Spatial Data Management and Scenario Planning for Paving Sustainable Future Trails in Insular Territories - Case Study Milos Island, Greece

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Abstract. Regional development and cohesion policies in the European Union (EU) aim at reducing disparities among regions and promoting economic, social and territorial cohesion. Recently, relevant initiatives pay particular attention to insular regions as distinct examples of vulnerable and lagging-behind territories. These policies also emphasize place-based approaches as the means for the needs and challenges of diverse types of regions to be effectively addressed. This, in turn, calls for delving into spatial/developmental peculiarities; and utilizing planning tools that are capable of handling complexity and uncertainty related to the future of studied regions within the rapidly evolving external decision environment. That said, this work sets the stage for an in-depth exploration of future sustainable developmental pathways of insular contexts, using Milos Island, Greece as an example. Spatial data management, scenario planning/visualization and multicriteria evaluation provide the means for a foresight exercise that grasps and assesses diverse sustainable, spatially-defined developmental trails of Milos Island. As key drivers of change for the scenario building endeavour, strategic EU/national policy directions compatible to the islands' context are utilized, namely the Green and Blue Growth strategies; and an effort to downscale them in the case study context is carried out. Scenarios produced are evaluated by use of multicriteria analysis (MCA), highlighting social, economic and environmental dimensions. Integration of spatial data management, scenario planning/visualization and MCA render planning outcomes and related policy decisions more robust, justifiable, fair and transparent.

Keywords: Island territories · Spatial data management · Scenario planning · Blue and Green Growth

1 Setting the Scene

Insular regions in the Mediterranean are outstanding examples of areas endowed with exquisite tangible and intangible, land and maritime, natural and cultural resources [1], rendering these regions highly-rated destinations in the global scenery. Nevertheless,

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islands in general and Mediterranean islands in particular are also perceived as distinct examples of lagging-behind spatial entities in developmental terms [2]. The reason for that lies on their geographical peculiarities and especially their isolation from the mainland, raising a number of developmental barriers, summed up under the "insularity" concept [1]. Insularity, in its very essence, is closely connected with a number of inadequacies and bottlenecks that hinder effectiveness of islands' developmental efforts. Managing insularity constraints and tracing visionary place- and people-centred future trails of Mediterranean islands is currently dealt by planners and policy makers, seeking to sketch and implement policies that are able to support more sustainable and resilient future end states and enable competitive advantages of islands in the demanding and rapidly evolving external decision environment.

The insularity condition and related drawbacks that frame the future of insular regions have recently gained noteworthy attention by the EU [3, 4]. Equity concerns lie behind this EU policy turn, aiming to ensure regional cohesion objectives and provide equal opportunities to the more than 20 million inhabitants (4,6% of the total EU population), residing in island areas and being spread over approximately 2400 islands in 13 Member States [5]. Given the distinct geographical features of EU island regions and their diverse institutional setups, the challenges the European islands are currently confronted with can vary significantly, due to e.g. size, location, economic profile, value systems, vulnerability to climate change (CC), etc. Some key concerns when studying island territories are as follows [5–7]:

- Geographical diversity: Islands in the Mediterranean face diversified challenges, compared to those in the Northern Atlantic or the Baltic Sea. Climatic conditions, sociocultural regimes and natural/cultural resources can vary significantly, impacting thus local economies and lifestyles, while conditioning future trails.
- Environmental vulnerabilities: Many European islands are vulnerable to environmental pressures, emanating from the impacts of CC or other natural phenomena. As such can be mentioned the rising sea level, extreme weather events, biodiversity loss, etc. These can shape the type and pace of their future development and need to be properly handled through effective adaptation strategies.
- Unique economic opportunities: The geographical attributes of islands, including their ecosystems and climatic peculiarities, give rise to unique economic opportunities, linked to both the land and the sea. Main sectors of their economic profile are agriculture, fishing and particularly tourism, namely critical sectors in terms of sustainable development and resilience objectives.
- Infrastructure and connectivity: Connectivity, both within the islands' territory and between the islands and the mainland, can be a critical factor for islands' flourishing. Some islands are confronted with challenges as to the transport and energy connectivity, and access to digital infrastructure; while others may have well-established connections.
- Institutional frameworks: The governance and administrative structures of islands can vary due to historical, cultural, political, etc. factors. Some islands may have a high degree of autonomy, while others are depended on administrative bodies of larger islands, being the main nodes of relevant island complexes [8], further enhancing insularity implications (double insularity).

- Cultural and social factors: Each island is marked by its unique identity, formed by the natural and cultural assets, historical trajectory, social dynamics, etc. [1]. Future pathways should be structured in harmony with this identity and definitely engage communities in visionary planning processes and related policy decisions.
- Tourism repercussions: Many islands are heavily depended on specific economic sectors, such as agriculture, fisheries and especially tourism. The latter is quite vital for most Mediterranean insular economies, with noticeable contribution to GDP, employment, and foreign exchange earnings. However, the prevalence of the Tourism-Led Growth (TLG) model [9] can render islands' economies more vulnerable to external shocks, global tourism market fluctuations, changes in tourism demand pattern, etc. In addition, managing the impacts of tourism on the environment, infrastructure, and local communities lies currently at the heart of the policy agenda and calls for specific strategies, tailored to each single island's context.
- Energy independence/resilience: Many islands are currently heavily relied on imported energy sources. Developing sustainable energy solutions and increasing autonomy or resilience to energy-related disruptions are of key importance for island regions both in developmental and spatial terms [10].

Given the aforementioned challenges, a one-size-fits-all approach does not seem a relevant choice for studying insular territories. As Barca et al. [11], but also McCann [12] claim, place-based approaches are of key importance for effectively addressing regional peculiarities in policy formulation. Towards this end, a detailed collection and management of spatial and other – quantitative and qualitative – data is necessary, as part of a planning endeavour. These data form the ground for better understanding distinctiveness of each single study region, while are perceived as valuable input for conducting a scenario planning exercise, i.e. structuring and evaluating alternative future trails that fit well into or take advantage of developments of the wider policy decision environment. That said, the focus of this work is on demonstrating the value of data management and especially scenario planning tools in the case of Milos Island, Greece. The structure of the paper has as follows: in Sect. 2, contemporary policies, establishing the decision environment within which development in insular territories takes place, are discussed; Sect. 3 demarcates the methodological approach of this work; Sect. 4 demonstrates the results obtained by implementing this approach in Milos Island, Greece; while finally in Sects. 5 and 6 discussion and conclusions are respectively drawn.

2 Grasping the Broader Decision Environment

As part of every policy formulation exercise at the local level (Milos Island in this respect), exploration of policy directions that demarcate the broader decision environment within which such an exercise is conducted, needs to be carried out. The key pillars of this exploration in the present work are demonstrated in Fig. 1 and are shortly discussed in the following.

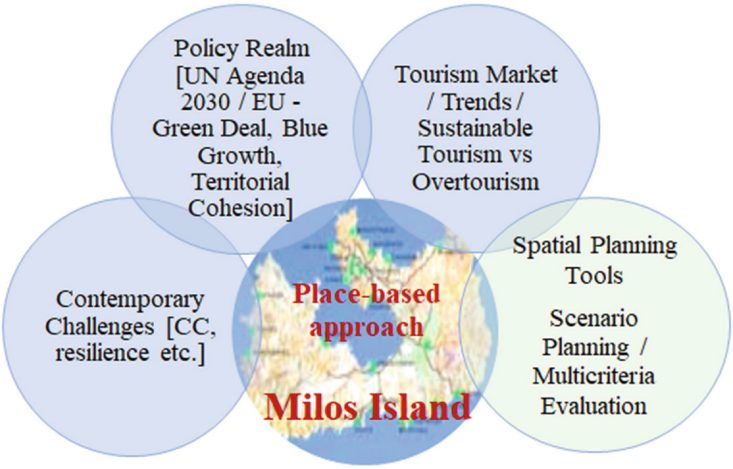


Fig. 1. Key pillars of the external decision environment. Source: Own elaboration.

Wealth of Mediterranean islands has been largely determined by the sea, acting, among others, as the means for economic/trade transactions and development of societal ties among Mediterranean communities; and a valuable resource for economic activity, such as commerce, fishing, maritime transport, tourism, etc. [13]. However, currently the Mediterranean region is perceived as a CC hotspot [13], with CC being recognized as a key driving force of global reach [14]. In fact various estimations demonstrate a general warming and drying trend of Mediterranean as a whole, a fact that is source of multiple socioeconomic stresses affecting health, energy and water consumption, food safety and security, habitat and biodiversity loss, risk of fire and drought, etc. [15]. Within the Mediterranean Region, islands seem to be more affected by CC impacts, lying in one of the most susceptible to CC areas of the world [16].

Overall reduction of GHG emissions and climate neutrality lie at the heart of the United Nations' Agenda 2030 for Sustainable Development, but also the European policy aspirations, as these are expressed by the Green Deal [17]. Speaking of the Agenda 2030, CC confrontation is reflected in SDG 13. Indeed, SDG13 is dedicated to "Climate Action" and highlights the urgent need to undertake steps that can tackle transition to carbon neutrality. This SDG is further specialized into sub-objectives that aim, inter alia, at [18]: boosting resilience and adaptive capacity of states/regions to climate-related hazards and natural disasters; integrating CC measures into national policies, strategies and planning processes; building capacity and raising awareness of population and institutions, etc. In addition, the concept of resilience comes to the forefront, leading a number of countries to undertake mitigation and adaptation actions, targeting the reduction of their national emissions and promoting national and / or regional / local adaptation plans for addressing CC challenges. Despite the critical importance of SDG 13 in confronting CC, this effort is further strengthened by a number of other SDGs as well, such as the SDG 7 ('Affordable and Clean Energy'), SDG 9 ('Industry innovation and infrastructure'), SDG 10 ('Reduced inequalities'), SDG 12 ('Responsible production

and consumption'), etc., all being closely related or relevant to challenges faced today by insular communities.

In order to harmonize its climate policy with the United Nation's Agenda 2030 and the 17 SDGs, the European Union has put forward the Green Deal, i.e. a strategy aiming to promote more green and sustainable pathways by serving the transition of the European territories towards [17]: a just and prosperous society; a resource-efficient and competitive economy, marked by the decoupling of economic growth from resource use; and a continent seeking to become a pioneer in climate neutrality achievements. In its effort to attain climate neutrality, a clear and coherent EU 2050 vision is set up; while Green Deal's strategic objectives are downscaled to the member states' level by enforcing legislation updates and policy reforms as well as by monitoring their implementation [18]. An ambitious EU strategy, targeting adaptation to CC, is also predicted in the Green Deal for enhancing resilience of spatial systems; while emphasis is placed on data and instruments in support of the integration of CC into risk management practices, smart energy infrastructure, and digital transformation, all three being grasped as critical 'vehicles' for reaching the Green Deal visionary end state [17]. In complementing the Green Growth perspective of the European territories, the EU has set up its vision for the marine environment. Realizing the (economic) value of the five seas surrounding the European territory, it has put in place the Integrated Maritime Policy (IMP) [19], emphasizing the need to promote the sustainable growth of maritime sectors and coastal regions. In support of the IMP, the Blue Growth Strategy [20] is articulated, aiming to attain sustainable growth of maritime sectors as a whole, with these sectors perceived as a new source of economic prosperity of the European regions, particularly of coastal and insular ones.

Further to the above statements, a thorough reflection is needed on how to best tailor policies to the peculiar economic profiles and geographical features of insular regions for better addressing the multiple developmental challenges, as well as the diversified social and employment circumstances such regions imply. In such a context, a place-based approach is highlighted in the new Territorial Agenda 2030 [21], perceived as the key to transposing priorities for a 'Just Europe' into practice. Thus place-based approaches have guided the reform of the EU territorial cohesion policy; and have introduced a new developmental strategy for better accounting place-specific contexts, assets and capacities [11, 12].

Speaking of developments in the global tourism market, sustainable tourism is nowadays largely advocated by both the demand and the supply side. As to the demand side, well-informed and environmentally-aware consumers rate environmentally-committed tourist destinations high in their preferences [1]. The supply side, in turn, has set up systems and procedures in its management processes that aim at fulfilling consumers' sustainability expectations. Thus environmental concerns and rational use of resources, both natural/cultural and human, are placed at the epicentre of the tourism production processes [22]. Same holds for decision makers at the local level, e.g. local government, Destination Management Organizations (DMOs), etc., in order for long term developmental perspectives, on behalf of both local population and visitors, to be supported. Concurrently, regionalization of policy making processes of the last decades and the rising power of local decision-making bodies has increased capabilities for more inclusive

approaches in planning and implementing sustainable local tourist development trails. The aforementioned orchestrated efforts reflect reactions to the realization that sustainable tourism is capable of boosting the sector's contribution to economic growth, job and income creation; while simultaneously addressing the major environmental challenges of the times [23]. In fact, sustainable tourism development is of critical importance for insular territories as fragile and geographically-confined land compartments. This holds even truer when considering that islands are perceived among places under intense and steadily increasing risk to overtourism, a currently alarming phenomenon in the policy discourse. In fact, the TLG model in island regions renders, in a longer run, sustainability objectives at stake by overcoming carrying capacity limits. Thus overcrowded islands destinations are confronted with various risks such as [24]: deterioration of their natural/cultural assets; high pressure on local community due to the loss of identity and sense of place; overconsumption of scarce resources; traffic congestion and air quality worsening; excessive waste volumes; etc. These, in turn, lead also to the degradation of tourist satisfaction, experience and loyalty to the destination; and, in a longer term, to destination's stagnation or decline by jeopardizing the very nature of its attractiveness, i.e. the natural and cultural beauty [24].

Taking into consideration the aforementioned key pillars as well as the main strategic guidelines at the national level, guiding spatial decisions with regard to tourism, Renewable Energy Sources (RES), aquaculture and industry as additional key drivers that frame the decision environment, a scenario planning exercise is conducted in the following that aims to sketch a sustainable future of Milos Island, Greece. Such a future seeks to achieve a well-structured balance among economic perspectives, environmental protection and social well-being. At the heart of this exercise lies a holistic and integrated, place-based approach for islands' development, ensuring sustainability objectives and seeking to attain a balance – in spatial and developmental terms – of sectoral objectives on the ground of the available natural and cultural assets [25, 26], while keeping track with directions of the broader decision environment.

3 The Methodological Approach

The proposed methodological approach consists of two main streams (Fig. 2). More specifically, in Stream 1 the external decision environment is investigated, aiming to identify those key drivers that can affect future developments of island regions. Out of this search, two key uncertainty axes are sought that can form the backbone of the *scenario planning approach.* In Stream 2, a *spatial data analysis* is conducted, aiming to grasp the very nature of the study region by: highlighting spatial dimensions of the natural, cultural, socioeconomic, infrastructural, etc. attributes; and identifying strengths and weaknesses as well as the region's dynamics. Combination of outcomes of Stream 1 and 2 guides the scenario planning endeavour in order for decision support as to the future sustainable pathways of the region at hand to be enabled and potential policy paths for their implementation to be sketched.

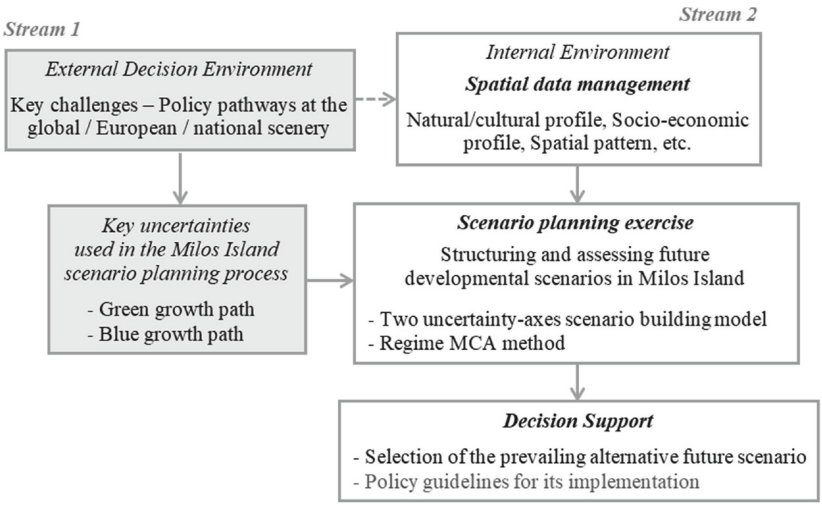


Fig. 2. Steps of the methodological approach. Source: Own elaboration.

3.1 The Scenario Planning Approach

Studying the future is an effort to find ways to explore the "unknown [27]. Thanks to professional futurists' work, a range of techniques and methods are currently available for thinking and discussing the future; and are used at both the micro (business) and the macro (regions) level. Among them falls scenario planning [27, 28] as a foresight technique for developing cohesive, plausible and flexible long-term strategic plans in support of policy-makers in their effort to anticipate/understand change, prepare responses to evolving conditions and establish more robust strategies. At the heart of the scenario planning process lie questions as to what is going to happen in the future and how this can affect the region under study. Out of this thinking, key uncertainties can be identified and can be further explored; especially those that present a high uncertainty as to their future state, while are also highly impacting the studied system. These can be used as building blocks in the scenario development process.

In setting up scenarios for the sustainable future of Milos Island, the *two uncertainties axes* scenario planning model is applied. The rationale of this model is displayed in Fig. 3. At the heart of this model lie two critical uncertainties (Key uncertainty A and B) (Fig. 3a) that are grasped as both highly uncertain and piercingly impacting the future of island regions (Fig. 3b). As key uncertainties for the future development of Milos Island are perceived two strategic EU/national policy directions namely the *Green and Blue Growth* that are compatible to the islands' context; while aligning with the aforementioned key pillars of the external decision environment (see Fig. 2).

In fact, pursuing "Green Growth" can potentially foster economic development, while ensuring that natural assets will continue to provide environmental services upon which community's well-being relies. In addition, promotion of "Blue Growth" rests upon the sustainable utilization of ocean and coastal resources – i.e. resources of critical importance for insular contexts through the centuries – in order for socioeconomic

prosperity, improved livelihoods and environmental sustainability of coastal and marine space to be attained. Downscaling the Green and Blue Growth EU directions on the studied island can in fact sketch a new spatial and developmental model which, among others, enables an internally-balanced pattern of activities in the various settlements of the island – inland and coastal ones – thus removing inequalities and promoting socio-economic and spatial cohesion.

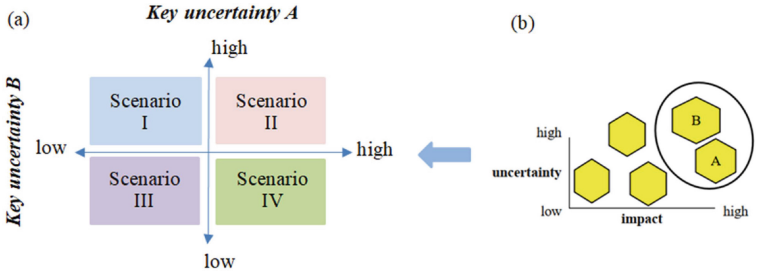


Fig. 3. The rationale of the two uncertainty-axes scenario model. Source: adapted from [27]

3.2 Assessment of Structured Scenarios – The REGIME Method

The structured scenarios for Milos Island are assessed by use of the REGIME discrete multicriteria method [29]. This method is used for evaluating both projects and policies; and has the advantage of utilizing quantitative, qualitative and/or mixed data with regard to the effects and criteria priorities considered in the evaluation problem. The main input for applying the REGIME method comprises the [30]:

- *evaluation (impact) matrix*, composed of elements e_{ij} that measure the performance of each alternative i, i = 1,2,…,I (4 discrete alternatives in the case of Milos Island) as to every evaluation criterion j, j = 1,2,…,J (17 evaluation criteria, falling into the environmental, economic and social sustainability pillars in the Milos example);
- *set of political weights* that provide information on the relative importance of criteria to be considered in the evaluation context.

The REGIME method is founded on a pairwise comparison of all alternatives. Produced outcome of the method is the probability of alternative i to rank higher than the rest of the alternatives; and is calculated by the following formula [31]:

$$P_i = [1/I - 1] \sum_{i \neq i'} P_{ii'} \quad (1)$$

where P_i is the average probability that alternative i ranks higher than any other alternative. Ranking order of P_i's is then defining the prioritization of respective alternative options (scenarios). It is worth highlighting that the comparison of every set of alternatives is not influenced by the presence and effects of other alternatives, while the potential ranking order of a certain alternative is conditioned by all remaining ones (for more information see [18, 29, 30]). Application of the REGIME method is accomplished by use of the DEFINITE (DEcisions on a FINITE set of alternatives) software.

4 Implementation of the Proposed Methodology and Results

4.1 The Study Region

Milos is a Greek island, holding a surface of 150.6 km2 and a coastline of 125 km long. It is located in the southwestern part of Cyclades complex, Aegean Sea (Fig. 4a). It disposes quite distinguishable and fragile natural ecosystems, coupled with environmentally-sensitive coastal parts (Fig. 4b). The island is distinguished for its volcanic origin, resulting in impressive landscapes, beaches, rock formations and other geological configurations (e.g. caves); while it is well-known for its mining activity, served by a dispersed pattern of mining sites all around the island (Fig. 4c).



Fig. 4. The study region: (a) Location of Milos Island, (b) Natura 2000 areas, c) Mining sites. Source: (a) [32], (b) [33], and (c) Own elaboration.

Milos Island counts for 5,193 inhabitants (2021 provisional Census data), with the population displaying escalating trends during the last three decades (Fig. 5). Traditional economic sectors are mining, tourism and fishing. More specifically, the primary sector is based on agriculture, livestock farming and fishing; and displays signs of decay, shifting its share in the local economy from of 7.71% in 1991 to 3.69% in 2011. Secondary sector demonstrates also a declining trajectory (from 34.78% in 1991 to 29.76% in 2011), with mining activity being the prevalent one.

In fact the local economy is gradual shifting towards a tertiarized one – from 57.52% in 1991 to 66.55% in 2011 – dominated by the tourism sector. Milos, as most island regions, attempts to capitalize on its natural and cultural capital; and use it in order to increase its tourism attractiveness. The tourism sector, in this respect, is gradually strengthened in the local economy, as also demonstrated by bed-night stays in the time slot 2015–2022 (Fig. 6); while same holds for hotel/guesthouse and Airbnb beds. Inspection of results of Fig. 6 manifests a steadily escalating trend in overnight stays in the island in the time span 2015–2022; while quite evident is the impact of COVID-19 in 2020.

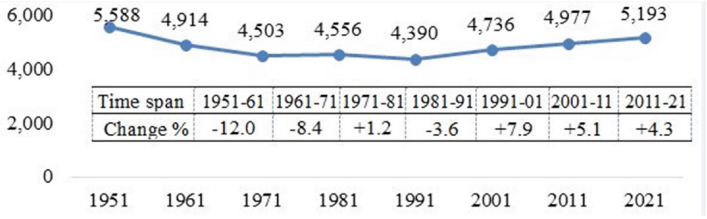


Fig. 5. Evolution of population in Milos Island - Time span 1951–2021. Source: Hellenic Statistical Authority [34].

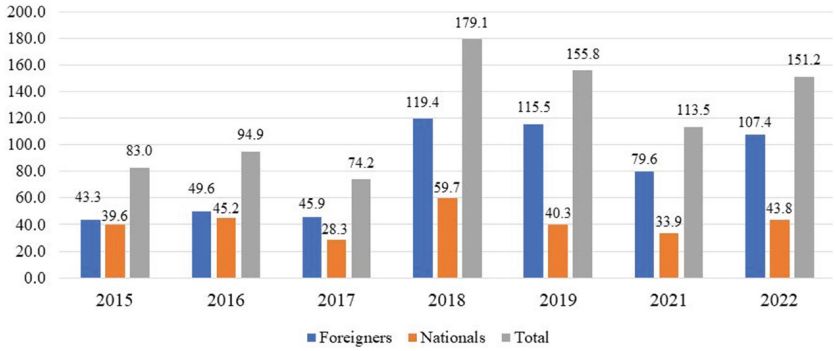


Fig. 6. Evolution of overnight stays in Milos Island 2015–2022 (in thousands). Source: [35].

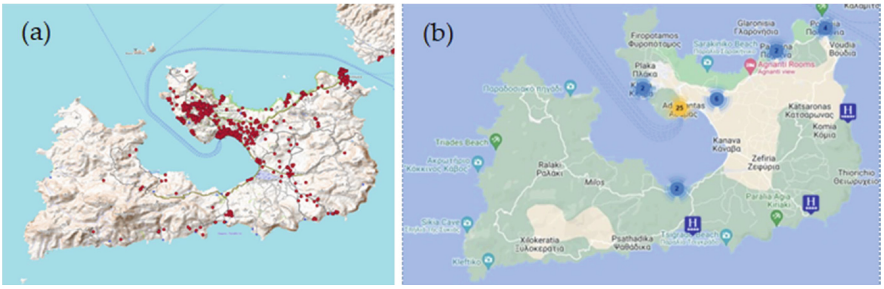


Fig. 7. Current spatial pattern of tourism accommodation in Milos Island. a) Airbnb accommodation, b) Hotel accommodation. Source: a) [36], b) [37]

In addition, tourist accommodation demonstrates a rather concentrated pattern (Fig. 7a and 7b), displaying signs of surpassing carrying capacity of specific island's locations with obvious repercussions in respective settlements. In seeking to avoid the unpleasant consequences of tourism overload and the monocultural pattern of the local economic profile due to the prevalence of the tourism sector, scenarios for a holistic and integrated island's future development are built in the following, having as a backbone the Green and Blue Growth pathways; and aiming to promote a multisectoral and

spatially-balanced pattern to the benefit of environmental protection, social integrity and cohesion, economic prosperity and overall experience of tourists.

4.2 Structuring Scenarios for Sustainable Future Pathways of Milos Island

The two uncertainties axes scenario planning model (see Sect. 3.1) is applied in Milos Island resulting in four distinct scenarios, seeking to achieve more sustainable development pathways, in alignment with directions of the external decision environment and particularly the EU vision. Such a perspective is sought using as a backbone the Green and Blue Growth directions (see also Sect. 2), perceived as the key uncertainties in the scenario building process for island contexts (Fig. 8). The distinct features of each single scenario of Fig. 8 are displayed in Table 1.

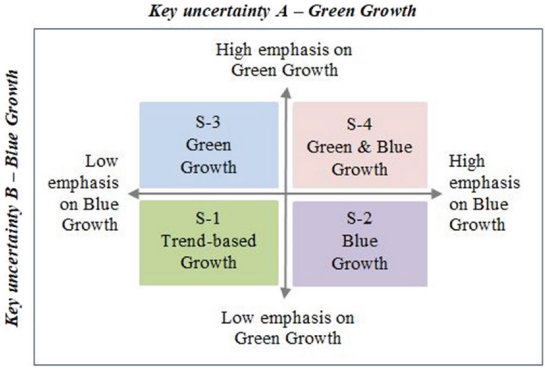


Fig. 8. The rationale of the two-uncertainty axes scenario planning model as featured in the scenario building process of Milos Island, Source: Own elaboration.

4.3 Evaluation of Scenarios by Use of the Regime MCA

The starting point for the scenario assessment is the delineation of the evaluation criteria. Those used in this respect (type, measurement scale and direction) are demonstrated in Table 2. Next follows the construction of the impact matrix (Table 3), describing the performance of each scenario against the set of evaluation criteria. Such a performance is qualitatively assessed by use of the authors' experience as well as evidence-based results in Greek islands [38, 39] that have already implemented relative interventions, as those predicted in each single Milos scenario image. Qualitative values of the impact matrix (Table 3), representing performance of scenarios as to the criteria set, are properly handled by the DEFINITE software. The criteria weights need also to be determined. In this work, three different weights' prioritization schemes of evaluation criteria are used. In the first scheme, all criteria are considered as of equal weight (equal importance of all three pillars, i.e. environment, economy and society); then the rest two criteria prioritization schemes give prominence to environmental and economic criteria respectively.

Table 1. Features of structured scenarios for the sustainable future of Milos Island

Scenario 1 – Trend-based scenario	**Scenario 2 –Blue Growth**
- Limited growth of the primary sector – Steady downward trend - Enhancement of the traditional activities of the secondary sector - Maintaining of mass tourism - Improvement of ferry connections - Low Renewable Energy (RE) penetration	- Promotion of fishing activity - Further development of the secondary sector, based on mining activity - Promotion of mass and alternative tourism model -geological, conference tourism, maritime tourism - Upgrading of maritime transport infrastructure - Upgrading of ports' infrastructure - Limited penetration of RE
Scenario 3 –Green Growth	**Scenario 4 –Green & Blue Growth**
- Prevalence of RE in the energy profile of Milos Island - Sustainable mobility - Green building stock - Innovative crops' development for energy production – Primary sector development - Stagnation of the secondary sector, low manufacturing growth - Mass tourism model, combined with mild nature-based forms of tourism (eco- and agro-tourism)	- Penetration of RE - Smart and sustainable mobility in land and at sea - Energy saving in the building stock - Upgrading of island's infrastructure - Balanced sectoral development / Integration of economic sectors – Establishment of value chains - Organic production in agriculture/animal husbandry - Promotion of fishing activity (aquaculture) - Strengthening of manufacturing activity - Stimulation of export activity of qualitative products - Upgrading of ferry connections / Ports' upgrading - Balance of mass and alternative tourism (eco- and agro-tourism; geological, Spa and conference tourism; maritime tourism)

Ranking of alternatives in the three distinct criteria weighting schemes are demonstrated in Fig. 9. More specifically, in all three REGIME rankings, Scenario 4 (Fig. 10) displays the highest performance. This scenario covers, in a great extent, the goal set for a holistic and integrated development of Milos Island; and fulfills sustainability objectives by making proper use of available resources, both in land and at sea. In fact, the combination of both Green and Blue Growth strategies promotes RE exploitation with considerable environmental repercussions. The scenario invests in the spatially-balanced development and integration of all three productive sectors, taking advantage of available natural and cultural resources and using them in a sustainable way. It also attempts to diminish land use potential conflicts. The island gains autonomy in a number of sectors, while avoiding a tourism developmental pattern that overcomes carrying

Table 2. Evaluation criteria for Milos scenarios' assessment, Source: Own elaboration

Sustainability Pillar/Criterion description			Measurement scale	Direction
Economy	C1	Development of entrepreneurship - New jobs creation	---/+++	Benefit
	C2	Promotion of secondary sector activity	---/+++	Benefit
	C3	Strengthening of primary sector activity	---/+++	Benefit
	C4	Degree of integration of productive sectors	---/+++	Benefit
	C5	Development of new infrastructure	---/+++	Benefit
	C6	Spatial distribution of tourism – Containment of mass tourism	---/+++	Benefit
	C7	Preventing seasonality of tourism activity	---/+++	Benefit
	C8	Attracting high class tourists	Binary	Benefit
Environment	C9	Protection - designation of natural / cultural environment	---/+++	Benefit
	C10	Protection and sustainable use of marine resources	---/+++	Benefit
	C11	Development of alternative types of tourism	---/+++	Benefit
	C12	Shift to Renewable Energy Sources	Binary	Benefit
	C13	High quality products - Organic farming	Binary	Benefit
	C14	Environmentally-friendly tourism infrastructure/transport	---/+++	Benefit
Society	C15	Social cohesion	---/+++	Benefit
	C16	Upgrading of living standards	---/+++	Benefit
	C17	Fostering the development of human resources	---/+++	Benefit

capacity, raises seasonality drawbacks, and places unbearable stress in local resources and community. Attractiveness of Milos Island to visitors is reinforced by the spectrum of tourism forms available; while, in addition, it enables equal opportunities for access to jobs and services, thus strengthening socioeconomic cohesion.

Table 3. Impact matrix as input to the Regime MCA method

Evaluation Criteria	Scenarios	S1	S2	S3	S4
Economy	C1	-	++	++	+++
	C2	--	++	+	+++
	C3	-	+	++	+++
	C4	---	-	++	+++
	C5	-	+	++	+++
	C6	---	++	++	+++
	C7	-	++	++	+++
	C8	no	yes	no	yes
Environment	C9	---	-	++	+++
	C10	--	+++	--	+++
	C11	-	++	+	+++
	C12	no	no	yes	yes
	C13	no	no	yes	yes
	C14	---	---	+++	+++
Society	C15	-	+	++	+++
	C16	--	+	+	++
	C17	--	++	++	++

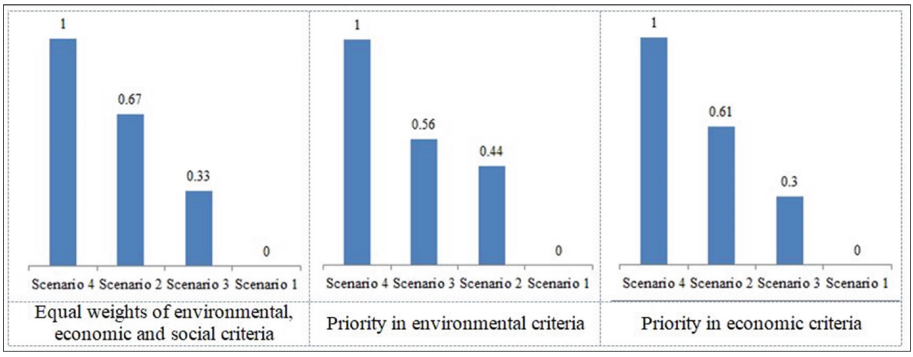


Fig. 9. Regime MCA results of the three distinct scenario assessments. Source: Own elaboration.

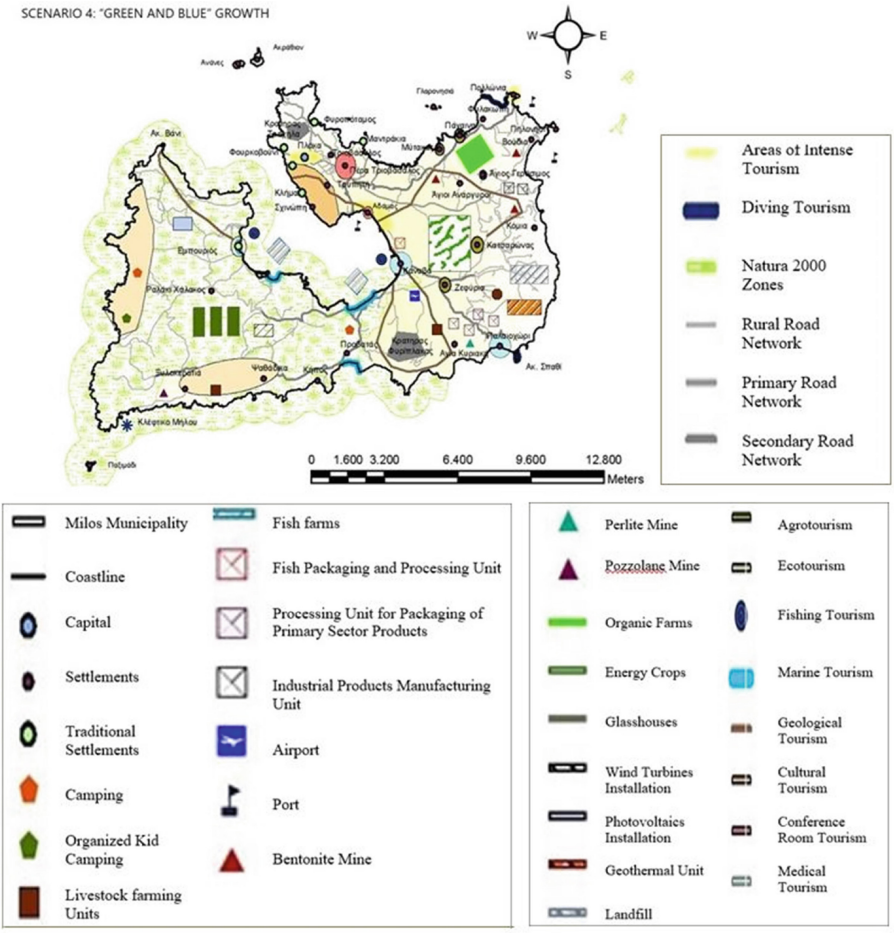


Fig. 10. Spatial development of the prevailing Scenario 4, Source: Own elaboration.

5 Discussion

European in general and Mediterranean Islands in particular, being in most cases lagging-behind territories, are currently confronted with great challenges and dilemmas [25]. Most of them, however, are perceived as a two-sided coin, by carrying certain risks but also presenting new opportunities ahead for awareness raising and action undertaking by local stakeholders; and assessment and valuation of services offered by the natural ecosystems to local communities. For reaping the benefits of these opportunities, more dedicated efforts need to be undertaken, capitalizing on the remarkable potential offered by the current technological advances and stepping forward towards more smart, sustainable and resilient future pathways that address the needs of both island communities and their visitors [26].

In order for such future pathways to be attained, a robust policy path needs to be featured. This should be designed on the basis of a place-based approach [11, 12], taking into consideration the very many peculiarities of such territories; the stakes that need to be served at the local/regional level; and the land use conflicts arising from highly competing actors/activities in both the land and the sea. Moreover, potential contribution of the evolving, of global or European reach, policy directions needs to be taken into account, stressing the potential pathways these can serve and assessing their performance with respect to sustainability and resilience achievements in these remarkable territories [25].

Along these lines, the focus of the present study is on structuring and implementing a methodological framework that sets the ground for a foresight exercise [40] towards a desired end state. This is accomplished by exploring the way EU Green [10, 17] and Blue Growth [20] directions can match to a specific island territory, namely Milos Island. The spatial data collection and management have proven crucial for realizing the distinctiveness of the specific island; and have provided input for unfolding, in spatial terms, the specifics of the Green and Blue potential interventions that have formed the narrative of the selected alternative scenario (Scenario 4 in Fig. 10). In addition, scenario planning has proven quite helpful towards the exploration of diversifying Green, Blue or combination of both future images in the specific spatial context, in alignment with the past and present economic, social, cultural and environmental profile of the study region. When seeking to achieve 'Qualitative islands' and 'Islands of equal opportunities' [6] on the basis of land and marine resource protection and sustainable exploitation, the specific exercise seems to be capable of producing a long term, well-documented, transparent and robust strategic policy direction for further negotiating with local communities and serve the 'big' challenge, being its implementation.

6 Conclusions

Current policy directions as well as technological advances and their applications in insular environments delineate new chances for paving a sustainable and resilient future pathway in such fragmented territorial entities. To the detriment of this pathway, apart from the insularity drawbacks, lie risks mainly linked to CC impacts, coastal urban sprawl and related infrastructure, but also a developmental pattern that goes beyond carrying capacity limits, largely associated with (over)tourism. On the contrary, to the benefit of such a pathway lies the spectacular natural and cultural resources of island territories as well as the, historically-embedded, tight connections with the sea and maritime activities, which lie at the heart of or have, even, formed the local culture and identity; and can structure challenging narratives about how the future might develop. That said, the Green and Blue Growth policy directions, coupled with the remarkable opportunities offered by technological advances, can form the ground for a more visionary developmental perspective, actually a new paradigm that is tightly interwoven with the past and the present of these fragmented land compartments as well as with newly emerging chances for successful implementation of these directions. Dedicated, spatially-designated, and future-oriented proactive efforts towards this end can support the flourishing of island communities, containment of population decline as well as expansion of employment

opportunities and social integrity; while ensuring the steady provision of environmental services.

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