPLEX, Tul il-Kosta / Triq ir-Ramla, Triq ta' Saverja, Naxxar

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CONTENTS

1. INTRODUCTION

This document provides agricultural land use information on the proposed construction of a Thermal Treatment Facility (TTF) in the locality of Maghtab and will effectively be an extension of the ECOHIVE Complex to the east of the landfill complex near the Magħtab Distribution Centre, Baħar iċ-Ċagħaq.

2.1 Background

The proposed project should establish a new hazardous waste incineration plant and centralise all the major waste operations carried out by Wasteserv Malta. The plan involves the preparation of a new hazardous waste incineration plant with two independent lines, and space for a potential third independent line in the future. The proposed development will form part of the ECOHIVE Complex.

Figure 1: General site locality (Source: Google Earth)

2.2 Site Location

The TTF shall form part of the ECOHIVE Complex and the proposed location mainly consists of seven fields of an area of about 18,200 square metres to the east of the Maghtab and Ghallis landfills. The general indications are that till recently agriculture was practised in these fields.

Figure 2: Site location (Source DESIGN report)

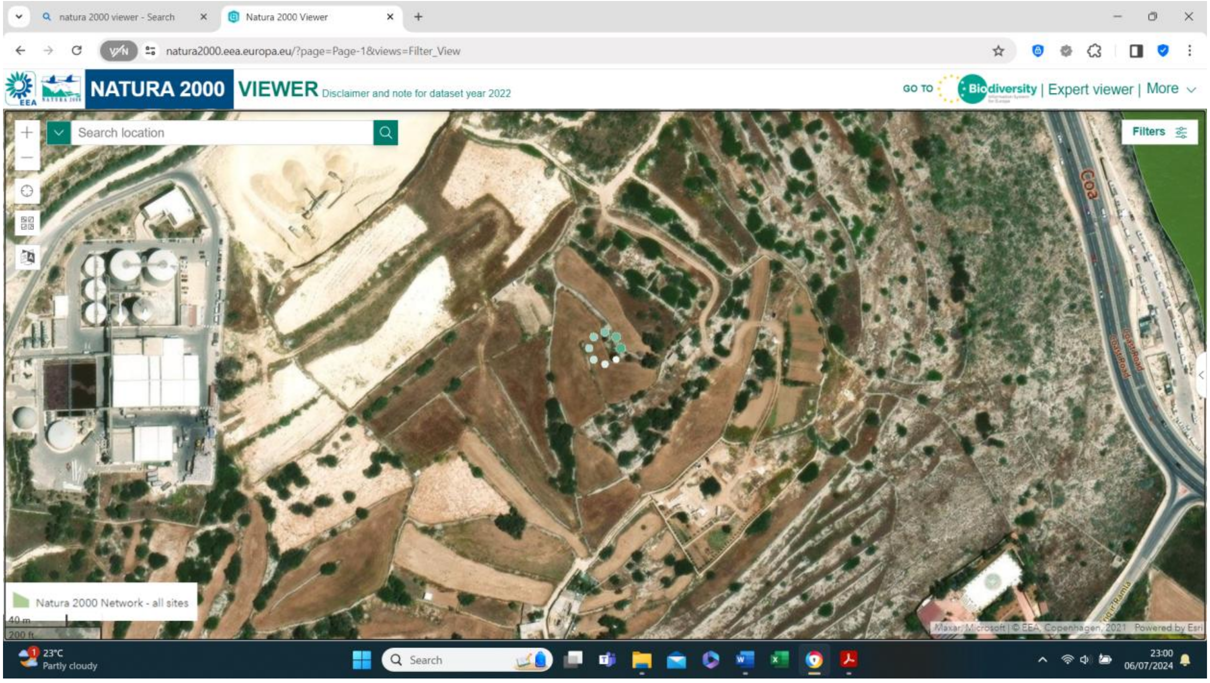
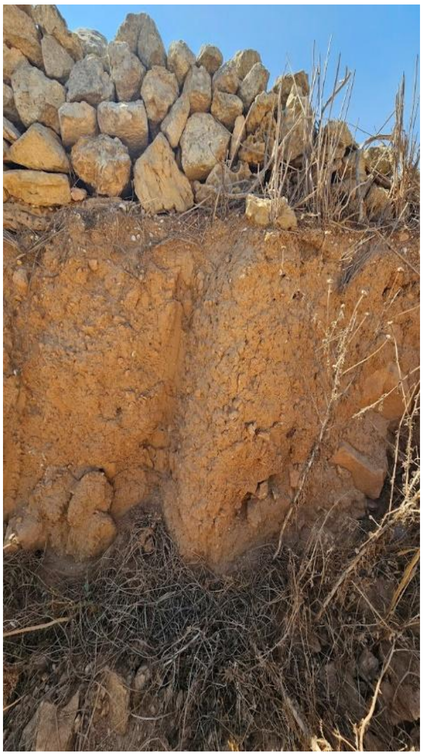
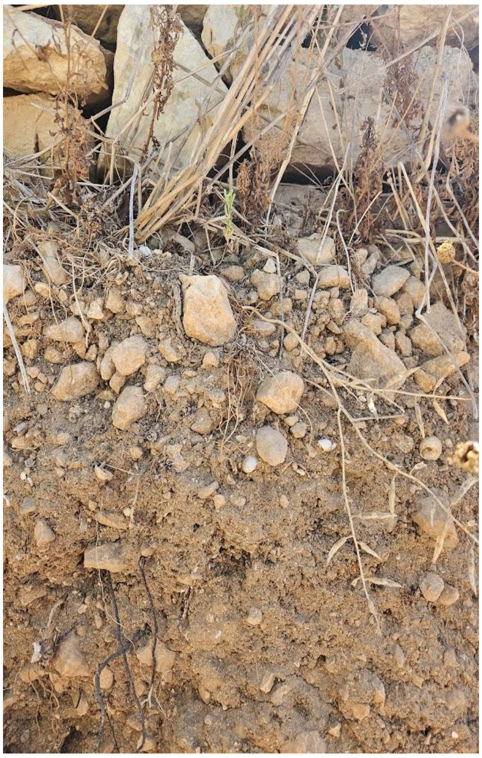


Figure 3: View of fields proposed for development (Source Natura 2000 viewer)

2. THE SITE RELATIVE TO SURROUNDING AREAS

The area where the proposed works will be carried out consists of a series of seven terraced fields adjoining each other. Stubble present on the soil surface indicates that most of the land was used for cultivating cereals, though in a few locations almond trees, *Prunus dulcis*, were present alongside the rubble walls to act as windbreaks. A handful of vines was present on a rubble wall. There are no signs of irrigation. The western stretch of land primarily consists of a maquis habitat dominated by low wind-swept carob trees, *Ceratonia silqua*. Close to the east is the garigue area along the coast road, while the Maghtab landfill complex is to the west.

Figure 4: Overview of the site proposed for development (Source: Google Earth)

Figures 5&6: Soil profile of fields closest to the OPP seashore (left) and adjoining second field (right)


Figures 7 & 8: Soil profile of adjacent lower fields getting shallower in depth

Figures 9 & 10: Vines and almonds on field borders

Figure 6 &12: Deeping soil profiles on the easternmost fields

Figures 13 & 14: Increasing rocks and stones in shallower soil close to garigue and carob area

Figure 15: Carobs with height controlled by wind

The majority of the fields have a very compact shallow topsoil with a depth ranging from a few centimetres to a maximum of 45 cm - with a 30 cm average depth. Given that these are sloped fields, there is a tendency for deeper soils towards the east. The subsoil is more stony and rocky in the shallower areas, though eastwardly, it was up to 120 cm deep. The shallow topsoil and compact subsoil, some of which are very stony, do not facilitate root access and would require rotavating before seeding. This arable land's dry and compact nature limits returns, particularly when prone to sea spray and when rainfall can be insufficient. The low windswept carob trees also indicate that wind is an influencing factor. Given the unavailability of water, the area may primarily be used for cereal cultivation for fodder production. In the best scenario, the probability is that this land will remain marginally productive. The fields envisaged for development are typically marginal due to poor soil properties. Most fields showed traces of cereal stalks, except for the carob garigue stretch, indicating the practice of wheat cultivation.

The Magħtab Area forms part of the locality of Naxxar and is located to the east of Burmarrad, west of Bahar ic-Caghaq, south of Salina, and north of the Naxxar/Għargħur Great Fault. The locality under study is an agricultural fringe caught between the landfill complex and the coastline garigue. Most of the fields in the study area are terraced, not irrigated, and support one dry crop. Dryland cultivation is mainly typical of this area and the limited depth of soil in some areas makes production very marginal. The attribute of minimal soil cover, together with the influence of sea spray limits cultivation practices.

Figure 7: Area in 1998 (Source: http://geoserver.pa.org.mt/publicgeoserver)

Figure 8: Area in 2004 (Source: http://geoserver.pa.org.mt/publicgeoserver)

Figure 9: Area in 2008 (Source: http://geoserver.pa.org.mt/publicgeoserver)

Figure 10: Area in 2012 (Source: http://geoserver.pa.org.mt/publicgeoserver)

Figure 11: Area in 2016 (Source: http://geoserver.pa.org.mt/publicgeoserver)

Figure 12: Area in 2018 (Source: http://geoserver.pa.org.mt/publicgeoserver)

The time series area photos confirm that, for the agricultural area under study, the pattern of agricultural practices consistently practised was that of dryland agriculture. This indicates that in the areas under study, the agriculture practised is that for more marginal dry land areas as the soil typology, climatic regime and lack of stored rainfall allow only one crop per year, namely cereals, very often wheat, sown in October/November and harvested dry, latest in May. The limiting soil factor, in conjunction with prevailing cultivation techniques, together with the lack of crop rotation, and even much more limited fertilizer inputs would indicate a minimal crop yield. The climate change trend for an increasing number of consecutive dry days and associated drought conditions will further contribute to a negligible yield.

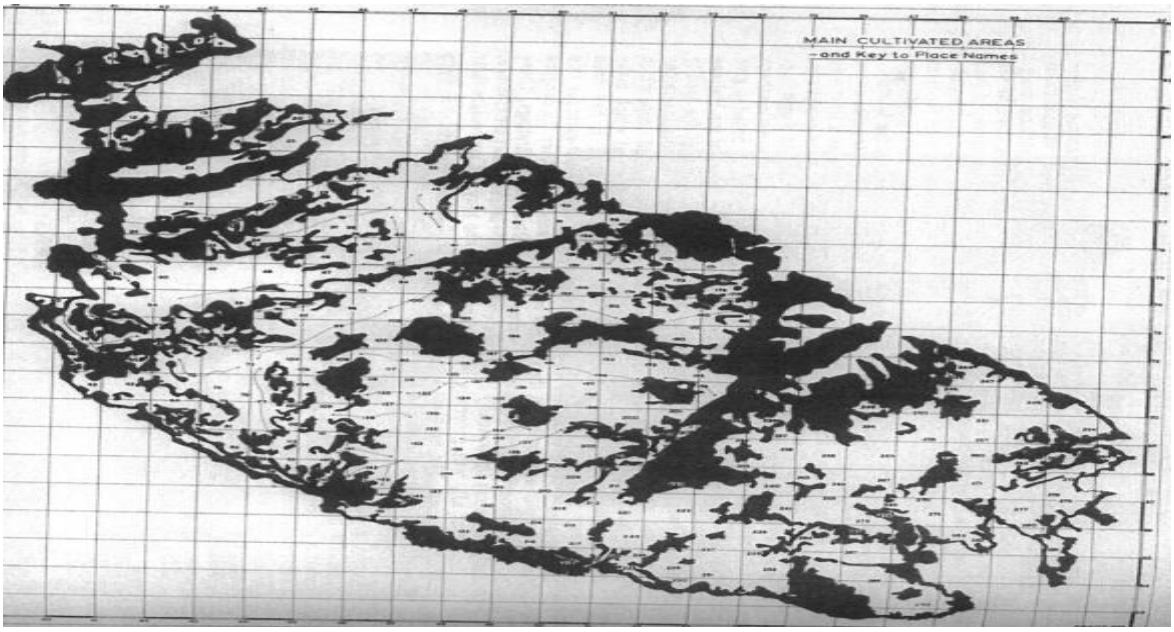


Figure 13: Bowen-Jones 1961 Malta's main cultivated areas

The locality under study was considered a cultivated area with cereals and was probably tilled and not left fallow, according to historical findings published Bowen-Jones in 1961. This publication also suggests that no vegetables, no viticulture and no fruit trees were grown in this area. The locality could have bordered on wasteland.

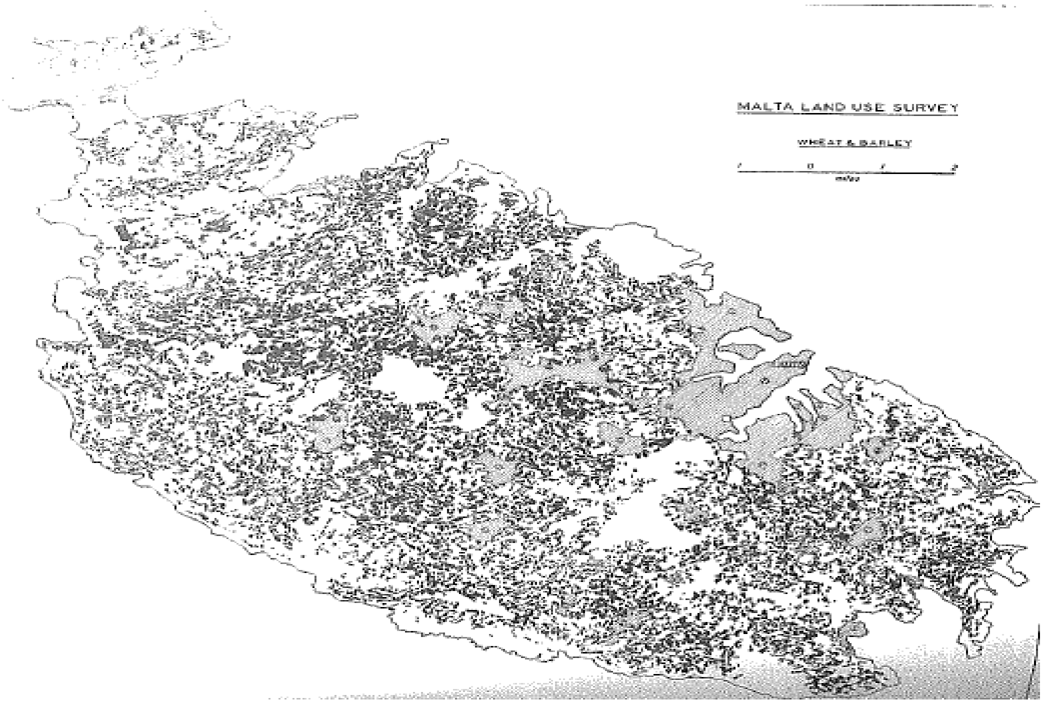


Figure 14: Bowen-Jones 1961 Tilled areas

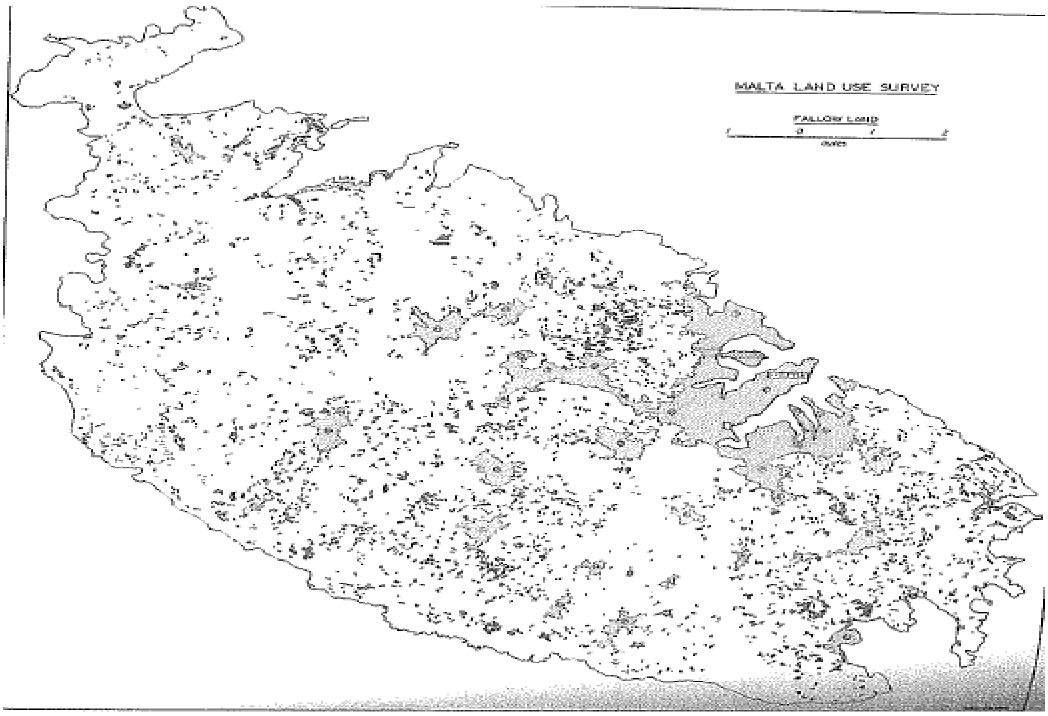


Figure 15: Bowen-Jones 1961 Fallow areas

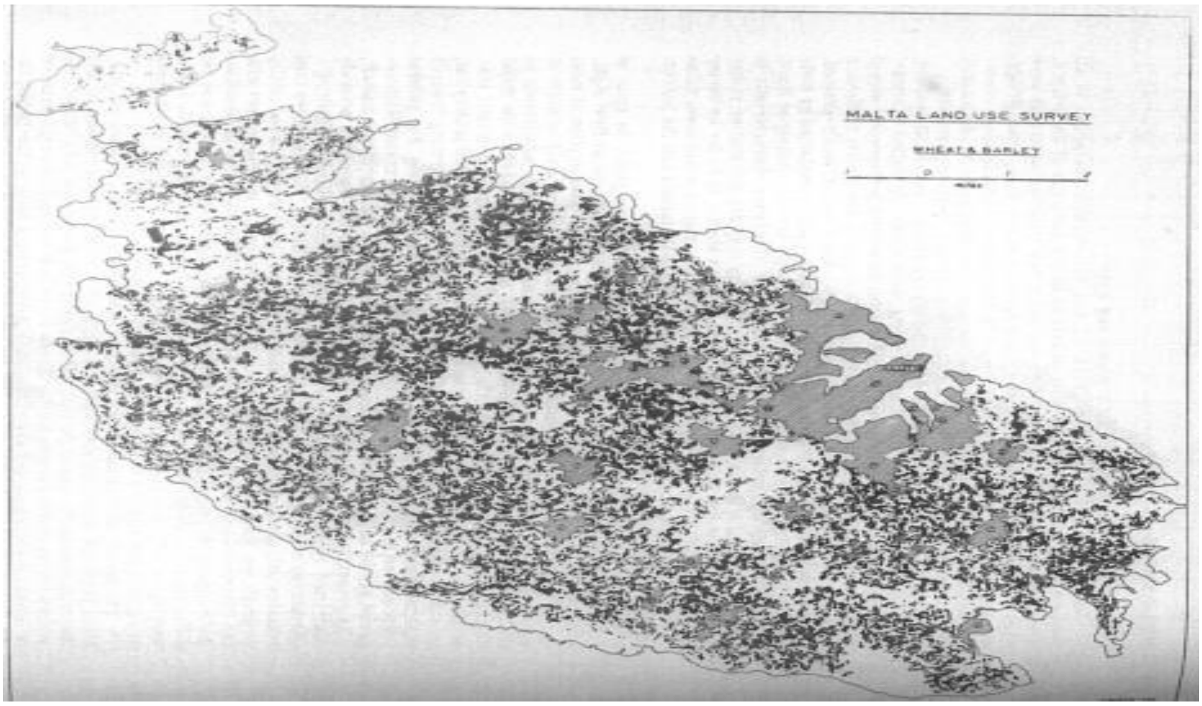


Figure 16: Bowen-Jones 1961 Malta wheat and barley cultivated areas

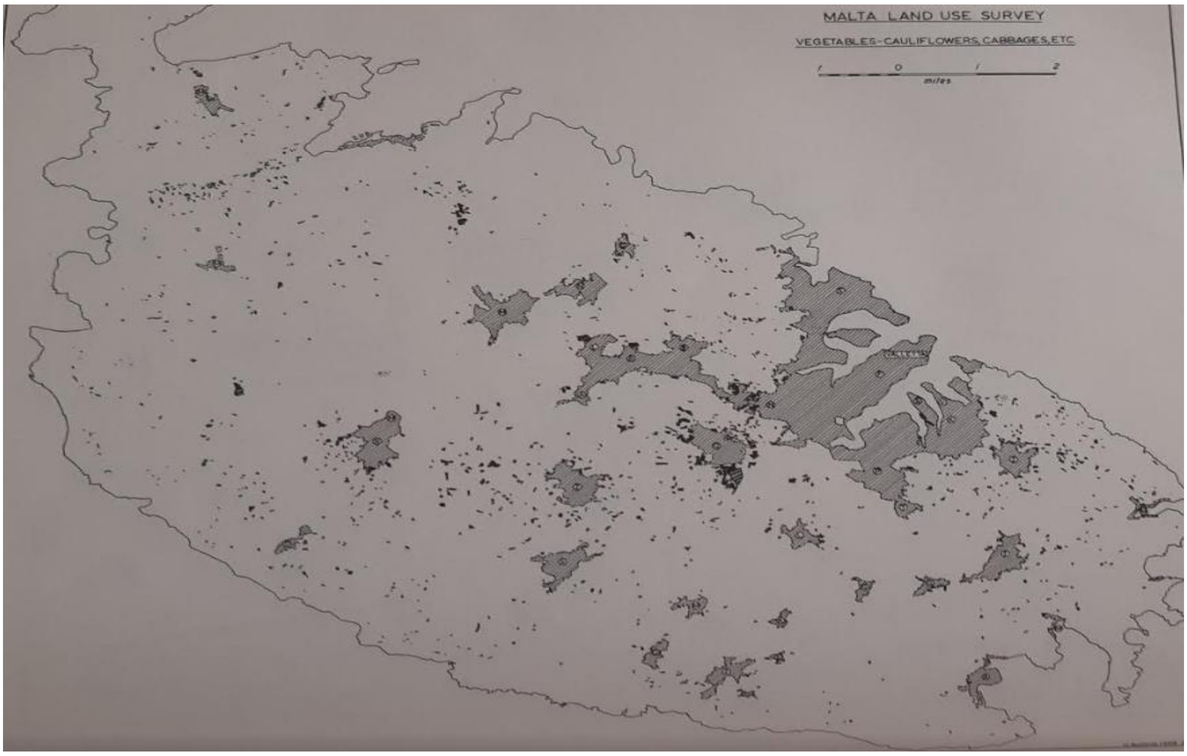


Figure 17: Bowen-Jones 1961 Malta vegetable growing areas

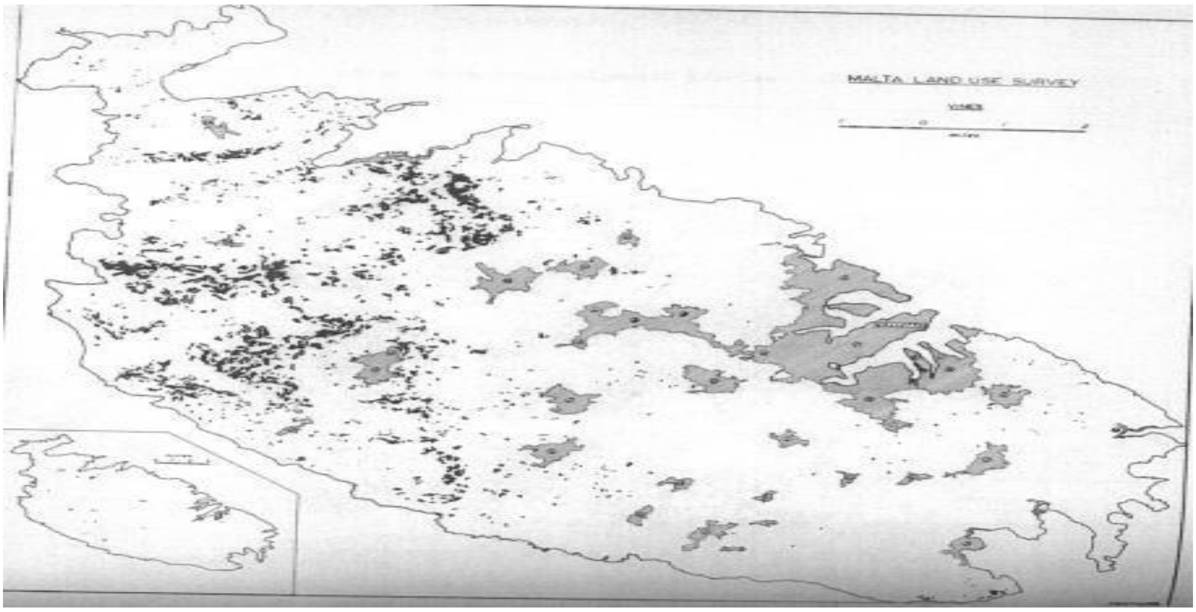


Figure 18: Bowen-Jones 1961 Areas with vines in Malta

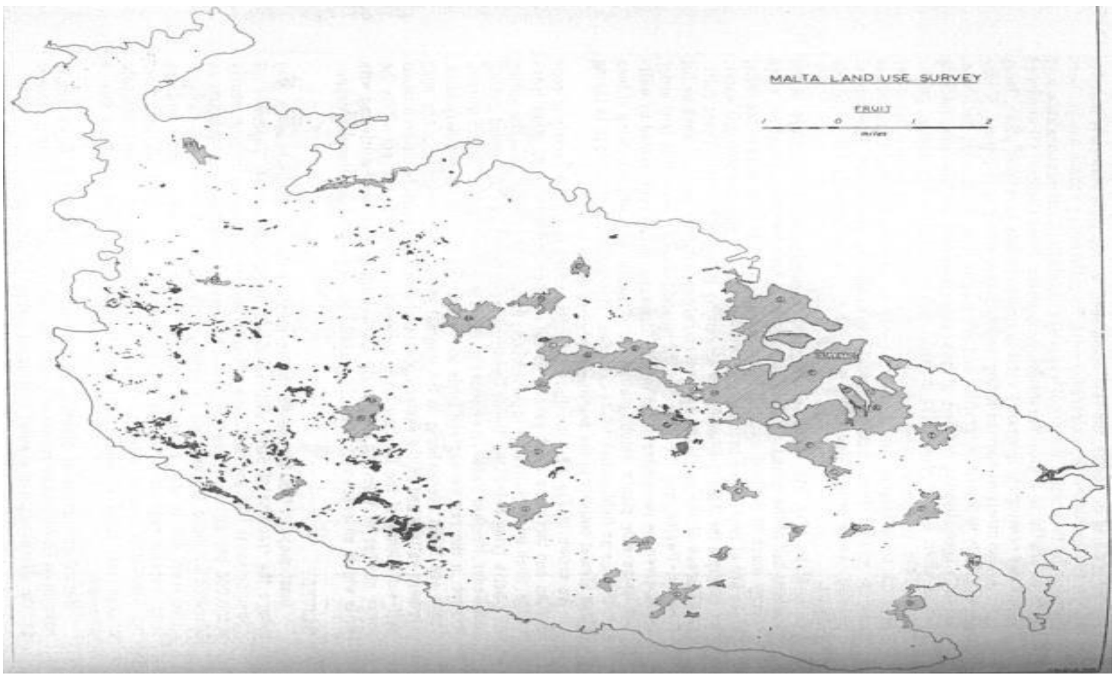


Figure 19: Bowen-Jones 1961 Areas with fruit trees in Malta

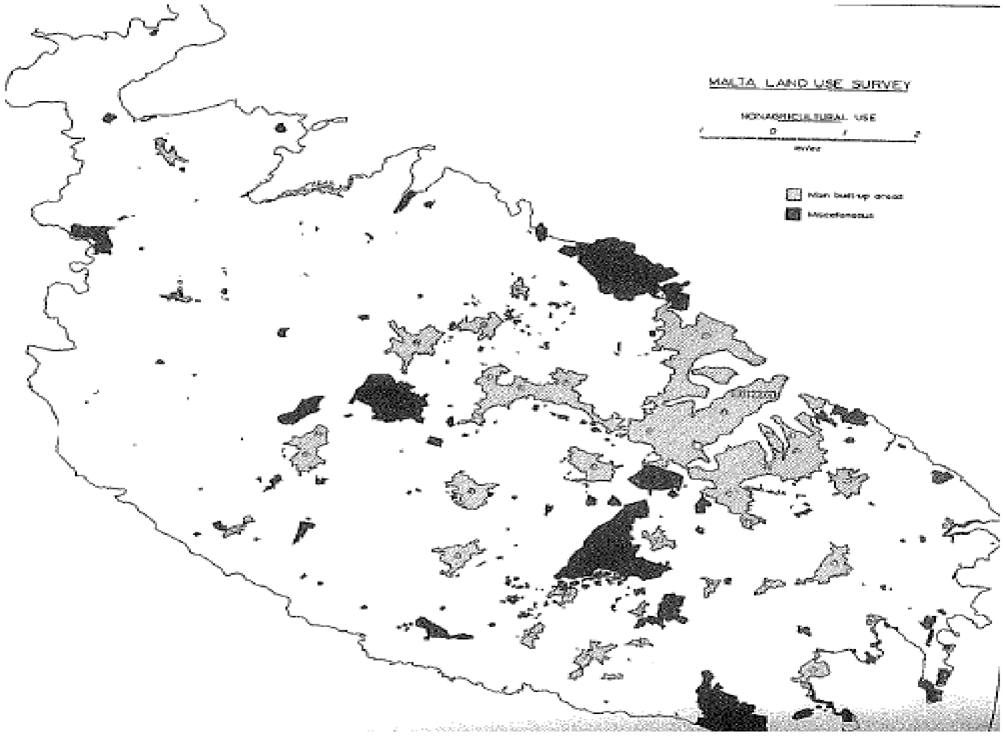


Figure 20: Bowen-Jones 1961 Non-agricultural Use

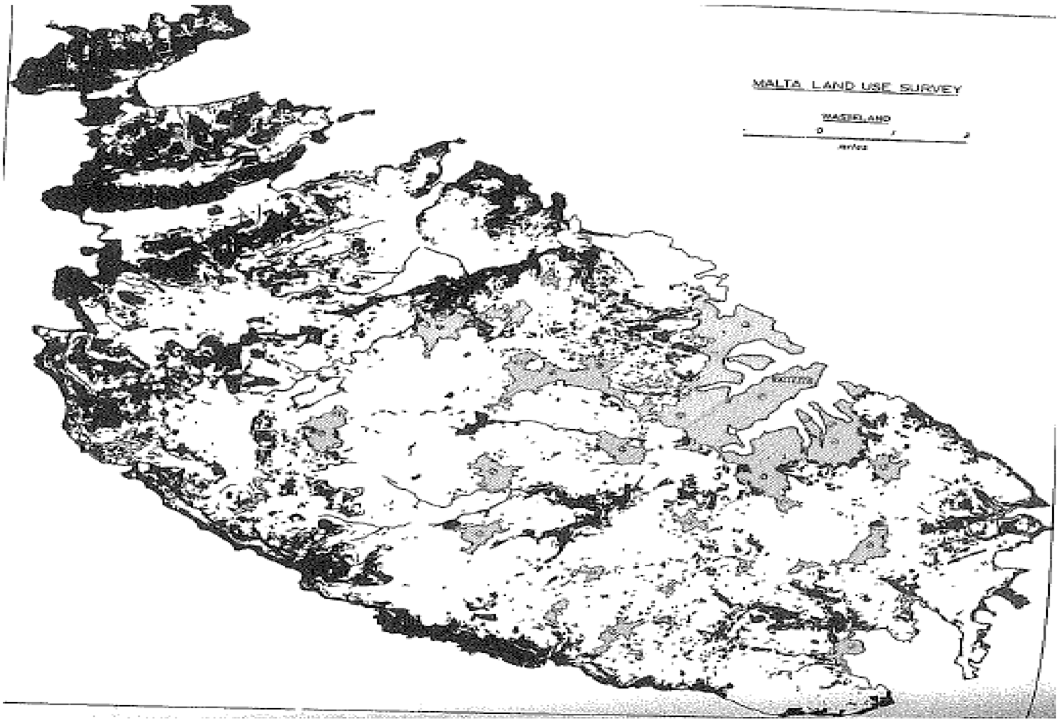


Figure 21: Bowen-Jones 1961 Wasteland

Reference to Bowen-Jones et al. (1961) indicates that, in the area under study, agriculture was, and still is, primarily governed by the prevalent lack of a water regime. Without irrigation, the prevailing soils may only support cereal production in a year with adequate rainfall, and there is no evidence that vegetables or fruit trees were grown here. The added closeness to the sea even makes the success of dry land cereal crop yield more questionable. Bowen-Jones et al. further indicate, concerning the Għallis region, that the distribution of wasteland corresponded to the surface exposure of Lower Coralline rocks and the degree of exposure to northerly winds was the second factor controlling agriculture, however the less exposed inland depression at Magħtab facilitated a better farming pattern.

The absolute lack of water, combined with the occurrence of winds for over 90% of the year, plus the prevailing hours of sunshine create a marked evapotranspiration factor. When considered in conjunction with available soil type this does not leave much of a choice for crops. The growing of cereals, primarily wheat and barley, has possibly been one of the few available options to eke out anything from this environment. This is not always successful given that the growth of cereals requires adequate follow-up rainfall to cater to the 'break of season' water requirement. Changing precipitation, temperature, and evapotranspiration are likely to have the largest impacts on crop production in locations that are already subject to heat and drought stresses, thus the area under study is typical of a dryland agricultural system continuously subject to climatic and economic uncertainty.

Figure 22: Area in 2021 (Source: http://natura2000.eea.europa.eu/#)

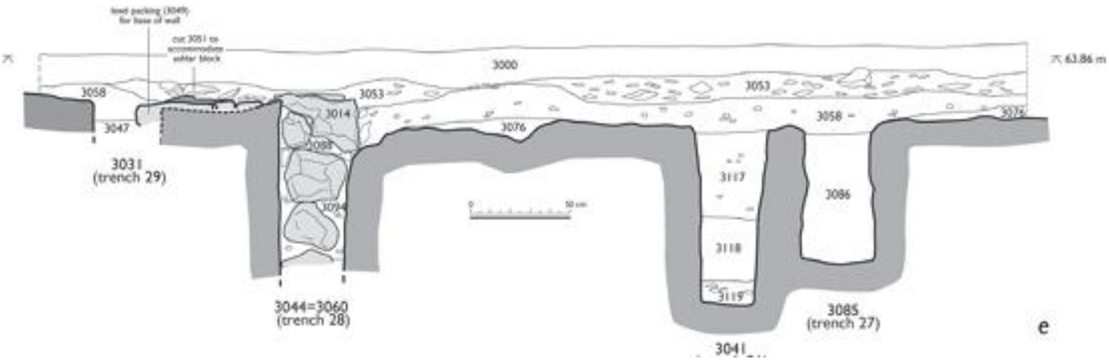
Figure 23: Area in 2021 (Source: http://earth.google.com/web)

Evaluation of the surrounding fields of the area shows that fields with adequate soil depth are cultivated, while shallower ones are abandoned. Cassar & Lanfranco, 2003 observed that long-derelict agricultural areas at Maghtab were characterised by topsoil that was generally shallow and discontinuous. It was also noted that the refuge and structural diversity provided by the Carobs and sub-dominants generated a microclimate that varied substantially from the surrounding habitat. The carob trees further indicate the effect of northerly winds - in that they are lower on the northern side and more profuse southward. The size of the carob trees indicates that they have been present for decades. The fields are not irrigated, but can support cereal production. The studies carried out by Bowen-Jones in 1961 show that the agricultural land within the proposed development site has been consistently used as agricultural land at least for the past 64 years.

Figures 24 & 33: Vine and water trenches

In areas where the soil has been removed, there is evidence of antique soil troughs for vines plus water channelling. These fields were comparatively shallow. Borg (1922), whilst noting the early introduction of vines in Malta, dating back to the time of the first Phoenician settlers, further indicates that, towards 1870, the planting of vines was commonplace. However, between 1919 and 1920 the spread of the Phylloxera insect pest devastated viticulture.

Attard et al. (2024) quote Borg on trench-like excavations carved into the bare rock on the barren stretches of the garigue landscape. The trenches were shaped as troughs, filled with soil that was most probably collected from shallow deposits in the vicinity, and finally planted with vines. In places that contained friable rock, trough-like ditches 1.5 to 2 metres long, and up to 1 metre deep and 0.5 metres wide, were excavated with a pickaxe. This was considered a modification to contain the sparse soil resource, while also functioning as minute terrace pockets that also trapped runoff rainwater. The dug-out channels served to convey rainwater from the higher to lower fields to a collection point in this sloped area. The excavations at Maghtab are shallower, however their presence confirms early agricultural adaptations that addressed the difficulties of agricultural production on this marginal land.



Figures 25: Vine trenches (Source: Vella et al. 2017)

Rock-cut trenches encouraging deep root growth where limited soil depth prevailed have been associated with the growing of vines. Vella et al. (2017) have discovered at Zejtun a vineyard that was abandoned sometime in the 2nd/1st century BCE and excavations indicated trenches that pre-date the construction of the villa-type establishment and confirmed that the planting of vines in trenches conformed to agronomic practices of planting in holes or pits practised in nearby Italy throughout the Hellenistic and Roman periods, but which could also date back to the Punic period.

3.1 SOIL LANDSCAPE AND TYPE

The landscape is an undulating Globigerina hilly area typical of this northern part of Malta. The soils are typically mainly brownish with limited soil depth. Soils of Malta are currently classified using the WRBS classification system (MALSIS, 2003). Referring to this system, this location at Magħtab comprises an area of Regosols as per Figure . The landscape is that of low shallow moderate terraces on Globigerina limestone – GTm.

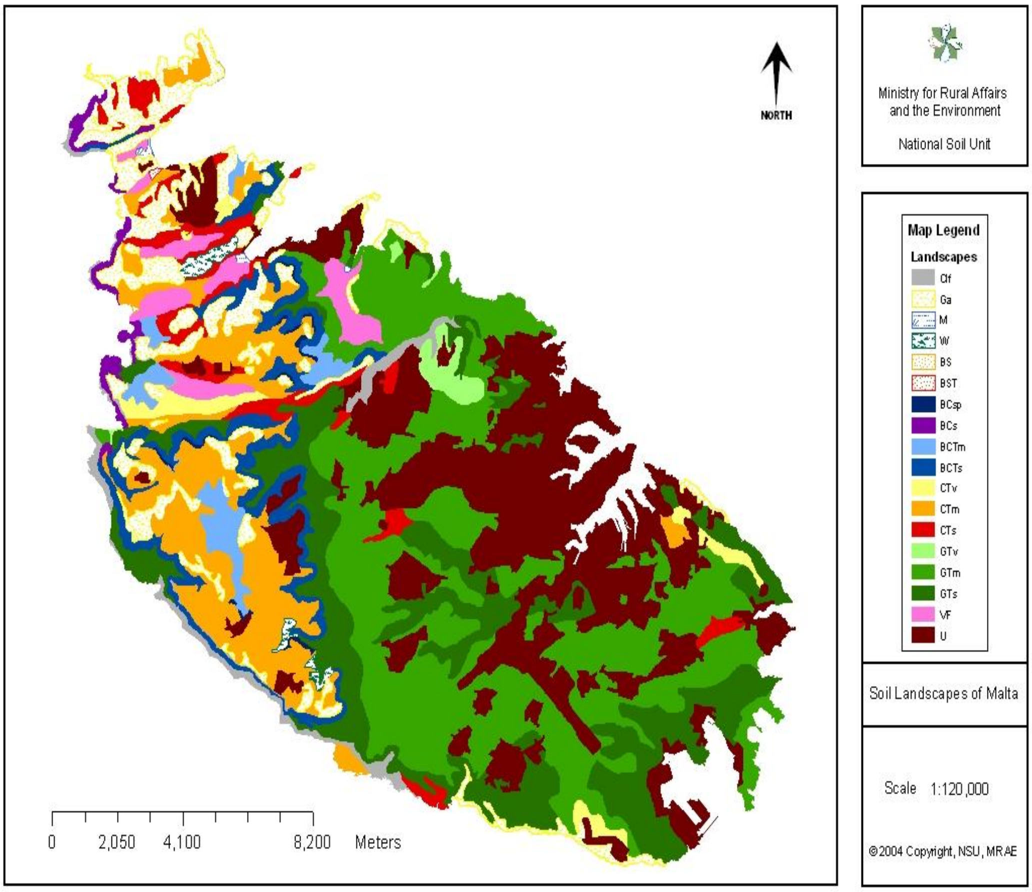


Figure 35: MALSIS Soil Landscapes (Source: MALSIS)

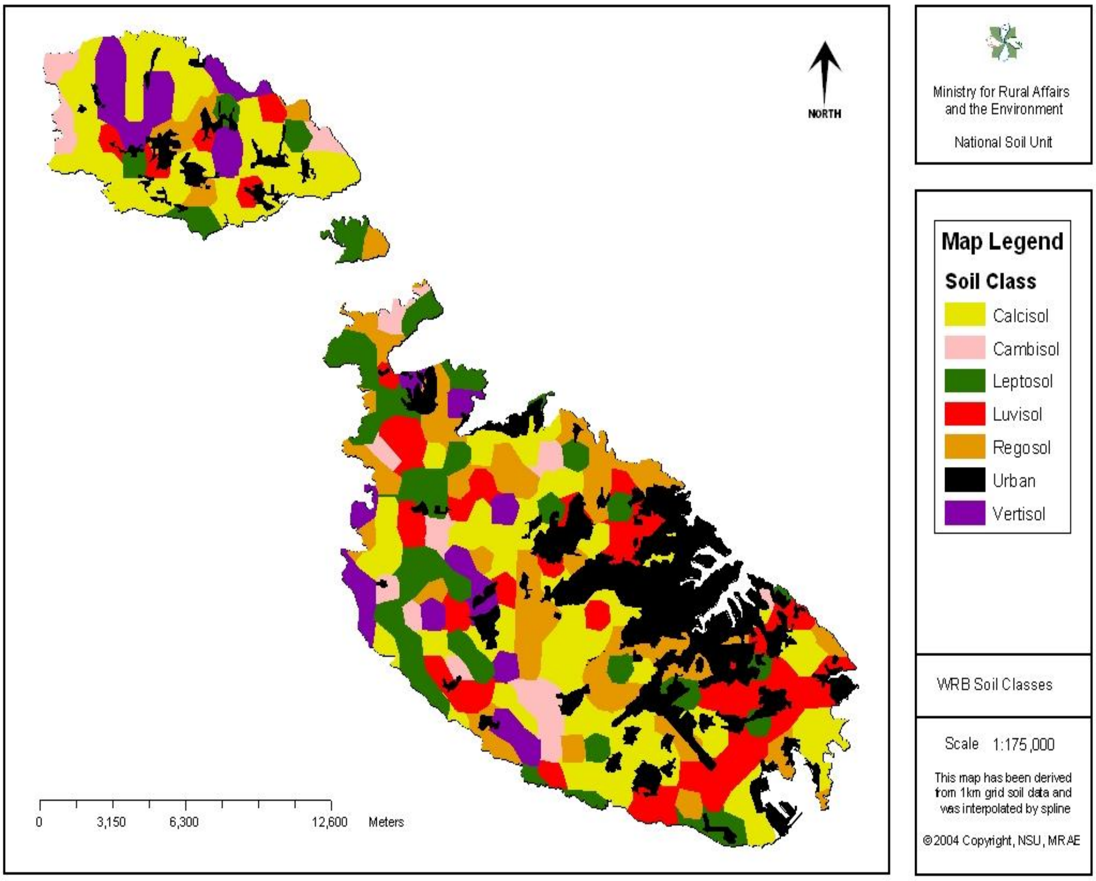


Figure 36: MALSIS Soil Classes (Source: MALSIS)

Regosols (RG) constitute a group that includes 'other' soils, with very limited development in virtually unaltered parent material, showing no dark-coloured topsoil and no distinct subsoil horizons. The Regosols group is a taxonomic rest group containing all soils that could not be accommodated in any of the other groups. In Malta, Spolic Regosols have been described; these soils are situated on made ground terraces overlying urban waste material. Regosols are characterized by shallow, medium- to fine-textured, unconsolidated parent material that may be of alluvial origin and by the lack of a significant soil horizon (layer). Regosols often show accumulations of calcium carbonate or gypsum in hot, dry climatic zones.

From an agricultural viewpoint, a Regosol is a very weakly developed mineral soil in unconsolidated materials with only a limited surface horizon having formed. Limiting factors for soil development range from low soil temperatures, prolonged dryness, characteristics of the parent material, or erosion. Ultimately, parent material and climate dominate the morphology of regosols, however, their low water-holding capacity and their higher permeability to water make them sensitive to drought. Thus quality and the low water-holding capacity of these soils would require frequent applications of irrigation water and fertilizer. Although this would result in better yields, it is rarely economical.

In 1960, a survey conducted by Lang, using the Kubiena classification system, placed these soils as complexes and designated them as the Inglin Complex soils. As many local reports, even recent ones still use the Kubiena classification system when referring to soils; it would be appropriate to also describe the soils of this locality using the system used by Lang (1960). According to Lang, the soils of this location have been classified as Inglin Complex. The soil is a pale brown to red, shall to moderately deep, with light to heavy textured soil that resembles the Xagħra soil series from which it has been largely derived but is effectively more disturbed.

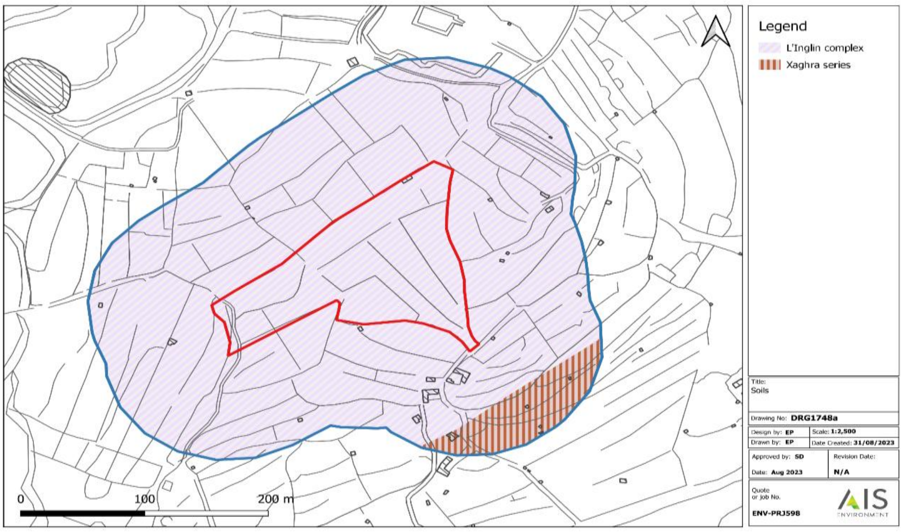


Figure 26: Area of study (Source: AIS Project Description Statement)

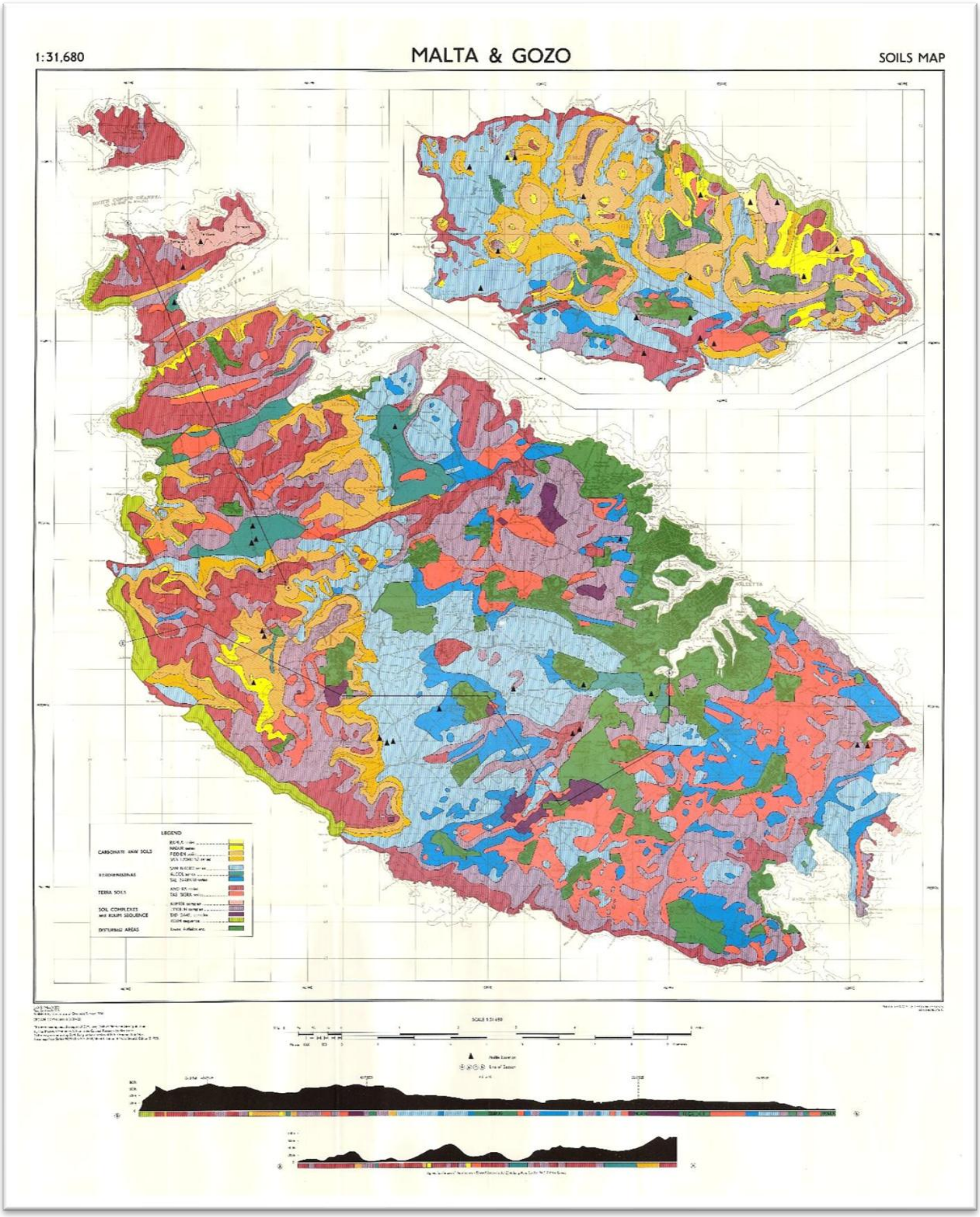


Figure 27: Malta and Gozo soils (Source: Lang 1960)

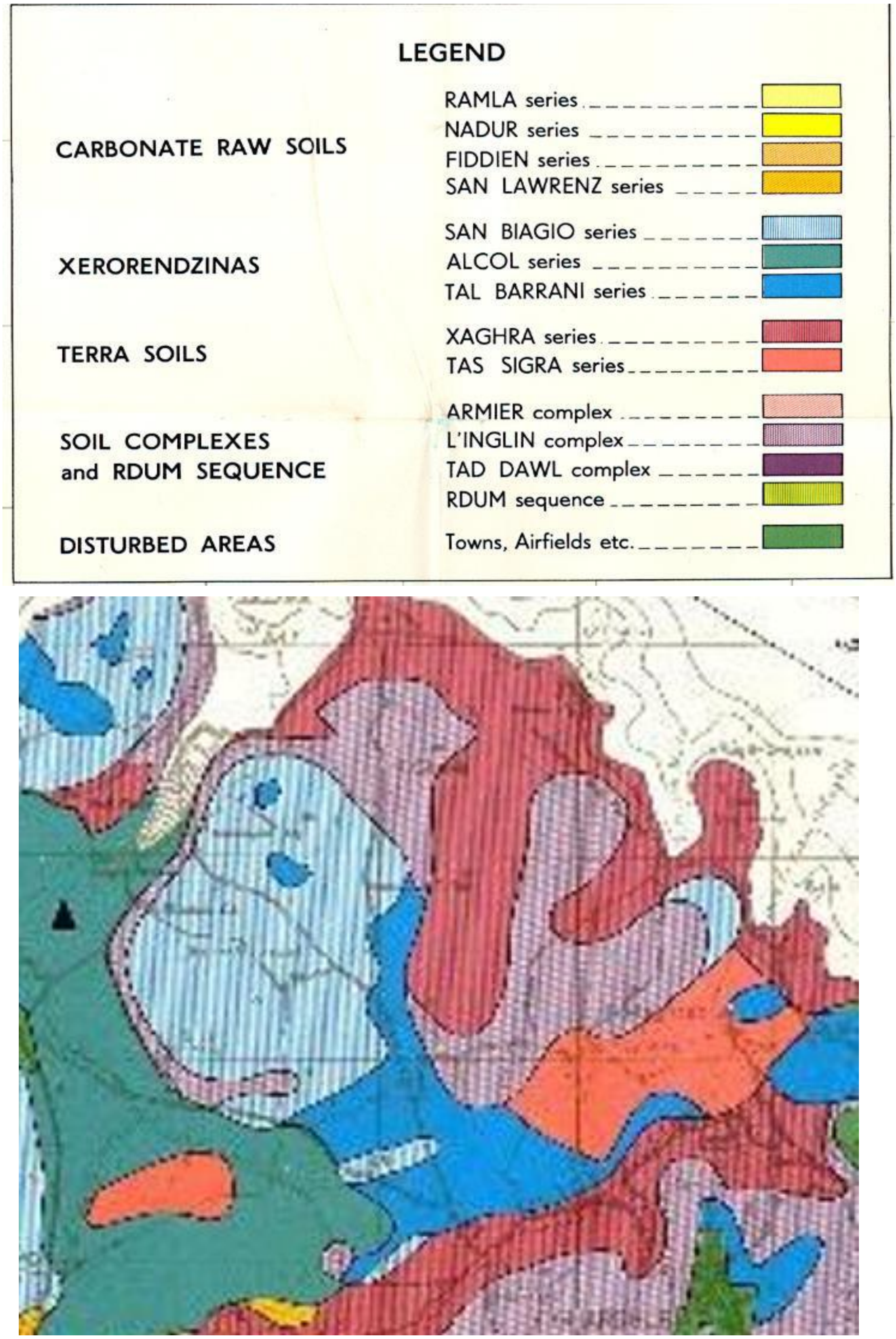


Figure 28: Enlargements from Lang's Soils of Malta and Gozo (Source: Lang 1960)

The Inglin Complex soils found in this location are typical anthropogenic soils. The rubble content, presence of broken rock surfaces, and lack of natural horizons typify this soil. These soils are mainly artificial, and this characterises their variability, being much disturbed and mixed in their formation process. Often the soil structure could be weakly developed, resulting in low fertility. Additionally, crops grown on these soils could be prone to pests and diseases, and the shallower soils would also be prone to erosion and drought.

3.2 AGRO-ECOSYSTEMS

In agroecosystems, agricultural management practices affect native soil biota through cultivation, irrigation, and application of agrochemicals. Soil is a critical component in the structure and function of agroecosystems, and the condition of the soil biological communities is important to both the structure and function of soils. Maintaining soil fertility is important to promote sustainable agriculture. Farmers' management approaches influence soil fertility. In natural ecosystems, soil minerals undergo limited change, however, through farming, the introduction of a crop and its harvesting before the minerals can be passed back to the soil creates imbalances. With good crop rotation and appropriate fertilizer application, such losses are minimised. An even more environmentally oriented approach would be the practising of crop rotations that utilise inoculated legumes to increase nitrogen availability. The utilisation of different crops, as opposed to monoculture, would further help to ensure better mineral utilisation rather than loss of elements associated with a single crop, though irrigation could be necessary. Farmers could also leave crop stubble or other residue on the field after harvest. In the case of cereal stubble, decomposition returns some minerals while limiting the effects of erosion. Retention of crop stubble is now a more common practice because of EU Rural Development measures.

Maintaining a sustainable agroecosystem will also necessitate balanced soil pH and salinity. Monocropping creates an artificial ecosystem that alters field pH. Changes in pH also influence soil organisms, and these, in turn, affect crop yields, but most relevant to plant growth, the pH of soil influences the availability of nutrients. The best range for nutrient uptake is between pH 6.0 and 7.0. At an average pH of 8.3, most Maltese soils indicate saturation with bases as the dry climate soils do not provide sufficient rainfall to leach away the bases, thus limiting the supply of nutritive elements.

This situation is further exacerbated during the dry period when evaporation exceeds precipitation with consequent limited water movement through the soil resulting in a high concentration of salts close to the surface. Very few species tolerate increasing salinity and crop plants growing in saline soil will have dwarfed root systems, reduced absorption, and transpiration with limited water resulting in a decrease in growth and yield. Salinization can be restricted by leaching of salt from the root zone, changed farm management practices, and the use of salt-tolerant plants.

The presence of water is the most essential component for ecosystem functioning and plays a key role in sustaining crop production. Daubenmire (1974) explains that water is retained by soils as films that coat the surface of particles, as wedges held in angles between the grains, and as moisture imbibed by colloids. In fine-textured soils, there is a greater general propensity to hold water when compared to coarser soils. Yet although fine textured soils can comparatively hold more water, they hold much of it in the upper layers which are highly vulnerable to drying and, furthermore,

1. do not admit water readily, so lose more by runoff,
2. retard root penetration so seedlings may not be able to reach deep moisture before the surface dries,

3. tend to be poorly aerated at lower levels, thus obliging shallow rooting and making plants susceptible to drought.

The porosity of coarse-textured soils and of heavy soils that are well aggregated tends to support a condition of equilibrium between the soil, the atmosphere, and temperature because of the lower moisture capacity and the freer gas exchange for which fine-textured soils are less favoured.

Since the Maltese Islands are characterized by a very high human population density and correlated high land use, most habitats have all been affected to some extent by anthropogenic factors and hence no part of the islands can be said to be in a truly natural state. The main vegetation assemblages are maquis, garigue, and steppe; minor ones include patches of woodland, coastal wetlands, sand dunes, freshwater, and rupestral communities. Human impact is significant. The present landscape is a result of the interaction of geology and climate, coupled with the intense human exploitation of the environment over many thousands of years, which has altered the original condition of the vegetation cover, principally through the diversion of vast tracts of land to cultivation, plus the development of land for buildings and industry. The scantiness of the soil, combined with the erratic rainfall and the periodic disturbance of the vegetation cover, has resulted in extensive erosion as well as loss of the original vegetation.

The agricultural landscape in this locality is one of very small parcels of land, frequently arranged in terraces and surrounded by rubble walls along which grow a variety of wild flora and fauna that contribute significantly to Malta's biodiversity. There are no distinctive livestock activities taking place. There is also no evidence of water reservoirs and irrigation practices and all fields around the area of study indicate dryland agriculture. From an ecosystem standpoint, the principal threats to the soils in this locality may be described as erosion, soil sealing, the decline in soil organic matter, soil contamination, and soil salinization although no specific data is available.

Effectively agroecosystems are ecological systems modified by farmers to produce crops. Unsuitable agricultural practices can cause a loss in soil quality and erosion to consequently increase or trigger desertification, particularly under Mediterranean conditions. Sustainable agricultural management will allow the soil to recover, and the use of straw mulching is a very effective management strategy in soil improvement both for increased water retention, nutrient recycling, and improved soil structure. The use of a cover, either through cropping, or even temporary fallow will contribute to reducing the risk of erosion and increase soil quality. Similarly, the presence of well-maintained rubble walls will not only help to contain soil loss but also serve as a niche for microflora and microfauna. However, at the same time, these would establish weed seed and pest banks near productive agricultural areas.

To ensure soil conservation, wherever soil deposits will be affected, all planned activities must be in line with:

- Cap 549 Environment Protection Act;
- Cap 236 Fertile Soil Preservation Act;

and also:

- S.L. 236.01 List of Places where Fertile Soil may be deposited Notice; and
- S.L. 236.02 Preservation of Fertile Soil Regulations

The extracted material (soil/rock) should be additionally examined paleontologically for fossils.

Reference to the Superintendence of Cultural Heritage may also be necessary.

3.3 ENVIRONMENTAL IMPACTS OF AGRICULTURAL ACTIVITIES

Climate change and agriculture are interrelated processes, both of which take place on a global scale. Global warming is projected to have significant impacts on conditions affecting agriculture, including temperature, precipitation, and glacial run-off. These conditions determine the carrying capacity of the biosphere to produce enough food for the human population and domesticated animals. Rising carbon dioxide levels would also have effects, both detrimental and beneficial, on crop yields. On the other hand, agriculture has been shown to produce significant effects on climate change, primarily through the production and release of greenhouse gases such as carbon dioxide, methane, and nitrous oxide, but also by altering the Earth's land cover.

The adaptation of farming to maximize agricultural production because of climate or other environmental changes is not expected to occur in this area given the marginality of the land due to soil characteristics and limited availability of water. Any negative environmental developments would likely lead to land abandonment.

Land use changes such as deforestation and desertification that change the ability to absorb or reflect heat and light, together with the use of fossil fuels, are the major anthropogenic sources of carbon dioxide. Agriculture obliges deforestation to clear land for pasture or crops, so most of the original vegetation would have been removed. Therefore, control of all road runoff in this location should be effected to control erosion and other ecosystem factors.

Irrigation can lead to considerable problems through depletion of underground supplies, and, on the other hand, under-irrigation can lead to increased soil salinity with the consequent build-up of toxic salts on the soil surface in areas with high evaporation. Additionally over-irrigation, because of poor waste management or chemical inputs, may lead to water table pollution. Irrigation with saline or high-sodium water may damage soil structure owing to the formation of alkaline soil.

A wide range of agricultural chemicals may be used and some become pollutants through use, misuse, or ignorance. In particular, pesticide drift can cause soil contamination, groundwater, and water pollution plus air pollution through spray drift. Some pesticides are particularly toxic to bees and pesticide residues may also end up in the harvested crop. While cereal production in the study area does not involve any chemical inputs – be they fertilizers, herbicides, or pesticides, irrigated crops would necessitate this. In the marginal fodder production areas, given the lack of application of pesticides, associated effects on soil contamination would be minimal while continuous cropping could mandate some chemical inputs albeit in not excessive amounts.

Given the marginal productivity of fodder crops in this locality, and the government's position on GMOs, no developments regarding the use of genetically engineered crops are foreseen. The land management approach of continuous cereal cropping in this semiarid environment together with the usage of conventional tillage, disc ploughs, or chisel seeders will determine the presence of organic residues on the soil surface as well as conditions for crop emergence and growth plus erosion. Residue removal increases spikes per square metre, grain per spike, grain yield, and harvest index compared with other treatments, and additionally, weed interference and lack of uniform crop establishment also occur in the presence of residues. On the other hand, reduced tillage with discs has the incorporation of residues leading to a build-up of carbon in the soil, with lower grain yields compared with residue removal, but these yields would be higher than those of chisel-seeded plots. In the area under study, as well as in the greater part of Malta, conventional tillage is practised.

A sustainable agroecosystem is environmentally sound, economically viable, socially just, and meets the needs of the present without compromising the ability of future generations to meet their own needs. Agricultural land in this Maghtab site is predominantly utilised for dryland production of fodder or hay crops. The main agricultural systems in the study area, typified by the fields that were cultivated at the time of the survey, are those characterised by low-to-moderate intensity traditional farming, where yields are similarly expected to be low to moderate. Irrigated fields are conspicuously lacking. In the area under study, fodder production as practiced in all neighbouring fields involves a low input/output system.

The absolute lack of water, combined with the prevalence of northerly and south-easterly winds, plus the prevailing soil type, do not leave much of a choice for crops. The unavailability of stored rainwater in the greater part of this locality obliges a dry farming approach entirely dependent on winter rains that manages to exact a cereal crop - generally wheat. Thus, dry farming was, and remains, extensive throughout. The presence of vine trenches further historically confirms the lack of soil and water in this site.

Effectively the holistic land use approach of this area, according to the FAO land suitability classification, would typify this locality as S3, inferring that the land could be marginally suitable for agricultural production and that the main limitations are the shallowness of the soil leading to low water holding capacity and ensuing water deficit.

Table 1: FAO land suitability classification (Source: FAO)

Class S1 Highly Suitable:	Land having no significant limitations to the sustained application of a given use, or only minor limitations that will not significantly reduce productivity or benefits and will not raise inputs above an acceptable level.
Class S2 Moderately Suitable:	Land having limitations which in the aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on Class S1 land.
Class S3 Marginally Suitable:	Land having limitations which in the aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs, that this expenditure will be only marginally justified.

3. IMPACT ASSESSMENT

Table 2: Impact types

Impact Type and Source		
Impact type	Agriculture	
Specific intervention leading to impact	Dismantling of rubble walls Loss of agricultural topsoil and subsoil	
Project phase	Construction/Installation works	Operations
Impact Receptor		
Receptor type	Land	
Sensitivity and resilience toward impact	Construction/Installation works	Operations
	Total loss of land parcel	Total loss of land parcel
Effect and Scale of Impact		
	Construction/Installation works	Operations
Direct/Indirect	Direct where agricultural land is lost, indirect impacts on surrounding agricultural land	Direct where agricultural land is lost
Cumulative	Yes	Yes
Beneficial/Adverse	Adverse	Adverse
Severity	Major	Major
Physical/geographic extent	Correlated to take up area, Surrounding agricultural land	Correlated to take up area
Short/Medium/Long Term	Long term	Long term
Temporary/Permanent	Permanent	Permanent
Reversible/Irreversible	Irreversible	Irreversible
Probability – Significance – Mitigation – Residual Impacts – Other Requirements		
	Construction/Installation works	Operations
Probability of impact occurring	Inevitable	Inevitable
Significance Overall Impact	Loss of agricultural land	Loss of agricultural land
Proposed Mitigation Measures	Land loss minimization, Adherence to best practice and regulatiosn during construction	N/A
Significance Residual Impact	Decrease of ODZ total area	Decrease of ODZ total area
Monitoring	N/A	N/A
Authorisations	Development Permission under the Environment and Development Planning Act (Cap 504)	Development Permission under the Environment and Development Planning Act (Cap 504)

Figure 40: Maghtab environs (Source: http://earth.google.com/web)

Effectively, the proposed site is mainly composed of marginal agricultural land fringed with disturbed habitats merging with maquis community outcrops. Surrounding this area are also some fields of similar agricultural value. In an agricultural context, the magnitude of the project shall create an irreversible impact due to the destruction of the agricultural land.

Malta's Planning Authority Outside Development Zone (ODZ) policy objectives are:

- To support development that is essential and genuine to the needs of sustainable agriculture and rural development to complement the competitiveness of the rural economy;
- To encourage farmers to diversify their main agricultural activities, whilst discouraging any proliferation of unnecessary new buildings outside the development zone boundaries; and

- To ensure proper conservation and management of the countryside for both present and future generations.

In this context, the Strategic Plan for Environment and Development ('SPED') for Rural Policy and Design Guidance 2020 states "that whereas 'urban' places are intended for people to 'live, work, play and interact', 'rural' areas are intended to sustain the farming community while providing the general public with an escape from daily urban life to places which are 'visually pleasant and rich in biodiversity'. The countryside also supports most of the Maltese Islands' biodiversity and natural heritage, and its landscape also includes various natural geomorphological features and traditional rural structures that individually and collectively form an important aspect of the Islands' distinctive cultural legacy and history. This would infer that planning should no longer be contemplated as a piecemeal approval or rejection of a project using solely a particular parameter, without evaluating all the holistic outcomes.

The eco-environmental effects of building expansion in Maghtab contribute significantly to rural land loss. Losses of agricultural land and surrounding maquis and garigue pockets will further infringe on the remaining ecosystem. The conversion of agricultural land to buildings, other than reducing ecological space, will also create a series of ecological security issues like local temperature rise, runoff and flooding, and increased pollution other than fodder reduction. (2022, Zongfeng Chen, Yurui Li, Zhengjia Liu, Jieyong Wang and Xueqi Liu in Impacts of Different Rural Settlement Expansion Patterns on Eco-Environment and Implications in the Loess Hilly and Gully Region, China.)

Leapfrogging expansion patterns of development ultimately encroach rural areas and increase total built-up area and, in this part site, reduce animal fodder and carob pod production, dwindle the flow of rainwater to water tables, can limit full light availability, increase surface temperatures by heat reflection, diminish distinct habitats and biodiversity, lessen carbon storage potential and habitat quality. The overall continued loss of biodiversity and degradation of natural resources represents a significant threat for rural areas, as ecosystems produce ecosystem services, such as pollination, biological pest control, or the regulation of freshwater quality. The decline in biodiversity and landscape diversity may also impact both tourism activities, as rural areas become less attractive, and rural populations' mental health due to the loss of the land they and their families worked.

The deposit of particulate matter is subject to a number of factors predominant amongst which is that just about 8% of the days are calm with no wind. The mean wind speed is approximately 14.1 km/hour, and this rises more when gusts that can reach over 60 km/hour are included. The main information on potential health effects that might arise due to substances emitted by incineration facilities comes from the risk assessments of individual chemicals emitted by incinerators. Estimates of relative contributions of pollutants to total risk depend on incinerator emission characteristics, populations potentially exposed, potential routes of exposure, and, to some extent, the amount of information that has been collected.

The TTF Air Quality Study that assessed the likelihood of significant effect on ambient air quality, including exceedances of the ambient limit values in SL.549.59, as well as on the deposition levels of particular components when considering three simulation scenarios corresponding to three different plant operations, has a not significant adverse impact when evaluating the MTTF in isolation. The differences in emissions have been considered negligible in concentration and not leading to a discernible adverse impact on air quality. For the three scenarios, the 90.4th percentile of concentrations for are below the regulatory limits of 50 µg/m3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m3 for concentrations.

However, for the R27 receptor where the changes in the annual levels for NO2, PM10 and PM2.5 due to scheme are equal to 0,4 μg/m3 and the impact result is Minor. This essentially refers to the agricultural environs within 0.78 kilometres of the facility.

Properties of both particles and the vegetation are important in deciding their interactions and consequently the effectiveness of particle removal from atmosphere. Leaves, susceptible and highly exposed parts of a plant, may act as persistent absorbers in a polluted environment (Maiti, 1993). Small vegetation elements are more effective in removing small particles from an air stream than are large elements. They act as pollution receptors and decrease dust concentration of the air. The capability of leaves as dust receptors depends upon their surface geometry, phyllotaxy, epidermal and cuticular features, leaf pubescence and height and canopy of trees (Fowler et al., 1989; Nowak, 1994; Beckett et al., 2000; Raupach et al., 2001). This confirms relevance of crop type, size and density.

On the basis of study data, a well-designed and properly operated incineration facility emits relatively negligible amounts of pollutants, contributes little to ambient concentrations, and so is not expected to pose a substantial health risk, although, while the risks indicated at the regional level posed by environmental pollutants appear minimal, the local minor effects foreseen indicate that monitoring remains advisable. The associated environmental and socioeconomic benefits resulting from this Thermal Treatment Facility can nevertheless be considered to offset the losses incurred in this rural area and thus appropriately tailored construction work is recommended to minimize impacts outside the development area.

An evaluation of agricultural land use around this locality will indicate a general practice of dryland agriculture with a small number of poultry, rabbit, cattle, and pig farms plus horse yards, mostly between the lower part of Naxxar and on the outskirts of Magħtab village. Towards Wardija and Għargħur there are irrigated parcels. In respect of livestock production, all animals are raised intensively in buildings. Crop production appears primarily oriented towards cereal production for fodder and this would constitute the primary crop in the marginal and non-irrigated areas around the Maghtab Environmental Complex. No particular spatial spread or extended zone of influence of the impact is envisaged other than the spread of particulate matter during the construction phase.

4. SUMMARY OF IMPACTS TABLE

Table 3: Summary of impacts

Impact type and source			Impact receptor		Effect & Scale							Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommissioning)	Receptor type	Sensitivity & resilience toward impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ geographic extent of impact	Short-/ Medium-/ Long-term	Temporary / Permanent (indicate duration)/ Permanent	Reversible (indicate ease of reversibility)/ Irreversible					
Loss and deterioration of agricultural land, Decrease in overall ODZ area	Excavation and Construction causing land loss	Construction & Operations	Site area	High sensitivity, Low resilience	Direct & Cumula tive	Adverse	Major	Developme nt area	Long-term	Permanent	Irreversible	Inevitable	Major	Containing impacts to site area by adhering to construction regulations	Major to Moderate Adverse	N A
	Dust generation during construction	Construction	Surrounding agricultural land	Moderate sensitivity, Moderate resilience	Indirect	Adverse	Moderate	Surrounding agricultural fields	Short-term	Temporary (during construction phase)	Reversible	Likely	Mode rate	Adherence to PA and ERA regulations and instructions to protect surrounding areas	Minor Adverse	N A

5. CONCLUSION

Rural shrinkage is simultaneously a land use and economic phenomenon and follows wider trends in European territorial restructuring. In this particular case, rural shrinkage is however linked to an opportunity to address solutions to environmental concerns by providing a thermal treatment facility that implements on-site disposal of hazardous waste using advanced technology, minimizing adverse effects on the environment and reducing the environmental footprint associated with exporting waste to distant treatment facilities..

This shift contributes positively to the economy as it encompasses resilient development pathways that open an additional dimension to reduce environmental pressures and costs. In this respect, the proposed TTF development, whilst generating a loss of agricultural land, will do so quite constrainedly, given the limited area and quality of agricultural land involved. However, when considering the whole area taken up by the Ecohive complex, there is a loss of agricultural land and natural pockets.

The inter-relationships between location, aspect, topography, geology, and soil characteristics in this site is typified by severe constraints concerning cultivation practices due to soil limitations, namely compaction, shallowness, stones, low moisture-holding capacity, and low fertility which all effectively limit agricultural productivity. This is further exacerbated by proximity to the sea with associated vulnerability to sea spray. Given the unavailability of water, this land may be used for cereal cultivation for hay, with the risk of insufficient rainfall and crop failure. Effectively, this area in Maghtab has, and has always had, limited agricultural potential, with constraints in supporting crop production.

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