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A BEACH MANAGEMENT MANUAL

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Cover: Ir-Ramla beach, Gozo (Malta).

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1. GENERAL INTRODUCTION

Within project BESS, the overall objectives of this Beach Management Manual were to:

- provide the basic elements and necessary guidelines for elaboration of three pilot management plans to be used as a model for the correct management of a beach environment resulting in a better and more rational use of resources;
- produce a specific tool for the management of the Pocket Beaches;
- be functional for the proper comprehension of beach management and related procedures;

While there exist very comprehensive beach management reference books and manuals (e.g. Rogers et al., 2010; Williams & Micallef, 2009) it was felt that within the specific consideration of pocket beaches by project BESS, a generally simplified (step by step) approach to the management of pocket beaches should be produced, providing examples of its application in the form of three case study beaches addressed by this project in Malta and Sicily (found below in section 4). The target audience for use of this manual is diverse and an exhaustive glossary of technical terms is provided for non-technical readers. Although the manual is self-contained, its use in conjunction with reference to the BESS online Geographic Information System that holds multiple data-sets concerning pocket beaches in Malta and Sicily, is strongly recommended. For example, the specific beach management plans presented in this manual should be read with reference to the *Socio-economic status and development needs* reports for each case-study beach, available in digital format on the BESS project WebGIS (http://bess.pa.ingv.it/).

The manual is in part, based on the development of beach management plans for three pilot case studies addressed by the BESS project and aims to serve as a guide for the formulation of future management plans for other pocket beaches, particularly in Malta and Sicily. The proposed methodology should be considered as a blueprint for the formulation of such management plans and, while localised conditions might necessitate departure from this methodology, the overall framework should be followed in order to ensure comparability and replicability between management plans. This would facilitate exchange of experiences and encourage networking and collaboration between those involved in beach management. Regular feedback from different localities and municipalities would help to keep the beach management framework up to date, as more management experiences are shared.

In this context, it is felt that the establishment of a Siculo-Maltese beaches network incorporating beach managers and scientists from the two islands that would share knowledge and experiences on the beach products of the two islands, their natural systems and the management success stories and difficulties encountered could help create greater synergy from this project.

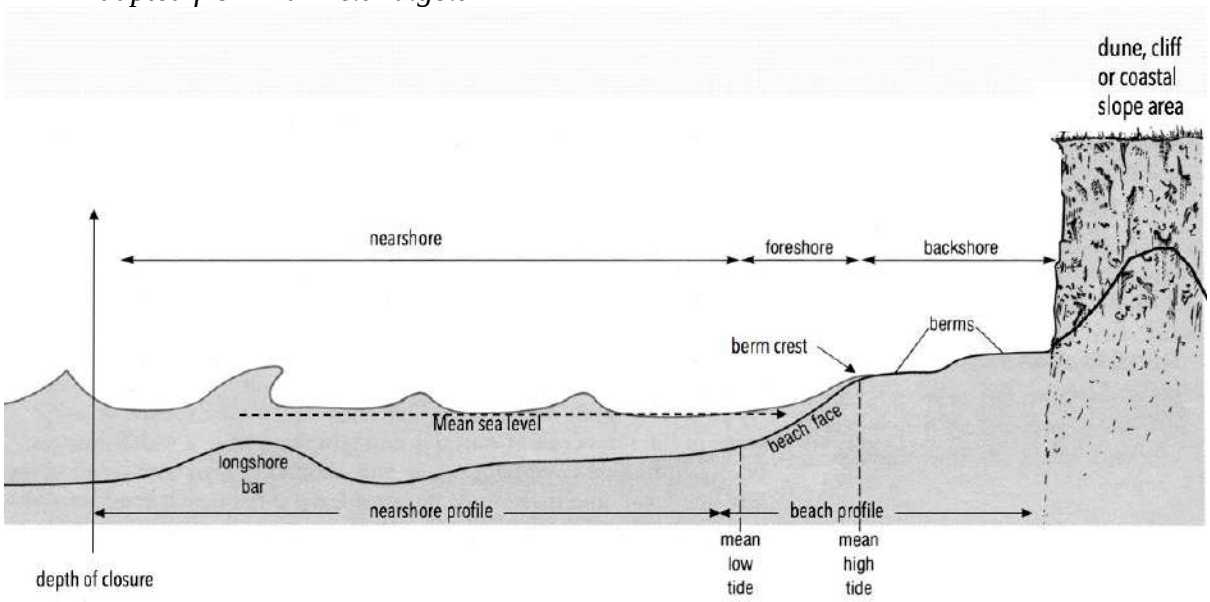
2. INTRODUCTION TO BEACH SYSTEMS

2.1 Physical description

At the physical level, beaches represent unconsolidated deposits of sand and/or gravel on a shore and their classification is often based on their morphology and sediment size composition (Pontee, et al., 2004; Bird, 1996). The Shore Protection Manual of the U.S. Army Corps of Engineers (1984, Appendix 'A') defines a beach as "*the zone of unconsolidated material that extends landward from the lower water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation*". Similarly, the UK's Construction Industry Research and Information Association (CIRIA, 1996, p.47) defined a beach as "*a deposit of non-cohesive material (e.g. sand, gravel) situated on the interface between dry land and the sea (or other large expanses of water) actively worked by presented-day hydrodynamic processes (such as waves, tides and currents) and sometimes by winds*".

A beach can be described as being composed of a *foreshore, nearshore and backshore.* The foreshore is the sloping portion of the beach between the limits of high tide and low tide swash. The nearshore (that zone seawards from the water's edge and the line where waves begin to break i.e. where waves steepen, break then re-form in their passage to the beach, where they break for the last time before surging up onto the foreshore. The backshore is the beach region extending from the berm crest landward to a foredune ridge, vegetation line, seawall or some other physiographic break; it is located above high tide and only influenced by the sea during storm and/or high tide events (Dingler, 2005; U.S. Army Corps of Engineers, 1984 - Figure 1). The water's edge is also often referred to as the shoreline (Bird, 1996), while the beach-face is the swash and back-wash zone within the near-shore (Weir et al., 2006).

Figure 1: A schematic representation of a shore / beach system & zonation
Adapted from marine.tmd.go.th



In Figure 1, the *berm* refers to that beach area where swash deposition takes place (swash refers to the wave-generated landward moving sheet of highly turbulent water). The *beach face* is that area where the swash and backwash act, the latter being the seaward retreat of the swash after it has lost its forward momentum due to gravitational and frictional forces. The summer shore profile normally includes a steep beach-face due to the high berm set up by swell waves. In contrast, the winter profile results from high, steep storm waves which erode the summer berm and move such sediment seawards, developing in turn long-shore sand bars.

One of the more important consequences of beach's sediment size composition is the relationship between sediment size and beach gradient. Studies have demonstrated steep beaches to be associated with larger, shingle-sized sediments while shallow beach profiles were present in the case of finer sandy sediments. The explanation for this phenomenon is based on the greater percolation rates of large sediments, which effectively reduces the back-wash effect of breaking waves (Bujan et al., 2019). It has also been noted by Orford (1993) that beaches possessing coarser sediments are representative of higher exposure conditions. Shingle and/or cobble beaches will contain rounded rock fragments, and are normally narrow and found on coastlines supporting hard rock and erosion resistant cliffs. Such narrow and steep beaches are formed along the base of cliffs and over abrasion platforms, which are found associated with this type of coastal formation (Coastal Engineering Research Centre, 1984). The steepness of a beach is the result of the angle of respose of beach sediment (resulting from a natural ability of rounded structures to wedge and support each other) and partly as a result of the absence of backwash.

2.2 Beach types

In addressing beach sediment composition, studies on beach management have described the composition of most beaches as including a mixture of sand and gravel (Pontee, *et al*., 2004; Bird, 1996; CIRIA, 1996). In this connection, beach grain-size categories have been largely based on the Wentworth scale of particle diameters which refers to boulders, cobbles, and pebbles, granules, very coarse, coarse, medium, fine and very fine sand in order of decreasing size. Finer particles, found mainly on muddy shores, are conventionally addressed separately as salt marshes and estuarine mud-flats. Using the Wentworth scale, four main types of beaches are theoretically identified, although most natural beaches exhibit a variety of sediment types at their surface and across their depth profile:

i. Sandy beaches, composed of an assortment of sand grain sizes.
ii. Sand / shingle beaches which include sand, pebbles and cobbles.
iii. Shingle beaches composed entirely of well-rounded pebbles and cobbles.
iv. Boulder beaches: possessing stones ranging in diameter up to more than one meter.

Studies based on beach morphological characteristics have referred to two main types of beaches, namely those dominated by along-shore drift (producing *linear beaches* on open coasts), and swash dominated beaches typically represented by smaller *pocket beaches* that bounded by headlands (Williams & Micallef, 2009; Bird, 1996). Such pocket beaches are common to the Mediterranean, and typical of many beaches in Sicily and the only type found in the Maltese Islands. Davies (1980) further described a third beach-type which exhibits both swash and drift characteristics. The '*Zeta-form*' or fish-hook beach type is represented by only one headland which partially blocks long-shore sediment transport. This result in a swash dominated beach area in the lee of the headland, and drift dominated beach area down-drift of the headland (Figure 2).

With *linear beaches*, wave action is normally undistributed, exhibiting a predominant wave climate that determines the net long-shore direction of sediment movement. However, during an entire year, wave activity will also include a degree of variability in direction and size, resulting in temporal variations in sediment transport characteristics. Since linear beaches exhibit a long-shore transfer of sediment (including that between adjacent beach entities), they are particularly sensitive to any disruption of normally occurring sediment flow. In linear beach systems, long-shore sediment transport therefore represents the most important sediment source. On such open coasts where wave action is oblique, linear beaches may exist only where sediment input to the coast is sufficient to meet the long-shore removal capability of oncoming waves (Pethic, 1984). The shape of a beach adjusts so as to offer minimum resistance to transport processes and as a consequence, the tendency for stable beaches is to face prevailing waves.

Figure 2. A morphological classification of beaches, showing a linear beach (top), headland bound pocket beaches (bottom right) and a fish hook shaped beach (bottom left).

Precise definitions for *pocket beaches* appear limited in scientific literature, and references to this type of environment sometimes conflict in description. Pethic (1984, p.166 &118) suggested that the curved or 'accurate' shape is particularly applicable to pocket beaches, and referred to pocket beaches as ones "*contained within bounding headlands*" and "*wave-crest oriented, sediment-tight beaches*". On the other hand, CIRIA (1996, p.79) have stated that the plan shape of a pocket beach may be "*virtually straight to almost circular*". Bird (1996) gave

no specific definition of pocket beaches but simply referred to them as swash-dominated beaches.

Based on the above remarks, it may be concluded that a pocket beach is one:

i. Bounded by headlands which prevent/limit long-shore sediment transport removing sediment from the littoral cell forming the beach.
ii. Having a concave or straight plan shape, the latter being determined by the pre-dominant waves arriving at the beach. Such wave characteristics are influenced by the degree of wave refraction generated at the headland and by sea-bottom topography
iii. Being swash-dominated but may include insignificant sediment drift, the latter being temporary and arising from secondary wave/wind activity, so that the predominant plan shapes of the beach is recoverable.
iv. The limited /insignificant long-shore sediment transport condition suggests a size (length) limitation for pocket beaches.

As to the issue of size limitation, CIRIA (1996) have pointed out that in 'small' pocket beaches, the plan shape is largely determined by the angle of diffraction of pre-dominant waves arriving at the embayment headlands. Conversely, in 'larger' pocket beaches, the plan shape is often adjusted as a consequence of varying angles of wave impact on the beach. This distinction suggests that 'true' pocket beaches are indeed size-limited as suggested by Sunamura (1998, pers. comm.) and are determined by the dominant influence of headland wave diffraction on beach plan shape.

In the absence of long-shore transport of sediment from upstream sources, pocket beach sediments originating from the land therefore represent the most important sediment sources. Changes in sediment size characteristics occur mainly in the cross-shore beach profile as a function of wave action with the coarsest material always being found in the area of the breaker zone. Additionally, due to the presence of headlands which restrict down-drift sediment transfer, the sediment volume in pocket beaches is as a rule, more stable than that of linear beaches.

2.3 Dynamic nature of beaches

Because of its inherent composition, being largely an accumulation of loose material made up of sand, pebbles or a mixture of the two, one of the more important properties of a beach is the ease with which its shape can be adjusted as a consequence of energy transfer from waves to the shore. In this regard, Orford (1993) regarded beaches as a coast's central response mechanism to wave energy through the provision of a sediment medium which can be moved onshore, offshore or along-shore. In the context of coastal erosion, this capability to adjust its shape in equilibrium with environmental forces makes a beach the best suited formation to offer protection to a shore-face.

With the beach in continuous motion under the influence of wind, waves and near-shore currents, this dynamic equilibrium can easily move from a state of deposition to one of erosion. The concept of beaches in equilibrium (in plan and profile) has been considered by a number of authors (e.g. Pethic, 1984; Carter, 1988; Dean, 1991; Pilkey et al, 1993; Bird, 1996). The plan shape equilibrium state of a beach has been described as the stage where the beach aligns itself to the curvature of refracted waves arriving at the beach. In this condition, since the wave approach angle in a well-formed pocket beach is zero (i.e. parallel to the shore), no wave-induced long-shore currents (and consequently no sediment transport) are generated. In those cases where the pocket beach is of sufficient length or the headlands are of limited seaward

extension, winds may pass beyond a headland boundary, influencing the wave approach angle (to an oblique one) and thus resulting in a limited long-shore sediment transport, the direction of which will depend on the direction of the wind. Thus, since the wave angle of approach will vary throughout the year, the state of equilibrium will change accordingly and is thus referred to as a 'dynamic equilibrium'.

Pethic (1984) pointed out that while pocket beaches (in equilibrium) may result in conditions of zero sediment transport, a linear beach will adjust its shape so as to reduce the angle of wave incidence to the minimum required to prevent local erosion or deposition while still transporting newly imported sediment received by long-shore drift. However, such conditions may only be found where sufficient sediment inputs are available, such as, for example, downstream of river inputs. In this connection, Bird (1996) distinguished between dynamic and cyclic equilibrium, where the latter refers to a beach state of equilibrium that returns to its original form after being disrupted. From the above it is surmised that linear beaches (recipient of long-shore sediment transport and a variable wave climate) may exhibit both dynamic equilibrium as well as cyclic equilibrium states, the latter following storm disruption.

Pocket beaches, on the other hand, experience less varied wave climates as a result of their sheltered nature, a stabilising influence of headland-induced wave refraction and situations where new sediment material is not readily available; in this scenario, an equilibrium profile is not maintained but rather recovered following episodic changes in near-shore processes conditioned by seasonal changes and storm events. This suggests that the plan shape of pocket beaches typical of the Maltese and Sicilian Islands, may be more limited to states of recoverable (cyclic) equilibrium.

Dean (1991) and Pilkey et al., (1993) described changes in beach profile equilibrium states as an adjustment between beach profile and wave/current influence. Such an equilibrium beach profile results from the combined influence of grain size and wave activity, and is described by a smooth, concave upward curve reached after sustained wave activity. Bird (1996) suggested that the equilibrium profile is achieved when the beach granulometric composition has become adapted to the site's specific wave conditions. Swell waves characteristic of the summer months tend to transport fine sediment from deeper waters on to the existing beach, increasing its sediment load and leading to the formation of a summer berm towards the top of the beach face. On the other hand, steeper winter waves tend to remove beach material back to the deeper waters. Storm waves may also lift sediment well past the previous summer berm to form what may be a series of higher winter berms, each reflective of the wave energy of a particular storm event.

2.4 Sediment supply, the concept of sediment cells and beach erosion

Changes in coastal morphology are normally expressed in a response by its sediment production and distribution pattern; these changes are reflected by the beach systems where present. In healthy beaches where a dune complex is also associated, the latter will feed the beach and replace its losses during catastrophic events such as extreme storms. In less turbulent conditions, the beach will itself subsequently feed the dune system via aeolian transport of sediments. It follows that any physical artificial construction at the back of a beach will disturb not only any related dune system but also the water regime of the area. This will often result in a local overland flow of water and subsequent beach erosion.

It is thus critical that beaches (being composed of unconsolidated sediment) are essentially considered in terms of their 'sediment system', the latter being represented not only by that

sediment deposited onshore (i.e. the beach itself and where present, sand dunes) but also by the underwater sediment associated with a beach that extends seawards up to what is identified as the 'depth of closure', i.e. that water depth at which incoming waves start to interact with the seabed (and are thus able to mobilise that sediment); this is dependent on wave height and period, and sediment grain size. A simplified estimate of this depth of closure is the water depth equal to one half of significant wavelength.

While the origin of sediments has been historically linked to sea-level oscillations, with changes in sea level bringing new sources of sediment into the near-shore environment, sediment is also provided from land-based sources by rivers and the erosion of rocky shores/cliffs. Sediment sinks are areas where sediment becomes deposited and are represented in the short-term by beaches and associated dune deposits and by more permanent offshore deposits that are lost to the sediment cells operating at the coast. However, sediment sinks may be influenced by any human activity such as dredging that reduces the natural sediment supply to the coast. In this context, the sediment budget is described as the balance of sediment volume for a selected stretch of coast. Davies (1974, p. 40) described a sedimentary cell as the '*sediment body associated with a coastal stretch bounded by rocky reefs or protruding headlands, particular those ending in deep water*'. Bird, (1996) has further described a sediment cell as that area where wave action may result in the to and fro long-shore movement of sediment along the confined shore or along the transverse profile. On this subject, CIRIA (1996) referred to coastal cells as coastal units within which sediment movement is self-contained; these types of sediment cells are clearly represented by pocket beach systems.

This concept of sediment cells is, however, far from fully understood or clearly established. In the United Kingdom, for example, the Ministry of Agriculture, Forestry and Fisheries (MAFF) report on Coastal Defence and the Environment (MAFF, 1995, p. 46) refers to a coastal cell as being able to "*bypass even the most formidable headlands so that sediment is transferred from one deeply indented bay across a headland into the next bay*". The main difficulty in agreeing on a common definition of a coastal sediment cell is likely to arise from suspended sediment in coastal waters. Unlike bed-load sediment which is transported by long-shore wave driven currents, suspended sediment falls under the influence of tidal and mass water movements and may travel further and independently of shoreline morphology. This observation is particularly relevant to beaches where much of the sediment produced by the parent rock is very fine or soluble and is therefore likely to be introduced into the marine environment as suspended sediment during or after precipitation storm events (often the case in Malta and Sicily). It is also interesting to note that the recognition of sediment or coastal cells was as a result in part, of past mismanagement in beach or related coastal engineering works which treated problems as localised ones without considering the consequence of downstream erosion. While sediment cells may be very large, each major cell may contain a number of smaller sub-cells (CIRIA, 1996). One of more useful applications of clearly defining sediments cells is for the establishment of specific planning zones in which coastal area management may be applied.

Natural and anthropogenically reduced sediment supplies to beaches is a major contributor to beach erosion which has become a prevalent trend in recent decades (Anthony, 2005). The Commission on the Coastal Environment set up by the International Geographical Union in 1976, reported that by 1984, more than 70% (by length) of beach fringed coasts had already retreated mainly as a consequence of reduced sediment supplies (Bird, 1985). In their consideration of pocket beach erosion in Provence, Brunel & Sabatier (2007) suggested that up to 50% of the shoreline retreat quantified could be attributed to sea-level rise and that the presence of cliffs preventing landward beach migration would significantly contribute to beach width reduction. Natural causes of decreased sediment supplies from cliffs are represented by

reduced rainfall, shoaling in the near-shore and a natural depletion of sediment-yielding cliff faces. Antropogenically, stabilisation of coastal landslides, reduced run-off over cliff-faces and the construction of artificial structures on the shore contribute to reduce beach sediment from cliffs and other coastal formations.

Diminishing beach sediment may be attributed to reduced supplies from:

i. Riverine discharges.
ii. Cliffs and other coastal formations.
iii. Inland dunes.
iv. Sea-floor sediments.

Natural causes of diminishing fluvial sediment discharges are represented by drought-reduced melting of snow and ice and the natural exhaustion of river-catchments sediment supplies. Examples of the latter have been reported by Bird (1985) and Bird & Fabbri (1993) as occurring in Greece and Turkey and on the Ligurian coast of Italy. Anthropogenic activities leading to reduced supplies of beach sediments include river damming, soil conservation projects (such as terracing and re-afforestation) and diversion of river mouths. Examples of beach erosion resulting as a direct consequence of river dam construction include the Rhone delta in France and the Dnieper and Dniester deltas in the Ukraine.

Wave action induces beach erosion through the generation of currents and long-shore drifting and wave scour by storm waves; this may be enhanced by tides and climate change induced sea-level rise and increased storminess. Both tidal transgression and sea-level rise increase wave impact by deepening of the near-shore waters therefore allowing larger waves to reach the shore. In a report by the U.N. Centre for Human Settlements (HABITAT, 1996), increased storm frequency, loss of beaches and increased shoreline exposure to wave impact were included in a list of environmental impacts resulting from increased global urbanisation.

A number of authors have reported on a clear increase in storminess and storm-related disasters that have taken place over recent decades. Reguero et al., (2019) for example, reported on how coastal processes that determine flooding and erosion are driven by wind-generated ocean waves and how the latter have been influenced by ocean warming. The authors reported that as a result of anthropogenic global warming, global wave power has increased globally and in ocean basins since 1948. Amarouche & Akpınar (2021), considered all storm wave events occurring in the western Mediterranean Sea over the last 41 years and identified that a very large part of the western Mediterranean Sea shows an annual increasing trend in total storm wave energy and storm power index. Increased storminess will also result in increased wave scour of beach sediments and destruction of sea-grass meadows, which also results in a deepening of near-shore waters.

Bird (1996) has critically reviewed a comprehensive list of 20 factors which have been identified by the IGU Commission on the Coastal Environment as initiating or accelerating beach erosion. The author suggested that such a list may be used for management purposes as a check-list, noting which factors are applicable to a beach exhibiting trends of erosion and thereby identifying what remedial action should be taken. Aspects listed but not already discussed above were, land submergence and increased wave attack, intensification of oblique incident waves as a consequence of beach-face erosion on adjacent shores, degradation and loss of beach material resulting from weathering, migration of beach lobes and forelands, rising water-tables which increase beach erodability as a result of increased wetness and the melting of sea-ice otherwise protecting beaches from wave impact. According to Sunamura (1992),

tertiary marine sedimentary formations (such as those forming the Maltese Islands) are particularly prone to wave induced erosion. While land-based sediment sources are transported via permanent or storm floodwater flows and from erosion of coastal formations into the sea, marine sediment is transported by waves and inshore current flows.

While beach erosion is a naturally occurring process generated by waves, currents and aeolian transport of sediment, anthropogenic activities have also made a significant contribution to beach loss. In considering human influence on the Mediterranean coast over the last 200 years, Anthony (2014) suggested that the Mediterranean coast has been significantly modified by human interventions. In particular, dam construction has resulted in severe riverine sediment input reductions and coastal engineering projects have additionally resulted in a loss of sediment input to beaches and dune systems. Reduced supplies of beach sediment from sand dunes may arise naturally through depletion or stabilisation by vegetation cover or anthropogenically, following stabilisation by surfacing and/or construction (Pye & Tsoar, 1990).

Reduced beach sediment supply from the sea-floor occur as a consequence of reduced biogenic sediments following destruction of shell fauna and the obstruction of shore-ward drifting of offshore sediments by artificial or natural barriers such as sea-grass meadows (Birds, 1985). Additionally, according to Tanner & Stapor (1972, p.102) as a beach matures, its sediment supply moves from "*an economy of abundance to an economy of scarcity*". Bird (1996) described this stage as one where the near-shore transverse profile of a beach develops a smooth concave shape thereby preventing further sediment supply from the sea-floor.

Other anthropogenically caused reductions in beach sediments are related to:

i. Beach and offshore mining.
ii. Constructions of beach structures (jetties, breakwaters, harbours) which impede long-shore drift of beach sediment and result in changes in angle of wave incidence.
iii. Increased coastal urbanisation which results in a reduction of permeable surface and subsequent increased surface run-off which causes increased beach sediment transport to be swept out to sea.

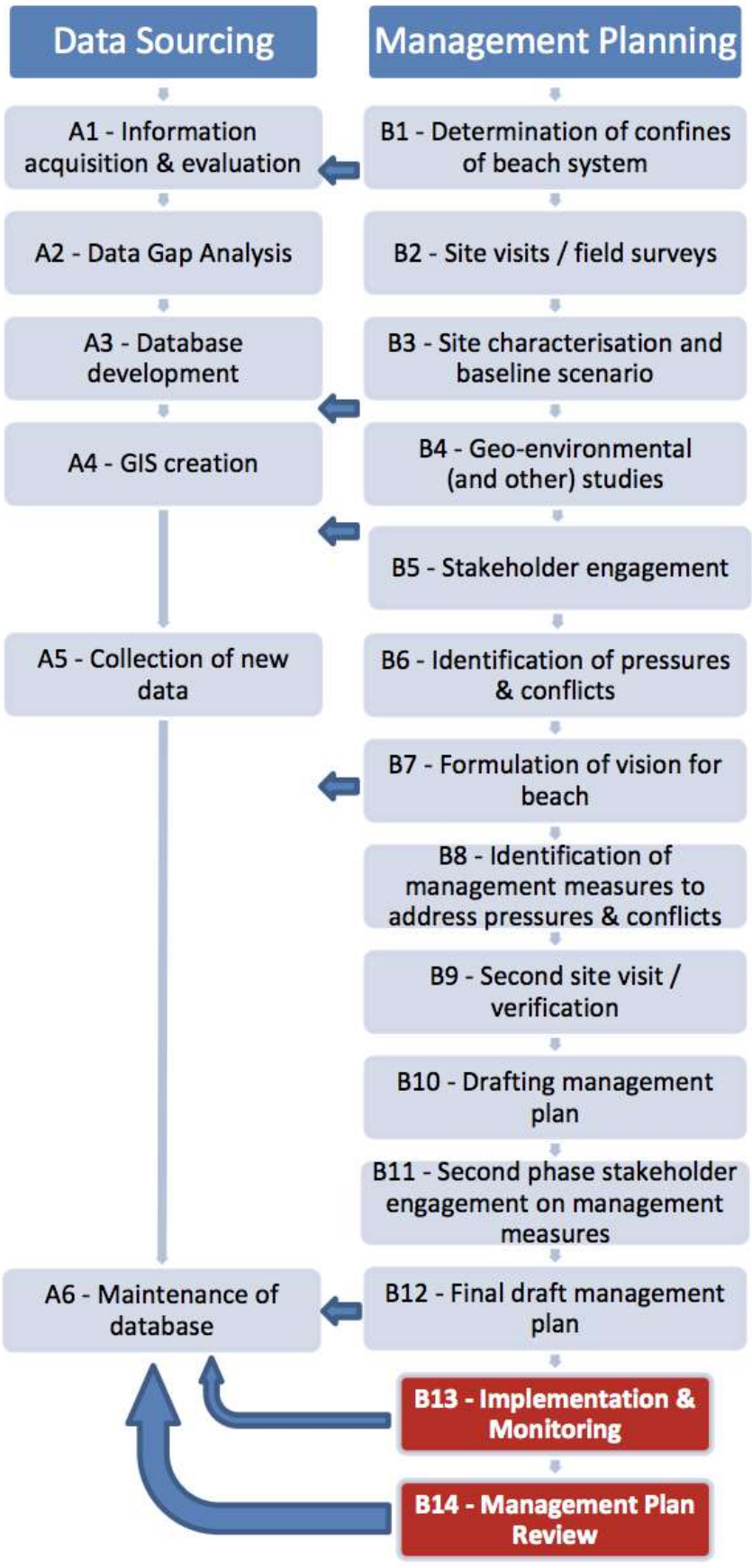
3. DEVELOPING BEACH MANAGEMENT PLANS

3.1 A common methodology

The approach to be taken should be holistic, taking account of both natural phenomena and anthropogenic pressures on the beach and surrounding area. A standardised methodology facilitates quality assurance and control, as well as replicability and comparability between sites and management measures.

A proposed methodology consists of twenty steps, undertaken in two parallel and interconnected strands: (i) Data Sourcing, and (ii) Management Planning (Figure 3). As shown, the two strands can take place concurrently, with the management planning strand feeding new data into the data sourcing strand and the database further guiding the management measures. Once the management plan is formulated, its actions will need to be implemented. Implementation will also require monitoring to ensure that the planned effects of the different measures are achieved. Monitoring results should be used to fine tune the measures as they are undertaken, as well as to periodically review the management plan. Monitoring and the revision of the management plan will also feedback data into the maintenance of the database to keep it current. The tasks in each of these strands are described in more detail and, as far as possible, chronologically, in the sections below.

Figure 3: Data Sourcing and Management Planning flow chart



Step A1 – Information acquisition & evaluation

The first step in the Data Sourcing strand of the methodology is the identification of the information requirements for the management planning process and the data sources for the creation of the database and the Geographic Information System (GIS). This will identify a list of data types and elements that would ideally be included in the database, and to feed into the management planning process. A major input for this is the first step in the Management Planning strand (Step B1), which is the determination of the confines of the beach system subject of the management plan. This sets the geographic extent of the data search.

Once this step is completed, the data is acquired from the different sources identified. These could be among other, existing web portals, databanks, databases, reports, articles, academia contacts. Issues of data copyright will need to be considered at this stage and the necessary arrangements made, especially for data that will be published. The data gathered will also need to be evaluated for relevance.

Step A2 - Data Gap Analysis

As the data identified is collected, a Data Gap analysis is also carried out, to determine what supplementary information might need to be gathered during the site visits / field surveys (see Step B2). This will involve a comparison of the data sourced against the list of data elements referred to in Step A1.

Step B1 – Determination of confines of beach system (terrestrial and marine)

To a layman, or a tourist seeking sun, sea and sand, a beach amenity is the dry strip of sand normally found around coves or bays, or along long stretches of coastline. It practically starts at the water line and ends where a person can no longer tread barefoot. Technically speaking, however, the beach system extends from an inland edge, such as a cliff, cane field, or dune area, to some point offshore, often an appreciable distance from the water line; for pocket beaches, this would extend to a line connecting the two headlands enclosing the beach (technically identified as the 'depth of closure' (defined above in section 2.4). The formulation of a management plan for a beach critically requires the determination of the confines of the beach system. While management of activities on, and immediately around, the sandy beach amenity will always be the main focus, a management plan cannot ignore activities further afield – both in the beach's hinterland and offshore in the marine environment. Determining the extent of this beach system is therefore an important first step in the Management Planning strand.

Step B2 – Site visits / field surveys

The determination of the beach system confines is followed by site visits and field surveys to verify the information gathered (see Step A1), and to collect site specific information, or to update available data. This also concludes the gap analysis (Step A2).

Site visits / field surveys will collect first hand data from the beach system. This could be among other, in the form of photographs / videos, water samples, sand samples, habitat surveys, infrastructure surveys such as access points, signage, lighting, transport amenities and landscaping and activity information. The data gathered will also depend on the type of beach (rural / urban / semi-urban – see section 3.2.below) and the facilities present on site. In certain cases, risk factors will also be important (e.g., rock fall / landslides, etc).

It would be ideal, wherever possible, for a beach to be observed and monitored over a number of years before a management plan is drawn up. This would allow the team working on the management plan to understand the dynamics of the beach and how the beach behaves under different climatic conditions and seasons. It is a common mistake for proposals for interventions on beaches to be made based on the observation of a single event, which might not be significant in the wider scheme of things. For example, the loss of sand from a beach might look catastrophic during the event, but it could also be part of a cyclical phenomenon, with the beach sand redeposited on the beach at a later stage. It is therefore crucially important to understand the dynamics of the beach before any attempt at implementing management measures are made.

Step A3 – Database development

This step involves the evaluation of all data collected (whether from third party sources, or from the field surveys) for consistency, quality and reliability. The database structure is also elaborated by identifying the type of data (e.g., raster, point, etc) and its proposed attributes (e.g., text, whole number, decimal number, date, etc.)

Step A4 – Creation of a Geographic Information System (GIS)

The database information is used to create the GIS for the beach. This could also form part of a wider GIS database incorporating other beaches, or even other geographic areas of a specific territory. The reach and scope of the GIS will need to be discussed to avoid duplication with other existing set-ups.

Step A5 – Collection of new data

As described in Step B2, additional data might be required for inclusion in the GIS database. This step is an open-ended one, with more data being added as this is gathered in future years. This will be particularly useful for monitoring programmes, with new data collected through the monitoring, added to the database as it becomes available (see Step B13). This will also allow ongoing updates of data and management measures (see also Steps A6 and B14).

Step A6 – Maintenance of database

This final step in the Data Sourcing strand of the methodology is intended to ensure that the data collection exercise is not a one-off activity. Data become obsolete and new information would be required to ensure that the management measures remain relevant as the beach is managed; this step keeps the database current. Ongoing data collection and monitoring will ensure that the database can also be used for trend analysis, allowing the beach managers to identify any particular patterns in data collected over time and thus help to improve effectiveness of future management measures and facilitate the periodical review of the management plan (Step B14).

Step B3 – Site characterisation and baseline scenario

This step leads on from Step B2. The data collected during the site visits and field surveys are used to characterise the site from a physical, environmental, and infrastructural perspective. It provides a baseline scenario of the condition of the beach and the general environment of the site, and the amenities and facilities available for beach users and other

visitors. This is to include both the terrestrial and the marine components of the beach system. As explained earlier (see Step B2), it would be advisable, where possible, for the baseline conditions of the beach system to be observed and recorded over a number of years to understand the dynamics of the pocket beach system under different conditions.

Step B4 – Geo-environmental (and other) studies (if not available)

One of the most important studies underpinning beach dynamics is the geoenvironmental characteristics of the site. A geo-environmental study of the beach system is, therefore, an important requirement and it is encouraged. Other studies might also be required, depending on the type of beach and its general characteristics. Beaches in natural areas, or protected beaches, might benefit from other studies on the ecology, or benthic resources. This will need to be determined on a case-by-case basis.

Where structures that interfere with the hydrodynamic conditions have been built inside the pocket beach (e.g., breakwaters, jetties, groynes, water polo pitches, marinas, or ports, etc) there may be a need for hydrodynamic modelling of currents and waves inside the pocket beach, in order to understand the sediment transport conditions at the site. Such studies tend to be costly; however, the information they provide is invaluable and therefore they need to be properly planned for.

Step B5 – Stakeholder engagement

Stakeholder engagement is a fundamental step in the management planning process. The input that stakeholders can provide is of significant value. Through this step, the management planning team initially identifies a diverse list of institutional and non-institutional stakeholders, including central government ministries, municipalities, regulatory authorities, non-governmental organisations (NGOs), beach operators (e.g., water sports, kiosks), hotels and restaurants, beach managers and beach management service providers (including beach cleaners, lifeguard services), and beach users; this list is not necessarily exhaustive.

A stakeholder engagement strategy is then drawn up. This will include a stakeholder analysis exercise, to evaluate the needs and interests of each of the institutional and non-institutional stakeholders, their roles and responsibilities in the formulation of the management plan, and their capacity and level of engagement in the beach management process. The stakeholder engagement strategy will describe how each stakeholder will be engaged and their involvement in the formulation of the management plans, as appropriate.

The stakeholder engagement strategy is then rolled out through a series of engagement events (meetings / focus groups / public events), depending on the plan and the targets set out. It is important that the stakeholder engagement strategy is tailor-made to the beach management process at hand, since different approaches can be adopted depending on the type of beach being considered, and whether the management process involves more than one beach. There will be a need for flexibility and adaptability in the approach to the stakeholder engagement. During the stakeholder engagement process, each beach system, the pressures that each is subjected to, and the conflicts and opportunities that exist are discussed. The stakeholder engagement will also discuss the vision for the beach, as well as the management objectives and actions to achieve that vision. The process of stakeholder engagement should be an iterative one, where stakeholders are consulted at different phases (see Step B11).

Engagement with stakeholders should also continue during management plan implementation, as appropriate.

Step B6 – Identification of pressures and conflicts

An important step following the characterisation of the beach system (see Step B3) and the stakeholder engagement (Step B5) is the identification of the pressures and conflicts that the beach system is subjected to. Pressures could be both man-made and natural, and conflicts could be spatial or temporal. This information is best mapped and included in the GIS database and used for monitoring purposes.

The information can be included as part of a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis used to help focus the vision and management objectives. In this step, the site features identified in Step B3 are summarised and assigned a positive (strengths) or a negative (weaknesses) value. Similarly, the factors influencing the site (including the pressures and conflicts referred to above) are summarised and assigned a positive (opportunities) or a negative (threats) value. The result of the SWOT analysis is then used to develop the vision for the beach (Step B7), which will aim to improve the strengths and capitalise on the opportunities, while minimising the weaknesses and addressing the threats.

Step B7 – Formulation of a vision for the beach

Visioning is an important part of the strategic planning process and helps to focus the formulation of the management objectives and the specific actions through which these will be achieved. It involves imagining the state of the beach in the future (say 20 or 30 years ahead) and following the implementation of management measures. Visioning is a very useful tool to be used in the stakeholder engagement process and, typically, visioning is undertaken with the involvement of all stakeholders (Step B5). It is normally useful to have a key person lead the visioning exercise, to encourage the participants to get involved in the process and to keep focus. The vision is written in the present tense. An example of a vision for a hypothetical beach is:

The beach at XXXX is managed and maintained in consultation with stakeholders. Bathing water quality is optimal throughout the year and beach users are fully cognisant of their obligations. Beach and boating activities during summer respect the general environmental characteristics of the area and monitoring of the beach throughout the year ensures maintenance or improvement of the baseline conditions year on year

Step B8 – Identification of management measures to address pressures and conflicts

The visioning exercise (Step B7) helps develop the aspired "future state" of the beach system. From there, the management objectives are derived, where these describe the goals and targets to be achieved by the management plan as they are driven by the shared vision for the site. The management objectives will be "smart" and address the threats identified in Step B6 and build on opportunities identified in the SWOT analysis. (SMART Objectives are Specific, Measurable, Achievable, Relevant / Realistic, and Time-based).

The management plan actions should be identified and developed with the aim of achieving the management objectives. The actions will be specific and targeted at addressing a particular opportunity or threat. They will also identify the entity responsible for implementation of the action and the implementation timeframe. Typically timeframes would be "immediate", short term (1-4 years), medium term (5- 9 years), and longer term (over 10 years).

Step B9 – Second site visit / verification

This step may be required, depending on the beach system being considered, the data available, and the familiarity with the site. However, it is always important to consider whether verification of the data and measures is required. This serves as a feedback loop in the management planning process and will help to tweak or confirm the measures being proposed.

Step B10 – Drafting of Management Plan

The drafting of the management plan is the culmination of the work undertaken in the previous steps. The management plan document outlines the road map for the management of the beach over the time period of the plan. The management plan also includes an estimation of the costs envisaged for the implementation of the agreed actions, as well as roles, responsibilities, and the timeframes, for implementation. Potential or actual sources of funding should be identified where possible. A monitoring programme and review timetable for the management plan is also to be included in the management plan.

Step B11 – Second phase stakeholder engagement on management measures

Once the draft management plan is available, it is good practice to hold a second round of stakeholder consultation, to discuss the management actions and the draft management plan in general. The aim of this second stage of stakeholder engagement is to identify aspects that may need to be adjusted in the plan and eventually to achieve endorsement of the management plan by the stakeholders. The involvement of the stakeholders should continue to be encouraged during plan implementation.

Step B12 – Final draft management plan

This step involves the formulation of the final version of the beach management plan, following the second round of stakeholder consultation referred to in Step B11.

Step B13 – Implementation & Monitoring

The completion and approval of the management plan is only the start of the journey. The real work starts at this point with the implementation of the actions set out in the Management Plan. The Beach Manager in charge would be the person responsible to implement the various measures or to see that they are effected. The role of stakeholders will remain important and effective communication is crucial to ensure a successful implementation phase.

Monitoring throughout the implementation is equally important. The Management Plan should include a monitoring programme to ensure that the interventions undertaken on site are reaching the intended goals. Monitoring will include both environmental / physical

monitoring such as water quality, beach profiles, benthic surveys, beach user surveys, litter surveys, etc., as well as monitoring of management effectiveness. A monitoring checklist and performance indicators will be helpful in this regard.

Data from the monitoring programme should be fed back into the GIS database to keep it current and to aid future review of the Management Plan (see Step B14).

Step B14 –Management Plan Review

Periodically (and ideally not less than every five years), the Management Plan will need to be reviewed. Information and experiences gathered throughout the implementation phase and through the monitoring of activities (Step B13) would be important to ensure that the review of the Management Plan results in an improved programme of works for the next beach management cycle.

3.2 The need for site specificity and beach typology

In considering the need for site specificity and beach typology, reference is made to the Bathing Area Registration and Evaluation (BARE) system developed by Micallef and Williams (2003, 2004, 2005) which acknowledges five beach types, namely resort, urban, village (semi-urban), rural and remote. Research carried out in the Euro-Mediterranean region and the US on beach user preferences and priorities, identified five main issues of concern namely, safety, water quality, facilities, scenery and litter (Morgan & Williams, 1995; Micallef et al., 1999; Morgan et al., 1996; 2000; Tudor and Williams, 2006; House & Phillips, 2007; Marin et al., 2007). Such preferences and priorities are utilised by the BARE system to rate beach quality for management purposes.

Since the five beach types recognized by the technique are considered to require different levels of management and intervention, the value of considering a wider variety of beach types is that management plans will be more site-specific and therefore more effective. It also enables a prioritization of the *five* main beach-related quality parameters that are rated according to beach type. While no universally accepted beach type definitions exist, the BARE scheme attempted to describe each beach type's attributes so as to aid a beach manager's consideration of quality-related criteria.

3.2.1 A remote beach is found in a rural environment but accessible only on foot or by boat. Normally, remoteness infers a distance from habitation, but for beaches one may understand remoteness to include a distance from the closest road access point of not less than 300m. If the beach is directly accessible by private car or by bus or the walk is short, then it is NOT a remote beach.

According to the BARE technique, in remote beach bathing areas, the provision of services (facilities) is not expected and hinterland scenery and litter criteria take on added importance as quality criteria. Where the average bathing season occupancy-rate is under 40% of the beach carrying capacity, safety-related provisions (for example lifeguards) are also not expected and water quality monitoring is limited to visual observation techniques. However at remote beaches where the average bathing season occupancy rate > 40% of the beach carrying capacity, safety and water quality criteria are also evaluated.

3.2.2 A rural beach is located outside the urban/village environment, having an *absence* of a community focal centre (religious centre, primary school, shops; sometimes cafes or bars may be found). If there is a school or a church and large shopping then it is not a rural area.
At rural bathing areas, the provision of services (facilities) is not expected and hinterland scenery and litter criteria take on added importance as quality criteria. Where the average bathing season occupancy rate is under 40% of the beach carrying capacity, safety-related provisions (for example lifeguards) are also not expected and water quality monitoring is limited to visual observation techniques. However, at Rural beaches where the average bathing season occupancy rate is over 40% of the beach carrying capacity, safety and water quality criteria are also evaluated.

3.2.3. A village (semi-urban) beach is located outside the main urban environment and is associated with a *small but permanent population reflecting access to organized but small-scale community services*, such as a primary school(s), religious centre(s) and shop(s). The beach may be sited within or adjacent to the village. If there are no primary schools, churches, shops serving a small permanent population then it is a rural area while if the community is large and services include banks, post-offices, internet cafes a central business district, then it is an urban area.

Top quality-scoring (scale A), village/ semi-urban beaches are expected to offer basic safety facilities such as a safe bathing environment, bather/boating zonation buoys, fixed safety equipment, beach safety related warning notices, and emergency telephone facilities and strict water quality monitoring. Facilities at village bathing areas are expected to be limited to clean public showers and toilets, restaurants, adequate parking and good access, regularly cleaned litter bins, and bed and breakfast accommodation. These beaches would also be expected to be cleaned regularly. Absence of parameters as defined for scale A beaches results in a lowering of scale (B – D).

3.2.4. Urban areas serve large populations with *well-established public services* such as a primary school(s), religious centre(s) banks, post-office, internet cafes and a well-marked central business district. Urban beaches are located within the urban area or adjacent to it. This is probably the easiest to define. A beach in an urban area is an urban beach, unless it is a resort.

Top scoring urban bathing areas will include stringent safety-related facilities and water quality testing (as in resort beaches), hotel/apartment complex accommodation (not integrally linked to the beach as in the case of resorts), restaurants, regularly cleaned public toilets, showers and litter bins, parking space and good access and subject to daily cleaning. Absence of parameters as defined for scale-A beaches results in a lowering of scale.

3.2.5. Resort beaches are self-contained entities that fulfil all recreational needs of beach users to different degrees, the majority of such users would reside at the beach-associated accommodation complex that is integrally linked to the management of the beaches. Resort beaches-users visit largely for recreational rather than leisure (e.g. sunbathing/swimming) purposes. Resort beaches can be private but may be open to the public for day-use against payment.

A top-scoring resort beach is served by a variety of safety measures (safe bathing environment, lifeguards, bather/boating zonation buoys, fixed safety equipment, first aid posts, beach safety warning notices and emergency telephones); regular water quality monitoring by competent authorities; a wide variety of facilities (hotels, restaurants, good camping grounds, beach

showers, toilets, clean litter bins, adequate parking and good access); a variety of beach-related recreational activities for hire or freely available for resort residents (for example beach sports, wind-surfing, jet skiing, paragliding, diving, speedboat activities, pedaloes and aqua-parks). Resort beaches are also subject to daily beach cleaning. Absence of parameters as defined above results in a lowering of the scale in beach quality.

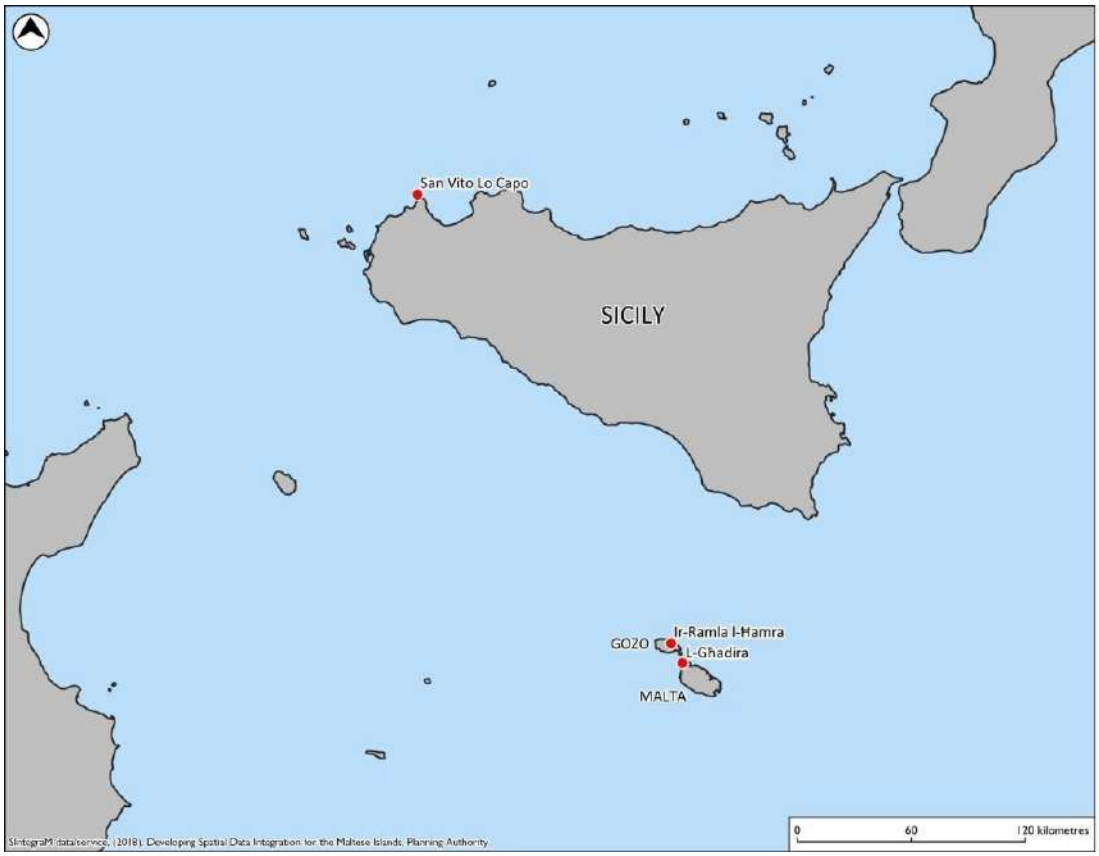
4. BEACH MANAGEMENT PLAN CASE-STUDIES

Beach management plans for three case-study pocket beaches (Figure 4) were developed based on the common methodology described in section 3.1.

Beach Management Plans (BMPs), including proposed actions and monitoring measures, should be developed with the aim of ensuring the long-term sustainability of the natural beach system and the socio-economic benefits it generates. As described by Retama et al (2019), the benefits of having a management plan and management strategies are well amplified from the economic and social sectors. Management strategies contribute to government revenues, foreign exchange, employment opportunities, direct financial contribution for its protection, and continued management and planning. Management strategies also provide scope for strengthening communities, revitalising culture and tradition and social involvement (Retama et al, 2019).

The proposed BMPs adopt an integrated approach for defining the tourism status and coastal management for improved sustainable conservation of beach ecosystem and services.

Figure 4: Location of the three beach management plan case-study sites.



4.1 GHADIRA BEACH, MALTA

Figure 5: Għadira beach and environs.

4.1.1 A SWOT analysis (Table 1) was carried out based on baseline information collected for the pocket beach and its environs via a desk-top study, site visits and stakeholder engagement (see the Ghadira *Socio-Economic Status and Development Needs* report available in digital format on the BESS project WebGIS (http://bess.pa.ingv.it/). This analysis was conducted to facilitate the identification of the issues to be taken account of in the formulation of the beach management plan. The SWOT analysis serves to identify the features considered to be positive (the strengths) and negative (the weaknesses), as well as the opportunities and threats, that will inform development of the management actions.

Table 1: SWOT analysis matrix for Ghadira beach

FEATURES	FACTORS
Strengths (S)	***Opportunities (O)***
S1. Beach already has Blue Flag status S2. Range of infrastructure / facilities / services for bathers during the bathing season. S3Community pride in the beach and surrounding amenities S4.Degree of appreciation of the naturalness of the beach and its environs	O1. Proximity to natural and cultural heritage areas and features, for recreation, education, and awareness potential O2. TEN-T Development Plan – removal of road and re-establishment of beach system linking the beach to the dunes O3. Turtles coming back to nest on the beach O4. Beach already has a Blue Flag status O5. Għadira beach as a year-round destination for different users
Weaknesses (W)	***Threats (T)***
W1.Concreted platforms between the North and South Għadira beaches impinging on the coast, negatively affecting the coastal vegetation and visual amenity W2. Damage to the *Posidonia oceanica* meadows from anchoring of boats W3. The road containing the beach on the landward side interfering with the beach dynamics W4. Sand being lost from the beach during strong winds (being eliminated from the system) W5. Lack of awareness of the natural beach system and biodiversity W6. Lack of infrastructure, facilities and services for bathers outside of the bathing season W7. Inadequate infrastructure / facilities in connection with the Lifeguard Stations W8. Inadequate provision of drinking water facilities W9. Inadequate provision of sanitary facilities W10. Poorly maintained and inadequate signage in some regards, and visual clutter from the number of signs along the promenade W11. Inadequate emergency access and response times W12. Inadequate car parking facilities W13. Lack of sustainable transport modes (e.g., park and ride) targeting the beach users and to minimise car use (and pollution) in the area W14. Inadequate cycling facilities W15. Inadequate pedestrian amenity W16. Inadequate beach cleaning management W17. Fragmented management responsibilities W18. Lack of appreciation of Għadira beach being a year-round destination	T1. Increasing number of visitors in the peak season (over-capacity), including the beach and use of the marine environment e.g., by boats. T2. Continued fragmentation of management responsibilities T3. Discharges to the marine environment from surrounding establishments T4. Impacts on seabed and *Posidonia* meadows from indiscriminate anchoring T5. Discharges to the marine environment from boats T6. Lack of police presence and long response times for emergency services

4.1.2 Issues identified for address by the Għadira beach management plan

i. *Given its Blue Flag status,* and being a long-established beach attraction, Għadira beach is relatively well placed in respect of the infrastructure, facilities and services it provides and in terms of meeting the socio-economic development needs of the beach. Nevertheless, there are issues affecting and arising from the current physical and natural features of the beach system, as well as from the current provision of infrastructure, facilities, and services which should be taken account of in the formulation of the management plan. These issues have been identified through the SWOT and the engagement with stakeholders at all levels, as well as through the survey work conducted.

<u>Physical and natural issues</u>

The issues in respect of the physical and natural characteristics of Għadira beach, and which should be taken account of in the formulation of the management plan are described as follows.

ii. *Concreted platforms between the North and South Għadira beaches impinging on the coast.*

There are two concrete platforms extending to the shoreline on either side of the rocky area. These platforms are remnants of the foundations of restaurants that were relocated inland in the late 1980s / early 1990s. The platforms are having an impact on the coastal vegetation, on currents and wave action, as well as having a detrimental impact on the visual amenity of the beach.

iii. *Damage to the Posidonia oceanica meadows from anchoring for boats*

There is currently no regulation on anchoring in respect of boats using Mellieħa Bay; the practice is to simply drop anchor wherever within the bay. This causes significant damage to *Posidonia oceanica* meadows, and to the stability of the seabed sediments. The problem is particularly acute given the number of boats that frequent the bay during the summer.

5. *The road containing the beach on the landward side is interfering with the beach dynamics*

The presence of the road (Triq il-Marfa) on the landward side of Għadira beach is a significant barrier to sand movement to and from the beach to the dunes further inland. Its removal (especially in the northern stretch in front of the Ghadira nature reserve) would be ideal from a beach dynamics and biodiversity point of view and would lead to a wider beach. The relocated road would allow through traffic away from the beach. Whatever the decision, this is now long overdue and is hampering other decisions on infrastructural upgrades.

6. *Sand being lost from the beach during strong winds*

The sand being lost from the beach during strong winds is sand being eliminated from the beach system. This loss is more acute because of the presence of the road, which is where a lot of the sand is deposited and often carted away when blown across the road.

7. *Lack of awareness of the natural beach system and biodiversity*

It is clear from the stakeholder engagement that there is a degree of appreciation of the naturalness of the beach, and a desire to protect its natural character. Nevertheless, there is a lack of awareness and understanding of how the natural beach system works and of the biodiversity inter-relationships.

Socio-economic issues

The issues in respect of the socio-economic development needs of Għadira beach, and which should be taken account of in the formulation of the management plan are described as follows.

8. Lack of infrastructure, facilities and services for bathers outside of the bathing season

This is seen by all of the local stakeholders to be a significant issue for consideration in the formulation of the management plan, where Għadira beach is used for swimming and other activities beyond the close of the bathing season and also in the spring, and by increasing numbers of tourists and locals. The opinion of the stakeholders is that the bathing season should be extended. It should also be considered that the bathing water quality programme of the Environment Health Directorate runs between the third week of May and the end of October, whereas the current Blue Flag bathing season runs from June to September.

Extension of the Blue Flag bathing season, and the lifeguard service in particular, is considered to be a critical need in terms of the safety of bathers. This need has also been identified by the Malta Red Cross.

There is also considered to be the need for the facilities for disabled bathers to be able to access the sea beyond the current bathing season.

9. Inadequate infrastructure / facilities in connection with the Lifeguard Stations

Whilst there is sufficient lifeguard coverage at Għadira beach, the lifeguard towers themselves are considered to be not fit for purpose. There is also an issue with the first-aid facilities being administered from a container and there not being a purpose-built clinic available on the beach.

The provision of both more adequate lifeguard towers and clinic facilities has been an issue for some time, where the main stumbling block to securing new, more permanent facilities is considered to be the planning process and a reluctance by both the Planning Authority and the Environment and Resources Authority to permit new structures on the beach, because of the environmental impact.

Uncertainty over the future of Triq il-Marfa is also considered to be a factor in delaying the provision of the clinic in particular. Proposals that have been taken forward to construct the facility in the area at the back of the beach, and under the road, are being considered premature in advance of any decision to relocate Triq il-Marfa. The elimination of the northern section of road and widening of the beach landward would allow the re-utilisation of the old police station into a beach clinic and first aid post. Nonetheless, in the interim, the provision of better temporary / mobile facilities should be actively considered.

10. Poor visual and general amenity of the formal recreation area

The formal recreation area on the rocky shore (designated picnic / barbecue area) has a very poor visual appearance, looking generally like an abandoned area. The area could benefit from some upgrading, including some sensitive landscaping and planting, as well as a more regular cleaning regime.

Abusive use of parts of the area by adjacent commercial activities to store water sports equipment, boats, and jet skis, should be stopped.

11. Inadequate provision of freshwater for drinking

There is only one drinking water facility currently available (a vending machine on the North Għadira beach).

In addition, there are a number of catering establishments operating in the immediate vicinity of the Għadira beach (off-site facilities). Given the distances involved, and the measures to discourage the use of plastic bottles, it is considered that there is the need for provision of at least one, possibly two, more drinking water facilities.

12. Inadequate provision of sanitary facilities

There is currently only one public toilets block on the beach and this is located on the South Għadira beach and is therefore relatively remote from the areas of the beach further north. Whilst there will soon be new toilet facilities to serve the North Għadira beach (currently being constructed within the new car park to the north of the beach), it is considered that these facilities will be too distanced to adequately serve the central areas of the beach in particular. The restaurant / kiosks operators are already providing a service to non-customers and are not convinced that the new facilities in the northern car park will reduce the need for use of their own facilities. It would be advisable if the commercial outlets were to provide toilet (and shower) facilities for beach users, even if against a small fee. This would provide the service without having to clutter the beach with further structures and should be a condition of their operating licence.

13. Poorly maintained and inadequate signage

There is a good range of signage currently on Għadira beach. However, in respect of the signage giving information to bathers (on beach facilities and jellyfish) and giving educational information (on the natural and cultural heritage of the Għadira coast) there is a general need for some maintenance and replacement of signs; it is clear that most of this signage has been in place for some time. Furthermore, there is an issue with the number of signs, and of different forms, which has resulted in visual clutter and a poor visual amenity.

14. Inadequate emergency access and response times

The fact that Triq il-Marfa is the only road access to Għadira beach, the volume of vehicular traffic in the wider area during the bathing season, as well as parking congestion at the beach, is of concern in respect of emergency access and response times. This is relevant both in terms of the ambulance service and the Police service. The relative remoteness of Mellieħa Bay adds to the issue here, where the distances to the hospitals influence response time for ambulances.

In respect of the ambulance service, there is also a localised issue, in respect of parking for emergency vehicles. As mentioned, there are two reserved ambulance bays on Triq il-Marfa, adjacent to Għadira beach. However, stakeholders highlight that these are often illegally taken up for parking by cars during the bathing season, and cite the lack of enforcement in respect of these reserved areas.

In respect of Police service, the stakeholders complain of there being no service, because of the time it takes for the Police to travel from the nearest Police Station at Qawra. The Mellieha Police Station has recently closed and the local Għadira Police Station was closed some time ago.

15. Inadequate car parking facilities

The previously informal car parking area at the northern end of the North Għadira beach is currently being upgraded, and will serve visitors to the beach. Notwithstanding this, stakeholders highlight parking congestion and the lack of adequate parking facilities to be an amenity issue for visitors to the beach, as well as a safety issue, in respect of the volume of cars, the fact that Triq il-Marfa is a busy through route and dual carriageway, and because of the road-side parking arrangements. There is a general consensus that the volume of visitor traffic to Għadira beach should be reduced, including by establishing Park and Ride facilities.

16. Inadequate cycling facilities

There is no formal cycling infrastructure in the area (either cycle lanes or bicycle parking).

17. Inadequate pedestrian facilities

There is no footpath on the western side of Triq il-Marfa to facilitate visitors to Għadira beach moving to / from the roadside parking on this side to the nearest pedestrian crossing points giving access to the beach. The promenade on the seaward side of Triq il-Marfa is relatively very narrow at points, especially where it abuts the North Għadira beach. This is an issue in view of the number of visitors to the area during the bathing season, and even outside of the season. The local stakeholders have also raised concerns over the lack of upkeep of the promenade and have highlighted the need for upgrading. The matter of pedestrian amenity and safety is a consideration related to the proposals of Triq il-Marfa. If the road were to be relocated inland, the promenade would be replaced with an elevated boardwalk across the sand, which could also be accessible to bicycles. In the interim, until a decision on the fate of Triq il-Marfa is taken, some upgrading of the current facilities would be warranted.

18. Inadequate beach cleaning management

The Cleansing Department is responsible for the day-to-day cleaning of Għadira beach during the bathing season, with inspections made and litter cleared three to four times a day. However, stakeholders complain about poor service arising from the lack of staff and adequate equipment available to the Cleansing Department. They also highlight issues in respect of the number of refuse bins available during the busiest months, and the need for these to be increased. The collection of refuse is also considered to be an issue, with refuse bags left overnight and well into the next day before collection, and with consequent visual amenity and odour issues. The possibility of having a dedicated team of beach cleaners assigned sole responsibility for Għadira beach should be actively considered.

Dogs are prohibited on most sandy beaches in Malta and Gozo during the bathing season, including Għadira. Additionally, there are fines for dog fouling offences at Għadira beach, which are issued by the Mellieħa Local Council.

The lack of bins for disposal of dog waste has also been raised as an issue, where dogs are allowed on Għadira beach outside of the bathing season, but when the beach is still visited for swimming and sunbathing, etc.

The clearing of the *Posidonia* banquettes at the beginning of the bathing season, and involving heavy vehicles on the beach, is considered by stakeholders to be a potential safety hazard. The stakeholders highlight that this always takes place with visitors being on the beach, including young children and point to the need for selective closure of the sections of beach being cleaned.

The above described SWOT analysis (Table 1) also provided the basis for the development of a Vision Statement for Għadira pocket beach and environs.

4.1.3 Vision Statement for Għadira beach

- The beach has a range of infrastructure / facilities / services available to users throughout the year.
- Tourism is practiced in harmony with the beach system's conservation needs.
- The management of the beach raises environmental awareness within the community and amongst other beach users through activities involving stakeholders, including beach users.
- The beach system is restored to optimal natural conditions.
- The amenity of the area around the bay is well-maintained and regulations are respected by all.

4.1.4 Management objectives for Ghadira beach

The Management Objectives define the strategy through which the Vision will be achieved and provide a Mission Statement for the area / site manager(s) to follow. Each Management Objective (MO) corresponds to a Vision Statement and develops a policy to address the issue, considering the baseline information gathered (Table 2).

Table 2: Management Objectives for Ghadira beach in relation to the Vision Statement that the objective aims to achieve.

Vision Statements	Strategic Objectives
The beach has a range of infrastructure / facilities / services available to users throughout the year.	• To explore the possibility with the relevant authorities to extend the services provided during the bathing season to other months outside the Blue Flag bathing season. • To improve beach safety
Tourism is practiced in harmony with the beach system's conservation needs.	• To reduce impacts from boats on the beach system (i.e. the benthos, in particular, *Posidonia* habitat) and amenity of the bay. • To manage the beach with minimal impact on any turtle nests. • To monitor and control any discharges into Mellieħa Bay to avoid further regressions of the *Posidonia* meadows and to safeguard bathing water quality. • To control beach concession areas and limit the area of beach and sea dedicated to water sports operators throughout summer.
The management of the beach raises environmental awareness within the community and amongst other beach users through activities involving stakeholders, including beach users.	• To promote the natural heritage assets within Mellieħa Bay and increase environmental awareness on the marine and coastal environment among beach users.
The beach system is restored to optimal natural conditions.	• To reconsider the possibility of relocating the road at the back of the beach to an inland location / tunnel and re-establish the full beach – dune system. • To conduct coastal monitoring to collect and process beach profile survey data, beach litter and seabed surveys, and similar.
The amenity of the area around the bay is well-maintained and regulations are respected by all.	• To enhance the amenity of the rocky shore • To improve the promenade for all users. • To improve enforcement of beach management regulations and legal requirements • To enhance beach cleaning management programme. • To ensure that the swimmer zone is correctly set up and maintained

4.1.5 Actions for Ghadira beach

Management actions were developed to address the MOs and there may be more than one action per MO.

A priority rating has been assigned to each of the actions to facilitate implementation by the beach manager according to priority for the duration of the BMP. The priority rating criteria are defined as follows:

- **Critical:** The implementation of this action is necessary for the implementation of the BMP as a whole. It should be implemented within the first two years of the BMP.

- **High:** The action is of main importance and its implementation is necessary for a major component of the BMP. It should be implemented within the first three years of the BMP.

- **Medium:** The action is of main importance; however, it either follows after the implementation of another action or it can be implemented at any time within the implementation period.

- **Low:** The action is of complementary importance. It should be implemented towards the end of the implementation period of the BMP.

Table 3 presents the list of actions in relation to the MOs and relevant vision statement. The priority rating and the entity responsible for implementation are also identified.

Actions that have a spatial component are identified in an Actions Map (see Figures 6a, b, c)

Appropriate performance indicators are identified to enable measurement of the effectiveness of each action, and the monitoring requirements for each action are also defined. Table 4 presents the monitoring framework, including performance indicators and responsibilities.

4.1.6 Responsibilities

The delivery of the BMP will be the responsibility of a Beach Manager for Għadira beach. As indicated, Table 3 includes the responsibilities for action implementation, many of which lie with government entities / regulatory authorities. As is apparent, there are a number of entities that will be called upon for the implementation of aspects of the BMP. It is therefore recommended that a Management Committee is set up to assist the designated Beach Manager. The Management Committee will include one designated representative from each of the main entities to ensure an integrated approach to Plan implementation. The Management Committee will meet on a regular basis, (frequency to be defined by the Committee itself). It is recommended that the Management Committee will include representatives from:

- The Malta Tourism Authority;
- Environmental Health Directorate;
- The Environment and Resources Authority;
- Nature Trust-FEE (Malta);
- Transport Malta; and

- The Mellieħa Local Council.

The Beach Manager / Management Committee will be able to also call upon expertise from the environmental / scientific sector to assist with specific aspects of the BMP. It will also consult with operators and service providers in the area, including hoteliers, water sports providers, beach lido operators, restaurants, beach users.

Table 3: List of actions in relation to the MOs and relevant vision statement for Ghadira beach (MTA - Malta Tourism Authority; ERA – Environmental Resources Authority; TM- Transport Malta; NTM – Nature Trust Malta; EHD - Environmental Health Directorate).

Management Objective	Action	Priority Rating	Responsible entity
1. To explore the possibility with the relevant authorities to extend the services provided during the bathing season to other months outside the Blue Flag bathing season.	**1.1 An assessment to determine the feasibility of extending the bathing season services to beyond the current Blue Flag bathing season.** The stakeholders discussed the possibility of officially extending the bathing season beyond the existing June to September period, since the bay is used by swimmers for months before and after. Extending the bathing season would also mean extending the time when services at the beach are available, including the presence of life guards and beach cleaning activity, such as sand sifting. It may be that not all the services provided during the summer months can, or need to, be extended outside of the existing bathing season, also in terms of justifying associated costs; however, an extended official bathing season to start in May and end in October / November could be a viable option that merits further investigation.	High	MTA
2. To improve beach safety	**2.1 Upgrading the existing first aid clinic facilities** The current set up is not considered to be adequate. Adequate clinic facilities are of particular importance, given also the distance that emergency vehicles have to travel to arrive at the beach; this was flagged during the stakeholder engagement. The aim will be to ensure that all facilities are provided at or below street level (for as long as Triq il-Marfa remains in its current location), though they will need to be designed sensitively in order to minimise negative impacts on amenity and avoid clutter on and around the beach. The possibility of using the abandoned Police Station for such facilities could be further explored also in conjunction with Action 7.1, described below.	Medium	MTA Malta Red Cross
	2.2 Provision of drinking water fountains Installation of at least three water fountains, at street level along the promenade.	Medium	MTA Mellieħa Local Council

3. To reduce impacts from boats on the beach system (i.e. the benthos, in particular, Posidonia habitat) and amenity of the bay.	**3.1 Installation of ecological moorings** Evidence of impacts on the benthic environment, in particular that causing damage to the *Posidonia* meadows was described in the *Ghadira socio-economic status and development needs* report. In addition, the stakeholder engagement identified the negative impact of boats entering and anchoring haphazardly in the bay. Therefore, improved organisation of this current use is required. Deployment and enforced use of ecological moorings will reduce negative impacts on the benthic environment and can be organised in such a way so as to avoid a complete blockage of views outside of the bay from the beach towards the horizon. ERA has issued a tender to study the provision of ecological moorings in Maltese bays.	High	ERA TM
	3.2 Declaring Mellieha Bay a "no anchor zone" Following on from the establishment of ecological moorings (Action 3.1), the bay can then be declared a 'no anchor zone' to protect the seagrass meadows. Vessels would need to pre-book their mooring spot before entering the bay.	Medium	TM
4. To manage the beach with minimal impact on any turtle nests.	**4.1 Cordoning off any section of the beach where turtle nests are located and managing the surrounding area to minimise impacts.** Apart from restricting access to the nest/s, including by designating a buffer, other tasks include studying impacts from existing lighting on the promenade, the road, and from private establishments in and around the beach. This action can provide the opportunity for community involvement in the protection of the nest(s). Monitoring of the area by designated wardens, potentially using the existing beach supervisors, and volunteers, should be carried out regularly to ensure compliance and protection of the nest(s) throughout the day / evening. Monitoring will be carried out by NTM to identify potential new nests (by looking for turtle tracks) every morning between 5.00 – 6.00 am. All activities on the beach can commence only after this daily inspection. Therefore, activities including sand sifting and setting up beach concessions must occur post- inspection (likely to be from 6 am onwards).	High	NTM Beach Managers Mellieħa Local Council MTA
5. To monitor and control any discharges into Mellieħa Bay to avoid further regressions of the Posidonia meadows and to safeguard bathing water quality.	**5.1 Study / inventory determining discharges into Mellieħa Bay.** Regression of the *Posidonia* habitat is affected by the urban surroundings/discharges reaching the sea according to a study carried out by SPA/RAC (MedKeyHabitats II). In order to manage this situation, a clear understanding of the discharges reaching the Bay and their composition is required. Checks to confirm that existing discharges are in line with permit conditions will need to be carried out and any irregularities addressed. Most of these discharges will be from point sources such as hotels. All hotels discharging to the Bay will be operating in line with a planning and an	Medium	ERA EHD

	environmental permit and the data gathered in order to satisfy the requirements of the permit will inform this study. Understanding discharges will also help with regards to ensuring bathing water quality is maintained.		
	5.2 Monitoring programme for non-point sources. A monitoring programme will be set up to analyse non-point sources such as discharges/run-off from the road reaching the Bay. The monitoring programme will include the parameters to be tested and frequency of testing.	Medium	ERA EHD
6. To control beach concession areas and limit the area of beach and sea dedicated to water sports operators throughout summer.	**6.1 Monitoring beach concession areas** Since the concession areas were physically marked out on site, operators have largely conformed to their license area. Regular monitoring will be undertaken throughout the summer months to ensure that public beach space is safeguarded and operators respect their license conditions.	High	MTA
	6.2 Limit areas occupied by water sports operators While water sports operators are welcome to provide a service on the beach, the proliferation of these service providers and the ever increasing number of beach equipment, vessels, and other paraphernalia is creating a toll on the beach – both during the summer months when space is at a premium, and during the winter months, when equipment is stored in various locations along the beach and the rocky coast (most likely abusively). The situation needs to be controlled before it gets out of hand. Operators are ideally to be attached to an existing outlet and the equipment they provide should be commensurate with the area they occupy / storage available. Offsite storage of equipment is also to be provided to remove clutter from the beach (especially during the winter months). The number of launching lanes, which have been increasing year on year with a concomitant reduction in the swimmer zone area, should be rationalised and only one launching lane designated per stretch of beach. Launching lanes are not to be dedicated to a single operator, but these should be shared and, where possible, equipment moored outside the swimmer zone and only brought in when hired out.	High	TM MTA
7. To promote the natural heritage assets within Mellieħa Bay and increase environmental	**7.1 Consolidate signage and plan their location to reduce clutter** The location of all signs were mapped during data collection fieldwork carried. This showed that the plethora of signs at all access points to the beach is leading to a degradation in the visual amenity of the place. The overall number of signs needs to be reduced through signage consolidation and the location of signs and information panels planned according to need. An overabundance of information is often counterproductive. The materials used for the creation of the signs themselves also needs to be more durable for a coastal location and they need to be regularly maintained to safeguard visual amenity.	Medium	MTA

awareness on the marine and coastal environment among beach users.	**7.2 Hold regular events in accordance with Blue Flag Educational Programme, to raise awareness on environmental issues and to promote the natural heritage on the beach and the surrounding area, including the Għadira Nature Reserve** Raising awareness and organising educational events is part of the Blue Flag requirements and is the responsibility of the Beach Manager. Events in line with the Beach Management Plan vision and objectives will be organised to raise awareness about the importance of conserving the beach system as a whole. For the purposes of the Beach Management Plan, one event will be carried out each month over the Blue Flag season (June to September) and one outside of the bathing season. Educational events can include talks and demonstrations on the beach itself. Themes to tackle can include waste management and impacts on the marine environment, turtles in the Mediterranean and those nesting in Malta, the beach system itself including the connection to the wetland – guided visits and demonstrations can also occur at the wetland. These events target beach goers.	High	Beach manager
8. To reconsider the possibility of relocating the road at the back of the beach to an inland location / tunnel and re-establish the full beach dune system.	**8.1 Re-visit the merit of removing the road that currently interrupts the landward side of the beach system.** The removal of the road (Triq il-Marfa), especially the section between the central roundabout and the hill to the Red Tower, would allow the natural beach system to be re-established, linking the beach to its dunes and allowing the sand to migrate naturally across the area. This would also increase the size of the beach landward without interfering with the marine section. This is outside of the beach manager's responsibility, but a serious and concerted attempt at reaching a final decision and solution to this problem is required and should not be postponed further since a lack of a decision is also postponing decisions on upgrading of the existing infrastructure leading to a shabby environment around the beach. Interventions should ideally aim at re-establishing the natural system. A decision on the road would also allow decisions on other facilities (such as the clinic) to be taken. The road relocation project will be put on the beach management committee's agenda to be raised with the relevant authorities for a decision.	High	Ministry for Transport, Infrastructure and Capital Projects Ministry for Tourism TM MTA Infrastructure Malta ERA PA Mellieħa Local Council
9. To conduct coastal monitoring to collect and process beach profile survey data, beach litter	**9.1 Coastal monitoring** Aerial photography and visual inspections should be carried out in order to study the evolution of the beach profile over time (seasonally and form year to year. This will allow the generation of trend data. Data analysis will help to inform the Beach Management Plan and identify the need for the inclusion of any additional management measures.	Medium	Beach manager

and seabed surveys, and similar.	**9.2 Monitoring of the extent of the *Posidonia* habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project** This project (concluded in 2020), set up a monitoring system for *Posidonia oceanica*, in Mellieħa Bay. Eleven markers (also known as balises) were deployed at the meadow's lowest limit in the bay, in accordance with the methodology reported by Pergent (2007). As required by the protocol, photographs were taken related to the positioning of the balises. Two orthotropic rhizomes were collected approximately 2 m behind each balise and one sample of sediment was collected for laboratory analysis. Monitoring the health of the meadow in accordance with the protocol over time, using the balises to determine whether the Posidonia habitat is stable, regressing, or extending will provide data to inform the Beach Management Plan about the status of the seaward side of the beach system and whether additional actions are required to safeguard it	Medium	Beach Manager ERA
10. To enhance the amenity of the rocky shore	**10.1 Remove the old concrete platforms encroaching onto the rocky shore** Old, disused concrete platforms and areas where concrete appears to have been haphazardly applied should be removed as these take away from the naturalness as well as the amenity of the area. Hard structures at the shoreline also interfere with waves and currents leading to direct impacts on the beach through scour. Existing restaurants that may have been making use of these extended concrete areas are required to carry out their operations within their license area and ensure that there is no overspill. Restaurants and water sports activities are expected to maintain their areas tidy and should not clutter the surroundings with various paraphernalia.	High	MTA
	10.2 Upgrade the area behind the rocky shore through landscaping, using appropriate species, and allowing for the beach habitat located close to this area to extend . The rocky coast between the north and south Għadira beaches (see *Ghadira Socio-Economic status and development needs* report) needs some improvement in terms of amenity, it is currently largely neglected. Improving the amenity through appropriate landscaping will provide an additional attraction particularly outside of the bathing season. In addition to this embellishment, operators are required to contain any equipment, furniture and any other items related to their operations within existing storage facilities to ensure that the place is kept tidy from clutter. The rocky area should be kept free of such equipment.	High	MTA Mellieħa Local Council
	10.3 Removal of ornamental / alien species in the area close to the promenade beside San Remo restaurant *Carpobrotus edulis, Ficus* sp. and others were recorded at beach level close to the promenade in this area. These species will be removed and can be replaced with	Medium	ERA

	appropriate species to be advised by the Beach Manager in accordance with ERA guidelines.		
11. To improve the promenade for all users.	**11.1 Provide bicycle racks at promenade level for cyclists** This action together with action 11.2 aims to facilitate and promote this recreational activity, thereby attracting different users and further enhancing opportunities within the area.	High	TM
	11.2 Provide a bicycle lane on promenade Inclusion of a cycle lane on the promenade will allow for different users to better enjoy the area.	High	Infrastructure Malta
	11.3 Improve and maintain the promenade and ensure access for all. Until a final decision is taken on whether to relocate the road or not, the promenade still requires some urgent attention in terms of improving the surface quality, ensuring accessibility and revisiting the alignment in places. A survey should be undertaken to determine where repairs need to take place and the works carried out accordingly.	High	MTA Infrastructure Malta
12. To improve enforcement of beach management regulations and legal requirements	**12.1 Inspections / Wardening** Beach supervisors will monitor the beach regularly throughout the day (summer months) to ensure that the beach management regulations are adhered to by all beach users (bathers and operators). Wardens will pay particular attention to ensure that parking facilities for emergency vehicles always remain available. Wardening in the area will be enhanced to ensure that regulations are followed with regards to parking and speeding.	High	MTA Mellieħa Local Council
13. To enhance beach cleaning management programme.	**13.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season** As a first exercise, the suitability of existing waste management bins, including type and number, and how frequently they are emptied, should be investigated. Re-evaluation of the beach cleaning management programme overall, in terms of ensuring sufficient and efficient management (resources allocated) will be carried out by the Beach Manager. This exercise will be repeated from one season to the next. A team of beach cleaners will be recruited and trained by the Beach Manager. The beach cleaners will be responsible solely for Mellieħa Bay and will be stationed at the beach throughout the summer months. The Beach Manager will coordinate the beach cleaning team and the team will report to the Manager. In addition, the Beach Manager will help to ensure that the beach concessions fulfil their responsibilities with respect to ensuring waste management and cleaning of their concession area is carried out in accordance with their license at the end of their daily operations.	High	Beach Manager MTA Beach Cleaning Department

14. To ensure that the swimmer zone is correctly set up and maintained	**14.1 Swimmers zone marker ropes are to be deployed in the correct location** The Beach Manager will ensure that the marker ropes are set up to ensure that the swimmers zone is correctly demarcated each season. The outer extent of the swimer zone marker rope to be shifted outwards to increase the size of the swimmer zone.	High	TM MTA Beach Manager

Figure 6a: Actions Map for Ghadira beach (marine interventions)

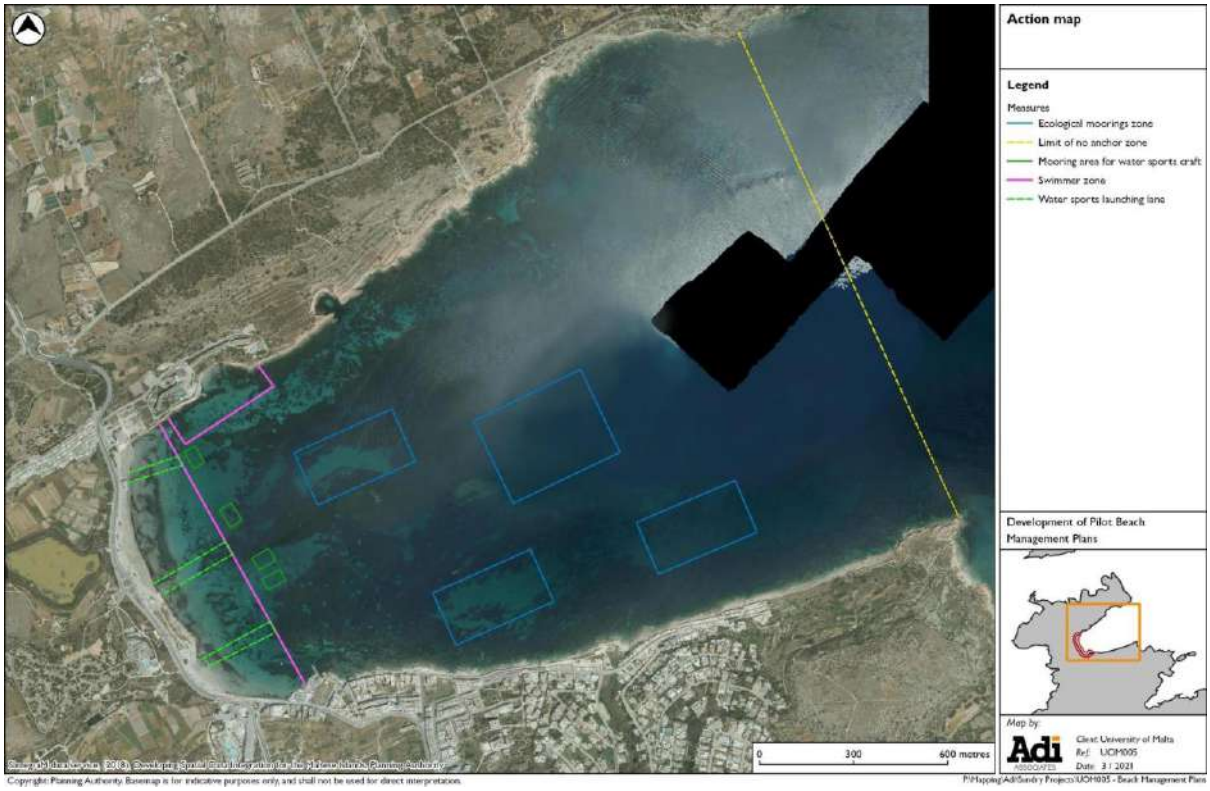


Figure 6b: Actions Map for Ghadira beach (land intervention: if promenade and road remain in place)

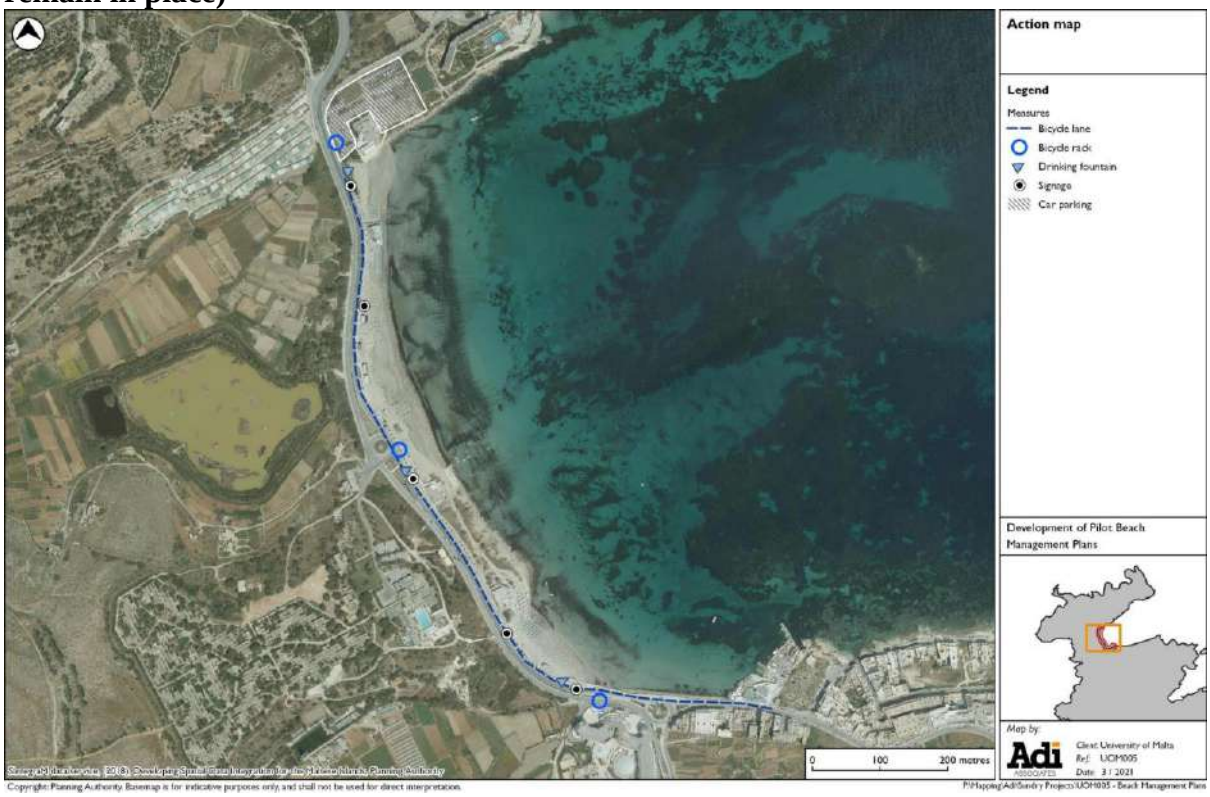


Figure 6c: Actions Map for Ghadira beach (land intervention: if promenade and road are removed)

4.1.7 Monitoring Programme

A key part of the Management Plan is to monitor the implementation and evaluate the success of the interventions. A set of simple, high-level indicators have been developed to monitor the actions identified for Mellieħa Bay in this Beach Management Plan. It is envisaged that, once the monitoring programme is in place, this will be used to report on the implementation of the Beach Management Plan as part of an annual review cycle.

Table 4 outlines the monitoring programme for the interventions identified at Mellieħa Bay. In the case of each action, the programme identifies the monitoring indicator(s) that will be used to assess the implementation of the action and the entity(ies) that will be responsible for its implementation as well as indicative timelines.

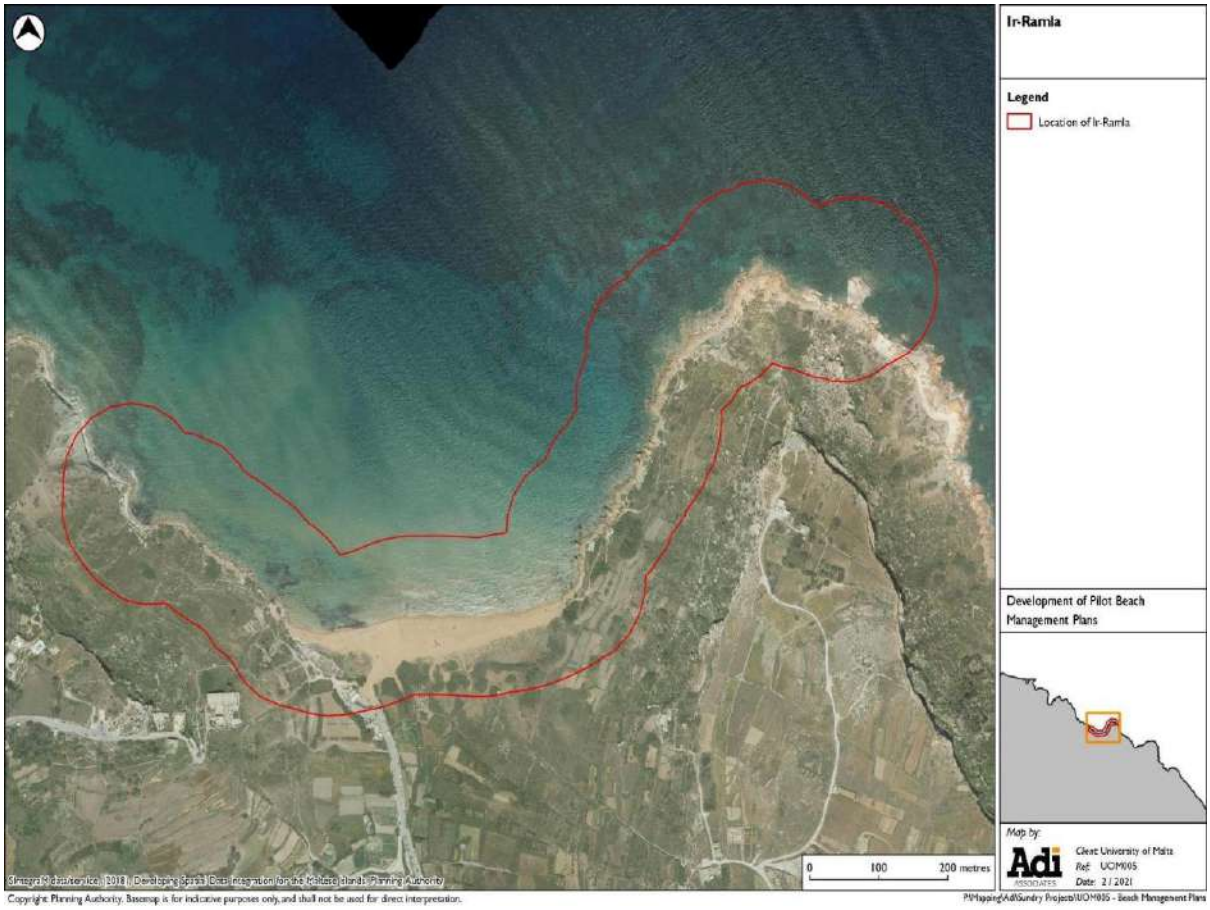
Table 4: Monitoring programme for Ghadira beach, including actions, performance indicators and responsibilities. (MTA - Malta Tourism Authority; ERA – Environmental Resources Authority; TM- Transport Malta; NTM – Nature Trust Malta; EHD – Environmental Health Directorate; IM – Infrastructure Malta; MRC – Malta Red Cross)

Action	Monitoring indicator	Responsible entity	Timeframe
1.1 An assessment **to determine the feasibility of extending the bathing season services to beyond the current Blue Flag bathing season.**	Assessment report	MTA	Year 1
2.1 Upgrading the existing first aid clinic facilities	New clinic facilities	MTA; MRC	Year 2
2.2 Provision of drinking water fountains	Drinking water fountains have been installed	MTA; Mellieħa Local Council	Year 2
3.1 Installation of ecological moorings	Ecological moorings in place and booking system active	ERA	Year 2
3.2 Declaring Mellieħa Bay a "no anchor zone"	Legislation / Regulation prohibiting anchoring in Mellieħa Bay published	TM	Year 3
4.1 Cordoning off any section of the beach where turtle nests are located and managing the surrounding area to minimise impacts.	Daily beach inspections to determine presence of new nests Any nests cordoned off	NTM-FEE	Year 1, then annually as necessary
5.1 Study / inventory determining discharges to Mellieħa Bay	Discharge inventory created	MTA; EHD	Year 3
5.2 Monitoring programme for non- point sources	Monitoring programme established	ERA; EHD	Year 4, then annually
6.1 Monitor beach concession areas	Inspection reports	MTA	Year 1 and ongoing
6.2 Limit areas occupied by water sports operators	Removal of paraphernalia from beach and surroundings	TM MTA	Year 1 and ongoing
7.1 Consolidate signage and plan their location to reduce clutter	Signage replaced with consolidated set of new signage	MTA	Year 2
7.2 Hold regular events in accordance with Blue Flag Educational Programme, to raise	Number of events held	Beach Manager	Year 1 and annually

awareness on environmental issues and to promote the natural heritage on the beach and the surrounding area, including the Għadira Nature Reserve			
8.1 Re-visit the merit of removing the road that currently interrupts the landward side of the beach system	Meeting minutes with Management Committee and relevant authorities	Management Committee (all entities) / MTA and ERA to take the lead	Year 4
9.1 Coastal monitoring	Monitoring reports	Beach Manager	Year 1, then annually
9.2 Monitoring of the extent of the Posidonia habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project	Monitoring reports	ERA; Beach Manager	Year 1, then annually
10.1 Remove the old concrete platforms encroaching onto the rocky shore	Random concrete removed from the beach	MTA	Year 2
10.2 Upgrade the area behind the rocky shore through landscaping, using appropriate species, and allowing for the beach habitat located close to this area to extend	Landscaping plan Implementation of approved landscaping plan	MTA; Mellieħa Local Council	Year 2
10.3 Removal of ornamental / alien species in the area close to the promenade beside San Remo restauraant	No alien species are present at beach level	ERA	Year 2
11.1 Provide bicycle racks at promenade level for cyclists	Bicycle racks installed	TM	Year 2
11.2 Provide a bicycle lane on promenade.	Promenade includes a bicycle land	IM	Year 2
11.3 Improve and maintain the promenade and ensure access for all.	Promenade upgraded	MTA; IM	Years 2
12.1 Inspections / Wardening	Inspection programme for Mellieha Bay	MTA; Mellieħa Local Council	Year 1
13.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season	Beach cleaning management programme Beach cleaning team set up for Mellieħa Bay	Beach Manager MTA Beach Cleaning Department	Year 1
14.1 Swimmers zone marker ropes are to be deployed in the correct location and maintained	Records, including visual, of location of swimmer zone markers	TM; MTA; Beach Manager	Every season

4.2 Ir-RAMLA BEACH, GOZO, MALTA

Figure 7: Ir Ramla beach and environs



4.2.1 A SWOT analysis (Table 5) was carried out based on baseline information collected for the pocket beach and its environs via a desk-top study, site visits and stakeholder engagement (see the ir-Ramla *Socio-Economic Status and Development Needs* report available in digital format on the BESS project WebGIS (http://bess.pa.ingv.it/). This analysis was conducted to facilitate the identification of the issues to be taken account of in the formulation of the beach management plan. The SWOT analysis serves to identify the features considered to be positive (the strengths) and negative (the weaknesses), as well as the opportunities and threats, that will inform development of the management actions.

Table 5: SWOT analysis matrix for ir-Ramla beach

FEATURES	FACTORS
Strengths (S)	***Opportunities (O)***
S1. Beach already has Blue Flag status S2. Range of infrastructure / facilities / services for bathers during the bathing season S3.Community pride in the ecology and cultural heritage of the beach and its environs	O1. Proximity to natural and cultural heritage areas and features, for recreation, education, and awareness potential O2. Turtles coming back to nest on the beach O3. Beach already has a Blue Flag status

S4. Degree of appreciation of the naturalness of the beach and its environs	O4. Ir-Ramla beach as a year-round destination for different users
Weaknesses (W)	***Threats (T)***
W1.Damage to the beach system from the removal of the pebbles from the beach W2. Damage to the Posidonia meadows from anchoring of boats W3. Damage to the sand dunes, from encroachment for agriculture W4. Over-abstraction from the aquifer affecting the ecosystems of the sand dunes (threatening the grass that binds and stabilises the dunes) W5. Damage to habitats (including the dunes) from illegal barbecues and camping W6. Damage to the Blue Clay slopes from hiking / camping / parking W7. Damage to fields from the overspill of car parking W8. Lack of awareness of the natural beach system and biodiversity W9. Suitability of the facilities for disability access W10. Poor broadband facilities (restricting the use of POS payments at the commercial facilities) W11. Lack of bins for dog fouling waste W12. Inadequate car parking facilities W13. Lack of sustainable transport modes (e.g., park and ride) targeting the beach users and to minimise car use (and pollution) in the area W14. Inadequate cycling facilities W15. Fragmented management responsibilities W16. Lack of appreciation of ir-Ramla beach being a year-round destination	T1. Increasing number of visitors in the peak season leads to greater demand for parking, which impacts nearby fields, and use of the marine environment e.g., by boats. T2. Continued fragmentation of management responsibilities T3. Impacts on seabed and Posidonia meadows from indiscriminate anchoring T4. Discharges to the marine environment from boats T5. Loss of cultural heritage elements (where some of the pebbles on the western end of the beach are thought to comprise elements from the Roman villa remains) T6. Presence of a population of Ghost crabs that predate on turtle eggs.

4.2.2 Issues identified for address by the ir-Ramla beach management plan

i. Given its *Blue Flag* status and having been managed for a significant period of time by the GAIA Foundation, ir-Ramla beach is relatively well placed in respect of the infrastructure, facilities and services it provides and in terms of meeting the socioeconomic development needs of the beach. Nevertheless, there are issues affecting and arising from the current physical and natural features of the beach system, as well as from the current provision of infrastructure, facilities, and services which should be taken account of in the formulation of a new beach management plan. These issues have been identified through the SWOT and the engagement with stakeholders at all levels, as well as through the survey work conducted. Since ir-Ramla also forms part of a Natura 2000 site, for which a management plan had been prepared in 2013, elements of the N2000 management plan are taken forward or referred to in this beach management plan. Since this beach management plan is more restricted in scope than the N2000 site, both plans will need to be considered in tandem by the eventual beach

manager until a holistic plan incorporating both the beach and the wider Natura 2000 site is formulated.

Physical and natural issues

The issues in respect of the physical and natural characteristics of ir-Ramla beach, and which should be taken account of in the formulation of the management plan are described as follows.

ii. Damage to the beach system from the removal of the pebbles on the western end of the beach.

A number of interventions are affecting the hydrological regime of the beach system at ir-Ramla. These include the removal of the pebbles from the western section of the beach. As mentioned below, there is a general lack of understanding of the beach system. There is also a reluctance to leave the pebbles on the beach as it is seen to compromise use of the beach, and the perception of the beach being a 'sandy beach'.

iii. *Damage to the Posidonia oceanica meadows from anchoring for boats.*

There is currently no regulation on anchoring in respect of boats using Ramla Bay; the practice is to randomly drop anchor within the bay. Though the inner parts of the bay are mostly sandy, the outer sections support important seagrass meadows. Indiscriminate anchoring may cause significant damage to the Posidonia oceanica meadows, and to the stability of the seabed sediments. The problem is acute especially given the number of boats that frequent the bay during the summer.

iv. *Continued threat of damage to the sand dune system from agricultural encroachment.*

The majority of the sand dunes, especially in the hinterland, have been turned into fields by the local farmers. Although this practice has apparently ceased, the potential danger of further agricultural encroachment on the dune area adjacent to the sandy beach is very conspicuous. There is the need for periodic surveillance to ensure that the existing field boundaries do not encroach further on the dunes and an outreach to the local farmers to explain the importance of the dune habitats. Opportunities of restoring fields back to dune habitats should also be explored.

v. *Over-abstraction from the aquifer affecting the ecosystems of the sand dunes.*

Over-extraction of groundwater by farmers from the mean sea-level aquifer in the dune area could also have an undesirable influence on the ecosystems of the dunes. This in turn could have an adverse impact on the conservation of the dunes, particularly if the grass that binds and stabilises the dunes is affected.

vi. *Damage to the Blue Clay slopes from hiking / camping / parking.*

The clay slopes are very prone to erosion. The slopes have been impacted by campers, hikers and bathers over the years, which has damaged the natural characteristics of the slope and resulted in the slumping onto the sand in the easternmost corner of the beach. There is the need for formal walking tracks to be established and demarcated, including with signage and other areas closed off to allow them to regenerate. Camping on the slopes should be prohibited. Former parking spill-off on the western slopes (behind the kiosks) had created major damage

to this part of the site. This practice was eliminated in the past years through the management efforts implemented on site, with access now only granted along a short stretch of road to service the kiosks and public toilets.

vii. *Pollution of the Wied ir-Ramla watercourse from agricultural run-off.*

Agricultural activity further inland along Wied ir-Ramla can be a source of pollution in the watercourse through fertiliser and pesticide run-off. Such polluted run-off would flow down towards the sea at ir-Ramla affecting the watercourse habitats along the way.

viii. *Lack of awareness of the natural beach system and biodiversity.*

It is clear from the stakeholder engagement that there is a degree of appreciation of the naturalness of the beach, and a desire to protect its natural character. Nevertheless, there is a lack of awareness and understanding of how the natural beach system works and of the biodiversity / geomorphological inter-relationships. Pressures to "clean" the beach from the "pebbles" are misguided and could potentially irreversibly impact the beach system. These pebbles are an integral part of the system and, from a geomorphological and beach dynamics point of view, form an important sand-binding matrix. Some of the "pebbles" are also remains from the Roman villa buried under the sand on the western side of the beach and therefore need to be carefully managed. Various observations have been made over the years, but unfortunately always in a sporadic manner. In 2014, Adi Associates was requested to provide advice to the Ministry for Gozo on management measures for the sand at ir-Ramla. This included site observations and review of photographic evidence, which showed that although sand was lost in winter and the pebbles exposed, there was an accumulation of sand in advance of summer. Suggestions for a detailed scientific investigation were also put forward in line with Terms of Reference provided by the then Malta Environment & Planning Authority. Unfortunately, it appears that the proposals were not taken forward. The need for such studies is still strongly relevant and should be actively considered as part of any beach management plan. However, attempts at removing the "pebbles" should be resisted lest a repeat of the situation at Ix-Xlendi is created, where the pebbles matrix was removed in the 1970s leading to a near complete loss of the beach.

ix. *Damage to habitats from illegal barbecues and camping.*

Areas of the ir-Ramla beach system are under threat from illegal behaviour associated with barbecues and camping. In respect of barbecues, the threat comes from fires; in the past this has resulted in the loss of populations of the rare Bushy Restharrow (*Ononis natrix*). Camping is prohibited at ir-Ramla but illegal camping sometimes takes place in the slopes just west of the beach, where the vegetation is negatively affected by excessive trampling and overuse of the area. Camping on the dunes themselves seems to have been eliminated as a result of active management over the past years.

x. *Damage to fields from overspill of car parking.*

In the bathing season in particular, the limited car parking spaces along the road results in the use of nearby fields for parking (the fields are used for agriculture during winter). This results in trampling, damage to the soil structure and potentially pollution from leaking vehicles, brakes, etc. As described below, there is a general consensus that the volume of visitor traffic

to ir-Ramla beach should be reduced, including by establishing Park and Ride facilities and other sustainable transportation to ir-Ramla.

xi. *Damage to the beach from waste disposal from boats in the bay.*

The increasing number of boats mooring in the bay has also been identified as a problem in respect of foul waste being discharged and ending up washing in onto the beach.

xii. *Issue with rocks and boulders being washed down from the valley onto the beach.*

The stakeholders identified issues where interventions might need to take place further upstream in the Wied ir-Ramla, in order to address problems affecting the beach. Maintenance of rubble walls in the valley is important to retain agricultural soil and minimize unnecessary rock input onto the beach; however, sediment input from the valley remains an important contribution to the beach system.

xiii. *Presence of the Ghost Crab*

The presence of this species on the beach provides a serious threat to any potential turtle nests. The species is nocturnal and can burrow up to half a meter into the sand. It is a voracious predator of loggerhead turtles eggs as recorded in various areas of the world (Marco et al, 2015)[9] . NTM-FEE who was in charge of helping to guard the nests report the seriousness of this threat[10].

Socio-economic issues

The issues in respect of the socio-economic development needs of ir-Ramla beach, and which should be taken account of in the formulation of the management plan are described as follows.

xiv. *The need to extend the closing hours of the public facilities and amenities at the beach during the bathing season.*

The stakeholders have identified issues with the early closing time for facilities and amenities at the beach during the bathing season, where these currently close at 22:00. However, later opening times might impact any nesting turtles so great care needs to be taken in considering such suggestions. Opening times of the public toilets and the Park Ranger's Station / information Centre might also need revisiting, both in terms of extending the opening times during the summer months and ensuring they are opened during winter. Changes to opening times must respect the sensitivity of this important site and its rural nature, avoiding additional urbanisation of the place.

xv. *Disability access issues.*

The stakeholders have identified issues with the access for visitors with disabilities, in respect of the suitability of the wooden platform that is laid down during the bathing season to facilitate wheelchair accessibility. A re-evaluation of the wooden walkway and the possibility of creating a more durable and raised wooden walkway that is retained all year round to also counteract the "pebbles" issue and protecting the Roman villa remains from unnecessary trampling could be considered.

[9] Marco, A., De Graca, J. & Garcia-Cerda, R. 2015. Patterns and Intensity of Ghost Crab Predation on the Nests of an Important Endangered Loggerhead Turtle Population. 468. Journal of Experimental Marine Biology and Ecology

[10] Vincent Attard, personal communication.

xvi. *Heritage considerations in respect of the pebbles on the western end of the beach.*

There is evidence that the pebbles on the western end of the beach include remnants of cultural heritage features, specifically pottery fragments from the Roman villa remains in the area and possibly also material from the underwater wall built by the Knights of St John. There is the need for this to be investigated, with the intervention of the Superintendence of Cultural Heritage. During particularly heavy storms, the significant parts of the remains of the Roman villa have been exposed in recent years. Measures to ensure the protection of these features are urgently required.

xvii. *Need to improve the broadband facilities at the beach, for the benefit of the commercial businesses.*

The stakeholders have identified issues with internet connectivity in respect of Point of Sale (POS) payment transactions, which is often problematic. If the broadband facilities cannot be improved, the business operators are suggesting that there be an Automated Teller Machine (ATM) installed near the kiosks. However, it must be pointed out that ir-Ramla is not an urban type beach and certain facilities might not be congruous with the aims and nature of the site.

xviii. There are no designated areas for sunbeds and umbrellas, as is the case with other popular beaches, such as Mellieħa Bay. The private operator sets up according to where customers want to stay, while the general public, not wanting to make use of the services of the operator, is free to choose any spot along the beach.

xix. The business operators cannot use motorised equipment on the beach (to facilitate transportation of umbrellas and sunbeds)

These issues were raised by operators in the area; however, comparing ir-Ramla with Mellieħa Bay or other locations is not appropriate. ir-Ramla is a rural and protected beach and its management needs to be specific to the conditions pertaining there. Operators have been given an opportunity in being allowed to operate in this location, but their operations need to respect the importance of the site. It is therefore not appropriate to formalise the beach through specific beach concessions; rather the current informal situation should be retained as long as the sunbeds / umbrellas are kept away from the dune system. Use of motorised equipment should also continue to be prohibited to protect the biodiversity of the site as well as the buried archaeological remains.

xx. Inadequate car parking facilities

As mentioned, the vehicular parking arrangements at ir-Ramla beach are causing issues for the ecology of the area. However, the lack of adequate parking space and parking congestion is also an amenity issue for visitors to the beach, particularly during the busy bathing season. There is a general consensus that the volume of visitor traffic to ir-Ramla should be reduced, including by establishing Park and Ride facilities, cycling infrastructure and encouraging other sustainable and collective means of transportation to the site.

xxi. Inadequate cycling facilities

As mentioned, there is no formal cycling infrastructure in the area (either cycle lanes or bicycle parking).

xxii. Lack of bins for dog fouling waste.

As mentioned, dogs are prohibited from ir-Ramla beach during the bathing season. However, outside of the bathing season, when dogs can be on the beach, there are no bins for the disposal of dog fouling waste available at the beach.

The above described SWOT analysis (Table 5) also provided the basis for the development of a Vision Statement for ir-Ramla pocket beach and environs.

4.2.3 Vision Statement for Ir-Ramla beach:

- Ir-Ramla beach has an appropriate range of infrastructure / facilities / services available to users throughout the year.
- Human activity, including tourism and agriculture, is practiced in harmony with the conservation needs of ir-Ramla beach system.
- The management of ir-Ramla beach raises environmental and cultural awareness amongst beach users and those living and working in the area, through activities involving all these stakeholders.
- Ir-Ramla beach system is restored to optimal natural conditions.
- The amenity of ir-Ramla beach and its environs is well-maintained and regulations are respected by all.

4.2.4 Management Objectives

The Management Objectives define the strategy through which the Vision will be achieved and provide a Mission Statement for the area / site manager(s) to follow. Each Management Objective (MO) corresponds to a Vision Statement and develops a policy to address the issues (Table 6), considering the baseline information gathered (see the ir-Ramla *Socio-Economic Status and Development Needs* report available in digital format on the BESS project WebGIS (http://bess.pa.ingv.it/).

Table 6: Management Objectives for ir-Ramla beach

Vision Statements	Management Objectives
• *Ir-Ramla beach has an appropriate range of infrastructure / facilities / services available to users throughout the year.*	• To ensure the provision of suitable facilities for disability access onto the beach. • To explore the possibility of enhancing broadband coverage at the beach.

	• To improve the sustainable transport / green mobility options for travel to / from the beach (park and ride, cycling infrastructure, etc.). • To explore with the relevant authorities the potential for extending the availability of some of the infrastructure / facilities / services available at the beach outside of the Blue Flag bathing season.
• *Human activity, including tourism and agriculture, is practiced in harmony with ir-Ramla beach system's conservation needs.*	• To reduce the encroachment of, and damage to, the sand dunes (from agricultural activity, overspill car parking, and from camping, barbeques, hiking, etc.). • To reduce and manage the erosion and destabilisation of the clay slopes (from overspill car parking, camping, barbeques, hiking, etc.). • To manage the beach with minimal negative impact on any turtle nests and ensure that the nests are safeguarded • To reduce impacts from boats on the beach system (i.e. the benthos, in particular, *Posidonia* habitat) and the amenity of Ramla Bay. • To monitor and control all discharges (including agricultural run-off) into Ramla Bay, to avoid further regressions of the *Posidonia* meadows and to safeguard bathing water quality.
• *The management of ir-Ramla beach raises awareness amongst beach users and those living / working in the area of the natural and cultural assets and environmental processes, through activities involving all these stakeholders.*	• To promote the natural and cultural heritage assets at ir-Ramla and increase environmental awareness on the beach system and the marine and coastal environment amongst beach users and those living and working in the area (through activities involving all these stakeholders).
• *Ir-Ramla beach system is restored to optimal natural conditions.*	• To conduct ground investigations on the geomorphology of the beach. • To conduct coastal monitoring to collect and process beach profile survey data, beach litter and seabed surveys, and similar. • To establish a management programme to address the presence / exposure of pebbles on the western end of the beach (subject to the montoring programmes above).
• *The amenity of ir-Ramla beach and its environs is well-maintained and regulations are respected by all.*	• To improve the enforcement of beach management regulations and legal requirements. • To enhance the beach cleaning management programme at ir-Ramla. • To ensure that the Swimmer Zone at ir-Ramla is correctly set up and maintained.

4.2.5 Actions

Management actions were developed to address the MOs and there may be more than one action per MO.

A priority rating has been assigned to each of the actions to facilitate implementation by the beach manager according to priority for the duration of the BMP. The priority rating criteria are defined as follows:

- **Critical:** The implementation of this action is necessary for the implementation of the BMP as a whole. It should be implemented within the first two years of the BMP.

- **High:** The action is of main importance and its implementation is necessary for a major component of the BMP. It should be implemented within the first three years of the BMP.

- **Medium:** The action is of main importance; however, it either follows after the implementation of another action or it can be implemented at any time within the implementation period.

- **Low:** The action is of complementary importance. It should be implemented towards the end of the implementation period of the BMP.

Table 7 presents the list of actions in relation to the MOs and relevant vision statement. The priority rating and the entity responsible for implementation are also identified. Actions that have a spatial component are identified in an Actions Map (see Figure 8).

Appropriate performance indicators are identified to enable measurement of the effectiveness of each action, and the monitoring requirements for each action are also defined. Table 8 presents the monitoring framework, including performance indicators and responsibilities.

4.2.6 Responsibilities

The delivery of the BMP will be the responsibility of a Beach Manager for ir-Ramla beach. As indicated, Table 7 includes the responsibilities for action implementation, many of which lie with government entities / regulatory authorities. As is apparent, there are a number of entities that will be called upon for the implementation of aspects of the BMP. It is therefore recommended that a Management Committee is set up to assist the designated Beach Manager. The Management Committee will include one designated representative from each of the main entities to ensure an integrated approach to Plan implementation. The Management Committee will meet on a regular basis, (frequency to be defined by the Committee itself). It is recommended that the Management Committee will include representatives from:

- Ministry for Gozo / Eco-Gozo;
- Malta Tourism Authority;
- Environmental Health Directorate;
- Environment and Resources Authority;
- Nature Trust-FEE (Malta);
- Xagħra and Nadur Local Councils.

The Beach Manager / Management Committee will be able to also call upon expertise from the environmental / scientific sector to assist with specific aspects of the BMP. It will also consult with operators and service providers in the area, including kiosk/restaurants operators, water sports provider, Red Cross (Malta), beach users.

Table 7: Management actions, priority rating and responsible entities for ir-Ramla beach

Management Objective	Action	Priority Rating	Responsible entity
1. To ensure the provision of suitable facilities for disability access onto the beach.	**1.1 Improve and maintain the wooden walkway facilitating disability access onto the beach, to ensure access for all.** Ir-Ramla beach is accessible by bathers with accessibility needs. There is level access onto the beach from Triq ir-Ramla and a wooden walkway is laid out during the bathing season to provide access to wheelchair users across the beach. Additionally, the MTA also provides beach wheelchairs for use by persons with a mobility impairment to facilitate access into the sea. However, the stakeholders identified issues with the suitability and maintenance of the wooden walkway. Through this action, it is proposed to re-evaluate the suitability of the current wooden walkway and consider installing a more durable but reversible raised wooden walkway that would be retained throughout the year. The walkway would not only provide access to wheelchair users but also provide easier access across the pebble bed to all beach users. Being raised, it would also minimise interference with the sand movement and other beach dynamics.	High	Ministry for Gozo (MoG)
2. To explore the possibility of enhancing Broadband coverage at the beach.	**2.1 Assess possibility of enhancing Broadband coverage at ir-Ramla.** The commercial operators at ir-Ramla beach raised the issue of poor internet connectivity in respect of Point of Sale (POS) payment transactions. It is therefore proposed to engage with the relevant service providers to explore the possibility of improving Broadband coverage at ir-Ramla.	Medium	MoG
3. To improve the sustainable transport / green mobility options for travel to / from the beach (park and ride, cycling infrastructure, etc.).	**3.1 Assess the potential to establish park and ride facilities to serve ir-Ramla.** There is an issue with parking congestion at ir-Ramla, particularly during the bathing season, which also results in overspill car parking onto adjacent fields and damage to habitats. There is therefore the need to address transportation to / from the beach, to reduce the volume of car traffic, and to improve the sustainability / green mobility options. This Action is related to Action 3.2.	High	Transport Malta (TM) MoG
	3.2 Provide bicycle parking facilities at ir-Ramla. There are currently no facilities for bicycle parking at Ir-Ramla. Provision of such facilities will improve the sustainability / green mobility options available for visitors and work towards reducing the volume of car traffic to / from the beach. This Action is related to Action 3.1.	High	TM Xagħra Local Council MoG

4. To explore with the relevant authorities the possibility of extending the availability of some of the infrastructure / facilities / services outside the Blue Flag bathing season.	**4.1 An assessment to determine the feasibility of extending some of the infrastructure / facilities / services to beyond the current Blue Flag bathing season.** The stakeholders discussed the possibility of officially extending the bathing season beyond the existing June to September period, since the bay is used by swimmers for months before and after. Extending the bathing season would also mean extending the time when certain of the services at the beach are available, including the presence of life guards and the beach cleaning activity. It may be that not all the services provided during the summer months can, or need to, be extended outside of the existing bathing season, also in terms of justifiying associated costs; however, an extended official bathing season to start in May and end in October / November could be a viable option that merits further investigation. The opening times of the Park Ranger Station / Information Centre in the shoulder months also needs to be considered, with the Park Ranger providing an important awareness raising function at ir-Ramla. The opening periods of the kiosks/restaurants should also be considered within the light of the year-round attraction of Ir-Ramla to visitors. However, any extended opening times must not lead to further urbanisation of the area and will be undertaken in full respect to the ecological sensitivity of the site, including issues such as light, noise, and human activity. Extended opening times in summer are not viewed as positively as the possibility of extending opening times to the winter months to provide services to visitors during the lean months.	High	Malta Tourism Authority Ministry for Gozo
5. To reduce the encroachment of, and damage to, the sand dunes (from agricultural activity, overspill car parking, and from camping, barbeques, hiking, etc.	**5.1 Cordoning-off of the sand dunes to restrict access and to minimise impacts.** The sand dunes were cordoned off on the beach front to demarcate no trampoling areas. This has served to limit the damage. This needs ot be maintained to ensure that the area continues to be conserved. The location of the cordoned-off area needs to be re-assessed regularly for any required adjustments. The need or otherwise to also demarcate the hinterland should be studied. This Action will be supported by Action 10.2, to raise awareness of the natural heritage assets and environmental processes of the beach system at ir-Ramla. Moreover, the monitoring of the area by designated wardens (Action 13.1), potentially using the existing beach supervisors and the Park Ranger/Beach Manager, will be carried out regularly to ensure the adherence to the protection measures and to propose any additional measures that might be required.	Critical	Beach Manager Environment & Resources Authority (ERA)
6. To reduce and manage the erosion and destabilisation of the clay slopes (from overspill car parking, camping, barbeques, hiking, etc.)	**6.1 Manage access onto the clay slopes through the cordoning-off of selected areas and the demarcation of specific pathways.** Restricting access to the clay slopes, and by facilitating access along demarcated pathways only, will serve to limit the damage to the slopes. While the maintenance of existing walking trails on either side of the beach is supported, trampling would need to be eliminated. On the western side of the beach in particular, the clay slopes have been severely	High	Beach Manager ERA

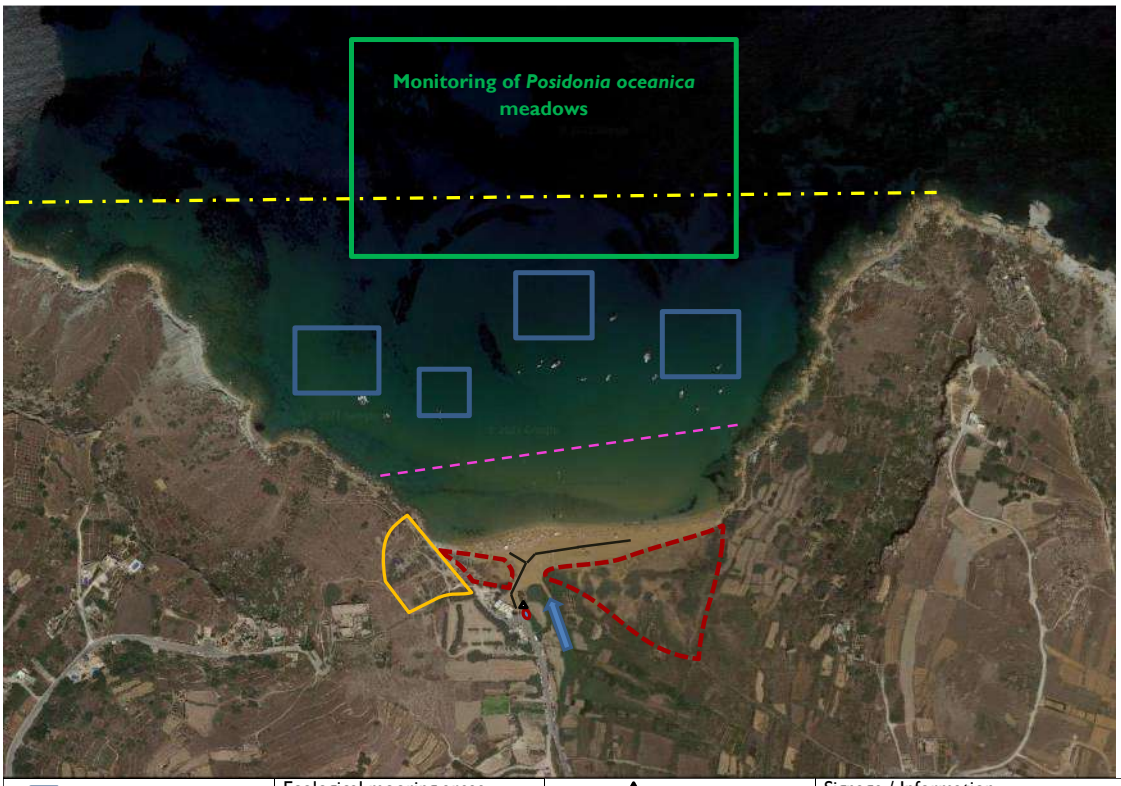
	impacted by past vehicular access and trampling by campers and hikers. This action, which is also included in the Natura 2000 management plan for the site, aims at designating specific footpaths, which would be demarcated with low rope markers and properly maintained. The rest of the footpaths will be closed off to allow the site to regenerate. This Action will be supported by Action 10.2, to raise awareness of the natural heritage assets and environmental processes of the beach system at ir-Ramla. Moreover, the monitoring of the area by designated wardens (Action 13.1), potentially using the existing beach supervisors, will be carried out regularly to ensure the adherence to the protection measures.		
7. To manage the beach with minimal negative impact on any turtle nests and ensuring that the nests are safeguarded.	**7.1 Cordoning-off of any section of the beach where turtle nests are located and managing the surrounding area to minimise impacts.** Restricting access to the nest(s), including by designating a buffer, will serve to protect the nests. Managing the area will include studying the impacts from existing lighting at the entrance to the beach and from commercial operators. This action can provide also the opportunity for community involvement in the protection of the nest(s). Monitoring of the area by designated wardens (Action 13.1), potentially using the existing beach supervisors, and volunteers, should be carried out regularly to ensure compliance and protection of the nest(s) throughout the day / evening. Due to the presence of the Ghost Crab (which has been protected by ERA), the turtle nests will need to be enclosed with fencing (with the fencing extending into the sand since the crabs burrow) to be watched over around the clock. Any crabs that attempt to attack the nest will need to be manually removed and transported to the other side of the beach, as far away from the nests as possible.	High	NatureTrust Malta Beach Manager ERA
8. To reduce impacts from boats on the beach system (i.e. the benthos, in particular, Posidonia habitat) and the amenity of Ramla Bay.	**8.1 Installation of ecological moorings** Impacts on the benthic environment, in particular on the Posidonia oceanica meadows, was described in Report 3. In addition, the stakeholder engagement identified the negative impact of boats entering and anchoring haphazardly in the bay leading also to visual impacts. Therefore, improved organisation of this current use of the bay by boats is required. This Action seeks to designate specific mooring areas within the bay, that would provide for the safe mooring of boats while protecting the seabed against anchor damage, and preserving some views of the horizon from the beach. Deployment and enforced use of ecological moorings will reduce negative impacts on the benthic environment and can be organised in such a way as to avoid a complete blockage of horizon views f the bay from the beach. The Environment and Resources Authority (ERA) has issued a tender to study the provision of ecological moorings in Maltese bays. This Action will be supported by Action 8.2.	High	Environment and Resources Authority Transport Malta
	8.2 Declaring Ramla Bay a "no anchor zone"	Medium	Transport Malta

	Following on from the establishment of ecological mooring areas (Action 8.1), the bay can then be declared a 'no anchor zone', to protect the seagrass meadows. Vessels would need to pre-book their mooring spot before entering the bay. This Action will be supported by Action 8.1.		
9. To monitor and control any discharges into Ramla Bay to avoid further regressions of the Posidonia meadows and to safeguard bathing water quality.	**9.1 Undertake a study / inventory to determine the discharges into Ramla Bay** Regression of the Posidonia oceanica habitat is affected by the discharges reaching the sea, according to a study carried out by SPA/RAC (MedKeyHabitats II). In order to manage this situation, a clear understanding of the discharges reaching the bay and their composition is required. A study on the chemical composition of the water outflowing from the valley into Ramla Bay would help determine whether action needs to be taken further up the valley.	Medium	Environment and Resources Authority Environmental Health Directorate
	9.2 Monitoring programme for non-point sources A monitoring programme will be set up to analyse non-point sources such as agricultural discharges / run-off from reaching the bay. The monitoring programme will include the parameters to be tested and frequency of testing.	Medium	ERA Environmental Health Directorate
10. To promote the natural and cultural heritage assets at Ir-Ramla and increase environmental awareness of the beach system and the marine and coastal environment amongst beach users and those living and working in the area (through activities involving all these stakeholders).	**10.1 Hold regular events, in accordance with Blue Flag Educational Programme, to raise awareness of the natural and cultural heritage assets of the area and on environmental processes and issues** Raising awareness and organising educational events is part of the Blue Flag requirements and is the responsibility of the Beach Manager. Events in line with the BMP vision and management objectives will be organised to raise awareness on the importance of conserving the beach system as a whole. For the purposes of the BMP, one event will be carried out each month over the Blue Flag season (June to September) with another event happening outside of the bathing season. Educational events can include talks and demonstrations held on the beach itself. Themes to tackle can include waste management and impacts on the marine environment, turtles in the Mediterranean and those nesting in Malta, beach dynamics, human interventions and their effects on the beach system. The rich cultural heritage of the area can also be promoted in this awareness raising. These events will target beach users and the local community. This Action will be supported by Action 10.2.	High	Beach Manager
	10.2 Enhance the information available at ir-Ramla on the natural and cultural heritage assets of the area and on the environmental processes and issues This will involve a review of the existing signage at the beach, with a view to improving and expanding the information available while reducing the clutter. The opportunity should also be taken to assess the quality of the signage and to develop a signage strategy to also enhance visual amenity (locations for signs, minimising visual clutter, etc) and the maintenance of the signage (durability and quality of materials used). A more efficient use of the Information Centre present on site is also an aim for this action. This Action will be supported by Action 10.1.	Medium	Beach Manager Ministry for Gozo Malta Tourism Authority

11. To conduct ground investigations on the geomorphology of the beach	**11.1 Ground investigations** An understanding of the geomorphology of the beach, and in particular of the ancient environments, will be crucial to understand the beach dynamics in operation. In this action, it is proposed to carry out a study to trace the catchment of the beach and to determine the potential run-off prior to anthropogenic presence. This will be done through the creation of a "geomorphological slice" across the bay, by drilling a series of boreholes and taking cores. This should help identify the original valley and the depth of the detritus that accumulated over time (in other words, the beach system we see today). Seeing underneath the surface may give us an indication of past geological activities. This would also help determine whether the exposed pebbles are part of an ancient sedentary pavement.	High	Ministry for Gozo
12. To conduct coastal monitoring to collect and process beach profile survey data, beach litter and seabed surveys, and similar.	**12.1 Coastal monitoring** Aerial photography / use of satellite imagery and visual inspections will be carried out in order to study the evolution of the beach profile over time (seasonally and from year to year). This will allow the generation of trend data. Data analysis will help to inform the BMP and identify the need for the inclusion of any additional management measures. This would also allow an appraisal of the interplay between the valley and the sea with the sand moving along and across the beach depending on the wind conditions and the amount of rainfall (for the part where the valley breaches the beach), including determination of any additional anthropogenic factors (e.g. interference with the valley hydrology) influencing such dynamics.	High	Beach Manager Ministry for Gozo
	12.2 Monitoring of the extent of the Posidonia habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project This project (concluded in 2020) proposed a monitoring system for Posidonia oceanica, and set up a pilot project at Mellieħa Bay. This included the deployment of markers (called 'balises') to mark the extent of the meadows. These will be checked over time to record any regression or growth in the Posidonia oceanica cover. This monitoring programme can be replicated at Ramla Bay. Monitoring the health of the meadow, in accordance with the protocol over time, and using the balises to determine whether the Posidonia habitat is stable, regressing, or extending will provide data to inform the BMP on the status of the seaward side of the beach system and whether additional actions are required to safeguard it.	Medium	Beach Manager Environment and Resources Authority
13 To establish a management programme to address the presence / exposure of pebbles on the western end of the beach.	**13.1 Prepare a management plan to establish the interventions, if any, to manage the exposure of pebbles on the western end of the beach** The ground investigation study proposed under Action 11.1 and the coastal monitoring envisaged under Action 12.1 will facilitate a greater understanding of the beach dynamics that result in the presence / exposure of pebbles on the western end of the beach. This will allow for development of a	Medium	Environment and Resources Authority Malta Tourism Authority

	scientifically-supported management strategy to address the issue and interventions which will protect the dynamics of the beach system.		Beach Manager
14 To improve enforcement of beach management regulations and legal requirements	**14.1 Establishing inspections / wardening of the beach** Beach supervisors will monitor the beach regularly throughout the day during the bathing season to ensure that the beach management regulations are adhered to by all beach users (bathers and commercial operators). Wardening in the area throughout the year by the Beach Manager / Ranger will be enhanced to ensure that site regulations are followed by all users and service providers.	High	Beach Manager MoG Ambjent Malta ERA Xagħra Local Council
15 To enhance the beach cleaning management programme.	**15.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season** As a first exercise, the suitability of existing waste management bins, including type and number, and how frequently they are emptied, should be investigated. Waste separation bins to be available throughout the year and not only during the summer months. It is already known that there are no dog fouling bins at ir-Ramla; hence, there is a need for these bins. Re-evaluation of the beach cleaning management programme overall, in terms of ensuring sufficient and efficient management (resources allocated) will be carried out by the Beach Manager in conjunction with the Ministry for Gozo. This exercise will be repeated before each bathing season. A team of beach cleaners will be recruited and trained by the Beach Manager. The beach cleaners will be responsible solely for ir-Ramla and will be stationed at the beach throughout the summer months. The Beach Manager will coordinate the beach cleaning team and the team will report to the Manager. In addition, the Beach Manager will help to ensure that the commercial operators fulfil their responsibilities with respect to ensuring waste management and cleaning of their areas is carried out in accordance with their license at the end of their daily operations. The Beach Manager is also to ensure that disposable ashtrays are available for use by beach users during the bathing season.	High	Beach Manager Ministry for Gozo (Cleansing Unit
16 To ensure that the Swimmers Zone is correctly set up and maintained	**16.1 Swimmers Zone marker ropes are deployed in the correct location** The Beach Manager will ensure that the marker ropes are set up to ensure that the Swimmers Zone is correctly demarcated each season.	High	Transport Malta Beach Manager

Figure 8: Actions map for ir-Ramla beach



	Ecological mooring areas		Signage / Information
	Swimmer zone		Bicycle racks
	Limit of no anchor zone		Study on valley discharges
	Cordoning of sand dunes		Manage access & restoration of clay slopes
	Elevated Wooden Boardwalk		Monitoring of *Posidonia oceanica* meadows

4.2.7 Monitoring programme

A key part of a Management Plan is to monitor the implementation and evaluate the success of the interventions. A set of simple, high-level indicators have been developed to monitor the actions identified for ir-Ramla in this BMP. It is envisaged that, once the monitoring programme is in place, this will be used to report on the implementation of the BMP as part of an annual review cycle.

Table 8 outlines the monitoring programme for the interventions identified at ir-Ramla. In the case of each action, the programme identifies the monitoring indicator(s) that will be used to assess the implementation of the action and the entity(ies) that will be responsible for its implementation as well as indicative timelines.

Table 8: Monitoring programme for ir-Ramla beach, including actions, performance indicators and responsibilities. (MTA - Malta Tourism Authority; ERA – Environmental Resources Authority; TM- Transport Malta; NTM – Nature Trust Malta; EHD – Environmental Health Directorate; MoG - Ministry for Gozo)

Action	Monitoring indicator	Responsible entity	Timeframe
1.1 Improve and maintain the wooden walkway facilitating disability access onto the beach, to ensure access for all.	Fit for purpose walkway is in place.	MoG	Year 1
2.1 Assess possibility of enhancing Broadband coverage at ir-Ramla.	Assessment completed and Broadband coverage has been enhanced (if feasible).	MoG	Year 3
3.1 Assess the potential to establish park and ride facilities to serve ir-Ramla.	Assessment has been carried out and options for park and ride facilities have been identified.	TM; MoG	Year 2
3.2 Provide bicycle parking facilities at ir-Ramla.	Bicycle parking facilities are in place.	TM Xagħra Local Council MoG	Year 2
4.1 An assessment to determine the feasibility of extending the availability of some of the infrastructure / facilities / services to beyond the current Blue Flag bathing season.	Assessment has been carried out and the feasibility of extending the infrastructure / facilities / services to beyond the current Blue Flag bathing season has been established.	MTA; MoG	Year 1
5.1 Cordoning-off of the sand dunes to restrict access and to minimise impacts.	Sand dunes have been appropriately cordoned off.	Beach Manager; ERA	Year 1
6.1 Manage access onto the clay slopes through the cordoning-off of selected areas and the demarcation of specific pathways.	Sensitive areas have been cordoned off and pathways have been demarcated.	Beach Manager; ERA	Year 1
7.1 Cordoning-off of any section of the beach where turtle nests are located and managing the surrounding area to minimise impacts.	Daily beach inspections to determine presence of new nests, and the any nests cordoned off.	NTM; ERA Beach Manager	Year 1, then annually as necessary
8.1 Installation of ecological moorings	Ecological moorings are in place and a booking system is active	ER; TM	Year 2
8.2 Declaring Ramla Bay a “no anchor zone”	Legislation / Regulation prohibiting anchoring in Ramla Bay published	TM	Year 3
9.1 Undertake a study / inventory to determine the discharges into Ramla Bay	Discharge inventory has been created	ERA; EHD	Year 4
9.2 Monitoring programme for non-point sources	Monitoring programme has been established	ERA; EHD	Year 4, then annually
10.1 Hold regular events, in accordance with Blue Flag Educational Programme, to raise awareness of the natural and	Number of events held	Beach Manager	Year 1 and annually

cultural heritage assets of the area and on environmental processes and issues			
10.2 Enhance the information available at ir-Ramla on the natural and cultural heritage assets of the area and on the environmental processes and issues	Updated signage / information boards have been installed.	Beach Manager MoG MTA	Year 3
11.1 Ground investigations	Investigation completed and report of study available	MoG	Year 1
12.1 Coastal monitoring	Monitoring reports	Beach Manager MoG	Year 1, then annually
12.2 Monitoring of the extent of the Posidonia habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project	Monitoring reports	Beach Manager; ERA	Year 3, then annually / biannually
13.1 Prepare a management plan to establish the interventions, if any, to manage the exposure of pebbles on the western end of the beach.	Management Plan has been prepared.	ERA; MTA Beach Manager	Year 3
14.1 Establishing inspections / wardening of the beach	Inspection programme for ir-Ramla	Beach Manager MoG Ambjent Malta ERA; Xagħra Local Council Nadur Local Council	Year 1
15.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season	Beach cleaning management programme in place. Beach cleaning team set up for ir-Ramla.	Beach Manager MoG (Cleansing Unit)	Year 1
16.1 Swimmers Zone marker ropes are deployed in the correct location	Records (including visual) of the location of the Swimmer Zone markers.	TM; Beach Manager	Every bathing season

4.3 SAN VITO LO CAPO BEACH, SICILY

Figure 9: The coastal area of San Vito Lo Capo

Source: Google EarthTM

4.3.1 A SWOT analysis was conducted to facilitate the identification of the issues to be taken account of in the formulation of the management plan for the beach at San Vito Lo Capo. This SWOT analysis (Table 2) is based on the information reported above and identifies the features considered to be positive (the strengths) and negative (the weaknesses), as well as the opportunities and threats, that will inform the development of the management actions for San Vito Lo Capo beach.

Table 9: SWOT analysis matrix for San Vito Lo Capo beach

FEATURES	FACTORS
Strengths (S)	***Opportunities (O)***
S1. The beach represents a strong foundation for the local community and the regional economy. S2. Pocket beaches are an important part of the regional heritage and local identity. S3. Community pride in the beach and surrounding amenities. S4. Range of infrastructure / facilities / services for bathers during the bathing season. S5. Beach meets most Blue Flag criteria and is a good candidate for the award. S6. Degree of appreciation of the naturalness of the beach and its environs.	O1. Greater emphasis nowadays on nature-based solutions and ecosystem services. O2. Establish system to monitor sand accumulation in port area and possible dredging and relocation to beach. O3. Safeguarding the beach and its environmental integrity supports economic and tourism development. O4. The beach represents a strong foundation for the local community and the regional economy.

S7. Existence of good legislation. S8. Economic operators support beach management.	O5. Proximity to natural and cultural heritage areas and features, for recreation, education, and awareness potential. O6. Covid-19 pandemic and social distancing precipitated concept of carrying capacity and zoning for the beach. O7. Awareness raising campaigns targeting beach users. O8. Beach management plan proposals well received by stakeholders. O9. Blue Flag considered the best process to achieve certain standards in beach management. O10. Blue Flag certification has a very clear tourism value and international recognition. O11. Beach management plans can be the vehicle for better coordination between municipality, regional and national efforts. O12. Tailor-made strategy for the beach. O13. Establishment of a central data repository to guide future projects.
Weaknesses (W)	***Threats (T)***
W1. Beach lacks Blue Flag recognition. .W2. Damage to the *Posidonia oceanica* meadows from anchoring of boats. W3. Need for better management of Posidonia banquettes. W4. Lack of awareness on impacts of human activities by the general public and beach users. W5. Good legislation exists but not always properly implemented (if at all). W6. Short-term political cycles hamper implementation of long-term actions. W7. Lack of coordination at various political levels. W8. Lack of understanding of beach system in places. W9. Vacuum at the pro-active level leading to *ad hoc* interventions just before summer.	T1. Increasing number of visitors in the peak season (over-capacity), including the beach and use of the marine environment e.g., by boats. T2. Covid-19 pandemic and social distancing requirements drastically reduced capacity of existing amenities. T3. Financial constraints at municipality level hamper management measures. T4. Impacts on seabed and *Posidonia* meadows from indiscriminate anchoring. T5. Discharges to the marine environment from boats. T6. Pocket beaches suffer from huge changes and impacts from various human activities. T7. Perceived reluctance by authorities to act against sand erosion. T8. Impact of port and related infrastructure on the adjacent beach and shoreline.

	T9. Success of plan implementation depends very much on them being framed within policy and backed by legislation. T10. Interventions undertaken without scientific backing.

4.3.2 Issues identified for address by the San Vito Lo Capo beach management plan

The importance of the beach at San Vito Lo Capo for the municipality's and the region's tourism and economic development is evident. Over the years it has been the focus of infrastructural development and provision of beach-related services, as described above, which help to meet the socio-economic development needs of the beach. Nevertheless, there are issues affecting and arising from the current physical and natural features of the beach system, as well as from the current provision of infrastructure, facilities, and services which should be taken account of in the formulation of a beach management plan. These issues have been identified through the SWOT Analysis and the engagement with stakeholders as well as through information obtained from past studies and surveys. However, in view of the inability to visit the site due to the travel restrictions brought about by the COVID-19 pandemic, the issues outlined in the following sections may require updating.

Physical and natural issues

The issues in respect of the physical and natural characteristics of the beach at San Vito Lo Capo, and which should be taken account of in the formulation of the management plan have been described as follows.

i. Lack of understanding of the beach system when undertaking interventions on the shore

There is an urgent need for any interventions on the shore to be guided by scientific evidence. Research activities need to be allowed to filter information to the actions and decisions taken by the political authorities. Impacts such as those created by the construction of the Port at San Vito Lo Capo must be avoided in future. Any interventions proposed on the coastline or in the sea need to be based on science.

ii. Impacts on seabed and Posidonia meadows from indiscriminate anchoring

It appears that anchoring outside of the Port area is not regulated (except in so far as navigation has to maintain at least a 300 m distance from the shore). This leads to boats stopping outside of the port to simply drop anchor within the bay. This causes significant damage to the seabed, and especially to the Posidonia oceanica meadows, if anchors are dropped in the eastern section of the bay. The increasing number of boats visiting San Vito Lo Capo exacerbate this impact during the summer.

iii. Need for better management of Posidonia banquettes

The formation of banquettes of dead leaves of the seagrass Posidonia oceanica over the winter months help to protect the sandy beach from winter storms. The banquettes are also important habitats for a variety of marine organisms. Unfortunately, these are often considered to be unsightly and an inconvenience whereas they should really be considered an important

resource and ally in the quest to protect and manage the beach. Such tension between environmental protection and tourism / economic operators is common around the Mediterranean.

Measures need to be found how to better manage these banquettes, allowing them to develop over the winter months and only removing them as late as possible in spring in preparation for the summer months. Guidelines on this aspect would be useful.

iv. Discharges to the marine environment from boats.

Past studies have indicated that the boats making use of the port may be a source of fuel discharges / contamination of the seawater, with nutrient levels inside the port increasing especially in summer. Episodes of mucilaginous algae were also reported in the past. Such water quality events will have serious repercussions on the tourism value of the beach if left unchecked, even if the waters at San Vito Lo Capo have consistently been classified as 'Excellent' under the EU Bathing Water Directive.

v. Impact of port and related infrastructure on the adjacent beach and shoreline

The impact of the port construction at San Vito Lo Capo has been well documented in past reports (see for example, Studio FC&RR Associati et al, 2014). It is clear from these studies, that the port construction did not adequately consider the beach dynamics at San Vito Lo Capo and how the new structures would impede these in the short and long-term. This has resulted in significant changes in the sediment movement in the bay, which in turn resulted in changes in the shape of the beach. In addition, the port itself engulfed the western extremity of the beach, which would otherwise have been available for bathing activities. Studies including hydrodynamic or physical modelling of the port would be useful to identify possibilities to improve / reverse the conditions that could help to counteract the regular siltation inside the port.

<u>Socio-economic issues</u>

The issues in respect of the socio-economic development needs of San Vito Lo Capo beach, and which should be taken account of in the formulation of the management plan have been described as follows.

vi. Beach lacks Blue Flag recognition

Despite being consistently voted as one of the top beaches in Italy and meeting most of the criteria for the Blue Flag award, the beach at San Vito Lo Capo is not one of the 18 Blue Flag beaches in Sicily. The Blue Flag label is a readily recognizable one and has international appeal and generates interest in tourism circles. The lack of Blue Flag certification is therefore odd and should be pursued. Stakeholders were supportive of the idea and considered the Blue Flag process to be a valid one to lead towards a more effective management of the beach within an established policy framework.

vii. Lack of awareness by the general public and beach users on impacts of human activities

Public awareness on the impact of human activities on the marine environment, including from waste disposal, plastics, etc, leads to unacceptable impacts on the environment. Raising awareness on even seemingly innocuous activities, will be important to improve the

management of the site. Educational events and site information to be addressed to locals and visitors to San Vito Lo Capo.

viii. *Need for proper implementation of legislation and policy and improved coordination at a political level*

Good legislation exists, but its implementation is not always up to standard so that good intentions outlined in laws and regulations remain little more than a paper exercise. There is a need to change this situation and ensure that the policies, plans and legislation that exist are properly implemented for the benefit of the environment and the locality. This includes the wider implementation of the Plan for the Use of the Maritime Property (PUDM).

Better coordination between different political levels (municipality, regional and national) for the furtherance of this goal is also crucial. Cross-party agreements for a long-term vision that is not hampered by the short-term cycles of political office should be aimed for.

ix. *Vacuum at pro-active level leading to ad hoc interventions just before summer*

In the absence of an agreed management plan that addresses issues in a holistic manner throughout the year and over several years, it is often the case that interventions are implemented in an ad hoc manner just before summer in view of urgent requirements or pressures from operators. These situations often lead to unexpected or unwarranted impacts on the beach system. A pro-active approach to management of the beach and its surroundings would eliminate these pressures and ensure that any intervention is in line with agreed measures that are guided by scientific knowledge.

x. *Increasing number of visitors in summer (over-capacity)*

Covid-19 pandemic and social distancing requirements drastically reduced capacity of existing amenities

Prior to the COVID-19 pandemic, the number of visitors to San Vito Lo Capo was on a constant rise, with numbers increasing significantly in August when the resident population is overwhelmed by the transient population. While this is good for the economy, it can also create tensions with the local population and also negatively affect the touristic experience. Indeed, several pre-2020 posts on popular travel portals and blogs refer to the over-crowding that is experienced in August.

The situation post-COVID-19 is an unknown and likely that following a restricted summer in 2020, a return to the situation in pre-Covid times is unlikely to happen any time soon, not least due to the required social-distancing on beaches, which resulted in a reduction in the overall capacity of the beach.

xi. Financial constraints at municipality level hamper management measures

While some management measures might be able to be implemented using internal workforce and available budget lines, others may require a specific budget to be allocated to ensure fruition. The lack of specific funding for beach management coupled with financial constraints at municipality level often results in limited implementation or postponement of required interventions.

The above described SWOT analysis **(Table 5)** also provided the basis for the development of a Vision Statement for the San Vito Lo Capo pocket beach and environs.

4.3.3 Vision for San Vito Lo Capo beach

- The place retains its character and brand as the "Caribbean of Sicily".
- The beach attains the Blue Flag award
- Urban development is controlled, and the relatively unspoilt feel of the beach is maintained.
- All stakeholders are involved in a common aim for the management of the beach and its uses. Existing legislation is implemented, and PUDM has been successfully rolled out and supported by all stakeholders, with all beach operators following rules and regulations and an improved management system.
- A good link has been established between research and implementation, with decisions and actions based on solid scientific evidence and monitoring.
- Increased awareness of the general public on the importance of the beach and its dynamics throughout the year and the impact of human activities on the beach system.
- Anchoring of boats outside the port area has been regulated and the Posidonia meadows protected.

4.3.4 Management objectives for San Vito Lo Capo beach

The Management Objectives define the strategy through which the vision will be achieved and provide a Mission Statement for the area / site manager/s to follow. Each Management Objective (MO) corresponds to a Vision Statement and develops a policy to address the issues (Table 10), considering the baseline information gathered (see the San Vito Lo Capo *Socio-Economic Status and Development Needs* report available in digital format on the BESS project WebGIS (http://bess.pa.ingv.it/).

Table 10: Management Objectives

Vision Statements	Management Objectives
The place retains its character and brand as the "Caribbean of Sicily".	• To further promote the scenic beauty of the beach and the town's orientation towards a beach-centred lifestyle. • To protect views into and out of the beach area.

	• To monitor and control any discharges into the Bay to safeguard bathing water quality.
The beach attains the Blue Flag award	• To establish the right management measures to meet all the mandatory Blue Flag criteria (environmental education and information, water quality, environmental management, safety and services).
Urban development is controlled, and the relatively unspoilt feel of the beach is maintained.	• To keep urban development away from the beach and its immediate hinterland through appropriate public open spaces as non-development buffer areas. • To control beach concession areas and limit the area of beach and sea dedicated to water sports operators throughout summer. • To improve the promenade for all users. • To re-assess the structures of the port and intervene where possible, to re-establish good sand dynamics for the beach system.
All stakeholders are involved in a common aim for the management of the beach and its uses. Existing legislation is implemented, and the Plan for the Use of the Maritime Property (PUDM) has been successfully rolled out and supported by all stakeholders, with all beach operators following rules and regulations and an improved management system.	• To engage with all stakeholders and establish a beach management committee representing the key stakeholders on the beach (municipality, tourism operators, water sports, port, fisheries, economic interest groups, NGOs, scientific community). • To implement existing legislation and the Plan for the Use of the Maritime Property through an agreed schedule of implementation. • To improve enforcement of beach management regulations and legal requirements • To enhance beach cleaning management programme.
A good link has been established between research and implementation, with decisions and actions based on solid scientific evidence and monitoring.	• To establish a permanent coastal monitoring programme that collects and processes beach profile survey data, beach litter and seabed surveys, sediment data, and similar studies. • To provide regular updates on the scientific data collected, which would be organised in a free data repository consultation of which would be mandatory for future projects and decisions affecting the coastal zone
Increased awareness of the general public on the importance of the beach and its dynamics throughout the year and the impact of human activities on the beach system.	• To promote environmental awareness on the marine and coastal environment among beach users (locals and visitors).

Anchoring of boats outside the port area has been regulated and the Posidonia meadows protected.	• To reduce impacts from boats on the beach system (i.e. the benthos, in particular, *Posidonia* habitat) and amenity of the bay.

4.3.5 Actions for San Vito Lo Capo beach

The management actions were developed to address the MOs and there may be more than one action per MO.

A priority rating has been assigned to each of the actions to facilitate implementation by the beach manager according to priority for the duration of the BMP. The priority rating criteria are defined as follows:

- **Critical:** The implementation of this action is necessary for the implementation of the BMP as a whole. It should be implemented within the first two years of the BMP.

- **High:** The action is of main importance and its implementation is necessary for a major component of the BMP. It should be implemented within the first three years of the BMP.

- **Medium:** The action is of main importance; however, it either follows after the implementation of another action or it can be implemented at any time within the implementation period.

- **Low:** The action is of complementary importance. It should be implemented towards the end of the implementation period of the BMP.

Table 11 presents the list of actions in relation to the MOs and relevant vision statement. A priority rating is also proposed. The entity/ies responsible for implementation of a specific action are not identified at this stage. We suggest that these be identified by the Municipality of San Vito Lo Capo prior to the approval of the Beach Management Plan.

Appropriate performance indicators are identified to enable measurement of the effectiveness of each action, and the monitoring requirements for each action are also defined. Table 12 presents the monitoring framework, including performance indicators. As with Table 2, the responsibilities are not identified at this stage. We suggest that these be identified by the Municipality of San Vito Lo Capo prior to the approval of the Beach Management Plan.

4.3.6 Responsibilities for San Vito Lo Capo beach

The delivery of the BMP will be the responsibility of a Beach Manager designated specifically for the management of the beach at San Vito Lo Capo. It is also recommended that a Management Committee is set up to assist the designated Beach Manager and facilitate coordination among government entities / regulatory authorities. The Committee will also have as a focus, the attainment of the Blue Flag eco-label, which will be managed by the beach manager. The Management Committee will include one designated representative from each of the main entities with an administrative responsibility in the management of the beach to

ensure an integrated approach to Plan implementation. The Management Committee will meet on a regular basis (frequency to be defined by the Committee itself). It is recommended that the Management Committee will include representatives from:

- The Municipality of San Vito Lo Capo;
- Entity responsible for tourism;
- Entity responsible for monitoring of bathing water quality;
- Entity responsible for environmental protection;
- Entity responsible for the marine and maritime environment;
- Port Authority;
- Coast Guard;
- Entity responsible for transport and parking;
- Entity responsible for fishing;
- Entity responsible for waste collection;
- Chamber of Commerce (or similar);
- Representative of Environmental NGOs;
- Representative of the Scientific Community; and
- Representative of entity working for persons with special needs.

The Beach Manager / Management Committee will be able to also call upon expertise from the environmental / scientific sector to assist with specific aspects of the BMP. It will also consult with operators and service providers in the area, including hoteliers, water sports providers, beach lido operators, restaurants, lifeguard services, beach users, etc.

Table 11: Actions for San Vito Lo Capo beach

Management Objective	Action	Priority Rating	Responsible entity
1. To further promote the scenic beauty of the beach and the town's orientation towards a beach-centred lifestyle.	**1.1 Re-evaluate the San Vito Lo Capo brand and create a promotional campaign on the beach-centred lifestyle and the scenic beauty of the beach and its surrounding landscape.** San Vito Lo Capo's vocation as a premier beach destination is well established. The beach is also central to the tourism product offered by the locality and the beach's beauty is the jewel in the crown. While much is already being done, San Vito Lo Capo can be further promoted internationally for its scenic beauty and the town's beach-centred lifestyle. Events linked more to the beach and the beach lifestyle would be particularly relevant. The campaign should also promote the shoulder months (April, May and October).	High	To be determined
2. To protect views into and out of the beach area.	**2.1 Protection of views** Any proposal for development close to the beach or the erection of temporary structures (such as tents or gazebos) or signage, will require permission from the municipality and will only be allowed if it does not impinge on the scenic	High	To be determined

	characteristics of the beach and protects the views into and out of the beach area.		
	2.2 Minimise clutter and occupation of the beach with temporary structures This action involves consultation and agreement with local stakeholders so that a common position is found that benefits the users of the beach.	HIgh	To be determined
3. To monitor and control any discharges into the Bay to safeguard bathing water quality.	**3.1 Study / inventory determining discharges into San Vito Lo Capo Bay** Regression of the Posidonia habitat is affected by the urban surroundings/discharges reaching the sea according to a study carried out by SPA/RAC (MedKeyHabitats II)3 . In order to manage this situation, a clear understanding of the discharges reaching the Bay and their composition is required. Checks to confirm that existing discharges are in line with permit conditions will need to be carried out and any irregularities addressed ([3] Golder, 2020. MedKey Habitats II Project, SPA/RAC) Most of these discharges will be from point sources. These would need to be checked to confirm that they are operating in line with their permits / licences and the data gathered in order to satisfy the requirements of the permit will inform this study. Understanding discharges will also help with regards to ensuring bathing water quality is maintained	Medium	To be determined
	3.2 Monitoring programme for non-point sources A monitoring programme will be set up to analyse non-point sources such as discharges/run-off from the road reaching the Bay. The monitoring programme will include the parameters to be tested and frequency of testing.	Medium	To be determined
4. To establish the right management measures to meet all the mandatory Blue Flag criteria (environmental education and information, water quality, environmental management, safety and services).	**4.1 Assess the beach management measures against the Blue Flag criteria with a view to apply for the eco-label** The management measures currently applied at San Vito Lo Capo already meet many of the criteria required for the Blue Flag award. The Beach Manager, with the support of the Beach Management Committee, will be tasked to benchmark the beach management measures at San Vito Lo Capo against the Blue Flag criteria to determine, through a gap analysis, which measures still need to be achieved. A programme of action will then be prepared with a realistic timeframe within which the beach at San Vito Lo Capo can achieve the Blue Flag award.	High	To be determined
	4.2 San Vito Lo Capo beach awarded the Blue Flag Following the gap analysis prepared through Action 4.1, the beach manager will ensure that the necessary measures are implemented and an application to the Foundation for Environmental Education will be made to inscribe San Vito Lo Capo on the list of Blue Flag beaches.	Medium	To be determined

5. To keep urban development away from the beach and its immediate hinterland through appropriate public open spaces as non-development buffer areas.	**5.1 Establish urban planning buffer areas for the beach** The beach's attraction and scenic beauty is a critical asset for the town and hence it needs to be protected against encroachment by urban development. To this end, a buffer area where no development will be allowed except for public open spaces, such as gardens, parks, promenade, and similar uses, will be established and no further development will be allowed to encroach closer to the beach and the maritime space. This would need to be a substantial distance from the beach and port area to safeguard views into and out of the beach.	High	To be determined
6. To control beach concession areas and limit the area of beach and sea dedicated to water sports operators throughout summer.	**6.1 Monitoring beach concession areas** Regular monitoring will be undertaken throughout the summer months to ensure that public beach space is safeguarded and operators respect their license conditions.	High	To be determined
	6.2 Limit areas occupied by water sports operators While water sports operators are welcome to provide a service on the beach, the proliferation of these service providers and the ever increasing number of beach equipment, vessels, and other paraphernalia may negatively impact the beach area – especially at the peak of summer and now with the COVID-19 restrictions when space may be at a premium. The PUDM has determined the maximum area and sea frontage that these operators can occupy on the beach. It is important that the provisions of the PUDM and the operator licences are strictly adhered to.	High	To be determined
7. To improve the promenade for all users.	**7.1 Improve and maintain the promenade and ensure access for all.** The promenade (Lungomare) serves an important social function. It is the centre of most of the activity that takes place around the beach. It is therefore crucial that this feature is kept in top shape at all times ensuring accessibility to all.	Critical	To be determined
	7.2 Encourage cycling Consider the need and feasibility of establishing a formal cycling lane along the lungomare and bicycle racks in appropriate locations to further encourage cycling as a mode of mobility around town.	Medium	To be determined
8. To re-assess the structures of the port and intervene where possible, to re-establish good sand dynamics for the beach system.	**8.1 Assessment of impacts of port infrastructure** A study will be commissioned to assess the effects of the port infrastructure on the beach dynamics at San Vito Lo Capo with the aim to consider options for interventions to rectify or mitigate these impacts.	High	To be determined
9. To engage with all stakeholders and establish a beach management committee representing the key	**9.1 Establish Beach Management Committee.** A beach management committee with representatives of the key stakeholders with an interest in the management of the beach	Critical	To be determined

stakeholders on the beach (municipality, tourism operators, water sports, port, fisheries, economic interest groups, NGOs, scientific community).	will be set up as a matter of priority. The Management Committee will provide guidance to the beach manager and assist in the coordination of activities and decisions.		
10. To implement existing legislation and the Plan for the Use of the Maritime Property through an agreed schedule of implementation.	**10.1 Implement the PUDM** The further implementation of the provisions of the Plan for the Use of the Maritime Property (PUDM) will be taken forward through a programme of activities and legislation to be established by the Municipality. A stakeholder engagement programme on the Plan implementation will also be created to *facilitate* buy-in by stakeholders.	High	To be determined
11. To improve enforcement of beach management regulations and legal requirements.	**11.1 Beach supervision** It is advisable during the summer months to employ beach supervisors to monitor the beach regularly throughout the day to ensure that the beach management regulations are adhered to by all beach users (bathers and operators). Beach supervisors, who will report to the Beach Manager, will liaise with the police for any enforcement requirements.	High	To be determined
12. To enhance beach cleaning management programme.	**12.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season** As a first exercise, the suitability of existing waste management bins, including type and number, and how frequently they are emptied, should be investigated. Re-evaluation of the beach cleaning management programme overall, in terms of ensuring sufficient and efficient management (resources allocated) will be carried out by the Beach Manager. This exercise will be repeated from one season to the next. In addition, the Beach Manager will help to ensure that the beach concessions fulfil their responsibilities with respect to ensuring waste management and cleaning of their concession area is carried out in accordance with their license at the end of their daily operations.	High	To be determined
13. To establish a permanent coastal monitoring programme that collects and processes beach profile survey data, **beach** litter and	**13.1 Establish Coastal monitoring programme** A coastal monitoring programme will be established to collect data throughout the year that will help guide the management of the beach and inform future reviews of the beach management plan.	High	To be determined
	13.2 Studies on the beach system Aerial photography and visual inspections should be carried out in order to study the evolution of the beach profile over time (seasonally and from year to year). This will allow the generation of trend data. Beach litter surveys will provide information on waste aspects. Data analysis will help to inform the Beach Management Plan and identify the need for the inclusion of any additional management measures.	Medium	To be determined

seabed surveys, sediment data, and similar studies.	**13.3 Monitoring of the extent of the Posidonia habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project** This project (concluded in 2020), set up a monitoring system for *Posidonia oceanica*, in a few Mediterranean locations. The monitoring involves the deployment of markers (known as balises) at the meadow's lowest limit in the bay, in accordance with the methodology reported by Pergent (2007). Photographs are taken related to the positioning of the balises. Two orthotropic rhizomes are also collected approximately 2 m behind each balise and one sample of sediment collected for laboratory analysis. Monitoring the health of the meadow in accordance with the protocol over time, using the balises to determine whether the Posidonia habitat is stable, regressing, or extending will provide data to inform the Beach Management Plan about the status of the seaward side of the beach system and whether additional actions are required to safeguard it	Medium	To be determined
14. To provide regular updates on the scientific data collected, which would be organised in a free data repository consultation of which would be mandatory for future projects and decisions affecting the coastal zone.	**14.1 Repository for scientific data** The data collected through the scientific monitoring programme (Action 14), should be collected in a scientific data repository, which will be freely available to all researchers and interested persons, who will be encouraged to submit their own data. Any projects proposed or decisions affecting the beach will be required to consult this data repository.	Medium	To be determined
15. To promote environmental awareness on the marine and coastal environment among beach users (locals and visitors).	**15.1 Establish an environmental awareness programme and hold regular events during Summer to raise awareness on environmental issues and to promote the natural heritage on the beach and the surrounding area.** Raising awareness and organising educational events will be one of the responsibilities of the Beach Manager. Events in line with the Beach Management Plan vision and objectives will be organised to raise awareness about the importance of conserving the beach system as a whole. For the purposes of the Beach Management Plan, at least one event will be carried out each month over the bathing season (June to September) and one outside of the bathing season. Educational events can include talks and demonstrations on the beach itself. Themes to tackle can include waste management and impacts on the marine environment, turtles in the Mediterranean and those nesting in Sicily, the beach system, maritime impacts, effects of anchoring, etc. These events will target locals and visitors and in partiuclar beach goers.	High	To be determined
16. To reduce impacts from boats on the	**16.1 Installation of ecological moorings** Indiscriminate anchoring outside of the port area creates impacts on the seabed habitats and, if unchecked, can be detrimental to the meadows of *Posidonia oceanica* on the eastern section of the bay.	High	To be determined

beach system (i.e. the benthos, in particular, Posidonia habitat) and amenity of the bay.	Therefore, improved organisation of any boat anchoring outside of the port area is required. Deployment and enforced use of ecological moorings will reduce negative impacts on the benthic environment while organising these in a way that the boats would not block views from the beach towards the horizon.		
	16.2 Declaring San Vito Lo Capo Bay a "no anchor zone" Following on from the establishment of ecological moorings (Action 16.1), the bay can then be declared a 'no anchor zone' to protect the seagrass meadows. Vessels would need to pre-book their mooring spot before entering the bay, in the same way that they book a berthing place at the port.	Medium	To be determined

4.3.7 Monitoring programme for San Vito Lo Capo beach

A key part of the Management Plan is to monitor the implementation and evaluate the success of the interventions. A set of simple, high-level indicators have been developed to monitor the actions identified for San Vito Lo Capo beach in this Beach Management Plan. It is envisaged that once the monitoring programme is in place, this will be used to report on the implementation of the Beach Management Plan as part of an annual review cycle.

Table 12 outlines the monitoring programme for the interventions identified for San Vito Lo Capo. In the case of each action, the programme identifies the monitoring indicator(s) that will be used to assess the implementation of the action as well as indicative timelines for each. The entity(ies) that will be responsible for the implementation of each action should be identified by the Municipality of San Vito Lo Capo prior to the approval of the Beach Management Plan.

Table 12: Monitoring Programme for San Vito Lo Capo beach and environs

Action	Monitoring indicator	Responsible entity	Timeframe
1.1 Re-evaluate the San Vito Lo Capo brand and create a promotional campaign on the beach-centred lifestyle and the scenic beauty of the beach and its surrounding landscape.	Report on brand re-evaluation New promotional campaign	To be determined	Year 1
2.1 Protection of views	New legislation / policy (if required) Proposals received Permits issued	To be determined	Year 1 and ongoing
2.2 Minimise clutter and occupation of the beach with temporary structures	Daily beach inspections to ensure against clutter and temporary structures Number of actions taken / fines issued	To be determined	Year 1 and ongoing
3.1 Study / inventory determining discharges into San Vito Lo Capo Bay	Discharge inventory created	To be determined	Year 3
3.2 Monitoring programme for non- point sources	Monitoring programme established	To be determined	Year 4, then annually

4.1 Assess the beach management measures against the Blue Flag criteria with a view to apply for the eco-label	Bench-marking report Gap Analysis Implementation programme	To be determined	Year 2
4.2 San Vito Lo Capo beach awarded the Blue Flag	Management measures completed Blue Flag application submitted Blue Flag award	To be determined	Year 4
5.1 Establish urban planning buffer areas for the beach.	Establishment of urban buffer Publication of legislation / policy	To be determined	Year 2
6.1 Monitor beach concession areas	Inspection reports	To be determined	Year 1 and ongoing
6.2 Limit areas occupied by water sports operators	Removal of extra paraphernalia from beach and surroundings Inspection Reports	To be determined	Year 1 and ongoing
7.1 Improve and maintain the promenade and ensure access for all	Promenade upgraded	To be determined	Year 1
7.2 Encourage cycling	Plans for cycling route established Bicycle racks installed	To be determined	Year 3
8.1 Assessment of impacts of port infrastructure	Study completed	To be determined	Year 3
9.1 Establish Beach Management Committee	First meeting of Committee held Minutes of meetings	To be determined	Year 1 and ongoing
10.1 Implement the PUDM	New legislation Records of interventions Programme of activities and interventions	To be determined	Year 1 and ongoing
11.1 Beach supervision	Number of beach supervisors recruited Monitoring reports	To be determined	Year 1 (summer) and annually
12.1 Ensure that the scope of the beach cleaning management programme meets the demand, particularly during the bathing season	Beach cleaning management programme Beach cleaning team set up	To be determined	Year 1
13.1 Establish Coastal monitoring programme	Coastal monitoring programme prepared Monitoring reports	To be determined	Year 1
13.2 Studies on the beach system	Scientific reports	To be determined	Year 1, then annually
13.3 Monitoring of the extent of the Posidonia habitat, using a methodology set up through the MedKeyHabitats II SPA/RAC project	Monitoring reports	To be determined	Year 1, then annually
14.1 Repository for scientific data	Data repository set up	To be determined	Year 2
15.1 Establish an environmental awareness programme and hold regular events during Summer to raise awareness on	Annual Environmental Awareness Programme	To be determined	Year 1 and annually

environmental issues and to promote the natural heritage on the beach and the surrounding area	Number of events held		
16.1 Installation of ecological moorings	Number of moorings installed	To be determined	Year 2
16.2 Declaring San Vito Lo Capo Bay a "no anchor zone"	Legislation / Regulation prohibiting anchoring in San Vito Lo Capo Bay published	To be determined	Year 3

5. Conclusions

Beach Management Plans were built upon a SWOT Analysis based on collected baseline data (see BESS WebGIS at http://bess.pa.ingv.it/) which set the scene for outlining of a management strategy. Vision Statements were devised and Strategic / Management Objectives identified for each Vision Statement. Specific actions for the delivery of the Objectives were identified and each action was prioritized and responsibilities for its delivery assigned. Indicative timeframes for the delivery of each action is also provided.

These BMPs have an initial timeframe of five years rolling. Action implementation and monitoring will provide feedback for the management measures and will aid in the review process for the BMP. By the fourth year, the BMP will need to be revised and a new five year plan formulated.

Once a BMP is approved, a budget for the first five years will also need to be devised and the necessary funds identified. Depending on the availability of the funding, the BMP can be delivered within the indicated timeframe or extended over a longer time period.

6. Glossary

Abrasion platform: Created by marine erosion, an abrasion platform is a very gently sloping or nearly flat bedrock surface extending from the foot of a marine cliff / coastal slope under shallow water.

Beach profile: refers to a cross-sectional outline of a beach, drawn perpendicular to the shoreline and extending seawards from the the beach backshore (cliff / dune / vegetated area) to the underwater 'depth of closure' (a water depth at which waves begin to interact with seabed sediment and thus lead to its transport to and from the beach.

Bedload sediment: In the case of the marine environment, the bedload refers to the sediment that is transported along the seabed

Benthos: (Marine) benthos is the community of organisms that live on, in, or near the seabed.

(Marine) **benthic environment:** That ecological region at the bottom of the seawater column, starts at the shoreline and continues seawards; it includes both surface and sub- surface sediment layers. Although this **zone** may appear barren, it plays a vital role in the health of aquatic ecosystems.

Cross-shore beach profile: Beach profile along the beach width (depth) rather than length.

Gap Analysis: An examination and assessment of current state to identify the differences between the current state and desired goals.

Littoral cell: A coastal section sedimentologically isolated from adjacent coastal sections by geomorphological features that prevent sediment exchange between adjacent cells. Each littoral cell exhibits its own sediment sources, transport paths, and sinks.

Oblique waves: waves reaching the shore at an angle;

Plan shape: The plan shape of a beach is an overhead view of the beach outline (in relation to the adjacent shoreline and sea.

Point-source: normally of pollution and refer to any single identifiable **source** from which pollutants (of air, water, thermal, noise or light) are discharged.

Posidonia oceanica: a seagrass species endemic to the Mediterranean Sea (also known as Neptune grass or Mediterranean tapeweed). Form ecologically important underwater meadows.

PUDM (Piano di utilizzo del Demanio Marittimo): refers to plans for the use of state-owned maritime property, adopted by the regional planning office in Sicily, Italy.

Undistributed wave action: exhibiting a predominant wave incidence that determines the net long-shore direction of sediment.

Wave crest: The highest point above the rest / undisturbed position of a wave.

Wave diffraction: the bending / spreading of waves around the corners of an obstruction or through an opening when the size of the opening or obstruction is of the same order of magnitude as the wavelength of the incoming wave.

Wave refraction: the bending of a wave-front. When a wave-front travels over water of different depths, it interacts with parts of the seabed and thus travels at different speeds and bending.

Sediment tight beaches: beaches without (or very limited) sediment loss;

SWOT: Stands for Strengths, Weaknesses, Opportunities, and Threats. A SWOT analysis is a technique assessing these four aspects of current management / operation.

Tertiary marine sediments: refers to marine sediments produced during the Tertiary period (66 to 2.6 million years ago) of the Cenozoic Era (66 million years ago to present day).

7. References

Amarouche, K.; Akpınar, A. (2021). Increasing Trend on Storm Wave Intensity in the Western Mediterranean. *Climate* **2021**, *9*, 11. https://doi.org/10.3390/cli9010011.

Anthony, E.J. (2014). The Human influence on the Mediterranean coast over the last 200 years: a brief appraisal from a geomorphological perspective. *Géomorphology: relief, processes, environnement*, vol. 20 - n° 3 | 2014, 219-226.

Anthony E.J. (2005) Beach Erosion. In: Schwartz M.L. (eds) Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3880-

Bird (1985) Bird, E.C.F., 1985. *Coastline Changes*. Chichester: Wiley Interscience.

Bird, E. C. F. (1996). *Beach management*. Chichester: Wiley Interscience.

Bird, E.C.F. and P. Fabbri, 1993. Geomorphological and historical changes on the Argentina Delta, Ligurian coast, Italy. *Geo Journal*, 29: 428 – 429.

Brunel, C. and Sabatier, F. (2007). Provence pocket beach erosion. *Méditerranée*, 108 | 2007, 77-82.

Bujan, N., Cox, R. & Masselink, G. (2019). From fine sand to boulders: Examining the relationship between beach-face slope and sediment size. *Marine Geology*. in press. 10.1016/j.margeo.2019.106012.

Carter, R.W.G. (1988). Coastal Environments: *An introduction to the physical, ecological and cultural systems of coastlines*. Academic Press, London.

CIRIA (1996). Beach Management Manual. (ed.), J.D. Simm. Construction industry research and information, association report 153, 1996. London.

Davies, J.L., 1974. The Coastal Sediment Compartment. (In): *Bird, E.C.F. 1996.*

Davies, J.L., 1980. *Geographical Variation in Coastal Development*. Longman Press, London.

Dean, R.G., 1991. Equilibrium Beach Profiles: characteristics and applications. *J. of Coastal Research*, 7: 53 – 84.

Dingler J.R. (2005) Beach Processes. In: Schwartz M.L. (eds) Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3880-1_36

HABITAT, 1996. *An Urbanising World – a Global Report*. U.N. Centre for Human Settlements (HABITAT). Oxford University Press. Pp. Xxxiv + 559.

House, C., and M. R., Phillips, 2007. Islands of theory in a sea of practise: Implementation theory and coastal management. *Proc. 8th Int. Conf on the Mediterranean Coastal Environment*, (ed.), E Ozhan, Medcoast '07, 105-116.METU, Ankara, Turkey.

MAFF, 1995. *Shoreline Management Plans – a guide for coastal defence authorities*. Ministry for Agriculture, Fisheries and Food, 1995. Pp. 24.

Marin, V., Ivalsi, R., Palmisani, F and M., Fabiano. 2007. Application of Participatory method for beach management, (In), *Proc. Medcoast '07*, (ed.) E Ozhan, 283-294, METU, Ankara, Turkey.

Micallef, A., Morgan, R. and A.T. Williams, 1999. User Preferences and Priorities on Maltese Beaches –Findings and Potential Importance for Tourism. (In - CD-ROM): Coastal Environment Management, EUCC - ITALY/EUCC. (ed.), G. Randazzo, 1999.

Micallef, A., and A T. Williams. 2003. Application of Function Analysis to Bathing Areas in the Maltese Islands, *Journal of Coastal Conservation.* 9 (2), 147-158.

Micallef, A. and A.T. Williams, 2004. Application of a novel approach to beach classification in the Maltese Islands. (In): *Journal of Ocean & Coastal Management*. 47, 225 – 242.

Micallef, A. and A.T. Williams, 2005. Report to the Priority Actions Programme/Regional Activity Centre of the Mediterranean Action Plan (United Nations Environment Programme) on the *Evaluation of Bathing Area Management in the Mediterranean*. Pp 31.

Morgan, R. Gatell. E. Junyente, R. Micallef, A. Ozhan,E. and A.T. Williams, 1996. Pilot studies of Mediterranean beach user perceptions. (In): *ICZM in the Medirerranean and Black Sea: Immediate Needs for research, Sarigerme, Turkey.* (ed.), E. Ozhan, MedCoast Secreteriat, Middle East Technical University, Ankara, Turkey. Pp. 99 – 110.

Morgan, R. and A.T.Williams, 1995. Socio-demographic parameters and user priorities at Gower beaches, Wales, UK. (In): *Directions in European Coastal Management*. (eds), M.G. Healy and P. Doody, Samara Publishing Ltd., Cardigan. Pp 83 - 90,

Morgan, R. Gatell. E. Junyente, R. Micallef, A. Ozhan,E. and A.T. Williams, (2000). An improved beach user climate index , *Coastal Conservation*, vol 6, no 1, pp41 - 50

Orford, J.D., 1993. Coastal Environments. (In): *Environmental Management, Vol.II, The Ecosystems Approach,* (eds.), B. Nath, L. Hens, P. Compton and D. Devuyst, VUB University Press, Belgium. Pp.15 – 57.

Pethick, J. 1984. *An Introduction to Coastal Geomorphology.* Edward Arnold, London. Pp 260.

Phillips, M. R., 2007. Beach response to a total exclusion barrage: Cardiff Bay, South Wales, UK. *Journal of Coastal Research.* Vol. 23(3).

Pilkey, O.H., Young, R.S., Riggs, S.R., Smith, A.W.S, Wu, H. and W.D. Pilkey, 1993. The concept of shore-face profile equilibrium: a critical review. *J. of Coastal Research*, 9: 255 – 278.

Pontee, N.I., Pye, K., & Blott S.J. (2004). Morphodynamic Behaviour and Sedimentary Variation of Mixed Sand and Gravel Beaches, Suffolk, UK. *Journal of Coastal Research, 20*(1), 256-276.

Pye, K. and Tsoar, H. (1990) *Aeolian sand and sand dunes*. Unwin Hyman Ltd.

Reguero, B.G., Losada, I.J. & Méndez, F.J. A recent increase in global wave power as a consequence of oceanic warming. *Nat Commun***10,** 205 (2019). https://doi.org/10.1038/s41467-018-08066-0.

Retama, I., Sujitha, S.B., Rivera Rivera, D.M., Shruti, V.C., Rodriguez-Espinosa, Jonathan, M.P. 2019. Chapter 6 – Evaluation and Management Strategies of Tourist Beaches in the Pacific Coast: A Case Study from Acapulco and Huatulco, Mexico. In Coastal Management : Global Challenges and Innovations. Academic Press.

Rogers, J., Hamer, B., Brampton, A., Challinor, S., Glennerster, M., Brenton, P., Bradbury, A., ... Construction Industry Research and Information Association. (2010). *Beach management manual*. London: CIRIA.

Sunamura, T., 1992. *Geomorphology of Rocky Coasts*. John Wiley & Sons, England. Pp. 302.

Tanner, W.F. and F. Stapor, 1972. Accelerating crises in beach erosion. *International Geography*, 2: 1020 – 1021.

Tudor, D.T., and A. T., Williams, 2006. A rationale for beach selection by the public on the coast of Wales, UK, *Area,* 38(2), 153-164.

Coastal Engineering Research Centre (1984). *Shore Protection Manual*, two volumes. Vicksburg, M.S. US Army Corps of Engineers.

Weir, F.M., Hughes, M.G. and Tom E. Baldock, T.E., 2006, Beach face and berm morphodynamics fronting a coastal lagoon. *Geomorphology,* Volume 82, Issues 3–4, 2006, Pages 331-346,

Williams A.T. and A. Micallef, 2009. *Beach Management: Principles and Practice*. EARTHSCAN Publishers, London, U.K. Pp 445.

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