

FROM SUSTAINABLE URBAN MOBILITY PLANS TO SUSTAINABLE ISLAND MOBILITY PLANS – SUSTAINABLE MOBILITY POLICIES IN ISLAND CITIES

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Abstract: Transport planning of island cities has set, until recently, as a priority, the service of travelling by private vehicle, so their development was based on this logic. However, the consequences of the dependence on the car use are now evident at all levels: urban, transport, environmental, economic and social. The era of car dominance in island regions must come to a closure. After recognizing the problems that modern island cities have to face, due to the inability of existing infrastructures and networks to respond to the dynamics for more sustainable mobility, new models of transport and urban planning need to be adopted. Sustainable mobility is one of the most contemporary directions of the EU, in terms of organizing the transport system and addressing the main problems of island cities. Sustainable mobility practically describes a transport system that meets transport needs and, at the same time, defends environmental integrity, social equity and economic efficiency. The “Sustainable Island Mobility Plans” (SIMPs) which provide a comprehensive strategy to meet mobility needs through the principles of “integrated planning, participatory effort and evaluation”, tend to this direction. The SIMP differs completely from a conventional traffic approach, as it focuses on the human factor (residents and visitors), as well as the change in attitude towards mobility, promoting alternative and friendly means of transport.

This paper will present island cities policies that will provide measures and strategies for the enhancement of sustainable island mobility, namely traffic and road network management, equal mobility of vulnerable users, improvement of network service, transport infrastructure, and spatial and urban planning. Future planning should aim to reduce the negative impact of transport on the environment, as well as create efficient and affordable transport in island regions.

Keywords: island cities, small islands, sustainable mobility, transport planning, case studies, Greece.

1. Introduction

As part of the long search for the appropriate urban form (Barbopoulos, Milakis and Vlastos, 2005), two conflicting urban planning models have been proposed (Bakogiannis, et al., 2017): (a) the model of the "diffused" city, which is based on the policy of expansion and development of uniform urban arrangements with undefined boundaries that extend in the scope of local human activity (Aesopos, 2006), low urbanization and sociability; and (b) the model of the "compact" city, which adopts a design standard for the control of urban sprawl (Rodi, 2012) with compact and flexible allocation of mixed uses, which utilize as a social life center the small surface public space (Klampatsea, 2012).

The current status in Greece regarding the urban organization of space is closer to the first model, since there are many settlements that have been developed illegally. In fact, according to the estimations of the Technical Chamber of Greece (TCG), there are more than one million informal developments in non-planned areas across Greece (Apostolopoulos, et al., 2017; Apostolopoulos, Mittas and Potsiou, 2017). Initially, the majority of informal developments were concentrated around big urban areas. This tendency changed over the years and thus today the phenomenon of diffusion is more prevalent in areas of great environmental value, such as coastal areas, wooded areas and islands (Polyzos and Minetos, 2007).

The intensity of the problem of illegal housing is more intense in the islands, as a result of great pressure from tourism, rambling legislation, absence of control mechanism and lack of planning policies (Syrmalenios and Athimaritis, 2003). Apart from the degradation of the landscape and the environmental characteristics of many islands, the above causes have resulted in the creation of residential areas lacking “character” and specific form. They are hybrid areas with compact settlement cores that have been created historically and circumferential enclaves of houses that are dependent to the settlements’ centre. In many cases, the vast majority of the islands tend indeed to resemble a vast urban area that spans across the whole island and is limited exclusively due to the fact that the islands are “body of land cut off from adjacent lands by water” (Verrill, 1922 in Calado, Quintela and Porteiro, 2007). A typical example is the case of Salamina, where a great percentage of its area is occupied by houses or anthropogenic activities, as one can see in Image 1. Such situations, in turn, cause transport problems, since the diffusion of houses away from commercial activities creates mono-functional areas, resulting in the increase of the residents’ movements for their daily needs. As a matter of fact, in the case of islands, which constitute closed systems (Calado, Quintela and Porteiro, 2007; Gil, Calado and Bentz, 2011), residents and visitors meet their needs in specific areas, leading to further traffic congestion there, the degradation of these areas and the diminution of the quality of life of their residents (Fasoulas, 1999; Psatha, 2012; Garling, 2018). The problems are even more intense during the summer months, when the population of the Greek islands skyrockets. According to Anagnostopoulos, Spyridonidou and Psarra (2017), the population of the Greek islands in summer is up to 15 times bigger compared to the population during winter. Therefore, tourist travel constitutes a major source of environmental problems, like in the case of Norway, as Hoyer (2010) notes, since the tourism model that prevails in the Greek islands is not combined with sustainable mobility.

The above matters are just some of the factors that set the framework in which urban planners and transport planners are asked to design sustainable island communities, implementing strategies and policies. Therefore, the following question

arises: Which policies can be implemented in the planning of the islands of Greece, in order to promote sustainable mobility? For that reason, this paper examines the existing strategies from a theoretical perspective, through the study of official texts. At the same time, the subject is approached in practical terms, through the examination of case studies of Greek islands where there have been implemented projects aiming to the integration of sustainable mobility policies.

2. Islands and Sustainable Mobility

As mentioned in the above section, the increased use of cars in modern societies has led to the degradation of cities. This fact raised concerns already since 1970 at a global scale (Bakogiannis, et al., 2015). In this context, a series of conferences took place in several cities across the world (Beriatos, 2009; Bakogiannis, et.al., 2014), a typical example being the Global Conference on Human Settlements Habitat II, which took place in Constantinople in 1996 and focused on the need of the transformation of modern cities into more compact cores. The purpose was multiple, but the need to reduce transport costs prevailed (Binde, 2003), with the purpose to make cities more economic.

In this context, in March 2011 the European Commission proposed the implementation of Sustainable Urban Mobility Plans (SUMP) for cities of a certain size through the White Paper on Transport “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” (COM (2011) 144*final). The present agenda of travel planning, known as “Sustainable Urban Mobility,” was designed in accordance with the White Paper. We can consider as “Sustainable Urban Mobility” the public or private mode of travel and transport in the city that has public, natural, motor-driven or combined character. Compared to other European countries, the interest in Greece is relatively recent (Bakogiannis, et al., 2015). Nevertheless, many municipalities of the country invest on sustainable urban mobility, implementing SUMP with a view to exploit the positive effects on a number of sectors, such as the transportations, the environment, the free urban space, the culture, and the economy.

The beneficial effects on islands may differ from those on urban areas, as a result of the special characteristics of the islands. The question that arises in view of these different characteristics is whether a different planning of the projects of sustainable urban mobility is needed for urban areas and for islands.

Table 1 Differences between a SUMP and a SIMP

	SUMP	SIMP
Methodology		
General Vision	Car-free city	Car-free tourism
Area	Urban-Suburban-Satellites	Whole island-More islands-Urban areas?
Population	Residents + Tourists	Residents + Tourists
Need for Infrastructure	Heavy with fixed use	Light and flexible
Gates/External Connections	Numerous means of transport	Limited choices: Ferry-boats (mainly) and airplanes (sometimes)
Focus		
Trips	Home to work	Leisure
Car	Massive use. Need for permanent solutions	Need for flexible solutions (high VS low season)
Public Transport	Need for heavy, massive and stable PT	Need for light, personalized (on demand) and flexible PT
Rail	Existing or possible	Not possible
Maritime Transport	Not very critical. Ports only in coastal cities	Very important and always existing
Walking at non urban areas	Leisure. Not critical	Very important touristic activity. Always existing
Cycling	Mainly in the urban area	Mainly out of the urban area
Energy	Always integrated with the National Energy Network (On-grid)	Not always integrated. Possible off-grid solutions
Participation Engagement	Mainly residents	Residents + Tourists
Innovation	Difficult, slow and costly development of innovative ideas	Lighter, quicker, cheaper development of innovative ideas

Source: Anagnostopoulos, K. and Spyridonidou, A., 2018. D.2. Year-round Sustainable Island Mobility Planning (SIMP). 5th European Conference on Sustainable Urban Mobility Plans. Nicosia, Cyprus, 14-15 May 2018. Available at: http://www.eltis.org/sites/default/files/d2_spyridonidou.pdf (Accessed on June 2018).

According to Spyridonidou and Anagnostopoulos (2018), there are differences between the Sustainable Island Mobility Plans (SIMP) and the Sustainable Urban Mobility Plans (SUMP) regarding both the methodology and the aims on which the planning focuses. Indeed, the main methodological differences concern the delineation of the study region (Komninos, 2017), the existence of limited external connections and the need for light and flexible infrastructure in the

islands, compared to the urban areas in the mainland. At the same time, the trend towards population fluctuation, in yearly base, creates different mobility patterns in winter and summer season. This challenge (Anagnostopoulos, 2017) creates a different objective in the case of SIMPs, since planners focus on the development of car-free tourism and not of car-free cities, as is the case in urban areas. A different approach is apparent as to what is defined as target-group in each case: in the islands the focus of interest is more on tourists than on residents, whereas the reverse is true in the case of most cities. Therefore, a way needs to be found for the tourists to participate as actively as possible in the consultation of planning (Spyridonidou and Anagnostopoulos, 2018). This practice is also applicable in the case of planning in SUMP. In this case, however, the interest focuses mainly on the residents.

In addition to the above differences, there are also issues regarding the possible means that planners can implement in the case of SIMPs. As presented in Table 1, the focus of interest in the case of SIMPs is not on the massive use of cars for commuting purposes, but for periodic leisure transport. The capability for development of heavy infrastructure, such as the railway and the establishment of frequent itineraries with many transport modes, is limited; therefore, light, personalized and flexible personal transport modes are being sought. The spatial planning of most islands as open cities, characterized by a great dependency between the urban and peri-urban space, creates the need for cycling and walking even in the peri-urban space, which is not a top priority in the case of cities.

In that context, it is concluded that the planning principles of SUMP and SIMPs do not differ in their substance. Their differences concern exclusively the special morphological and socio-economical characteristics of the islands (Bakogiannis, et al., 2016). Both SUMP and SIMPs use planning as a tool to achieve the goal of a functional, sustainable, economic and human city, ensuring a minimum level of accessibility to key destinations for all citizens. In that way, the transportation system proposed through the integrated urban and transport planning will contribute to the financial, social and environmental sustainability of the island. These elements constitute two important strategic goals of a SIMP. The Table 2 (Komninos, 2017; Anagnostopoulos, 2017) presents the total of the strategic goals in summary.

Table 2 *Strategic goals of a SIMP*

1.	A transportation system contributing to the financial, social and environmental sustainability of the island
2.	Ensuring a minimum level of accessibility to key destinations and services for all citizens
3.	Improved safety and security across the whole island road network and overall transportation system
4.	The re-allocation of public space and the restriction of traffic access and parking
5.	Promoting car-sharing, car-pooling, bike sharing and other forms of sharing economy
6.	Significant change in the modal split towards sustainable transport modes: <ul style="list-style-type: none"> - High quality and more accessible public transport - New ways of using the car - Promoting walking and cycling - Improving air and/or sea transportation - Optimizing the design of multi-modal hubs and terminals - Intelligent transport management and information systems (ITS), on demand service provision, ICT use, etc., integrating the existing and new mobility services
7.	Efficient management of the seasonal peak of travel and parking demand and reduction of the subsequent air and noise pollution
8.	Stimulating car-free vacation destinations.
9.	Stimulating projects at the nexus of mobility and energy, such as electromobility, to promote alternative fuels and the smartening of the island electrical grids
10.	Logistics chain optimization

Source: Anagnostopoulos, K., 2017. Sump and Island Particularities. Available at: https://issuu.com/anyakosmas/docs/simp_and_island_particularities (Accessed on June 2018).

3. Case Studies: Three Greek Islands

3.1. Which islands were selected?

With the purpose of finding out whether and to what extent the above presented points can be easily applied to the Greek islands, three Greek islands were examined: Milos, Nisyros and Poros (Fig. 1). These islands were selected according to the following criteria:

(a) Small size: Small size facilitates the understanding of island characteristics, compared to islands that have broader settlement network and more transport choices. Furthermore, small islands constitute spatial units with more limitations, due to the small size of the closed system and their socio-spatial organization, and therefore their planning constitutes a great challenge for planners.

(b) Different geography: The islands are located in different complexes (the Cyclades, the Dodecanese and the islands of the Saronic Gulf) and in varying distance from Athens. However, the common parameter is the short distance from

each complex's capital. Different geography also translates to a different historical and cultural tradition, different architecture and different morphological characteristics in the organization of the settlements.

(c) Different transport infrastructure: In this way we can examine islands with different transports. Milos has an airport, while the other two islands have only ports. Even their maritime links are different: Poros and Milos have frequent links to Piraeus, whereas Nisyros has better communication with Kos.

(d) Difference in population and population fluctuations: We aimed to examine islands with settlements of varying size. It should be noted that for all these three islands, transport studies have been implemented. These studies, despite not being SIMPs, have already posed the question of integrating bicycle and more sustainable transport methods. Worth noting is the fact that, contrarily to the usual practice of selecting areas with different characteristics (Kyriakidis, 2016; Bakogiannis, et al., 2015), in this study islands with differences were selected., since the aim of their examination is not to find good practices, in order to implement them in a similar region, but to explore some points that, being common to most of the islands, can be taken into consideration during the implementation of SIMPs.

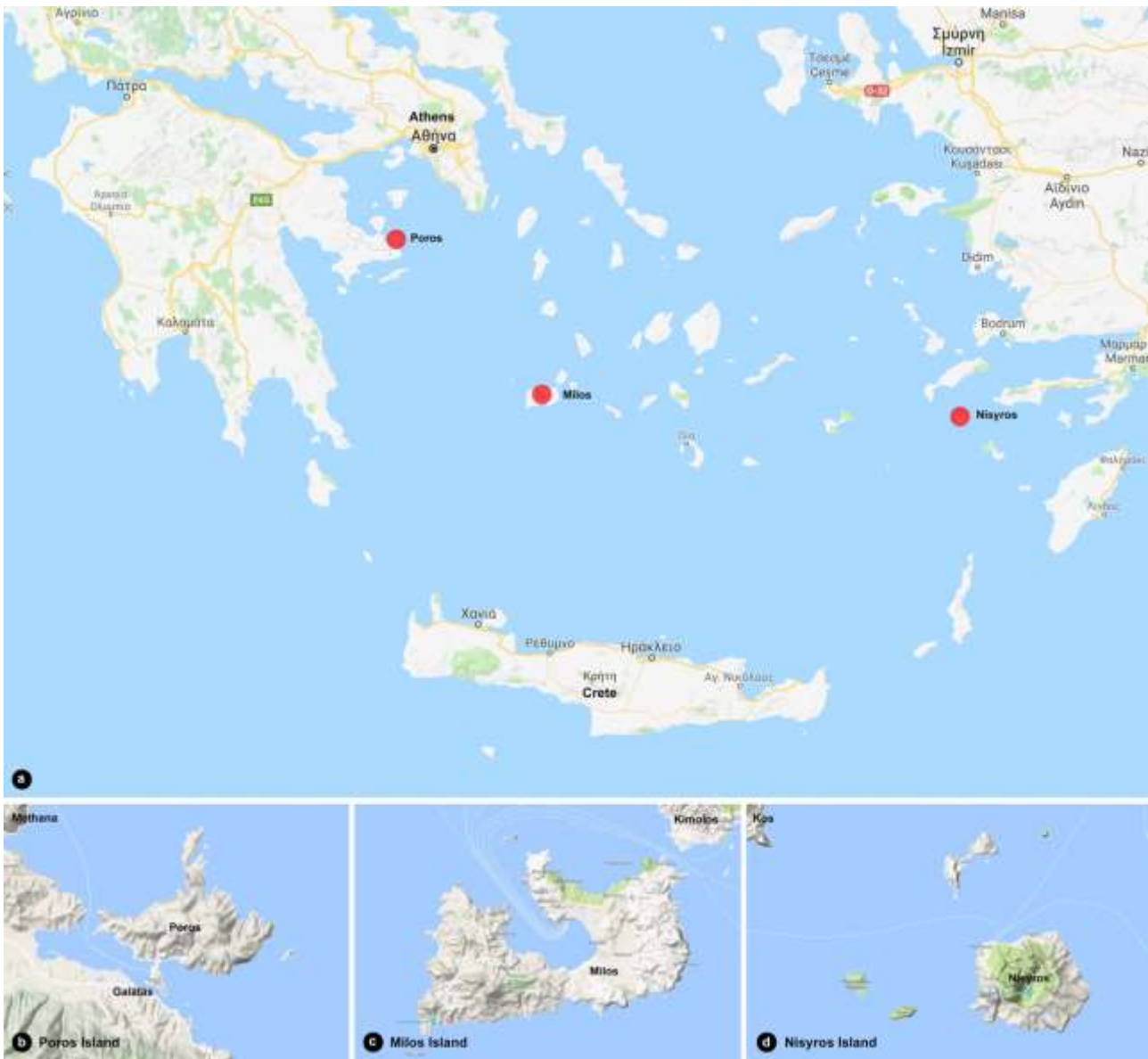


Fig. 1. Location of the islands studied
Source: Google Maps – Own Elaboration

3.2. Discussion on the three islands

The islands in question were examined with regard to their settlement network. Milos has the most settlements. Poros is populated only in its northern part, where there is the settlement of Poros and in small distance also the Kiani Akti. The small settlement network is probably the reason why previous studies focus spatially on the scale of central settlements (Poros, Mandraki, Adamas and Pala). The present planning approach has resulted in ignoring problems in other parts of

the islands. These problems were indeed evident during the summer months, when the increased traffic volumes were located on the roads leading to the beaches. It is nevertheless worth noting that in the case of Poros the related study (Vlastos and Bakogiannis, 2005) mentioned the adjacency and the existing dependencies between Poros and Galatas in the Peloponnese (Fig. 1b; 2c). This point is important, since it proves that in the case of implementing SIMPs in the Greek islands, the dependencies with bordering islands or settlements should be taken into serious consideration due to their direct adjacency. Typical examples are Spetses and Porto Heli; Milos and Kimolos (Fig. 1c); Elafonisos and Neapolis; Paros and Antiparos; Naxos and Koufonisia; Santorini and Thirasia; Kalymnos and Leros, Kos and Nisyros (Fig. 1d), etc.



Fig. 2. a-d: Poros Island; e-i: Milos Island; j-n: Nisyros Island.
Source: Google Street View – Own Elaboration

In all these three islands the importance of urban waterfronts was identified. Unlike the case of Nisiros, where the coastal front is pedestrianized and not occupied by the port, since the port is located at a distance of 330 m. from Mandraki (Vassi, 2016), in Poros and Adamas the port occupies part of the coastal zone, and the space required for the

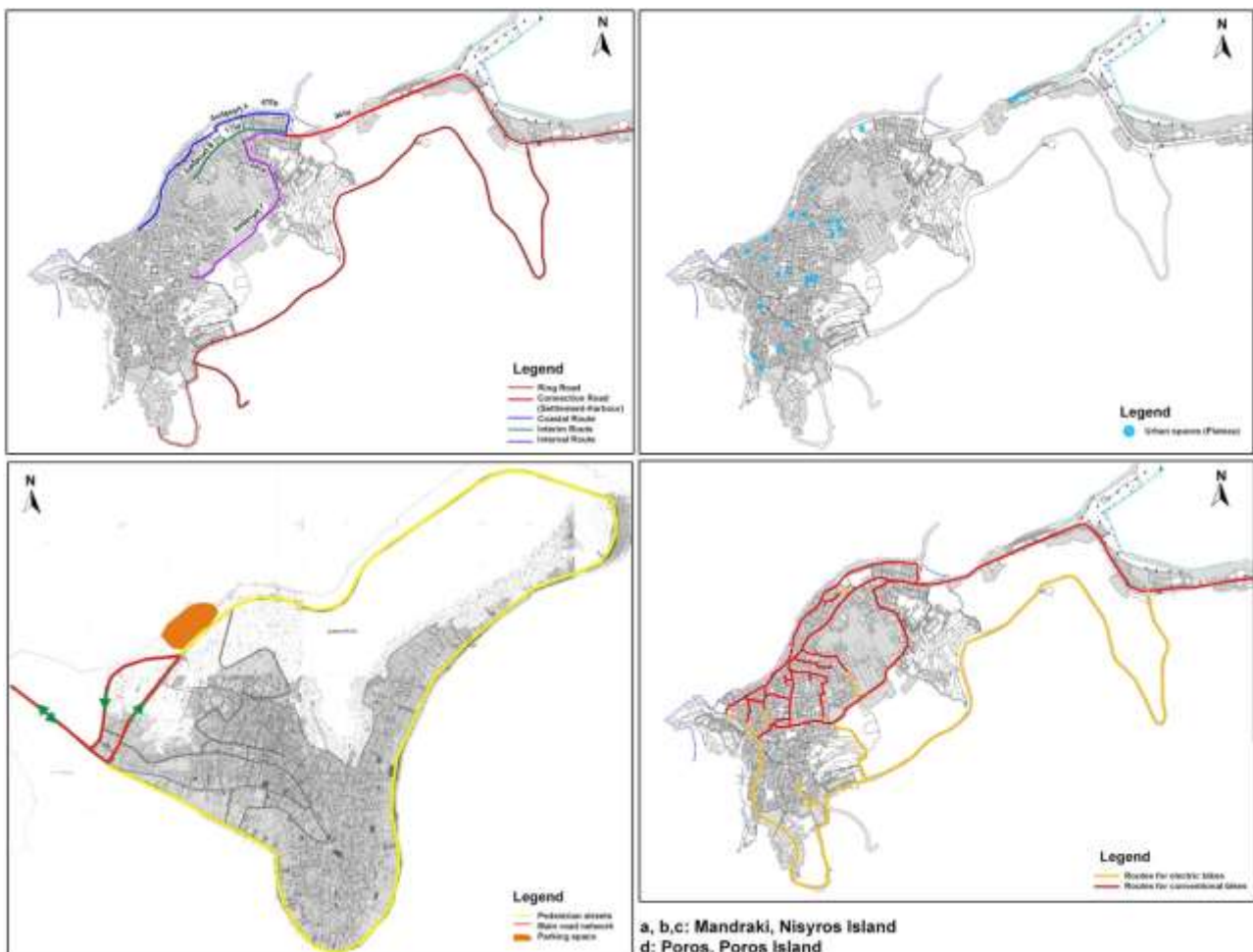
movement and parking of cars has reduced the space utilized by pedestrians (Fig. 1a;b; h). In fact, in the case of Poros, where the coastal road is practically the only open public space of the settlement, the limitation of on-street parking is necessary, in order that the pedestrians do not crowd in the narrow sidewalks (Vlastos and Bakogiannis, 2005).

The issue of roadside parking is, however, also evident in the interior of the settlements. Typical example is Mandraki in Nisyros, where, despite the fact that the structure of the settlement (Fig. 3a-c) is such that does not allow the access of cars to many of its areas, the presence of two-wheelers (Fig. 2l) is nonetheless evident in bigger roads. Especially in the platforms, which constitute the core of the settlement's social life, we observe the phenomenon of both car and two-wheeler parking (Vassi, 2016). This situation results in the reduction of the sociality of open spaces (Fig. 3b) and their satisfactory functioning. The need of combining renewal policies and parking policies is therefore evident. It is worth noting that in the context of the demarcation of parking, the issue of demarcating the parking spaces of buses and taxis in the areas close to the terminals should be also discussed (Bakogiannis, 2004).

The narrowness of the roads (Fig. 2 k; j) is characteristic of the other two islands, too. It is indicative that both in Milos and in Poros the average width of rural roads is about 6 m. Widening is not always possible, because of the roadside construction, which in many cases is unauthorized. In fact, in many places there is no sidewalk at all, and the lighting is deficient. Consequently, the development of a network of cycle routes (Fig. 3c) cannot take place without turning some road sections into one-way streets, in order to provide more space for cyclist and pedestrian movement. (Bakogiannis, 2004; Vlastos and Bakogiannis, 2005). Such interventions, however, should take place only after a study that would take into consideration both its movement needs and its geomorphology, examining whether and to what extent the area or the route is suitable for cyclists. It should be noted, however, that in the case of implementation of a bicycle route network, it is necessary to encourage visitors and residents to use it, through bicycle-sharing or bicycle renting systems. The use of electric bicycles (Fig. 3) is a further way to encourage visitors and residents to turn this transport mode and avoid the use of cars.

The issue of connecting the settlements with the islands is indeed an important planning parameter. Satisfactory connections are needed in the case of Milos, where bus routes are significantly increased during the summer months compared to the winter ones (MilosBuses, 2016). Nevertheless, there are accessibility issues in some settlements and destinations of interest. A typical example is the case of the airport's connection with the settlements of the islands, where the routes do not satisfactorily serve the morning flights (MilosBuses, 2016). For that reason, taxis are also used to meet the transport needs of residents and visitors. Frequently, however, the cost makes this mode of transport an uneconomical choice for most visitors. Solutions such as car-sharing and car-pooling can provide an alternative way of using car.

Finally, a point that should be taken into account in the process of planning the islands is the protection and enhancement of the natural environment. It is no rarely that the latter is sidelined in order to exploit every available land for construction purposes, while in other cases regions that should be protected are used for parking purposes. In the



case of Milos, characteristic is the presence of a stream that needs to be regulated and then designed for the enhancement of its image and its environmental value.

Fig. 3. *Main proposals for Mandraki (a-c) and Poros (d) presented on maps.*

Source: Vassi, 2016 ; Vlastos and Bakogiannis, 2005.

The above points confirm the majority of what was mentioned in the discussion on the strategies for the implementation of SIMPs. Even if this type of planning constitutes an innovation for the Greek islands, it is believed that its development is possible in collaboration with urban planning, due to their nature as closed systems. However, it is believed that in some cases the spatial dimension of planning should be taken into account and not be limited to the island scale, as it has been the case so far, with studies focusing exclusively on a single settlement or a settlement network. Such an approach is believed to contribute to the successful implementation of SIMPs, changing fundamentally the character of the islands and of the existing tourism model.

4. Conclusions

The planning for sustainable urban mobility is an increasing trend in cities of European Union countries. This trend is now also extended to the islands, most of which receive a great number of tourists during the summer months. In this category are included also the Greek islands, where a model of mass tourism constitutes the core of their economic base.

The present directions for SIMPs concern the selection of the vision for planning, the delineation of the study region and target-groups, and the promotion of sustainable modes of transport through combined transport, walking and cycling.

With the above strategies for the implementation of SIMPs in mind, three small Greek islands were examined. The aim of the examination of the case studies was to assess the implementation of the above strategies in the planning of the Greek islands. The conclusions drawn can be summarized as follows:

- Islands are closed systems and, therefore, constitute a settlement network that should be studied as a whole. The scale of the island constitutes the basis for the delineation of the study region. However, in the cases that strong dependencies to other islands or mainland regions are found, these dependencies should be taken into consideration and the region of study should be delineated in a different way. As in the case of SUMP, the delineation of the study region should be based on the frequent transports of the residents and visitors of the region to be planned.
- The planning, depending on the scale of the study region and on population changes, should focus on different target-groups. In the case of islands emphasis is usually placed on the transportations of tourists, which are substantially more, and for that reason the planning seems to be more about a car-free tourism than a car-free city or settlement network. Thus, what tends to be most important is the issue of assessing the accessibility of tourist destinations in various ways.
- The lack of heavy infrastructure raises the need of enhancing flexible solutions. New ways of using the car (car-sharing, car-pooling) and the bicycle (bike-sharing) can contribute to the development of a more alternative model of tourism, leading even to a change in the tourist profile and to the expansion of the tourist season. Electromobility is another option that can be promoted, given the small distances and the existing potential for alternative energy sources (wind, wave and solar power), which can be easily exploited.
- For the safety of drivers, cyclists and pedestrians, the existing provisions should be taken into account. Since in many cases their implementation is not possible, due to limited space, making one way roads may be the solution for providing space for pedestrian and cyclist movement. Such interventions should be in line with the parking policy, especially in sections within settlements, urban waterfronts and transport hubs, such as ports and bus terminals.
- Smart applications can contribute to ensuring a minimum level of accessibility to key destinations, reducing the impact from the islands' weaknesses (poor quality road infrastructure, unsatisfactory transport services, distant settlements, the ageing of resident population). At the same time, the strengths of the islands, such as short distances within settlements, pedestrian streets and paths, as well as natural and cultural assets can be exploited for promoting cycling and walking, or even participatory planning practice, through a model that approximates direct democracy.

The above points are just some of the planning pillars of a SIMP. While there are methodological and objective-related differences between SIMPs and SUMP, nevertheless, many elements remain the same. At any rate, the implementation of the first SIMPs will constitute a safe way of assessing the practices, and will raise further issues for discussion regarding the identification of the best planning approaches.

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