Sustainability Issues in European Sensitive Areas
Annex 4: European Islands

SENSOR Project Deliverable Report 6.1.1

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SENSOR Sustainable Impact Assessment: Tools for Environmental, Social and Economic Effects of Multifunctional Land Use in European Regions **www.ip-sensor.eu**

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SENSOR Project	The Integrated EU project SENSOR aims to develop ex-ante Sustainability Assessment Tools (SIAT) to support policy making regarding multifunctional land use in European regions. Land use represents a key human activity which drives socio-economic development in rural regions and manipulates structures and processes in the environment. At the European level, policies related to land use intend to support the efficient use of natural resources and to improve socio-economic developments. The project is financed by the EU 6th Framework Programme. Project duration is four years, starting in December 2004. The project is carried out by a consortium of research institutes, led by the Leibniz-Centre for Agricultural Landscape Research (ZALF). This document contributes to the development of a scientific methodology for generating an overview of delineated key issues of sustainability in sensitive areas at European level. This survey spatially identifies European islands and investigates key sustainability issues. There is a need for comparable datasets on these issues, which may be used to inform policy decisions at EU level regarding island sustainability.
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Islands at the Periphery: Overview of key sustainability issues in European islands

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Executive Summary
Islands have been identified as areas of particular sensitivity in European land use contexts due to their isolation and generally small size. This survey spatially identifies European (EU25+5) islands and investigates key sustainability issues. Based on the SENSOR NUTS 0 map, 4,966 islands are identified, occupying 5.55% of EU25+5 land area. Island regions are found in 136 NUTS x units, and 25 of these are entirely made up of islands. 20 Spatial Regional Reference Framework categories contain islands. In order to identify key sustainability issues in EU25+5 islands a set of 28 study islands is identified and 12 key sustainable development issues identified on the basis of expert interviews. 16 sustainability indicators are selected to describe these issues from indicators suggested by interviewees, and SENSOR's Module 2 indicators that relate to the EU impact issues. A spatial dataset based on these indicators is constructed and to ascertain whether particular areas of greater pressure in terms of these variables exist, statistical spatial cluster analysis is performed. Two distinct clusters emerge: Northern Islands and Southern Islands. Southern Islands indicated strong clustering for all variables, indicating the appropriateness of locating the SENSOR Islands Sensitive Area Case study (SAC) here. The island state of Malta, which occupies a central position in the Southern Islands Cluster, is suggested as the Islands SAC. This study has faced major constraints relating to lack of harmonised data on sustainability issues for European islands, mainly due to their low NUTS classification. There is a need for comparable datasets on these issues, which may be used to inform policy decisions at EU level regarding island sustainability.

1 Introduction and Background

1.1 General comment

This research into key sustainability issues in European (EU25+5) islands forms part of the broader research activity carried out within the SENSOR project. It falls under Module 6, which is the testing of the Sustainability Impact Assessment Tools (SIAT) within the sensitive areas of Europe, namely islands, mountains, coastal zones and post-industrial zones. The objective of this island sensitive area survey is to delineate the geographical position and extent of EU25+5 islands and identify the sustainability issues in these islands, creating a spatial dataset of key sustainability indicators in order to identify clusters of greater concern for key variables, and thus to select an island sensitive area case study for the SENSOR project (Deliverable 6.1.1).

1.2 International and EU Policy Context

The problems faced by islands, particularly small island states, started to gain more importance between the late 1970s and the mid-1990s, where at regular intervals the UN Conference on Trade and Development (UNCTAD) and the UN General Assembly began to prepare reports and discuss official resolutions (Hein 2004; UNCTAD 2004). In April 1994, the first Global Conference on the Sustainable Development of Small Island development States (SIDS) was convened in Barbados. The conference adopted the Barbados Programme of Action (BPoA) that set forth specific actions and measures to be taken at the national, regional and international levels in support of the sustainable development of SIDS. In September 1999, the 22nd Special Session of the UN General Assembly undertook a comprehensive assessment of the implementation of the BPoA and called for concerted efforts to support its implementation.

The World Summit on Sustainable Development (WSSD) in 2002 reaffirmed the special case of SIDS and highlighted a series of SIDS-specific issues and concerns in the Johannesburg Plan of Action, adopted by the Summit. In a follow-up to the WSSD, the UN General Assembly (UNGA) adopted Resolution A/57/262, which i.a. called for a comprehensive review of the BPoA at a high-level international meeting, held in Mauritius in 2004. This marked the 10-year review of BPoA and produced the Mauritius Declaration which strongly restated the importance of the BPoA. Along with the BPoA, the Rio Principles, the full implementation of Agenda 21, the Johannesburg Plan of Implementation and the outcomes of other relevant major UN conferences and summits, including the Monterrey Consensus and the Millennium Development Goals, were reaffirmed as central in achieving effective sustainable development for SIDS.

EU legislation has also made special provision for islands. The EU generally distinguishes between three categories of islands: 1) islands that are whole or part of ‘overseas countries and territories’ (such as Greenland, French Polynesia and Bermuda); 2) the group of the French overseas departments, the Azores, Madeira and the Canary Islands, often termed ‘most remote regions’, which it considers an inherent part of the EU, the distinctive characteristics of which qualify them for specific treatment in various sectors such as transport and cohesion policy under the Treaty of Amsterdam; and 2) continental EU islands, which are recognised under various sectoral polices such as agriculture and fisheries as in need of special consideration.

The Treaty of Amsterdam in Part Four specifically focuses on the association with the Community of the non-European countries and territories that have special relations with Denmark, France, the Netherlands and the United Kingdom, as listed in Annex II to the Treaty. The purpose of association is to promote ‘the economic and social development of the countries and territories … to further the interests and prosperity of the inhabitants of these countries and territories in order to lead them to the economic, social and cultural development to which they aspire’ (Article 182).

The Treaty of Amsterdam also makes special reference to Europe's 'most remote regions' – the French Overseas Departments of Guadeloupe, French Guiana, Martinique and Réunion, and to the Atlantic archipelagos of the Canaries, the Azores and Madeira. The special circumstances of these most remote regions are taken into account in Article 299 '[h]owever, taking account of the structural social and economic situation of the French overseas departments, the Azores, Madeira and the Canary Islands, which is compounded by their remoteness, insularity, small size, difficult topography and climate, economic dependence on a few products, the permanence and combination of which severely restrain their development, the Council, acting by a qualified majority on a proposal from the Commission and after consulting the European Parliament, shall adopt specific measures aimed, in particular, at laying down the conditions of application of the present Treaty to those regions, including common policies'.

In addition, Articles 158 and 154 of the Treaty on Trans-European Networks and cohesion policy respectively, address islands more generally. Article 154 notes that the European Union 'shall take account in particular of the need to link island, landlocked and peripheral regions with the central regions of the Community' while Articles 158 states that '[i]n order to promote its overall harmonious development, the Community shall develop and pursue its actions leading to the strengthening of its economic and social cohesion. In particular, the Community shall aim at reducing disparities between the levels of development of the various regions and the backwardness of the least favoured regions or islands, including rural areas'.

EU Cohesion policy makes special reference to islands and other regions with 'handicaps': The preamble to Regulation 1080/2006, which lays out the rules for application of the European Regional Development Fund, indicates that this fund 'contributes to reducing the gap between the levels of development of the various regions and the extent to which the least favoured regions, including rural and urban areas, declining industrial regions, areas with a geographical or natural handicap, such as islands, mountainous areas, sparsely populated areas and border regions, are lagging behind.' It also states that the Fund should 'address the problems of accessibility to and remoteness from large markets confronting areas with an extremely low population density, …[and] … the specific difficulties encountered by certain islands, mountainous areas, border regions and sparsely populated areas whose geographical situation slows down their development with a view to supporting their sustainable development (italics added).

EU funding instruments associated with agriculture and fisheries also provide special conditions for island regions. Regulation 1698/2005, which supports rural development through the European Agricultural Fund for Rural Development (EAFRD) indicates special provisions should apply 'to mitigate the specific constraints and structural problems in farming and forestry activities and in adding value to agricultural and forestry products as a result of remoteness, insularity or distant location and of the dependency of the rural economy on a limited number of agricultural products, and to promote a robust rural development policy' (Article 60). In the case of intensity of aid for modernisation of agricultural holdings: higher ceiling up to 75% support for the outermost regions and the smaller Aegean Islands (Article 26). Similar concessions are made regarding the maximum rate of support for adding value for agricultural products. There are no size limitations for the Azores, Madeira, the Canary Islands, the smaller Aegean Islands. Higher aid intensity percentages are permissible in outermost regions and in the smaller Aegean Islands (Article 28). The smaller Aegean islands are specifically noted. Also forestry support ownership limitations do not apply for tropical forests and to the wooded areas of the territories of the Azores, Madeira, the Canary Islands, and the smaller Aegean Islands (Article 40). On the Fund contribution to the Rural Development Programme, higher ceilings apply to the outermost regions and the smaller Aegean Islands (Article 70). Also in the aid of support per hectare, in the case of Malta, the Commission may set a minimum amount of aid for sectors of production in which total output is extremely small (italics added).

In terms of fisheries policy, the Commission proposal for a regulation on a European Fisheries Fund (COM (2004) 497 final) provides higher ceilings for outermost regions and outer Greek islands, which are described as 'under a handicap due to distant location'. Yet, as is demonstrated later on in this paper, despite the high policy profile of European islands, there is little harmonised data available on the basis of which to assess the progress or otherwise of Europe's islands towards sustainable development (italics added).

1.3 Review of principal sources on island studies

The sustainability challenges faced by small island states have repeatedly been emphasised through studies and UN policy initiatives. A summary of the literature on the special characteristics of small island states is provided in Table 1.

Table 1 Characteristics of Small Islands States

Environmental: Proneness to natural disasters; Fragile and rare ecosystems, which as closed systems, have a low level of resistance to external shocks; Long coastline makes islands more vulnerable to erosion; Urbanisation of coast means locals are often unable to have visual access to the sea; No hinterland to which unattractive activities may be displaced.

Social: Factionalism and sharper social cleavages - issues are perceived in 'black and white' terms; Loss of educated elite through emigration; High rates of emigration; Highly personalised relationships - this might increase a sense of agency.

Governance and Politics: Large pervasive government which is more 'expensive' on a per capita basis; Dependence on government yet suspicion of its motives; Economies are often made by limiting the size of governing structures: most small islands are governed by uni-cameral legislatures (where there are two chambers, one usually represents a chamber of traditional rulers); Distinctions blurred between administrative and political roles, creating tensions between the general (political, legal or administrative principle) and the particular (affective, relational, context-dependent); Importance of personalities in politics and in institutions, which are often dominated by particular individuals; Political stability; Good human rights record and genuine democratic practices; Issues clearer, informational feedback faster and often able to respond more flexibly to external events; Stronger national solidarity (although factionalism works against this tendency); Some of the last to achieve independence, due in part to strategic importance and partly due to their need for material support from the colonial power; Less vulnerable in terms of military threats than is generally supposed, but benefit from formal sovereignty and easing of global tensions.

Economic: High import context in relation to GDP; Dependence on external trade, which is higher for smaller populations; Vulnerability to external events; Less scope for independent macro policies; Tend to be price-takers; Less diversified economic structure; Inability to enjoy economies of scale; Difficulty with encouraging new industries through import substitution, and a tendency towards oligopolistic and monopolistic organisations; Poor natural resource endowment; Dependence on international aid; Remittances from abroad often provide significant support for local economy; Moderate prosperity; Relatively small agricultural sectors; High transport costs; Lack of skills could make small nations dependent on foreign consultants; Constraints in transport and communications; Distance from market centres.

Touristic: Economic importance of tourism to micro-states (in at least half these islands, tourism accounts for more foreign exchange earnings than gross exports put together); Dependence on 'landscape' tourism, often related to presence of picturesque coastal landscapes and climate, and 'getting away from it all' feeling; Mixed social and environmental impacts: foreign owned infrastructure, steep increases in land prices and land speculation, seasonal unemployment, coastal development, increased traffic and waste generation, and high levels of water consumption; Exposure to highly competitive international tourism industry, and the concentration of climate and beaches as selling points, which downplays spatial variation.

Source: Camilleri 2001 (adapted from: Baldacchino, 1992; Beller, 1986; Briguglio, 1995; Briguglio and Briguglio, 1996; Briguglio and Kaminarides, 1993; Dommen, 1980; Dommen and Hein, 1985; Farrugia, 1993; King, 1993; Lemon, 1993; Streeten, 1993; Tisdell, 1993; Warrington, 1994).

European islands also face several challenges in relation to smallness and remoteness. They suffer from lack of economies of scale, high transportation and communication costs, and costly public administration and infrastructure (Eurisles 1997, 2002). Despite a number of studies about 'backwardness' related to development in European islands (Eurisles 2002, Planistat 2002 and

Eurostat 1994), research into the particular sustainability challenges of European island has not yet been carried out.

At European level, three major studies have been carried out on island development, and these provide a useful backdrop to this survey. 'Portrait of the islands', published in 1994 by Eurostat and the DG Regio, represents an attempt to give a detailed spatial identification of the islands of the 10 member states that have island territories. Islands that are host to national capitals and those linked to the mainland by a bridge are not dealt within the report. The remaining islands are described with the help of maps and statistical indicators. The aim of this publication is to 'foster the desire felt by these island-dwellers to get to know each other, develop closer links and play a full and active part in the European adventure'. Although the publication provides detailed geographical information and presents population and tourism indicators, it did not directly address the wider sustainability issues, nor investigate the availability of data on sustainable development in islands.

In 2002 the Eurisles publication 'Off the coast of Europe', which was supported by the Conference of Peripheral and Maritime Regions, reaffirmed the concept that although islands are considerably diverse, they also share specific social, economic and environmental problems. These common issues represent various structural constraints that result in multiple consequences, such as a below average GDP per capita and higher cost of living due to insularity. Small size of markets and weaker competition result in lower wages and reflect the lower living standards present on islands. The exceptional environment of islands is often threatened by the seasonality of the tourism industry and the vulnerability to climatic and seismic events, apart from their being more exposed to environmental disasters. These vulnerabilities are compounded by other difficulties such as the fragmentation of territories due to mountains and poor accessibility. The study also enters into the effectiveness, or otherwise, of EU polices in respect of islands and the impact of certain policies on European islands. EU state and regional aid and agricultural and fisheries aid do not always favour islands because island dimensions are not always taken into consideration, when it comes to planning or designing polices. Furthermore, the liberalisation of transport services during the 1990s has resulted in various difficulties when applied to island transport.

The Eurisles study proposes that 'a new deal must be struck between the EU and its islands', also in the light of the then enlargement of the EU to the ten new member states. It notes that the manner in which EU policies are designed and implemented is significant for island regions and differences in island regions should be considered. The Eurisles study also mentions the need to use appropriate indicators to help monitor policies. It insists on the necessity to regard islands as a distinct space in EU statistics and in the EU policies drawn upon them. It also calls for maintaining the solidarity effort in the structural policies and revising state aid systems.

In June 2002, an important DG Regio-funded study entitled 'Analyse des regions insulaires de l'Union européenne' (Survey of insular regions of the EU) was published (Planistat 2002). The report consists of three parts: two reports focussing respectively on continental and outermost (ultra-périphériques) islands, and an Annex containing data tables and some discussion thereof. The first of these three reports focuses on continental islands in EU15 plus Estonia, considers the Spanish African territories of Ceuta and Mellila as islands, and excludes the Atlantic archipelagos of the Azores, Madeira and the Canaries, as well as the French Overseas Departments and any EU overseas territories and countries. Nevertheless the findings are of interest to the present research.

The objective of the Planistat study on continental islands is to analyse 'measures and policies undertaken by the European Union and Member States to remedy any backwardness caused by being an island.' (p.8). Accordingly, based on reports on islands prepared by the European

Parliament (EP 1998), ECOSOC (2000), and the Committee of the Regions (CoR 2002) the study identified 15 island problems that characterise 'backwardness' - although the report notes that this term is not unproblematic since islands do not all suffer from the same forms of insularity. These are: isolation from the mainland, higher costs of sea and air transport, communications and infrastructure, restricted usable land area, limited fisheries resource, restricted water supplies, restricted sources of energy, marine and coastal pollution, difficulties in waste management, falling population, coastal erosion, the shortage of a qualified workforce, absence of a favourable economic climate for business, difficulties in access to health and education services, small size of local market, and poor economic diversification.

This study first examines policy problems, policy approaches, examples of best practice and policy impacts for these island problems, based on EU and national policies aimed at overcoming island insularity. One of the first challenges noted in this part of the study was 'obtaining reliable statistics and ... finding impact studies of policies'. The report concludes with a number of observations: 1) that 'in studies of best practice, the impression can be given that faster progress is being made in reducing insularity than is actually the case', thus it is not simple to come to firm conclusions about policy effectiveness in islands; 2) 'the benchmarking exercise … gives a strong impression about the differences between islands and island groups' (3) the problems faced by the SME sector were particularly significant, as islands' SME sectors tended to be larger than in other territories (4) the study team agrees with the claim in the Second Cohesion Report that 'island regions will experience natural handicaps due to their location' (5) that 'much more accurate statistics need to be available from island areas to judge the severity of the problems' as well as for benchmarking measures and assessing policy impacts; (6) since policy impacts in islands take longer to emerge, this must be taken into account in policy impact studies.

The second part of the Planistat study concludes that EU policies can have impacts on islands in five ways: (1) by directly aiming at alleviating the problems of islands (cohesion and transport policies); (2) by applying across the whole EU with some limited territorial element (agriculture and fisheries, environment and cohesion fund); (3) by applying across the whole EU with little territorial element (competition and state aid); (4) by applying across the EU with no island priority but benefiting the islands (energy, research, information society, and public health); and, (5) within emerging areas of EU policy that may potentially assist the islands (employment – growing local dimension).

This second part of the Planistat study raises a number of issues about current EU assistance programmes as per the five types of policy described above: (1) Given that many EU islands are Objective 1 regions in terms of structural funding, but that a number are in the transitional phase to Objective Two status or have already achieved it – does the current statistical mechanism for assigning status - based on GDP, which is not easy to calculate for small populations - take account of the specific island problems? Are the current measures suitable for increasing regional competitiveness and impacting island development?; (2) Agricultural and fisheries production and the implementation of EU environmental legislation may be more expensive in island regions due for example to higher transport costs and higher concentrations of valuable environmental features such as inshore marine areas, and higher biodiversity; (3) The move to harmonise the relaxation of competition and state aids policy for islands with structural funding status may have negative impacts – the relaxation of state aid restrictions in islands should not be to give them any competitive advantage but should allow them to operate on a level playing field with mainland regions; (4) as the EU develops new policy initiatives such as in the field of employment, it is important that the situation on islands is taken into account; (5) there is a strong case for a financial instrument for islands and island regions in the new structural funding regulations in the form of a community initiative such as INTERREG, targeting regional competitiveness via two elements: funding for specific projects on islands; and a transitional

element for exchange of best practice. Any selection criteria should extend beyond GDP as this is an unreliable indicator for smaller islands. However any possible instrument must be based on criteria, so the need to promote collection of comparable statistics for eligibility assessment becomes a fundamental issue in any policy to address the 'backwardness' of islands due to remoteness.

Apart from research and policy that looks at island characteristics at UN or EU level, a number of researchers are attempting to understand more specific development issues in islands (Arnell 2005; Briguglio and Cordina 2004; Briguglio 2004; Baldacchino and Milne 2000; Hein 2004). Growing numbers of studies and specific projects, particularly at United Nations and Commonwealth level, have also contributed towards greater understanding of sustainability issues in islands, but this remains a relatively new area of research in the European context. This places the present research in an arena of innovation where island sustainability concepts need to be adapted for a European context, and studies from political economy need to be adapted to take sustainability into account. Many authors have discussed the problem of insularity and ultraperipherality (Planistat Europe 2002; Eurisles 1997; Briguglio 1992), highlighting the vulnerability of islands compared to mainlands. In view of the perceived structural and institutional weaknesses of small island states, and the fact that traditional economic indicators such as GDP are unable to capture these weaknesses, the UN has supported the development of an Economic Vulnerability Index. This is "a measurement of the lack of economic resilience arising from the relative inability of a small island state to shelter itself from forces outside its control" (Briguglio 1995), despite relative economic prosperity relative to other 'developing' countries. The index is a composite of three variables: exposure to external economic conditions; insularity and remoteness; and proneness to natural disasters.

Nevertheless, this portrayal of islands as vulnerable places has been disputed, for example by Bayliss-Smith et al. (1988) who draw attention to the social resilience of islanders. On the economic side, Streeten (1993) usefully distinguishes between self-reliance and self-sufficiency: foreign trade may be organised so as to integrate a small country into a diverse range of economic and social processes, which can actually reduce its overall vulnerability. Certain comparative advantages have enabled some islands to develop social or economic mechanisms favourable to their populations (Baldacchino and Milne 2000; Eurisles 1997; 2002), particularly in the European context. Interestingly however, it has also been pointed out that it is difficult to measure island specificities for example linked to the rarity of their natural resources, their ecological fragility, their transport over costs or their degree of dependence on the market economy, simply because many of these characteristics are so unique, and thus difficult to compare with conditions in other, larger, territories (Eurisles 1997).

Given the fact that a large number of small states are also island states, competitiveness strategies for small states (Briguglio and Cordina 2004) have also attracted considerable attention. Competitiveness is a matter of importance for small states because of their particular vulnerabilities and handicaps. Some small islands states such as Iceland or Aland have performed remarkably well, prompting some analysts to argue that smallness may actually be an advantage, but a deeper analysis would indicate that the economic success of some small states resulted in spite of and not because of their size (Briguglio 2004). Therefore, emphasising the role of competitiveness for islands is significantly important, and has effects in the environmental, social and economic sphere, particularly in a fast growing globalised economy. The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure is also addressed. Resilience is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures. In small states, and in many instances in islands, the issues of resilience is of a major importance given that such States (or islands) tend to be

highly exposed to external shocks (Briguglio, Cordina and Kisanga 2006). Most authors agree on the fact that economic resilience does not depend on economic factors only. Good governance, social cohesion and environmental management are also assigned major importance as contributors to economic resilience building.

It might therefore be more accurate to view islands as part of the 'pampered periphery' rather than isolated, marginal and depressed (Bayliss-Smith et al. 1988). For example, small island developing states receive more per capita foreign aid than other developing countries, partly because of their strategic importance to larger powers (Briguglio 1995). In fact, as Baldacchino (1992: 39) points out, there are "both economies and dis-economies of scale", and the evidence shows that micro-states tend to prosper, particularly when they have close relations with wealthier nations. Baldacchino makes a convincing case that small islands have their own set of development strategies that are at odds with both neo-liberal and dependency theories of development. He shows that successful small islands are pragmatic, flexible, opportunist, mendicant and ready to survive off rentier economies.

The political economy of sub-national island jurisdictions has also been analysed in the light of how jurisdiction has been utilised to obtain specific socio-economic advantages, including for example opting out of EU membership (Baldacchino and Milne 2000). The social, economic and environmental aspects of peripheral islands in Europe (Planistat 2002) are also aspects which are being debated constantly by policy and research communities involved in island sustainability studies. In the literature, sustainability is often used as a conceptual and analytical framework to link different environments, timescales and geographical scales and highlighting island similarities. Given the very sensitive geographical position that islands occupy, including the growing concerns for the consequences of climate change (rising of sea levels, loss of biodiversity, reduction of tourist activities, among others), several studies and research activities have been published in recent years (Nigel Arnell et al. 2005) to address this issue. Considering also the special conditions that islands experience in the administrative and economic sphere (Briguglio 1992) indicators have been applied to study specific problems that occur more frequently or are very particular to islands (ISSI 2002; Camilleri 1997).

After having reviewed some of the conceptual issues related to the study of sustainable development in islands, the methodology used in this research is described in the next chapter. Subsequently the findings of the research are presented and discussed also in the light of the selected sustainable development indicators identified for European islands. The conclusions summarize the major findings and outline directions for future research.

2 Materials and Methods

The methodology used in this survey follows the agreed SENSOR Module 6 protocol for Deliverable 6.1.1 which is to be used for the surveys coastal, post-industrial, mountainous and island sensitive regions. The protocol is reproduced below:

(1) Geographical identification of Europe's sensitive coastal areas, islands, mountainous regions, and post-industrial zones, preferentially at a NUTS x spatial level;

(2) Literature review to identify sustainability issues and data sources e.g. based on CORINE land cover, Eurostat and EEA reports;

(3) Assessment of secondary data availability and the evaluation of the necessity of primary data;

(4) Data collection on key issues in sensitive areas, based on the impact issues identified by the European Impact Assessment Guidelines (CEC 2005);

(5) Consultation with relevant stakeholders with regard to their view on sustainability issues in sensitive regions throughout Europe;

(6) Simple web-based questionnaire to collect qualitative and (semi)quantitative assessment of key sustainability issues;

(7) Statistical analysis and clustering of sensitive regions based on available indicators to create classes of coastal areas, islands, mountainous regions, and post-industrial zones with similar environmental, social and economic characteristics;

(8) Generation and interpretation of maps with key issues of sensitive areas;

(9) Drafting of four sub-surveys;

(10) Compilation of sub-surveys into a final report for the 4 sensitive areas types in SENSOR; and

(11) Integrated and comparative analysis of key sustainability issues across sensitive area types and against a standard, e.g. European average.

The island survey followed the steps outlined in this protocol, adapting each to the nature and challenges facing the islands survey. In line with step 1, European (EU25+5) islands were spatially identified. A literature review was conducted but found to be lacking firm conclusions with respect to sustainability issues in European Islands. An assessment of secondary sources therefore indicated that primary data on sustainability issues would have to be gathered. This was done by interviewing sustainability experts in a set of representative study islands. In order to discuss the sustainability issues identified further, indicators of EU island sustainability were developed and quantified as far as possible. A web-based questionnaire was not considered necessary given the detailed expert analysis carried out. Also consultation with a range of stakeholders was not possible given the many island communities addressed in the study – this type of consultation will be carried out in the Sensitive Area Case study (Work Package 7.3). Statistical analysis and clustering identified areas of greater concern for island issues. Maps illustrating the sustainability indicators were prepared and this present paper drafted as the island sensitive area sub-survey.

2.1 Geographical identification of EU 25+5 islands

The first step of the agreed M6 protocol was to identify the location and spatial extent of EU25+5 islands. Due to their clearly defined geographical limits, unlike the case for other sensitive areas, island regions could not be defined at NUTS x scale. This is because NUTS x units often contain both insular and non-insular land areas.

Islands were therefore identified on the basis of their geographical boundary rather than on NUTS x boundaries. The starting point for the analysis was the NUTS x map, which contains neither any island 'overseas countries and territories' belonging to EU25+5 countries outside the European continent nor the French Overseas Departments. However, although the Norwegian archipelago of Svalbard is not included in the NUTS x map it is a European island and therefore must be added to the list of EU25+5 islands.

The islands were identified by carrying out a GIS operation that removed the European mainland, leaving only islands and island regions. Where it was known, as in the case of the many Danish islands that lie close to the mainland, that islands are connected to the mainland with a bridge, these islands were removed from the dataset. The source of the information about islands connected to their mainland with a bridge is the extensive 'Portrait of the Islands' study published in 1994 by Eurostat in partnership with national statistics agencies, which however only covers EU12. A small number of inland islands within lakes were generated as slivers through polygon combination error, and were manually cleaned from the dataset as far as possible. Polygon anomalies such as Vatican City and Monaco were also removed from the list.

2.2 Selection of 28 study islands for identification of key sustainability issues

Due to the lack of existing studies and policy documents focussing on European islands' sustainability issues, the methodological approach utilised to identify key sustainability issues across European islands was to identify a representative sample of study islands and carry out expert interviews identifying key issues for each study island. A set of 28 representative islands and archipelagos was selected for detailed investigation. The NUTS x island regions of EU25+5 were not chosen as study islands because this would have made the sample biased against smaller islands or archipelago that have less political autonomy, and also biased in favour of southern European islands, which tend to be larger, with greater autonomy. In what follows, the selection process for choosing the set of islands is outlined.

The starting point for selection the study islands was the islands identified in the 1994 'Portrait of the Islands' study (CEC 1994). This study identified a set of approximately 450 inhabited European islands that includes all European islands that are not a host to a national capital and

not linked to the mainland by a bridge. However this study was restricted to EU12 (see footnote 1). Since the SENSOR island survey must cover the current EU25+5 countries (i.e. including Romania, Bulgaria, Norway, Switzerland and Iceland), European islands from Sweden, Finland, Norway, Iceland and Estonia were considered as candidates for the set of study islands. The island states of Malta and Cyprus were also included, since these small island states experience island sustainability issues to an even higher degree that other islands due to lack of support, particularly economic support, from a 'mainland'. However island states such as Ireland and the UK, which are not considered small island states at UN level (Hein 2004) were not included in this survey. Furthermore, it was considered that islands far removed from the European continent such as the French, Dutch and British overseas territories would not be covered in the study due to the fact that their bio-geographical situation differs considerably from the islands within the European continent. This criterion also excludes Greenland, in line with the decisions made in drawing up the NUTS x map.

In the light of the considerations mentioned above, a set of islands for detailed investigation was drawn up on the basis of the following criteria:
1. For each of the EU 25 +5 that have islands, at least one major island or island group was included;

2. The major (in terms of population and size, and political importance such as a high degree of political autonomy) European islands or island groups were included (e.g. Sicily and the Aland Islands)

3. A selection of both large islands and archipelagos were included (e.g. the Balearic and the Aland Islands as well as larger islands such as Sardinia and Crete)

4. Islands from both northern and southern Europe were included, as well as those in the Atlantic, in order to ensure a balanced geographical distribution of islands.

5. Islands that are both close to the mainland (such as the Tuscan archipelago), as well as ones far from the mainland (such as the Shetland Islands and Pantelleria).

On the basis of the above criteria, the set of 28 study islands and archipelagos presented in Table 2 was selected for detailed investigation. Fig. 1 presents this data in spatial form.

Table 2 Selection of 28 study islands

No	Country	Islands	NUTS Code	Discussion
1	Cyprus	Cyprus	CY	Since Cyprus is a small island state there is only one island and it was selected.
2	Denmark	Bornholm	DK007	Denmark is a land of 408 islands, of which 51 are inhabited. However by far the largest is Bornholm with approximately 45,000 people and an area of 580km^2. This has been selected. The Faroe Islands are also Danish, but have not been selected due to the presence of three other North Sea archipelagos in the selection. Greenland is not included since it is not within the European continental area.
3	Estonia	Saaremaa	EE00404	The two principal Estonian Islands are Saaremaa and Hiiumaa. Of these the larger island, Saaremaa, which has an area of 2,922 km^2 as opposed to Hiiumaa's 1,023km^2, has been included in the study.
4	Finland	Aland	FI2	Finnish Islands are made up of the Finnish Islands archipelago and the Aland Islands, both of which are included in the set of islands for the survey.
5		Finnish Islands Archipelago	Various	
6	France	Corsica	FR83	French continental islands consist of Corsica, the smallest of the French regions, (8,681km^2) and various small coastal islands on the Atlantic and southern coasts. Of these Corsica has been selected for inclusion in the study. French overseas island territories are not included since they are not part of the European continent.
7	Germany	East Frisian Islands	Various	The German islands are situated in the North Sea and the Baltic Sea. Of the three archipelagos of the East Frisian Islands, the islands of Schleswig-Holstein and those of Mecklenburg-Vorpommern, the East Frisian Islands have been included here.
8	Greece	Crete	GR83	The largest island in Greece is Crete, with an area of 8,336km^2 and a population of approximately 550,000. Greece also contains the archipelagos of the Ionian, the Northern and Southern Aegean, and about 40 small and medium-sized inhabited islets and islands scattered around the Greek mainland. Crete and the three archipelagos of the Ionian, the Northern Aegean and the Southern Aegean were selected.
9		Ionian	GR22	
10		N. Aegean	GR41	
11		S. Aegean	GR42	
12	Iceland	Iceland	IS	The island state of Iceland was selected.
13	Ireland	Irish Islands	Various	Of Ireland's 365 islands, most of which are off the west coast of Ireland, some 53 are inhabited. The Irish islands were considered as a group and all were included in the survey.
14	Italy	Sicily	ITG1	Italy's principal islands are Sicily and Sardinia, the two largest islands in the Mediterranean. These islands accounted for 11 percent of Italy's population in 2002.
15		Pantelleria	ITG11081	
16		Tuscan Archipelago	Various	Both of these islands were selected for this study. Besides these large islands, Italy also contains a number of smaller archipelagos: the Tuscan archipelago, the Ponziane Islands off Lazio, the Gulf of Naples islands, the Tremiti archipelago in the Adriatic, and the smaller islands surrounding Sicily and Sardinia. For this study the smaller Tuscan archipelago and the remote island of Pantelleria off southern Sicily were selected, in order to address both issues of smaller archipelagos and those of remote islands in the Mediterranean.
17		Sardinia	ITG2	
18	Malta	Malta	MT	The island state of Malta with its sister islands of Gozo and Comino were selected.
19	Netherlands	Western Frisian	Various	The seven West Frisian Islands of the Netherlands were selected.
20	Norway	Svalbard	n/a	Norway consists of a large number of islands. However the 62,700km^2 Svalbard archipelago, Europe's northernmost territory, is relatively remote from the mainland, and has been selected here as an example of an Artic archipelago. It lies only 1,000km from the North Pole and two thirds of its land area is covered by glaciers.
21	Portugal	Azores	PT2	Portugal contains two island archipelagos: the Azores (9 islands, 1,527 km^2) and Madeira (4 islands, 797 km^2). Both of these are autonomous regions with their own Parliamentary assemblies. Of these archipelagos the larger archipelago of the Azores was selected for the survey.
22	Spain	Balearics	ES53	Spain's principal islands lie within the Balearic and Canary archipelagos, both of which were selected. Minor islands off Galicia in the North and Alicante in the South were not included.
23		Canaries	ES7	
24	Sweden	Gotland	SE094	Sweden possesses numerous small islands; however Gotland is the largest island with a land area of 57,000 km^2 and a population of 57,000. Gotland was selected.
25	UK	Guernsey	n.a	The UK contains many islands and archipelagos, from the Channel Islands (not part of the EU) and Isles of Scilly, the Isle of Wight in the South, the Isle of Man in the Irish Sea, the numerous Scottish archipelagos and islands including the Shetland and Orkney Islands to the Northeast and the Outer Hebrides. To cover both northern and southern British Isles, Guernsey, and the Outer Hebrides, Orkney and Shetland Islands were included.
26		Hebrides, Outer	Various	
27		Orkney	UKM45	
28		Shetland	UKM46	

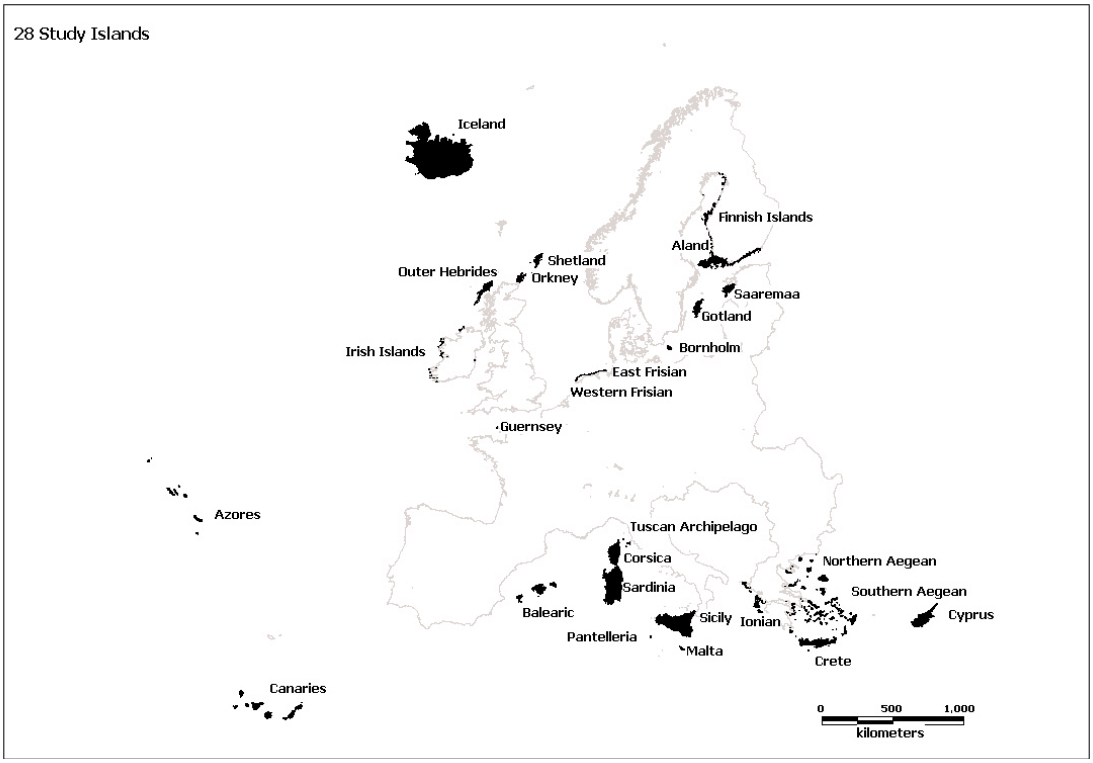


Fig 1 Set of 28 study islands selected for more detailed examination (note: Svalbard not in map but also one of study islands)

2.3 Identification of key issues for EU25+5 islands

Notwithstanding the growing literature addressing the issues analysed in this survey, lack of secondary sources was a severe constraint for this research. Furthermore, data is fragmented and indicators not harmonised. This lead to the choice of using primary data collection via telephone interviews with experts identified through the literature and various specialised networks such as the United Nations partnerships SUSTIS, the (European) Islands Commission, the Global Islands Network, and Eurisles. Experts were identified on the basis of their knowledge in the field of sustainability issues and/or expertise in relation to the islands that are the subject of the interview. The following table lists the experts interviewed for each study island. The expert interviews were carried out on the basis of semi-structured telephone interviews lasting between 30 and 45 minutes. When possible expert interviews were carried out face-to-face during international conferences and meetings, but this was only possible in a few cases. The first questions concerned identifying sustainability issues and the main indicators associated to the issues mentioned. Any potential influence on the issues by existing or pipeline EU polices was also examined. These questions were followed by one that explored how the EU might best (and least) help the islands under discussion to promote sustainability.

Table 3 Experts interviewed for 28 study islands

Expert No	Country	Islands	Name	Position/Background
1	Cyprus	Cyprus	Nicos Georgiades	Director, Environment Service, Ministry for the Environment
2	Denmark	Bornholm	Henrik Eybye Nielsen	International Consultant
3	Estonia	Saaremaa	Ulo Mander	Professor of Geography, University of Tartu
4	Finland	Aland	Helena Blomqvist	Environment and legislative expert
5		Finnish islands Archipelago	Mikael Nordström	Coordinator, Archipelago Sea Biosphere Reserve
6	France	Corsica	Michel Biggi	Director, Eurisle
7	Germany	East Frisian	Annemarie Lübcke	Sustainable development expert, Regionalbüro Uthlande
8	Greece	Crete	Harry Coccossis	Executive secretary for Tourism, Greek Ministry for Tourism and Professor of Spatial and Environmental Planning
8		Ionian	Harry Coccossis	Executive secretary for Tourism Greek Ministry for Tourism and Professor of Spatial and Environmental Planning
9		Northern Aegean	Ioannis Spilanis, Harry Coccossis	Professor of Geography and Environmental Planning Sector, Executive secretary of Tourism Greek Ministry for Tourism and Professor of Spatial and Environmental Planning
9		Southern Aegean	Ioannis Spilanis, Harry Coccossis	Professor of Geography and Environmental Planning Sector, Executive secretary of Tourism Greek Ministry for Tourism and Professor of Spatial and Environmental Planning
10	Iceland	Iceland	Danfríður Skarphéðinsdóttir	Head of Division, Ministry for the Environment
12	Italy	Sicily	Francesco La Camera	Former Director-General of the Sustainable Development Department, Italian Ministry for the Environment
13		Pantelleria	Giuseppe Bellanca	Architect, Expert on land use
14		Tuscan Archipelago	Marino Garfagnoli	Responsible for environment for the local government of the Island of Elba
15		Sardinia	Antonio Dessi'	Regional Minister for the Environment
	Malta	Malta	Data from Malta case study	Data from Malta case study
16	Netherland	Western Frisian	Arthur Oosterbaan	Biologist, Responsible of the Research Centre ECOMARE
17	Norway	Svalbard	Arvid Viken	Dept of Tourism Finmark College Norway
18	Portugal	Azores	Helena Calado	Geographer, University of the Azores
19	Spain	Balearics	Carles Manera	Professor of Economics, University of the Balearic
20		Canaries	Carlos A. Legna Verna	Professor of Economics, University of La Laguna
21	Sweden	Gotland	Lena Kulander	Expert in the Regional Environmental Agency of Gotland
22	UK	Guernsey	Patrick McAlpine	Advisor on Sustainability issues
23		Hebrides, Outer	Frank W. Rennie	Head of Research and Development, Lewis Castle College
24		Orkney	Graeme Robertson	Coordinator Global Islands Network
24		Shetland	Graeme Robertson	Coordinator Global Islands Network
25	General	European islands	Lino Briguglio	Professor of Economics, Head of the Department of Economics, Director of Islands and Small Island States Institute, University of Malta and Director of Gozo University Centre
26		European islands	Godfrey Baldacchino	Canada Research Chair in Island Studies, Professor of Sociology, University of Prince Edward Island, Canada and University of Malta

A question about the future of the islands was then posed, in order to highlight important trends. Finally, the issue of peripherality was investigated and finally respondents were encouraged to offer general comments or final remarks about the SENSOR project. A total of 26 experts were interviewed, some answering for more than one island. Two world-renowned experts were also interviewed in the light of their contribution to the study of island issues. Issues for Malta were derived from the expert interviews carried out in the preliminary states of the Sensitive Area Case Study, conducted under Deliverable 7.3.1.

2.4 Identification of sustainability indicators for EU25+5 islands

From the standard SENSOR Module 2 list of indicators and from the indicators listed during the expert interviews, a list of 143 indicators was prepared. In order to select sustainability indicators specifically directed at measuring the sustainability issues of islands, this list was related to the key sustainability issues identified for the islands (Appendix 1).

These 143 indicators were then assessed on the basis of two criteria: (1) Is the indicator an M2 indicator? and (2) How closely does this indicator describe the island' sustainability issue(s)? The two criteria were weighted so that the first received a weighting of one and the second a weighting of three points. The reason for this is that only indicators that described issues were required, however those that both described issues and were Module 2 indicators were preferred. Indicators receiving total scores of 3 or 4 were selected as candidates for a short-list of 24 indicators, which was in turn assessed on two criteria: (1) Is data available for this indicator? (2) Has this indicator an accepted EEA, IRENA or other internationally recognized methodology for computation? (Appendix 2). Both columns were weighted equally and allocated 2 points. Indicators with two or three points were selected for inclusion in the final list. This list provided a final list of 16 indicators of island sustainability. The results from this selection process are noted in Section 3.3 (Table 9).

The next step was to quantify the indicators. Major difficulties were encountered here as comparable statistics across the islands (as noted above and in Planistat, 2002 and Eurisles 2002) were not available. The decision was then taken to use comparable data even if the coverage of the data was smaller (for example restricted to NUTS 2 level as is much Eurostat data), rather than build up datasets from the statistics of the individual islands. A spatial dataset based on these sustainability indicators was developed and used to organize the set of islands into distinct geographical clusters.

2.5 Clustering of Islands and choice of Sensitive Area Case Study

Cluster analysis was performed to identify relatively homogeneous groups of islands or archipelagos within the set of 28 Study Islands, based on those sustainability indicators chosen through this survey that could be computed for a range of islands, ensuring that all three pillars of sustainability were addressed. Cluster analysis was performed by K-means and correlation analysis between the input variables was performed to exclude those less important variables that were intercorrelated with key indicators. Through this process a number of the variables were removed due to intercorrelations.

Spatial clustering was adopted in this study due to its ability to analyse at 1 Standard Deviation all those islands that fall within each variable's spatial and tabular ranges. The results are based on the analysis of each variable employing K-Means where a 4 cluster run was requested at 1 Standard Deviation. Interestingly, for each variable, each resulted into two clusters, spatially distinct at North and South groupings. The spatial ellipsoid that categorises each of the groupings represents the figures at 1 Standard Deviation, thus the peripheries would be visually excluded. Should a study at 2SD be carried out the ellipsoids would encompass all the islands' territory.

3 Results and discussion

3.1 Geographical identification of EU25+5 islands

The total number of islands identified in EU 25+5 is 4,966, although the Norwegian Svalbard archipelago, with an area of 62,700 and containing 150 islands, is not (with the exception of the southernmost Bjornoya island [179km^2]), in the NUTS x map that formed the basis of this process, and must be added. These island territories occupy 265,500km^2 or 5.54% of the land area of EU25+5 (Fig. 2). If the Svalbard Islands are added these figures rise to 328,021 km^2 or 6.76% of the area of EU25+5. In terms of all the countries of Europe (including those not in the EU), islands occupy 2.68% of the land area, or 3.31% if Svalbard is included.

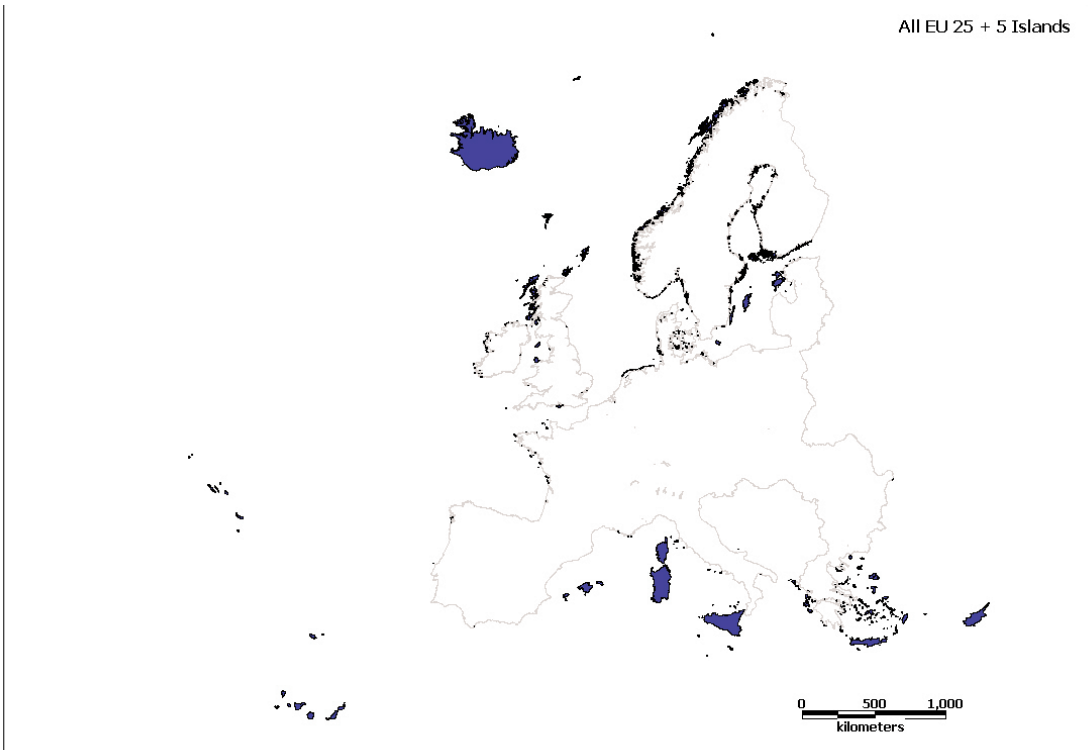


Fig 2 Islands across EU25+5

Island regions are found in 136 NUTS x units (Fig. 3). Some of these NUTS x units are made up entirely of islands. These are 25 (actually 23 islands/archipelagos since Corsica and the Canaries are made up of two NUTS x units): Balearic Islands, Canary Islands, Gotland, Bornholm, Balearic Islands, Corsica, Aland, Bjornoya (the southern most island of the Svalbard archipelago), Channel Islands, Cyprus, Faeroe Islands, Gibraltar, Ionian, North Aegean, South Aegean, Crete, Isle of Man, Iceland, Sicily, Sardinia, Jan Mayen Islands, Malta, the Azores, and Madeira. The rest of the NUTS x units are occupied by islands to varying degrees - 63 of these NUTS x regions have less than 1% island territory; another 38 have less than 10% island territory; and 10 regions have between 11% and 36% (the Scottish Highlands and Islands) island territory.

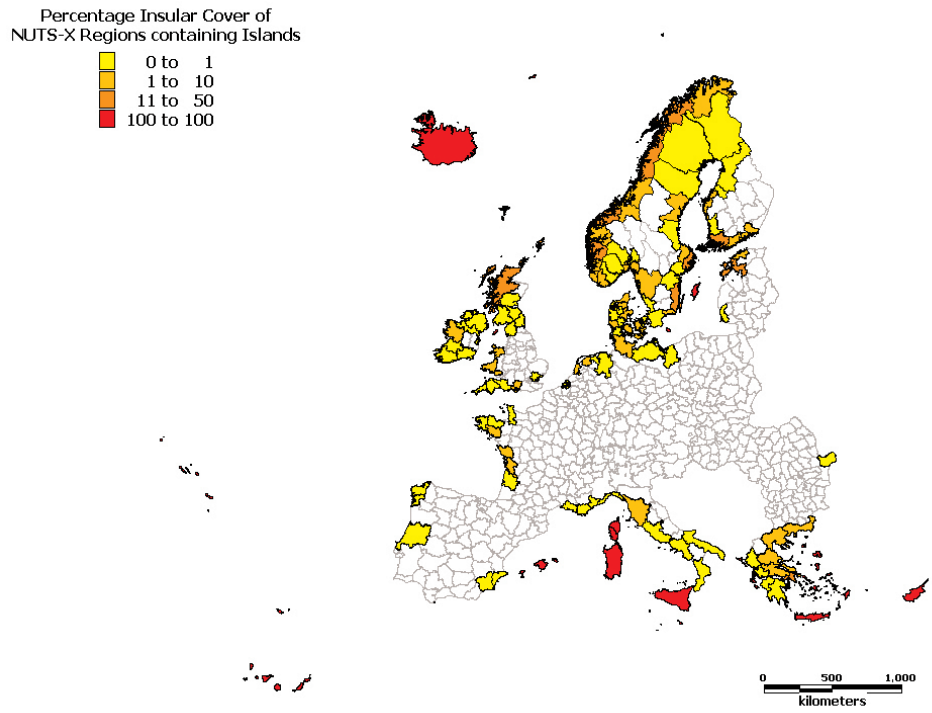


Fig 3 Percentage Insular Cover of NUTS x regions containing islands

Table 4 Insular coverage per Spatial Regional Reference Framework category

SRRF Category	Total Area of NUTS X units with this SRRF	Insular area (km²)	% Insular cover of SRRF Category	Number of islands (not archipelagos)
	128,288.64	125,459.63	97.79	144.00
01	145,311.50	34.73	0.02	8.00
03	227,745.61	40,543.57	17.80	229.00
04	414,978.86	1,300.65	0.31	30.00
06	77,270.79	25,727.55	33.30	19.00
08	183,620.21	17,664.44	9.62	89.00
11	11957.84	620.18	5.19	34.00
12	97,518.23	3,179.15	3.26	15.00
14	323.27	315.85	97.70	4.00
15	492,896.52	118.37	0.02	31.00
17	40,279.45	10.06	0.02	1.00
18	190,850.43	271.92	0.14	9.00
19	14,3720.34	23.05	0.02	10.00
20	109,145.31	1,002.62	0.92	102.00
21	184,065.42	241.72	0.13	38.00
24	121,865.61	1,820.36	1.49	127.00
25	152,951.20	11,683.47	7.64	257.00
26	134,148.94	8,972.07	6.69	838.00
27	627,671.09	4,582.64	0.73	1,407.00
29	46,624.40	1.85	0.00	5.00
30	424,422.79	21,850.49	5.15	1,569.00
	Totals	265,500.00		4,966.00

Source: SENSOR NUTS-X and SRRF data

In terms of the SENSOR Module 3 Spatial Regional Reference Framework (SRRF), a number of anomalies arise when the islands are spatially analysed by the 30 SRRF categories. A total of 12 islands or archipelagos have not been provided with an SRRF category. These are: the Balearic Islands, the Canary Islands, Bjornoya (Bear Island, Norway, the only Svalbard island in the NUTS x and SRRF maps), Channel Islands, Cyprus, Faeroe Islands, Gibraltar, Isle of Man, Iceland, Jan Mayen Islands (Norway), the Azores, and Madeira.

A total of 20 SRRF categories contain islands (Table 4), but some to a much greater extent – for example the Boreal categories 27 and 30 contain approximately 1,500 islands each (albeit with only 0.3 and 5.5 insular land cover respectively). The SRRF category that has the highest amount of insular land, as is to be expected, is the category for Malta, category 14 (MEDISL). However, its 97% coverage (rather than 100%) is anomalous and due to the slightly larger area than 315km^2 for the Maltese Islands that is indicated in the SRRF-NUTS-X spatial dataset. The next highest SRRF category in terms of insular land coverage is category 6 (MEDAGR). This category includes Mediterranean regions in France, Italy and Spain, with hills and mountains with crystalline and calcareous rocks. Most socio-economic conditions are similar to those of MEDISL. It is likely that northern and Atlantic islands do not feature strongly in these findings since many of them were not assigned SRRF categories.

3.2 Sustainability issues in EU25+5 islands

European islands display a wide range of characteristics with respect to certain key indicators such as size, population, wealth and climate. This has been widely documented (Planistat 2002; Eurisles 1997; 2002). However this does not detract from the overall argument that islands exhibit particular common challenges related to problems of size, remoteness, status and isolation that deserve specific policy attention, including creating or expanding related instruments, at EU and other scales. The major issues that emerged from the 26 expert interviews are listed in Table 5 and are discussed in Section 3.6. A total of 12 key issues emerged from the interviews. Of these certain issues were mentioned more than others. For example, extreme population dynamics was mentioned by almost 80 percent of interviewees, while education and training was mentioned by six interviewees in relation to only three islands. Since a large number of issues were mentioned, a cutoff point at 6 mentions was established, where there was a natural break in the responses, in order to close the list of key issues. However these other issues that received less than 6 mentions are also listed in Table 5.

Table 5 Sustainability issues in European islands

Key Issues	
Issues with number of mentions	Islands where issues were mentioned
1. Extreme population dynamics (19)	Guernsey, Balearic, Aegean, Ionian, Svalbard, Corsica, Finnish Archipelago, Irish islands, Outer Hebredies, Bornholm.
2. Low potential for economic diversification (16)	Guernsey, Shetland, Orkney, Azores, Aegean, Ionian, North Aegean, Tuscan archipelago, Pantelleria, West Frisian, Canary.
3. Negative impact of land development (16)	Saaremaa, Aland, Balearic Aegean, Cyprus, Tuscan archipelago, Pantelleria, Gotland, Malta, Outer Hebrides, East Frisian, Canary.
4. Marine Water Quality (13)	Iceland, Aland, Svalbard, Finnish, Tuscan archipelago, Finnish archipelago, Irish islands, Gotland, Sicily, Bornholm.
5. Water Status (13)	Aegean, Finnish archipelago, Tuscan archipelago, Pantelleria, Gotland, Malta, Sicily, Canary, Sardinia
6. Waste management challenges due to small size and remoteness (12)	Guernsey, Shetland, Azores, Aegean, Cyprus, Corsica, Tuscan archipelago, Irish islands, Gotland, Malta, Sicily, Sardinia.
7. Tourism pressures (12)	Balearic, Ionian, Finnish archipelago, Pantelleria, Gotland, Malta, Sicily, East Frisians, West Frisians, Canaries, Sardinia
8. Insularity and peripherality (10)	Azores, Cyprus, Pantelleria, Malta, Bornholm, Canaries, Sardinia.
9. Declining agriculture and fisheries (9)	Orkney, Cyprus, Corsica, Finnish archipelago, Irish islands, Bornholm.
10. Degradation of natural resources and loss of biodiversity (8)	Saaremaa, Iceland, Svalbard, Irish, Pantelleria, Malta, Sardinia.
11. High cost and impact of energy use (7)	Shetland, Balearic, Irish islands, Gotland, Malta, Sicily
12. Low levels of education and training (6)	Azores, Aegean, Malta.
Other issues:	
Climate change (4); Unemployment (3); Transport (2); Air pollution (2); Poor infrastructure (2); Coastal protection (2); Slow economic growth (1); High exposure to influences from outside (1); High dependency on imports (1); Small size (1); Extremeness (islands tend to experience extremes of many issues such as size, remoteness, climate, mono-sector economies, population density, etc) (1); How to operate and manage globalization (1); Social exclusion (1); Sustainability of social budget (1); High level of violence (1); Social polarization (1); Alcohol and drug abuse (1); Poor state of cultural heritage (1); Fires in forests (1); Cleaning up and rehabilitation of industrial or quarrying sites (1); Security of Oil Tankers (1); Housing in immigrant communities (1); Pollution due to industrial sites (1); Noise pollution (1); Intraregional imbalances between islands (1); Lack of understanding from the National and Regional Governments of the importance of sustainability issues (1); Misunderstanding in the population regarding tourism's high impact on environment (1).	

3.3 Impact assessment guidelines and sustainability issues in EU islands

This section addresses the relevance of the EU impact issues contained in the Impact assessment guidelines (CEC 2005) to European islands is presented. Table 6, Table 7 and Table 8 place each of the key island sustainability issues in the context of the EU impact issues, indicating that the impact issues are indeed general enough to cover all issues, however that some of the key island issues such as peripherality and competitiveness vis a vis the European mainland are only indirectly addressed. In terms of assessing the impacts of policy on sustainable island development, this is an important finding, suggesting that another impact issue on remoteness and peripherality could be added to the list.

Table 6 Comparison of Key Sustainability Issues for Islands with EU Impact Issues (Economic)

Impact issue	Key Sustainability Issue for EU Islands
ECO1: Competitiveness, trade and investment flows	Extreme population dynamics, Low potential for economic diversification
ECO2: Competition in the internal market	Extreme population dynamics, Low potential for economic diversification, Declining agriculture and fisheries
ECO3: Operating costs and conduct of business	Extreme population dynamics, Low potential for economic diversification
ECO4: Administrative costs on businesses	Extreme population dynamics, Low potential for economic diversification, Waste management challenges due to small size and remoteness
ECO5: Property rights	
ECO6: Innovation and research	Low levels of education and training
ECO7: Consumers and households	High Costs and Impacts of Energy Use
ECO8: Specific regions or sectors	Insularity and peripherality
ECO9: Third countries and international relations	
ECO10: Public authorities	Waste management challenges due to small size and remoteness, High costs and impacts of energy use
ECO11: The macroeconomic environment	Low potential for economic diversification
OTHER economic issues	

Table 7 Comparison of Key Sustainability Issues for Islands with EU Impact Issues (Social)

Impact issue	Key Sustainability Issue for EU Islands
SOC1: Employment and labour markets	Tourism pressures
SOC2: Standards and rights related to job quality	Tourism pressures
SOC3: Social inclusion and protection of particular groups	High costs and impacts of energy use
SOC4: Equality of treatment and opportunities, non – discrimination	
SOC5: Private and family life, personal data	Tourism pressures
SOC6: Governance, participation, good administration, access to justice, media and ethics	Insularity and peripherality
SOC7: Public health and safety	Insularity and peripherality, Tourism pressures
SOC8: Crime terrorism and Security	Tourism pressures
SOC9: Access to and effects on social protection, health and educational systems	Insularity and peripherality
OTHER social issues	

Table 8 Comparison of Key Sustainability Issues for Islands with EU Impact Issues (Environmental)

Impact issue	Key Sustainability Issue for EU Islands
ENV1: Air quality	Negative impact of land development, High costs and impacts of energy use
ENV2: Water quality and resources	Tourism pressures
ENV3: Soil quality or resources	Declining agriculture and fisheries; Degradation of natural resources and loss of biodiversity; Negative impact of land development
ENV4: The Climate	Marine Water Quality, High costs and impacts of energy use
ENV5: Renewable or non-renewable resources	Declining agriculture and fisheries; Degradation of natural resources and loss of biodiversity, Marine Water Quality, Negative impact of land development, High costs and impacts of energy use
ENV6: Biodiversity, flora, fauna and landscapes	Degradation of natural resources and loss of biodiversity, Negative impact of land development, Marine Water Quality
ENV7: Land use	Negative impact of land development, Tourism pressures, Waste management challenges due to small size and remoteness, High costs and impacts of energy use
ENV8: Waste production / generation / recycling	Waste management challenges due to small size and remoteness, Negative impact of land development Tourism pressures
ENV9: The likelihood or scale of environmental risks	Marine Water Quality, High costs and impacts of energy use
ENV10: Mobility (transport modes) and the use of energy	Insularity and peripherality, High costs and impacts of energy use
ENV11: The environmental consequences of firms´ activities	Tourism pressures, Waste management challenges due to small size and remoteness, High costs and impacts of energy use,
ENV12: Animal and plant health, food and feed safety	Marine Water Quality,
OTHER environmental issues Declining agriculture and fisheries	

3.4 Sustainability indicators for EU islands

In order to be able to discuss island sustainability issues in more depth and comparatively, a set of sustainability indicators has been developed, in line with the agreed protocol. This list, as noted earlier, was based on indicators suggested by interviewees and indicators proposed by SENSOR Module 2 to correspond with the EU impact issues as defined in its impact assessment guidelines (CEC 2005). Table 9 presents the final list of indicators for island sustainable development.

Although data availability in some cases was relatively poor (as noted also in Appendix 1), two indicators ('% land covered by Natura 2000 sites' and 'Compliance with Bathing Water Directive'), were left in the set as they related to highly significant issues which could not be better covered by an indicator. In two cases of difficult data access proxy indicators were used in this exercise, for which data may be more available, although it addresses the issue less well.

Table 9 Final list of 16 sustainable development indicators for EU25+5 islands

Issue No	Ind. No	Indicator Name	Proxy
1	1	Population density	
1	2	% of population above 65 years	
2	3	Employment by sector	
2	4	Unemployment rate	
2	5	GDP per capita (EURO/National currency)	
3	6	% land built up	% urban area of total (CORINE)
4	7	% Compliance with Bathing Water Directive	
5	8	Water abstraction rate (ground and surface)	Water abstraction rate for agriculture (IRENA)
5	9	Precipitation rate	
6	10	Municipal waste generation per capita	
7	11	Daily tourist population per square kilometre	
8	12	Virtual distance from centre of Europe (Eurisles study)	
9	13	% agricultural land use change	
10	14	% of land covered by Natura 2000 sites	
11	15	Energy consumption per resident population	
12	16	% of researchers in relation to active population	

In order to develop a spatial dataset for this research, the indicators were then quantified (maps in Appendix 3). Data was collected primarily from international databases such as that of Eurostat and the European Environment Agency. However in some cases coverage was thin, such as when it was only available at NUTS 2 level, and data had to be supplemented by data from island statistical publications. As much as possible, in order to avoid comparability errors, this was avoided. The spatial coverage of many of the datasets is therefore not wide for some indicators. Full coverage was only obtained for data available in raster format, such as the IPPC precipitation data and the EEA IRENA water abstraction for agriculture data, where values could be collected for small geographical regions. Comparable datasets for indicator 14 on Natura 2000 sites could not be located at the required scale. A major finding of this survey, therefore, which echoes the concerns raised in Planistat (2002) and Eurisles (2002), concerns the need to develop comparable datasets on sustainability issues, which may be used to inform policy decisions at EU level regarding the sustainable development of island regions.

3.5 Clustering of Islands and Identification of Sensitive Area Case study site

Once the island sustainability indicators had been quantified, a clustering exercise was carried out to identify areas across EU25+5 of greater concern. As noted in section 2.5, correlation analysis was carried on the 15 quantified variables, in order to ensure their mutual independence. Out of the 15 variables, it resulted that six variables were independent, and the complement could not therefore be considered for inclusion in the list of clustering variables. First, all five variables relating to 'population above 65 years', GDP, sectoral employment ('% services in total employment'), research and precipitation, were removed since they all correlated positively with unemployment rate. Next, modest positive correlations were found between '% Urban land use of total' and 'population density', and 'Energy consumption per resident population' and 'Municipal Waste Generation per capita'. Finally, there was a strong negative correlation between '% Agricultural land use change' and 'Unemployment Rate' and a slight negative correlation between bathing water quality and energy consumption.

The following independent variables were therefore used in the cluster analysis.

- Population density;
- Unemployment rate;
- Water abstraction rate;
- Daily tourist population per sq. km;
- Energy consumption per capita; and,
- Virtual distance from the centre of Europe (symbolised by Maastricht).

The clustering exercise that was carried out for the seven independent input variables resulted in clusters shown in Fig. 4. Two clusters emerge strongly, in Northern and Southern Europe. For two indicators, 'Daily tourists per square kilometre' and 'Energy consumption per capita', clusters did not appear in Northern Europe, and strong clusters emerged in the South. In the case of the energy variable, however, this is due to the poor data coverage in Northern Europe, where Eurostat NUTS 2 data only provided a figure for Aland. Despite the limitations of clustering on such small datasets, which may be skewed in favour of the more politically prominent islands of Southern Europe, which have higher NUTS classifications, and on the use of a limited number of six sustainability indicators out of the 16 indicators proposed, two clusters, with a stronger one in the South, do nevertheless emerge (Fig. 4).

These findings have been used to identify a case study area for the next phase of the SENSOR project. The island state of Malta was selected as a sensitive area case study (SAC) because it lies at the centre of the Southern Islands cluster, which was characterised by higher rates of clustering for all six variables.

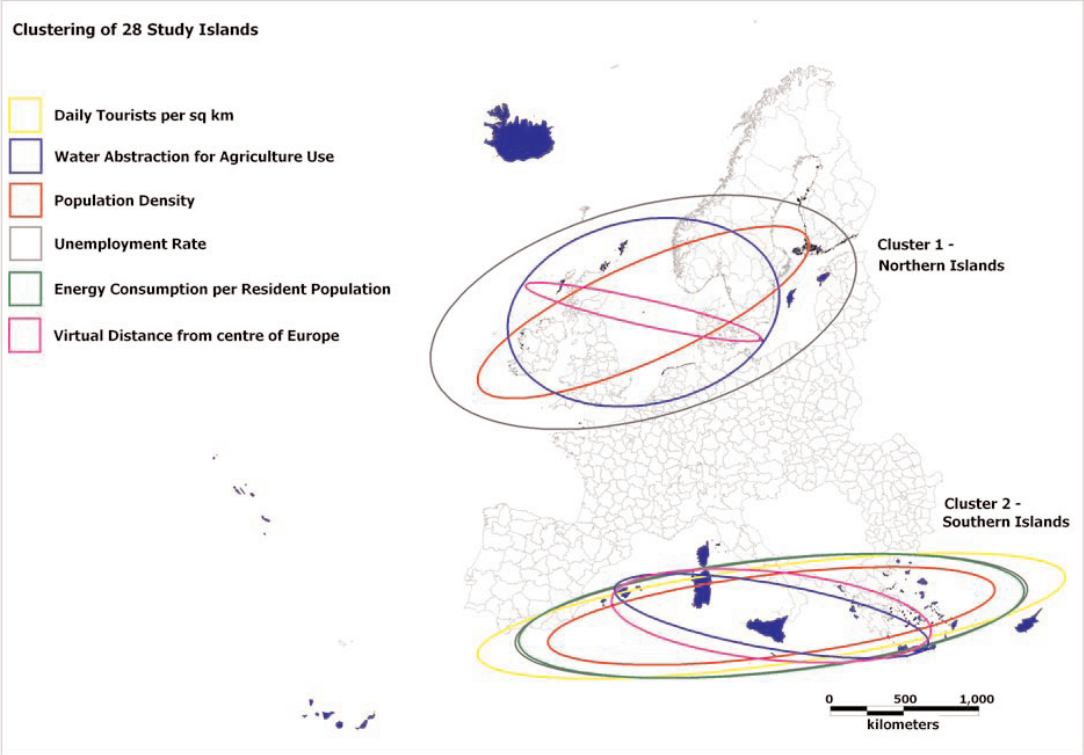


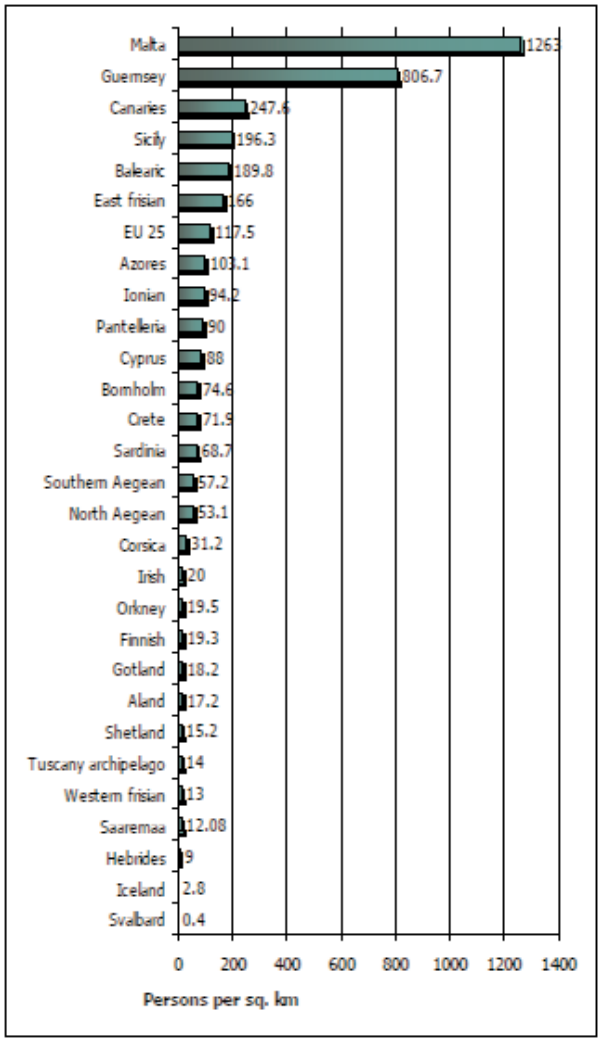
Fig 4 Geographical clusters where sustainability issues predominate in 28 study islands

3.6 Sustainability issues in EU25+5 islands

This section examines each key issue raised by interviewees in turn, drawing on the sustainable development indicators developed and quantified in this survey to better understand their scale and severity (Maps in Appendix 3).

3.6.1 Key Issue 1: Extreme population dynamics

Extreme population dynamics was a recurrent subject raising in the expert interviews. Population, in general, is an issue that is invariably linked with the sense of belonging to a community and to a territory. Population density may vary substantially among islands and may relate to both concerns over high and low densities, as shown in Fig. 5. Low density is often associated with depopulation, out-migration and the consequent problems of brain drain, aging population and concerns about sustainability of the social budget and of the economy (this was the case in Corsica, the Finnish Archipelago, the Irish Islands, Outer Hebrides, Bornholm, Southern and Northern Aegean, Guernsey). The issues associated with an ageing population were often mentioned by respondents (Fig. 17). Maintaining the population, often small, with an adequate presence (and quality) of services is also of a considerable concern, given the fact that citizens might be forced to travel significant distances to receive, for instances, medical services or enjoy educational facilities. This last phenomenon is particularly evident in the Southern and Northern Aegean Islands, and in the Ionian and Irish Islands. Many islands, on the other hand, experience very high levels of population density, manifesting severe environment capacity stresses as well as high levels of social concern related to issues such as land use and immigration.



Source: Eurostat, Saarema – University of Tartu, Finnish Islands – Archipelago Sea Biosphere Reserve
Note: data for Irish Is. 2002, Outer Hebrides and Finnish Is. is 2004, East Frisians and Saaremaa is 2005

Fig 5 Population density in European islands (2003)

The islands with the highest population density are Malta with 1263 persons per sq km, Guernsey with 806.7 persons per sq km, the Canary Islands with 247.6, Sicily registering 196.3 and the Balearic Islands with 184.1 persons per sq km, compared to an EU average of 117.5. Malta is the most densely populated country in Europe and the third densest in the world. In this context a special reference has to be made to the growing influence, not only numerical, of immigrant communities in European islands. This phenomenon is not exclusively European and does not influence only islands, but the implications for islands are perceived, and objectively appear, more serious. Small densely populated islands subjected to high immigration pressures in immigration often experience a dramatic change in the structure of their populations, posing social challenges in respect of cultural and religious identities and as well as logistical and financial ones.

In many islands, as in many European countries, the phenomenon of gentrification was noted, where the process of physical renovation of declining neighbourhoods that brings an increase in property values, favourites an influx of wealthier residents who, though out-pricing them, displace the island neighbourhood's original inhabitants from their home locality.

3.6.2 Key Issue 2: Low potential for economic diversification

The necessity to diversify economic activities in Islands was mentioned repeatedly. Respondents recognised the difficulty of achieving sustainable economic performance within the context of a fragile reliance on only one driving economic sector. This issue is characterised by the dominance of the oil industry in the Orkneys, financial services in Guernsey and tourism in most of the Mediterranean islands. Interestingly, policy communities seem to be aware of the potential dangers caused by the lack of diversification in the economy and sustainable economic and landuse planning was one of the major policy solutions recommended during the interviews. Fig. 6 shows the percentage of employment represented by services. This includes the tourism sector but excludes the construction industry, which is shown in the section related to land development.

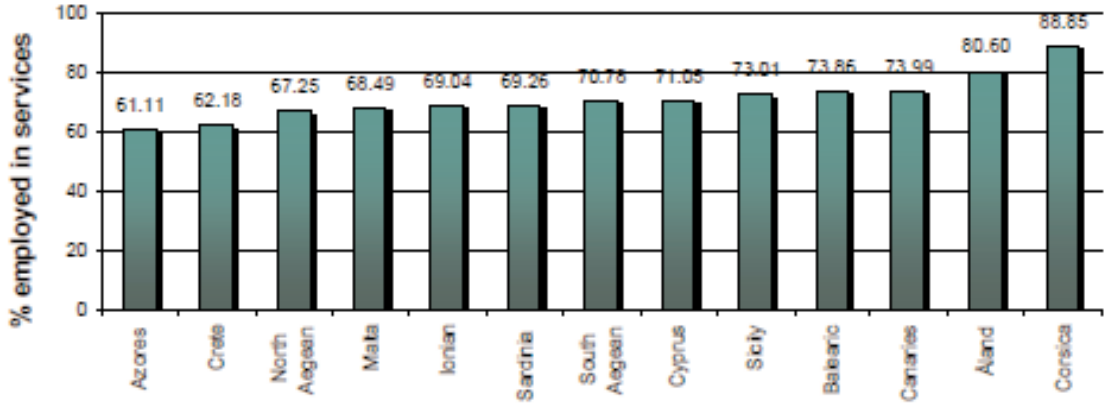


Fig 6 Proportion of services in total employment (2004)

3.6.3 Key Issue 3: Negative impact of land development

Land use and tendencies towards excessive development are at the basis for major concerns within most of the islands. Fig. 7 indicates that urbanization rates across EU islands are varied and generally higher in islands experiencing stronger tourist pressure. Pressure from developers in order to either boost tourism activities or enlarge the property market occurs across islands from the Baltic (Saaremaa) and the Mediterranean (the Balearics, Pantelleria and Malta) to the North Sea (the East Frisians) and the Atlantic Ocean (the Outer Hebrides). Coupled with this there is the recognition that the form of land-use planning as currently practiced may not be sufficient to address the proper management of present and future development. Strictly related to this there is also a concern related to extensive quarrying activity, where the Aegean Islands, Gotland and Malta registered particular concern. The important role of the construction sector in islands' economies, as shown in Fig. 8, is also a concern, particularly in relation to its impacts on the environment. This last concern interests particularly islands like the Canaries, the Aegean Islands, the Balearics and Malta.

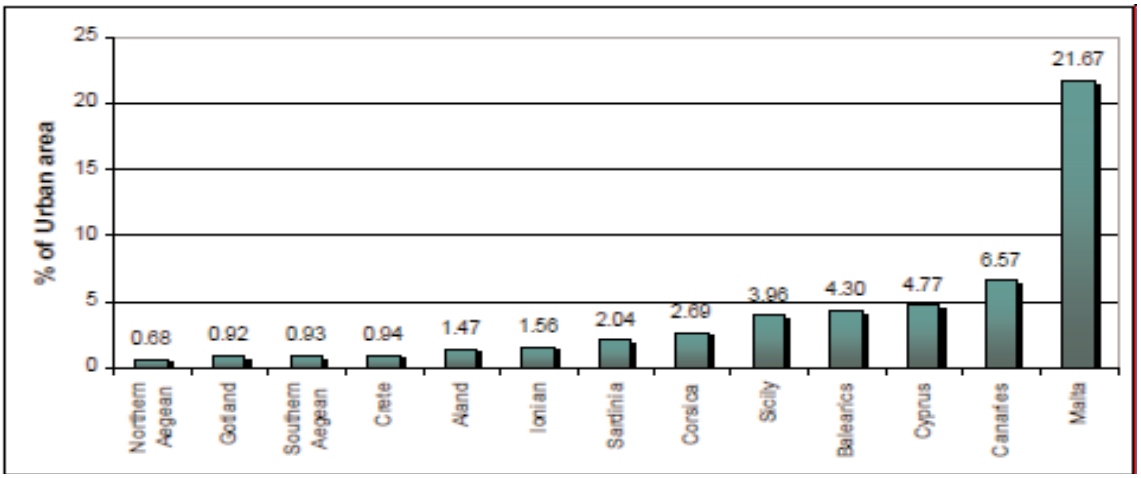


Fig 7 Percentage Urban area of Total (2000) Source: CORINE 2000

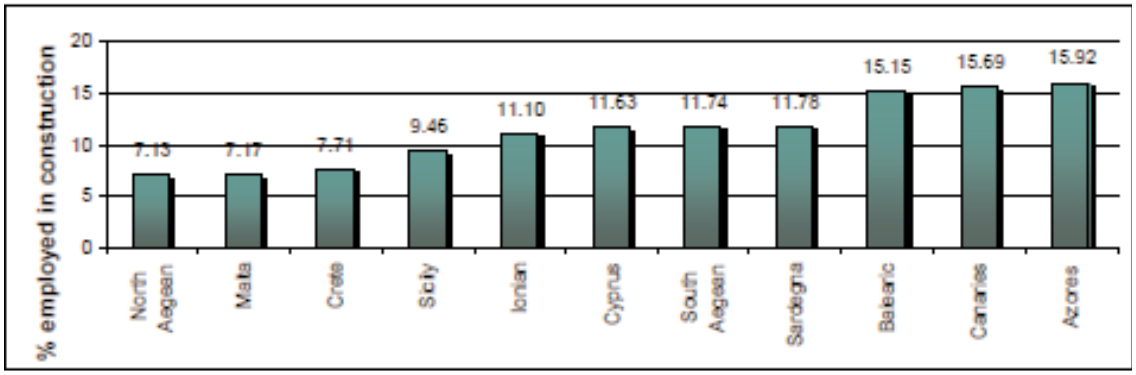


Fig 8 Role of the construction industry in island employment structures (2004) Source: Eurostat

3.6.4 Key Issue 4: Marine water quality

Sea water quality emerged as an important issue, due to the fact that inshore marine waters perform vital functions and services for islands. This is not only an ecological concern but in the majority of the islands sea is also associated with tourism. Maintaining an adequate level marine protection is also essential to preserve a high degree of competitiveness and consequently acceptable levels of employment. Sea pollution, sewage discharges, the extensive presence of fish farms, and maritime issues were all points raised during the interviews. The international aspects of the protection of marine areas were also highlighted, together with an extended concern associated with potential damages caused by climate change and sea level rise. This is more evident in islands like Iceland and the Svalbard, where ice melt and transboundary

pollution considerably affect the environment and the economy of these islands. European legislation, particularly the Bathing Water Directive and the Water Framework Directive, plays an important role in the protection of the sea and it is generally agreed that the directives and regulations during last decades have brought positive improvements, although results in the more remote islands are not very visible. Considerable difficulty was registered in gathering information on marine water quality, particularly because thresholds and parameters are often not tailored to islands' sizes and characteristics. Fig. 9 shows the percentage compliance with the Bathing Water Directive in 2005, with almost all the islands complying with the requirements.

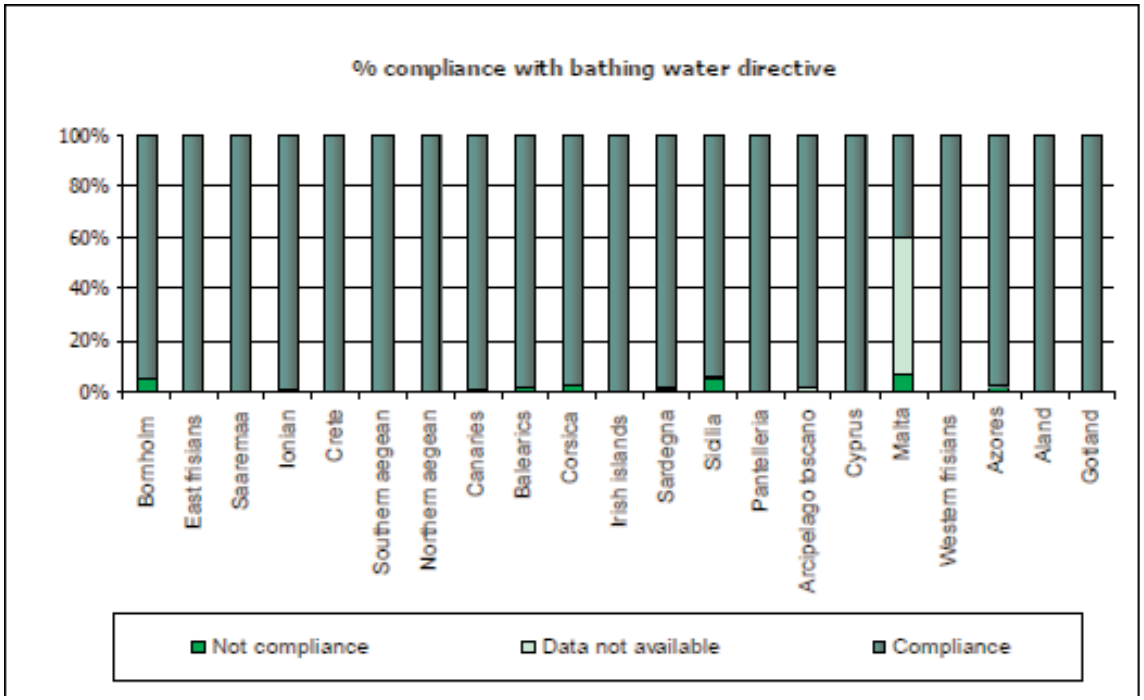


Fig 9 Percentage compliance with Bathing Water Directive (2005)

3.6.5 Key Issue 5: Water Status

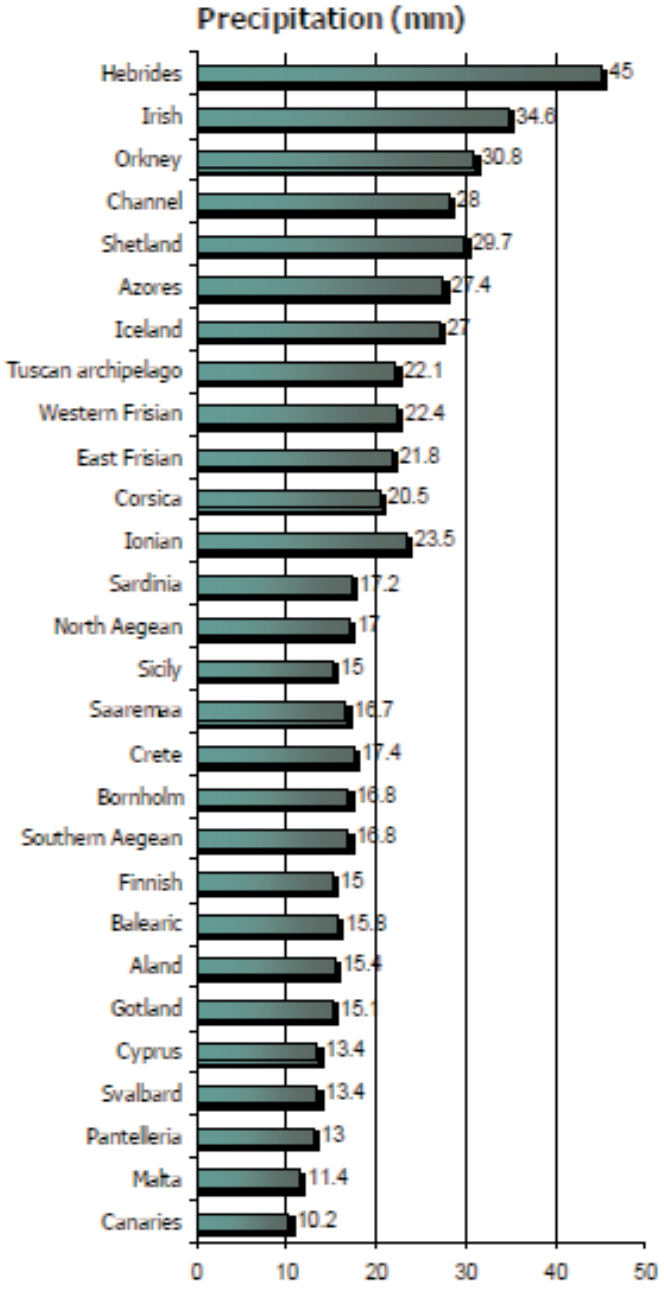
Water scarcity and sustainable use of this important resource arose as important concerns among European island experts. There is wide recognition that water plays a crucial role in environmental, social and economic aspects of islands' communities. In addition, contamination of ground water from polluting agriculture activities was also an issue (particularly in the Canary Islands, Sardinia, Malta and Gotland), together with illegal and uncontrolled water abstraction. Abstraction rates for agriculture indicate that water pressures are greater in southern Europe (Fig. 22), while precipitation rates in the southern islands are low, as might be expected (Fig. 10). Given these considerations, the need for a better management and regulation of water emerged as one of the most recurrent concerns.

3.6.6 Key Issue 6: Waste management challenges due to small size and remoteness

The problems associated with waste management invariably arose for most of the islands studied. Higher levels of consumption (Fig. 11) and consequently larger amounts of waste produced, in relation to land, was a common theme. Limited land area for storage of waste, and environmental and social problems associated with the location of landfills are major concerns within island communities.

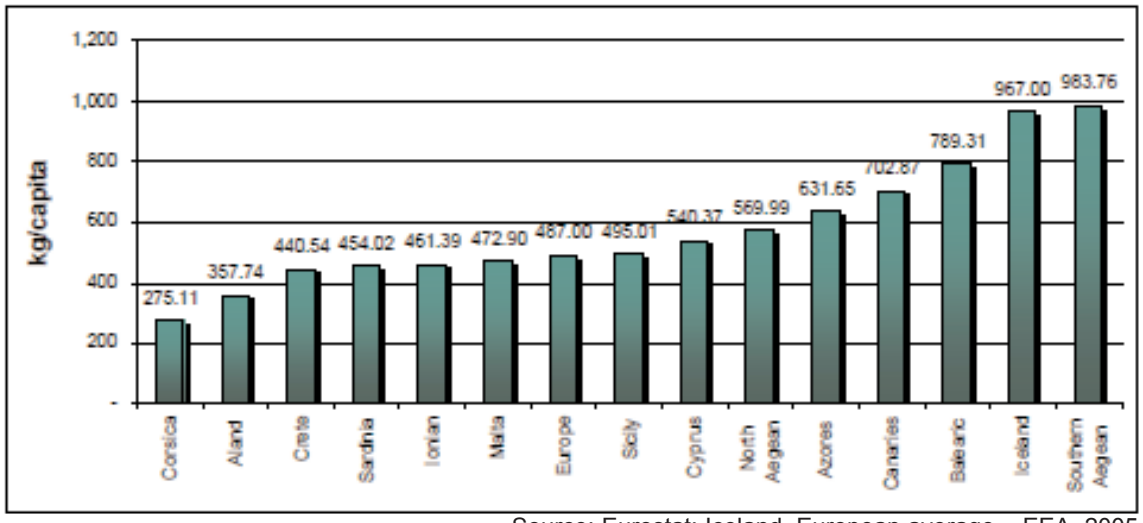
The challenges related to waste recycling in small islands were also raised by numerous respondents. The waste to energy issue was also raised on a number of occasions. The impossibility of collecting large quantities of waste to recycle (due to limited land and small catchment

areas for waste collection), does not allow small and medium size islands to benefit from economies of scale. The costs associated with the construction and maintenance of waste recycling plants and the high costs of transport of final products (shipping and air freight), together with markets far too small to absorb the amount of products which make this process worth investing in, constrain recycling activities and the development of alternative environmental options.



Source: IPCC
Note: data for Corsica is 1995, Outer Hebrides 2003 and Iceland 2005

Fig 10 Average monthly precipitation in European islands (1961-1990)

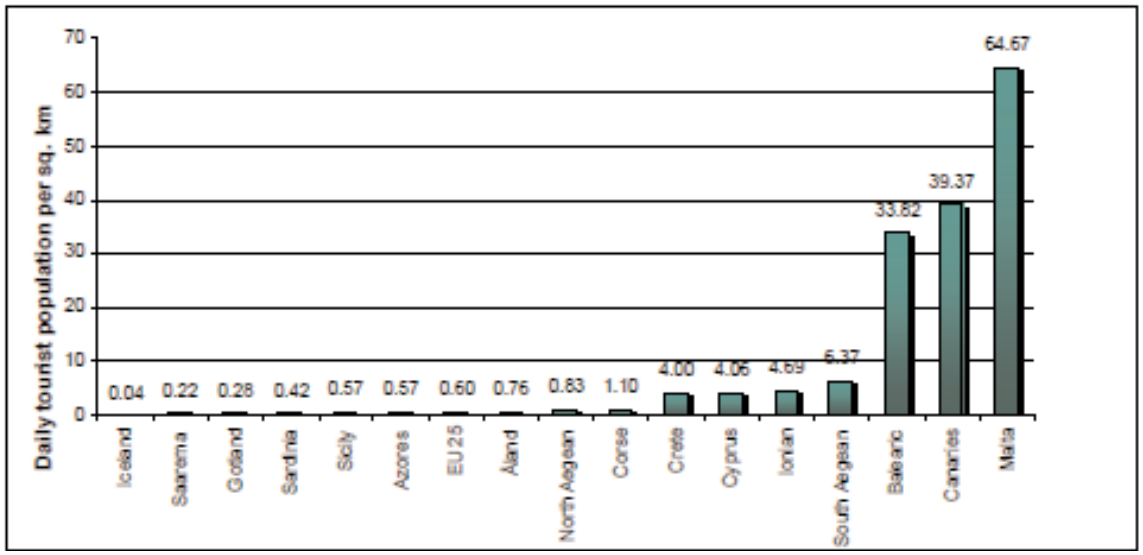


Source: Eurostat; Iceland, European average – EEA, 2005
Note: data for Aland is 1996, Corsica 1996 and Cyprus and Malta, 1999

Fig 11 Municipal waste generation per capita (1998)

3.6.7 Key Issue 7: Tourism pressures

Pressure on the islands from tourism also appeared to be a major concern for many European islands. Although tourism represents an important part of islands' income, the negative consequences represented by high consumption of energy, water and land for the creation of adequate infrastructures and facilities were often raised. The pressure represented by the presence of tourists in the islands may also be considerably high when related to the population density, as shown in Fig. 12. This is particularly true for highly densely populated islands and for islands that receive a high number of tourists throughout the year. Countries like Malta, the Canary Islands and the Balearics, which already have a higher population density in respect of the EU25 average, experience an even higher density if the population density represented by tourism is considered in the equation.



Source: Eurostat, Gotland - www.eurisles.com, Saaremaa - University of Tartu

Fig 12 Daily tourists per square kilometre (2004)

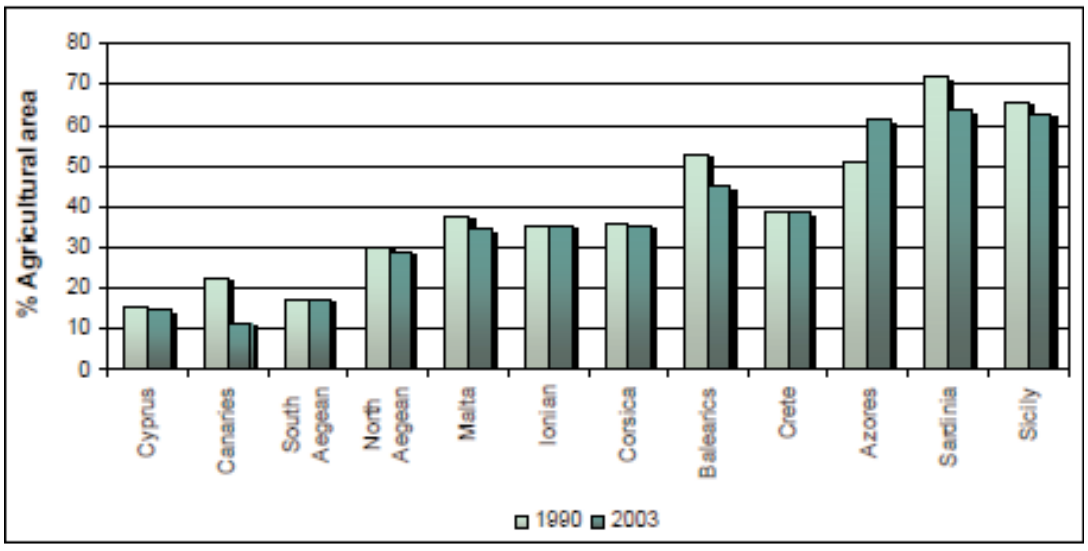
In some islands the short period of the tourist season also represents an additional pressure on the territory and its resources. Coupled with this there is the necessity to manage tourism activities better and to set strategies to concretely include sustainability issues into planning the future of this important economic sector.

3.6.8 Key Issue 8: Insularity and peripherality

Due to their insularity and peripherality, islands have certain characteristics which distinguish them from continental regions. From an economic point of view, growth is strongly influenced by the limitations of natural resources and the dependency on imports. This significantly affects the efficiency of the local economy, which leads to greater vulnerability. From an ecological perspective the isolation from continental areas and their relatively small size determine a greater diversity in their ecosystems. On the other hand, these conditions create a scenario where the impacts are both more intense and more noticeable due to the fact that the capacity for autoregeneration in insular systems is far weaker. Higher costs of transport and greater difficulties to reach the islands, compared with the mainland, are also of a great concern among islands communities, and this concern has reached the policy level as reflected in the 2002 EU Treaty of Amsterdam (Section 1.2). Fig. 26 indicates virtual distances from the centre of Europe, calculated on the basis of travel time, from the Eurisles (2002) study. Of the islands survey, Malta is the island that takes longest to travel to from Maastricht. In some instances air transport is the only means to respond emergencies, placing an additional cost on people living on islands. The disadvantages of insularity and peripherality were particularly highlighted by experts interviewed from Malta, Cyprus, Pantelleria, the Azores, the Canaries, Bornholm, Sardinia and the Outer Hebrides.

3.6.9 Key Issue 9: Declining agriculture and fisheries

Agricultural and fisheries activities have always played a very important role within European islands. Both the physical presence of the related facilities and the culture and traditions associated with these activities remain important for islands communities. However, agriculture and fisheries are experiencing either a decline in productivity, with less production and lower levels of employment, or a radical change from extensive to intensive production, changing the structure of the activity, often with the creation of negative externalities on the environment. Within this context the decline experienced not only has a negative effect on the economy but has also driven environmental change in the form of land abandonment, landscape degradation and loss of fish stocks and biodiversity, including agro-biodiversity. Fig. 13 illustrates the trend towards declining agricultural land use in many islands.



Source: Eurostat; CIHEAM, 1993
Note: Ionian Islands, South and North Aegean 1990-2002

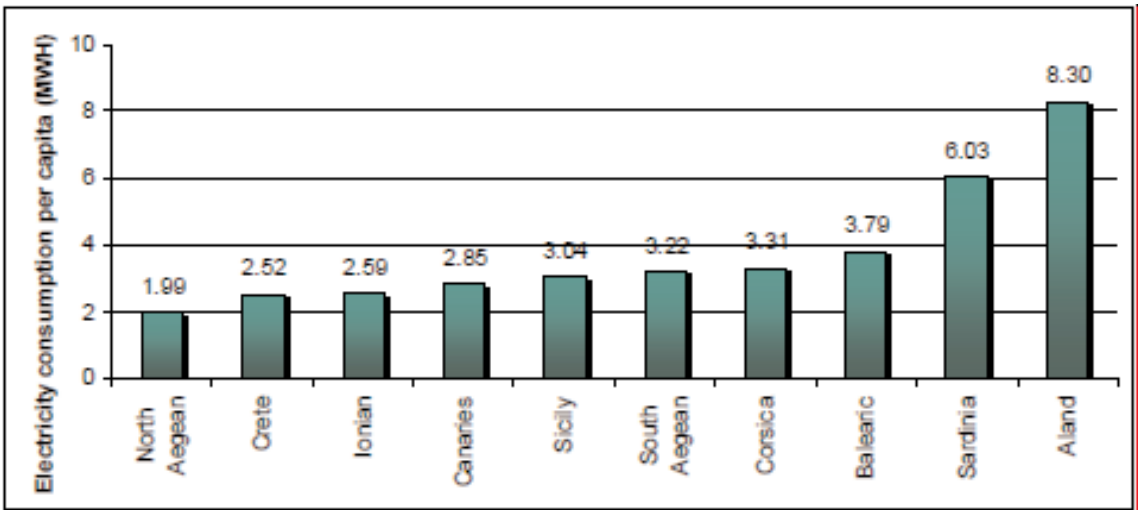
Fig 13 % Agricultural Land Use Change (1990-2003)

3.6.10 Key Issue 10: Degradation of natural resources and loss of biodiversity

Loss of biodiversity and the need for improved nature protection are very important concerns that have been strongly highlighted by the interviewees and the existing literature on European islands. The potential loss of the very specific and unique biodiversity of islands is one of the most frequent issues mentioned with the main concerns arising from Saaremaa, Malta, Svalbard and Pantelleria. Protection of nature against development (wind farms, major development projects, industrial plants, etc) is also a common preoccupation in islands, particularly in the Shetlands and in the West Frisians, where plans to develop wind farms have raised several questions regarding the impacts on landscape and disturbance of local fauna. Indeed, the fear of losing islands' natural assets because of unsustainable physical land development is a major concern. Islands' dependency on natural resources and the potential dangers that this process implies, were often noted. The expansion of aquaculture arose as a common concern, together with its consequences on quality of the sea and food safety. Attached to this there is a certain apprehension about how to ensure that traditional fishing and agricultural practices remain viable, both economically and socially. Furthermore, problems caused by erosion involve a large number of islands and it is generally agreed that this could undermine the future of many economic and environmental activities, which in the economic case may be the driving forces of development in the islands.

3.6.11 Key Issue 11: High cost and impact of energy use

Energy-related issues increasingly represent a matter of common concern in European islands, with excessive consumption, collectively or by sectors, recognized as a serious problem (Fig. 14). In certain instances this is particularly true as for those islands that rely on fossil fuels and do not have adequate facilities to store oil. The dependency on fossil fuels is critical, both as a strategic issue and because of the negative implications for the environment and health. The necessity to switch towards alternative energy provision, which would be less dependent on foreign suppliers and less polluting, was recognized as a priority for European islands. On the other hand, many of the islands identified are currently facing the problem represented by the development of new forms of energy and its repercussion on the landscape, mainly in the form of wind farms. Although the need to diversify the production of energy was recognized as extremely important and generally found the support of interviewees, the impact of these large plants on the landscape remains of great concern in many islands communities.

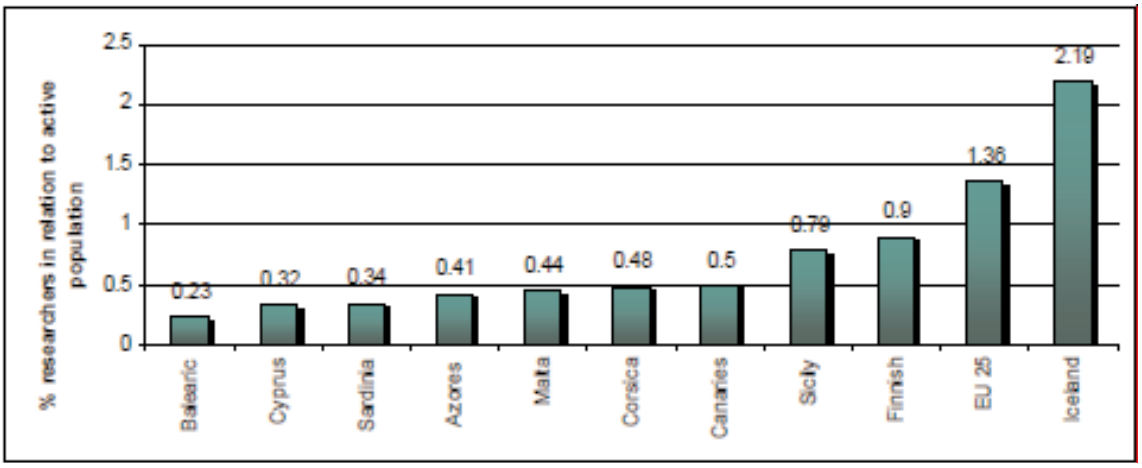


Source: Eurostat

Fig 14 Energy Consumption per capita (1996) (MWh)

3.6.12 Key Issue 12: Low levels of education and training

Issues related to adequate levels of education and training also emerged as matters of concern Lack of quality in human resources, understood in terms of the necessity to search outside the islands' work forces to fill jobs and positions, was of concern in many islands. The phenomenon of travel to learn was also raised as one of the consequences of lack of proper academic facilities and/or opportunities. Coupled with this there is the problem of 'brain drain', where a consistently sizeable segment of the skilled and educated workforce leaves the islands to take up work opportunities that would have not been available in the islands. Fig. 15 indicates that the percentage of researchers living and operating in European islands is often low. There is an exception in the case of Iceland, which has consistently invested in education and has a level of research that significantly exceeds the EU average (Baldacchino and Milne 2000).



Source: Eurostat
Note: data for Corsica is 2001

Fig 15 Researchers employed (2003)

4 Conclusion

This research has identified the position and extent of continental European (EU25+5) islands based on the SENSOR NUTS 0 map. A total of 4,966 islands have been identified, and these occupy 265,500 km^2 or 5.55% of the land area of EU25+5. The Norwegian archipelago of Svalbard must also be added to this list, as it did not emerge only because it is not featured in the NUTS 0 dataset. The figures including the 150 Svalbard Islands are 5,116 European islands, occupying a land area of 328,021 km2 or 6.76% of the area of EU25+5. In terms of all the countries of Europe (including those not in the EU), islands occupy 2.68% of the land area, or 3.31% if Svalbard is included.

Island regions are found in 136 NUTS x units, and 24 of these are entirely made up of islands. These are 25 (actually 23 islands/archipelagos since both Corsica and the Canaries are made up of two NUTS x units): Balearic Islands, Canary Islands, Gotland, Bornholm, Balearic Islands, Corsica, Aland, Bjornoya (the southern most island of the Svalbard archipelago), Channel Islands, Cyprus, Faeroe Islands, Gibraltar, Ionian, North Aegean, South Aegean, Crete, Isle of Man, Iceland, Sicily, Sardinia, Jan Mayen Islands, Malta, the Azores, and Madeira. The rest of the NUTS x units are occupied by islands to varying degrees – 63 of these NUTS x regions have less than 1% island territory; another 38 have less than 10% island territory; and 10 regions have between 11% and 36% island territory.

In terms of the Module 3 Spatial Regional Reference Framework (SRRF), a number of anomalies arise when the islands are spatially analysed by the 30 SRRF categories. A total of 12 islands or archipelagos have not been provided with an SRRF category. A total of 20 SRRF categories contain islands but some to a much greater extent – for example the Boreal categories 27 and 30 contain approximately 1,500 islands each (albeit with only 0.3 and 5.5 insular land cover respectively). The SRRF category that has the highest amount of insular land, is the category for Malta, Category 14 (MEDISL). The next highest SRRF category in terms of insular land coverage is category 6 (MEDAGR). It is likely that northern and Atlantic islands do not feature strongly in these findings since many of them were not assigned SRRF categories.

In order to identify key sustainability issues in the islands of EU25+5 a reduced dataset of 28 study islands was identified and 26 expert interviews (some experts in Greece and the UK doubled for a number of archipelagos) carried out. On the basis of these interviews, 12 key sustainable development issues were identified, which reflect the island ‘backwardness’ issues identified elsewhere (Planistat, 2002; Eurisles, 2002).
These are:

1. Extreme population dynamics;
2. Low potential for economic diversification
3. Negative impact of land development
4. Marine Water Quality
5. Water Status
6. Waste management challenges due to small size and remoteness
7. Tourism pressures
8. Insularity and peripherality
9. Declining agriculture and fisheries
10. Degradation of natural resources and loss of biodiversity
11. High cost and impact of energy use
12. Low levels of education and training.

On the basis of these issues, the following sustainability indicators were identified from indicators suggested by interviewees, and SENSOR's Module 2 indicators that relate to the EU impact issues (COM 2005). The indicators identified for European islands are:

1. Population density
2. % of population above 65 years
3. Employment by sector
4. Unemployment rate
5. GDP per capita (EURO/National currency)
6. % land built up
7. Compliance with Bathing Water Directive
8. Water abstraction rate (ground and surface)
9. Precipitation rate
10. Municipal waste generation per capita
11. Daily tourist population per square kilometre
12. Virtual distance from centre of Europe (Eurisles study)
13. % agricultural land use change
14. % of land covered by Natura 2000 sites
15. Energy consumption per resident population
16. % of researchers in relation to active population

When compared to the EU impact issues, it results that the latter are indeed general enough to cover all issues, however that some of the key island issues such as peripherality and competitiveness vis a vis the European mainland are only indirectly addressed. In terms of the adequacy of assessing the sustainability impacts of EU policy on island regions via these impact issues, this is an important finding, suggesting that another impact issue on remoteness and peripherality could be added to the list.

A spatial dataset based on these indicators has been constructed on which basis comparative analysis of these issues in the study islands has been possible. However for one of these indicators, although data at island level was available, comparable datasets could not be located, and therefore they could not be quantified as indicators for this present survey. In order to ascertain whether particular areas of greater pressure in terms of these variables exist across the European continent, statistical spatial cluster analysis was performed. Despite limited coverage of the 28 study islands, a clear result in terms of two clusters did emerge: Northern Islands and Southern Islands. Southern Islands indicated strong clustering for all variables, indicating the desirability of locating the SENSOR Sensitive Area Case study (SAC) in this region. The island state of Malta, which occupies a central position in the Southern Islands Cluster, is suggested as the SAC for the Islands sensitive area. This case study area has the advantage of having a NUTS classification of 0, which facilitates data collection.

This study has faced a major constraint relating to the lack of statistical data on sustainability issues for European islands, mainly due to the fact that they are often classified at lower than NUTS 2. This constraint is complicated by lack of harmonization of data for the different islands. A major finding of this survey, therefore, which echoes the concerns raised in Planistat (2002), concerns the need to develop comparable datasets on these issues, which may be used to inform policy decisions at EU level regarding the sustainable development of island regions. It is to be hoped that this survey will raise the profile of island sustainability in Europe, which will in term influence the EU policy-making process, and thus the progress of sustainable development in European islands.

5 Acknowledgement

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7 Appendices

7.1 Appendix 1: Extended list of 115 sustainability indicators for islands

Table 10 List of 115 indicators from SENSOR Module 2 list and expert interviewees, organized by key sustainability issues for islands

No	Indicator	M2 Indicator?	Describes issue?	Total Score	Indicator Selected?
1. Extreme Population dynamics					
1	Population density		3	3	Yes
2	% of population above 65 years		3	3	Yes
3	Population growth rate		2	2	
4	Emigration rate		2	2	
5	% no population below 15 years		1	1	
6	% of the population coming from different ethnic origins		1	1	
7	Adult literacy rate		1	1	
8	Gross enrolment ratio		1	1	
9	Participation rate in community activities	1		1	
10	Number of convicted per inhabitants		1	1	
11	Number of Immigrants/km^2		1	1	
12	Life expectancy at birth		1	1	
13	Teenage pregnancy		1	1	
14	Social cases in underage population		1	1	
15	Poverty rate		1	1	
2. Low potential for economic diversification					
16	Employment by sector	1	3	4	Yes
17	Unemployment rate	1	3	4	Yes
18	GDP per capita (EURO)		3	3	Yes
19	GDP growth rate		2	2	
20	GDP at current market prices		2	2	
21	Sectoral shares in GDP	1	1	2	
22	Consumer Price Index	1	1	2	
23	Change in Gini coefficient	1	1	2	
24	Number of doctors		2	2	
25	Reported criminal offences		2	2	
26	Growth rate of real GDP per capita	1		1	
27	Government expenditure as % of GDP	1		1	
28	Government investment as % of total expenditure	1		1	
29	Government debt as % of GDP	1		1	
30	No. of cattle exported		1	1	
31	How much added value has been put on cattle and sheep		1	1	
32	gender impact of income distribution	1		1	
33	Labour cost	1		1	
34	Labour productivity per hour worked	1		1	
35	self-sufficiency index for food and energy	1		1	
36	Number of serious accidents at work	1		1	
37	Number of bomb attacks against public buildings		1	1	
38	Number of attacks against houses		1	1	
39	Drinking related diseases		1	1	

No	Indicator	M2 Indicator?	Describes issue?	Total Score	Indicator Selected?
3. Negative impact of land development					
40	% built up land		3	3	Yes
41	% change of land cover per class per NUTS x	1	1	2	
42	Public Roads (km)		2	2	
43	Number of units per 1000 inhabitants		2	2	
44	Soil sealing	1	1	2	
45	Number of designated heritage sites	1	1	2	
46	% of urban area in respect to total area		1	1	
47	% of land used in urban, agricultural and protected		1	1	
48	Number of sewage treatment plants found on coastal zones		1	1	
49	% of coast built up		1	1	
50	Number of quarries		1	1	
51	Land taken up by quarries in % of the total land		1	1	
52	Number of dwelling permissions every 1000 inhabitants		1	1	
53	% of roads in relation to total land		1	1	
54	New houses built		1	1	
55	% of the population having a second house		1	1	
56	Number of pollution incidents/yr in coastal zones		1	1	
57	% of the population living in coastal zones		1	1	
58	Number of hotels found on coastal zones		1	1	
59	% of primary land lost every year in coastal zones		1	1	
60	Number of pedestrian zones		1	1	
61	% bike lanes in relation to roads		1	1	
4. Marine Water Quality					
62	Compliance with Bathing Water Directive		3	3	Yes
63	Chlorophyll-a levels		3	3	Yes
64	% sewage treated		3	3	Yes
65	Nitrogen surplus N	1	1	2	
66	Phosphorous surplus P	1	1	2	
67	Heavy metals in ocean		1	1	
68	Presence of marine algae		1	1	
5. Water status					
69	Water abstraction rate (ground and surface)	1	2	3	Yes
70	Precipitation rate		3	3	Yes
71	Water consumption per capita of resident population		3	3	Yes
72	Water exploitation index		2	2	
73	Number of sewage treatment plants		2	2	
74	Pesticide pollution	1		1	
75	No of water metres		1	1	
6. Waste management challenges due to small size and remoteness					
76	Municipal waste generation per capita		3	3	Yes
77	% waste recycled/treated		3	3	Yes
78	Waste water	1	1	2	
79	Solid waste generated	1	1	2	
80	Number of landfills		1	1	
81	% waste exported outside the islands		1	1	
82	% of solid waste recycled by municipality		1	1	
83	% of waste water recycled on the total		1	1	
84	% of solid waste recycled on the total		1	1	
85	Solid waste produced by municipality		1	1	
86	Solid waste produced per capita		1	1	
87	Year of construction of the sewage treatment plants		1	1	
88	% of waste water recycled by municipality		1	1	

No	Indicator	M2 Indicator?	Describes issue?	Total Score	Indicator Selected?
7. Tourism pressures					
89	Daily tourists per square kilometre		3	3	Yes
90	Number of tourists arriving annually per resident population		2	2	
91	Tourism share of GDP		2	2	
92	Number of high-season tourists in relation to local population	1	1	2	
93	No. of accommodation sites per tourists		2	2	
94	% land taken up for tourism purposes		1	1	
95	Energy production during peak tourist seasons		1	1	
96	Amount of agricultural land converted to urban land for tourists		1	1	
97	% Fall in agriculture production from the 70s due to an increase in tourism		1	1	
98	Waste produced by tourism		1	1	
99	Number of tourists & residents per km^2 of recreational space		1	1	
100	% loss of vegetation due to tourist attractions		1	1	
8. Insularity and Peripherality					
101	Virtual distance from centre of Europe (Eurisles study)		3	3	Yes
102	Distance from capital		1	1	
9. Declining Agriculture and Fisheries					
103	% Agricultural land use change		3	3	Yes
104	Land abandoned (trend)		3	3	Yes
105	Soil erosion	1	1	2	
106	% loss of agriculture products		1	1	
107	% of organic farming		1	1	
10. Degradation of natural reserves and loss of biodiversity					
108	% of land covered by Natura 2000 sites		3	3	Yes
109	Landscape diversity (IRENA35)	1	2	3	Yes
110	% land area designated		2	2	
111	Farmland & woodland birds	1	1	2	
112	Number of Natura 2000 sites		1	1	
113	Number of fish farms		1	1	
114	Loss of vegetation		1	1	
115	Loss of animals		1	1	
116	Forest fire risk		1	1	
117	Average altitude of the island		1	1	
11. High cost and impact of energy use					
118	Fuel consumption per resident population		3	3	Yes
119	Renewable energy consumption as % of total E.C. (CSI30)	1	1	2	
120	% of energy produced within the country (self sufficient)	1	1	2	
121	Energy used for heating and electricity	1	1	2	
122	Energy used by transport	1	1	2	
123	CO2	1	1	2	
124	CH4	1	1	2	
125	Ammonia NH3	1	1	2	
126	Nitrogen Oxides NOX	1	1	2	
127	Production of renewable energy by source (IRENA27)		1	1	
128	Vehicle fleet per capita		1	1	
129	Sectoral electricity consumption		1	1	
130	Net trade flows, overall		1	1	
131	Energy price		1	1	
132	Energy used to produce an additional unit of GDP		1	1	
133	CO2 by sector		1	1	
134	Ozone O3		1	1	
135	Sulphur dioxide SO2		1	1	
136	Greenhouse Gas Emissions		1	1	

No	Indicator	M2 Indicator?	Describes issue?	Total Score	Indicator Selected?
12. Low levels of education and training					
137	% of researchers in relation to active population	1	3	4	Yes
138	Early school leavers		1	1	
139	Adult literacy rate		1	1	
140	Number of patent applications per 1000 inhabitants		1	1	
141	E-government, on-line use of		1	1	
142	Voter turnout		1	1	
143	School achievement		1	1	

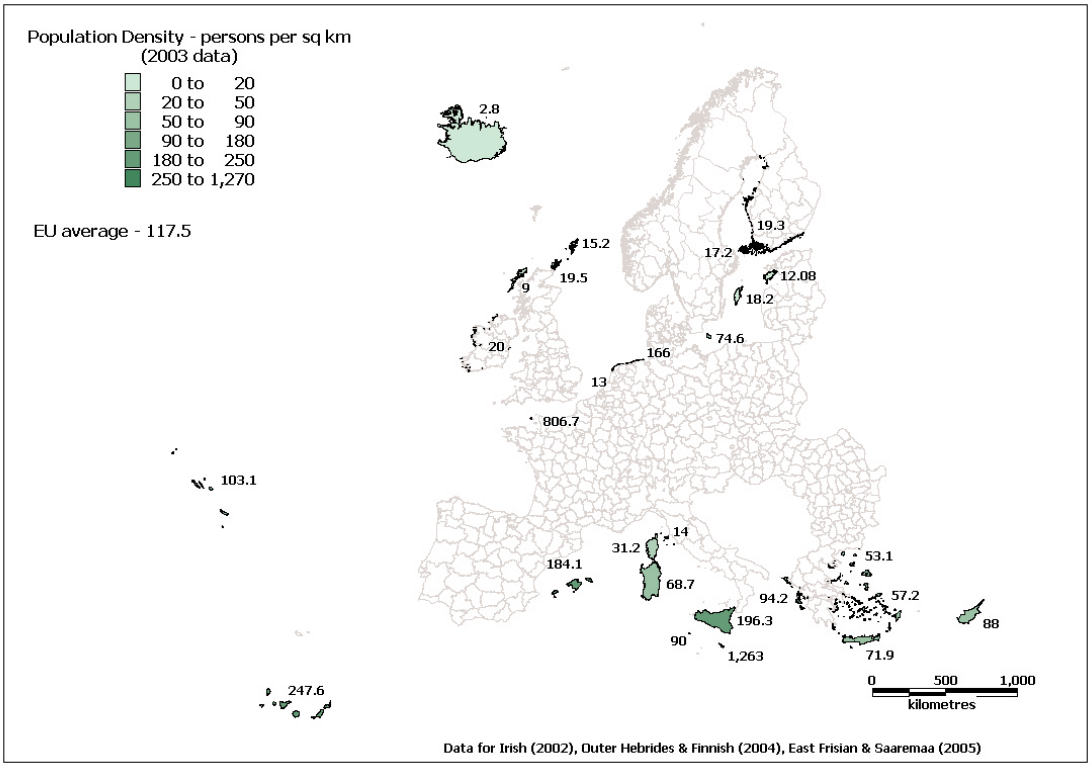
7.2 Appendix 2: Short-list of 24 sustainability indicators for islands

Table 11 Short-list of 24 sustainability indicators organized by key sustainability issues for islands

Key Island Sust. Issue	Indicator	Availability	IRENA/Eurostat/EEA/NEMESIS/CAPRI indicator	Total
1	Population density	2	2	4
1	% of population above 65 years	2	2	4
2	Employment by sector	2	2	4
2	Unemployment rate	2	2	4
2	GDP per capita (EURO/National currency)	1	2	3
3	% land built up	1*	2	3
4	Compliance with Bathing Water Directive	1	2	3
4	Chlorophyll-a levels	0	2	2
4	% sewage treated	0	2	2
5	Water abstraction rate (ground and surface)	2**	2	4
5	Precipitation rate	2	2***	4
5	Water consumption per capita of resident population	0	2	2
6	Municipal waste generation per capita	1	2	3
6	% of waste recycled/treated	1		1
7	Daily tourist population per square kilometre	2	2	4
7	Tourism share of GDP	0	1	1
8	Virtual distance from centre of Europe (Eurisles study)	2	1	3
9	% agricultural land use change	0	2	2
9	Land abandoned (trend)	0	2	2
10	% of land covered by Natura 2000 sites	2****	1	3
10	Landscape diversity (IRENA 35)	0	2	2
11	Energy consumption per resident population	1	2	3
12	% of researchers in relation to active population	1	2	3

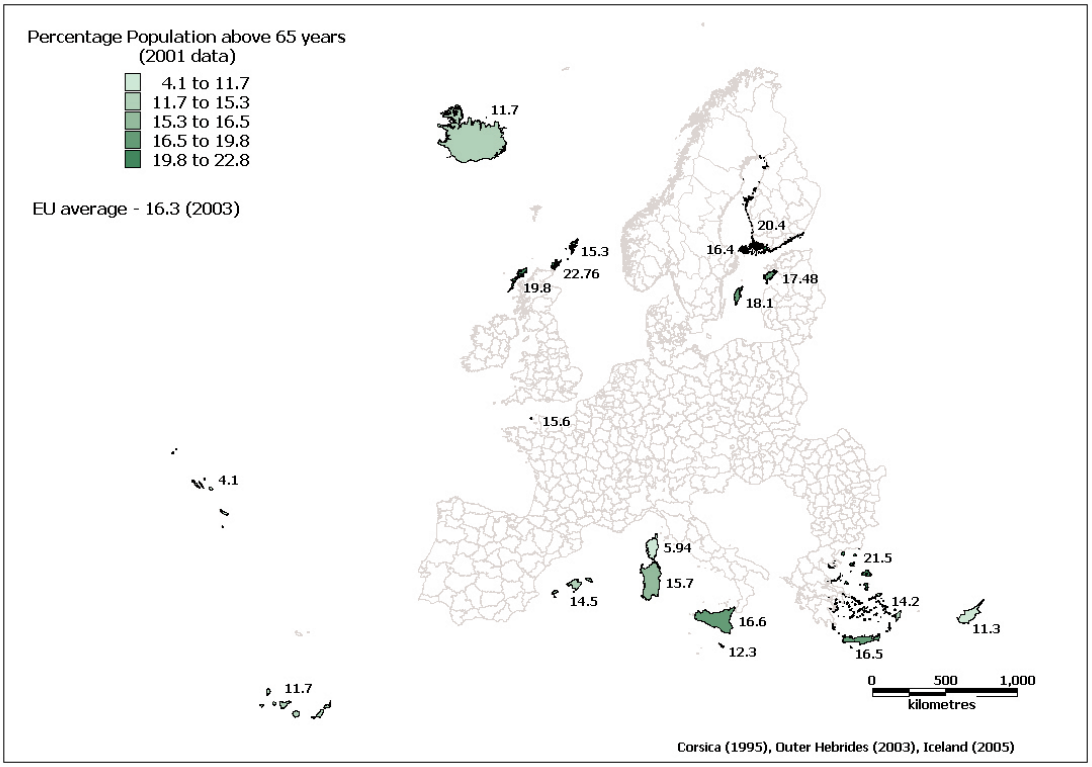
* data available is % urban land of total (CORINE)
** data available is water abstraction rate for agriculture (IRENA)
*** IPCC data available consisting of average monthly precipitation values for 1961-1990
**** IRENA indicator 4: data to be available upon official designation of Natura 2000 sites

7.3 Appendix 3: Maps related to EU25+5 Sustainability Indicators for Islands



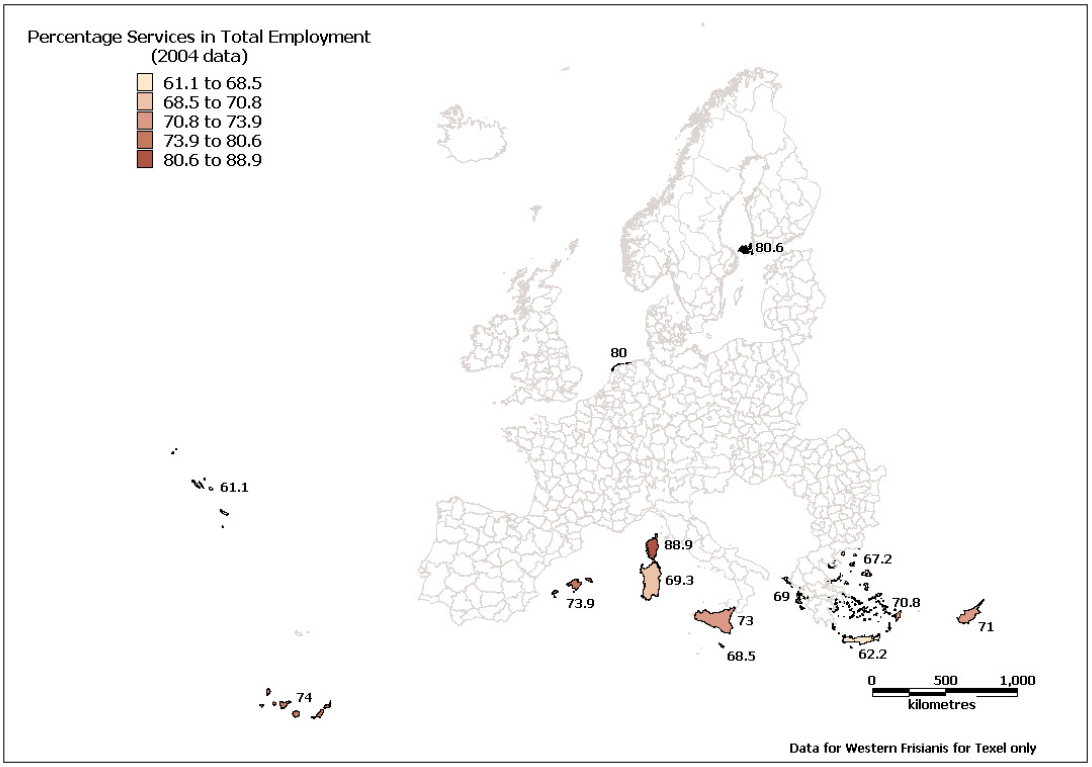
Source: Eurostat, Saarema University of Tartu – Finnish islands - Archipelago Sea Biosphere Reserve

Fig 16 Population density (2003)



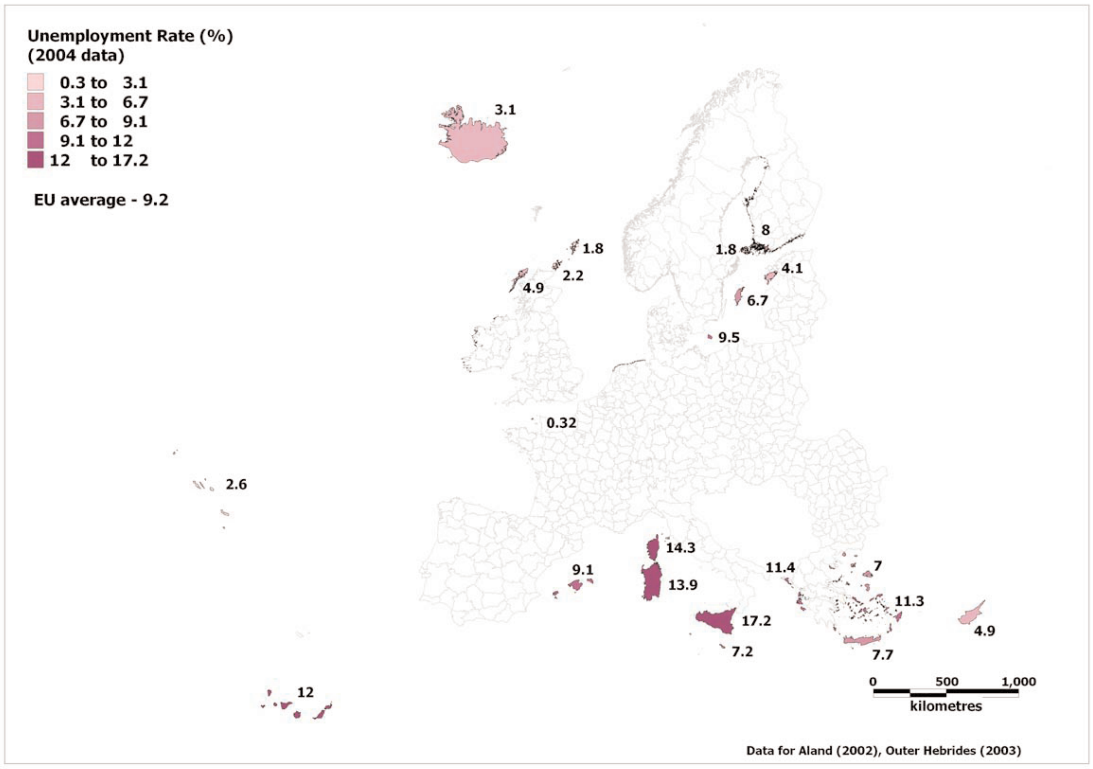
Source: Eurostat, Outer Hebrides - http://www.hie.co.uk, Iceland - http://iceland.vefur.is

Fig 17 % Population above 65 years (2001)



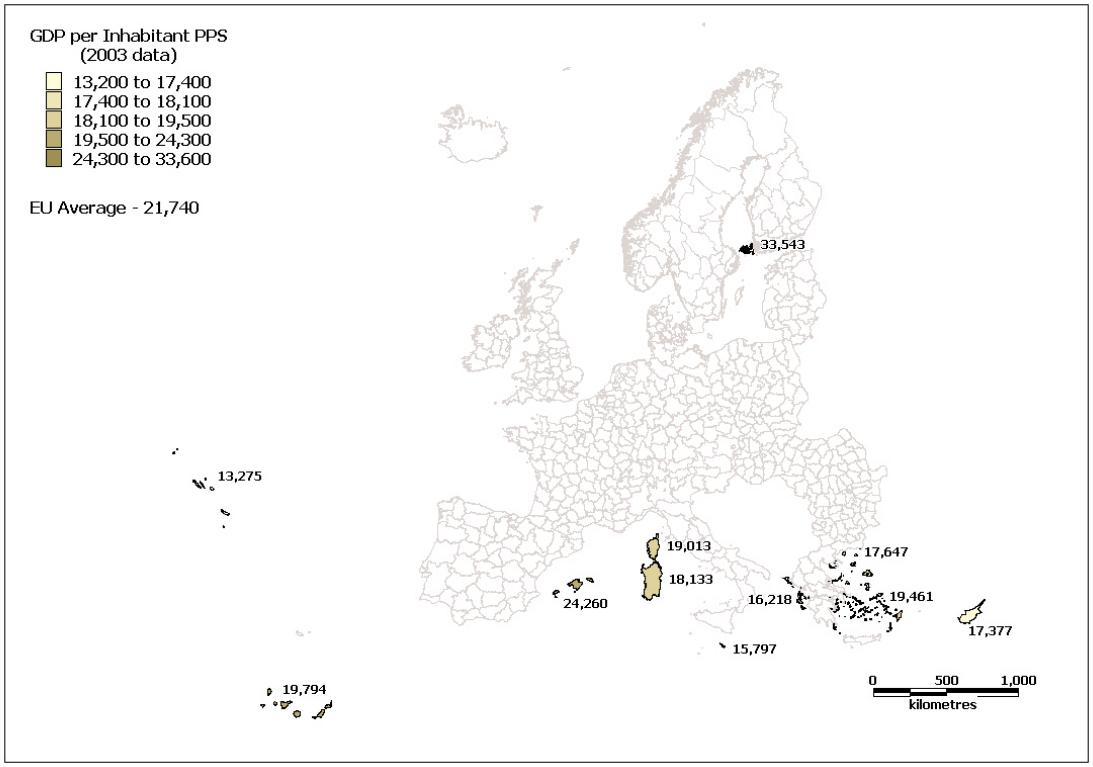
Source: Eurostat, ECOMARE - Western Frisians

Fig 18 % Services in total employment (2004)



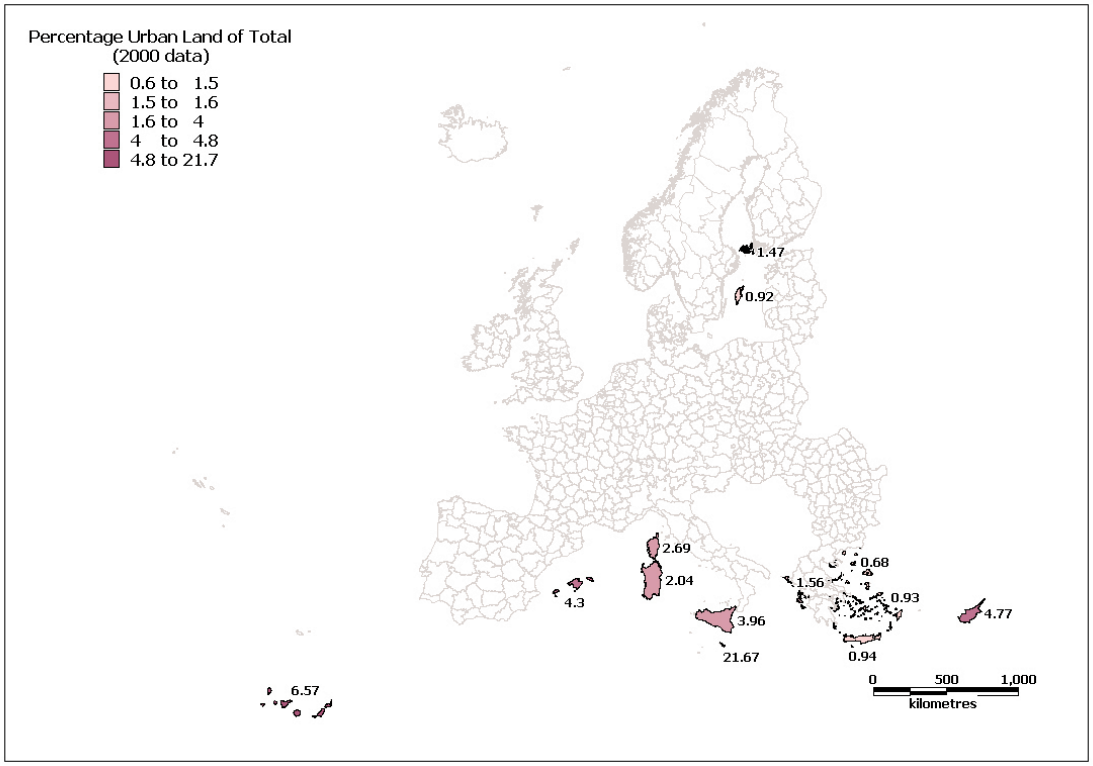
Source: Eurostat, Outer Hebrides - http://www.hie.co.uk

Fig 19 Unemployment rate (2004)



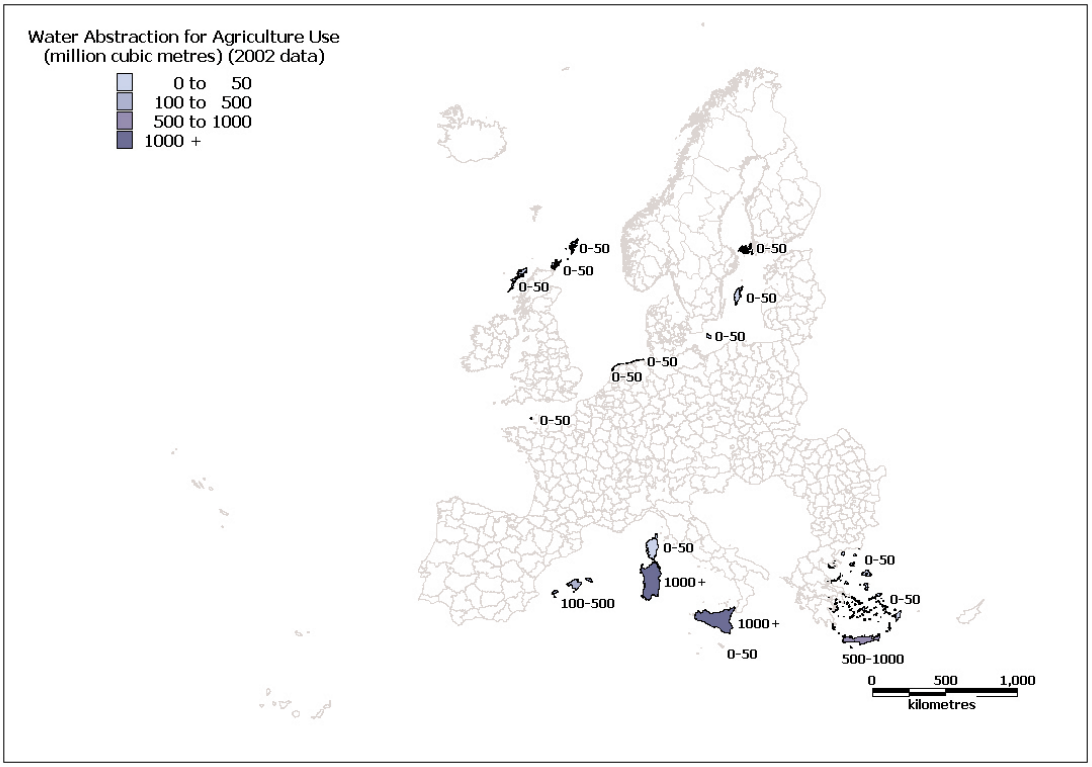
Source: Eurostat News Release 18 May 2006

Fig 20 GDP per inhabitant (2003)



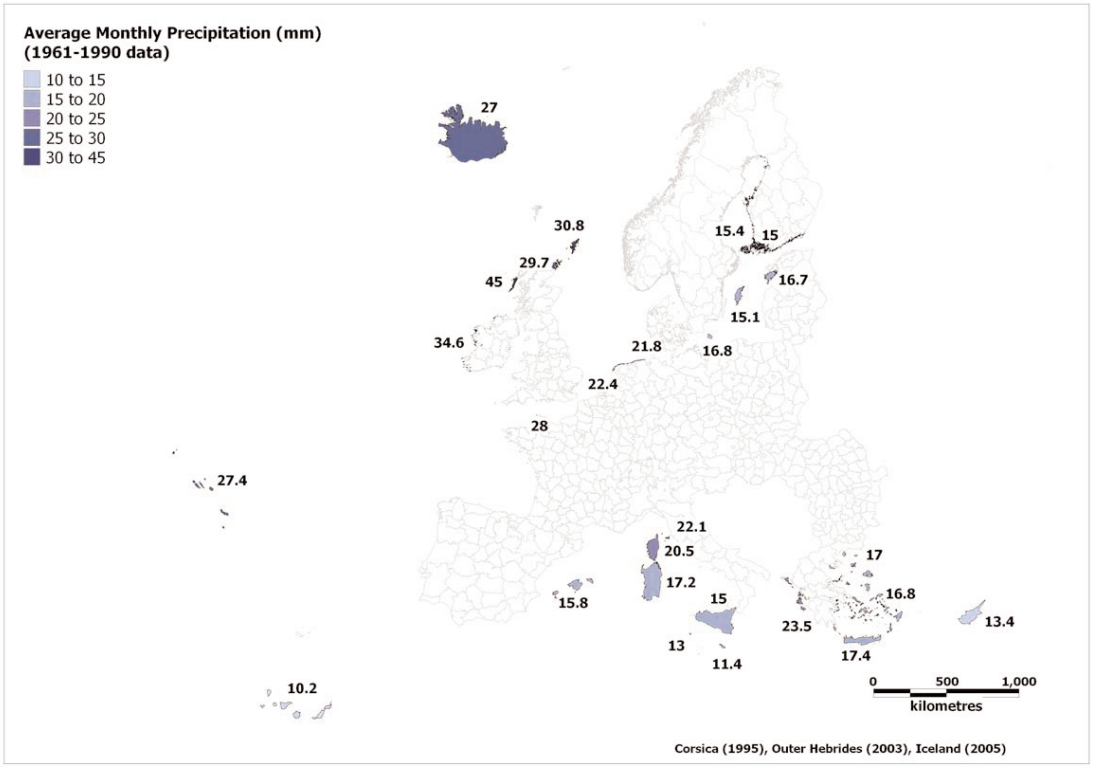
Source: CORINE 2000

Fig 21 % urban land of total



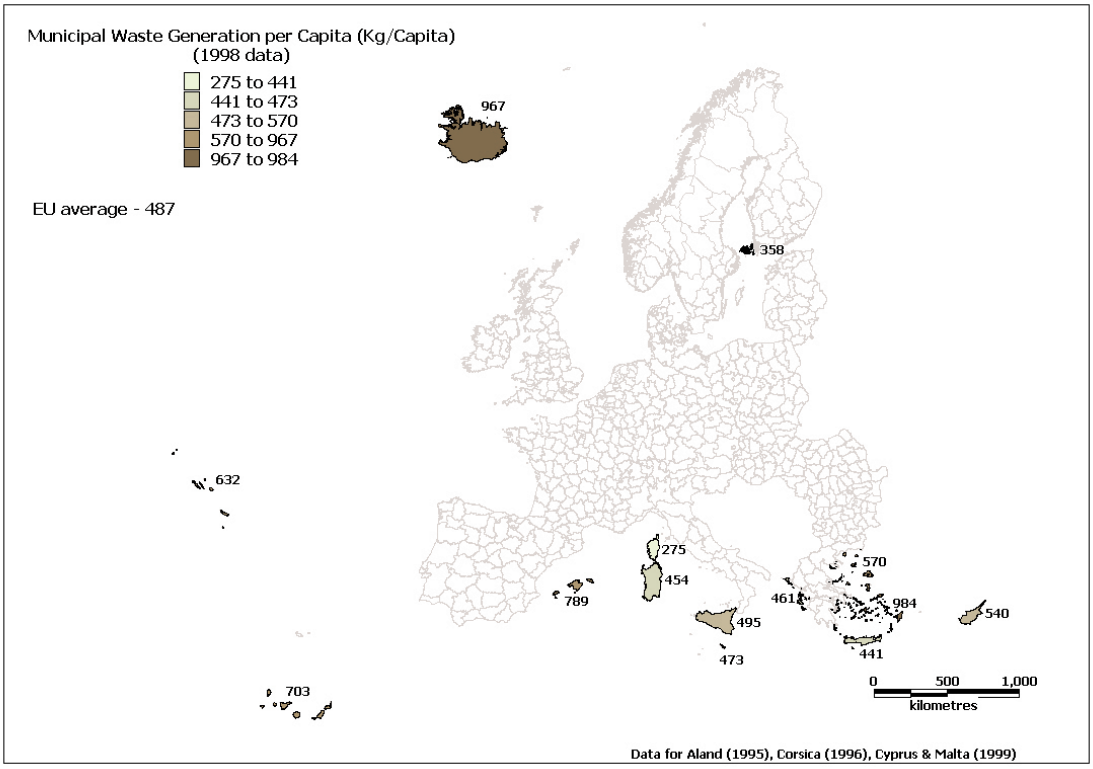
Source: IRENA 2002

Fig 22 Water abstraction rate for agricultural use



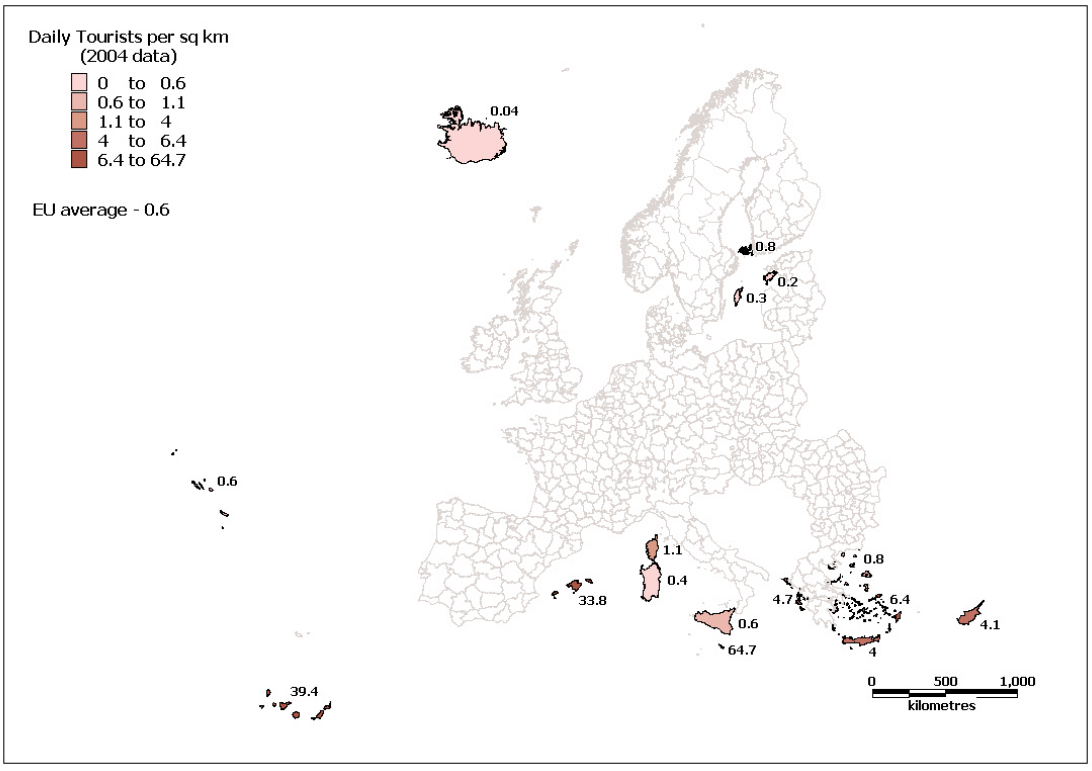
Source: IPCC

Fig 23 Average monthly precipitation 1961-1990 (mm)



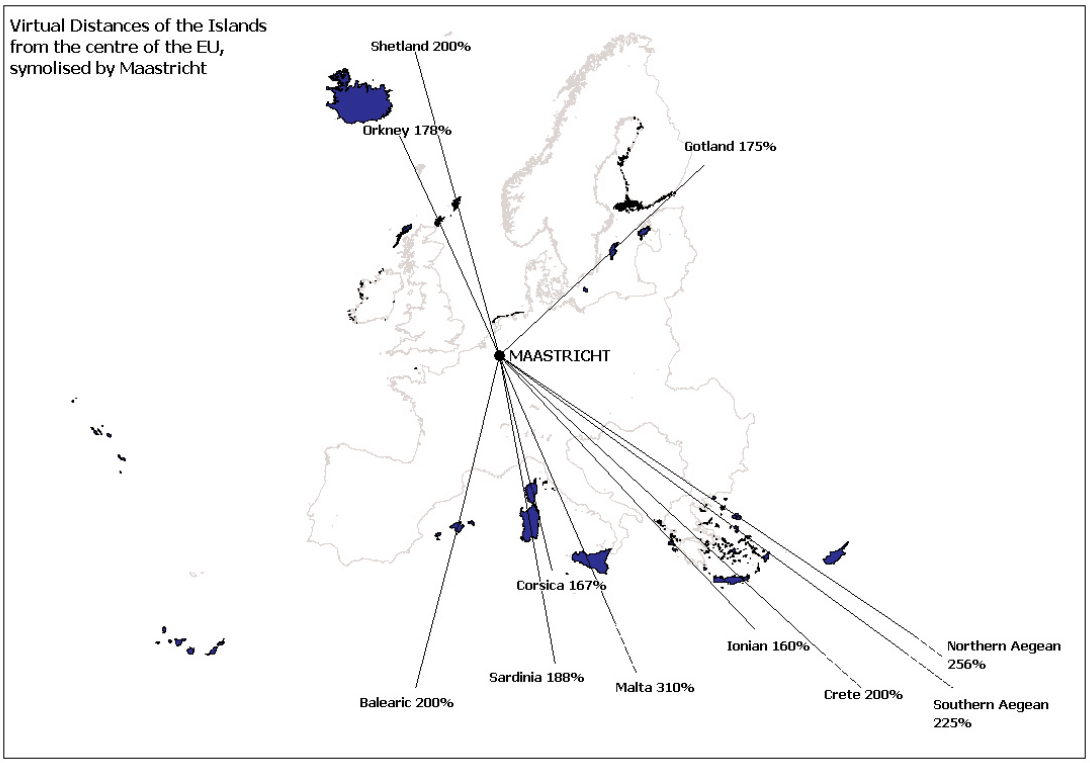
Source: Eurostat; Iceland and EU average - EEA, 2005

Fig 24 Municipal waste generation per capita



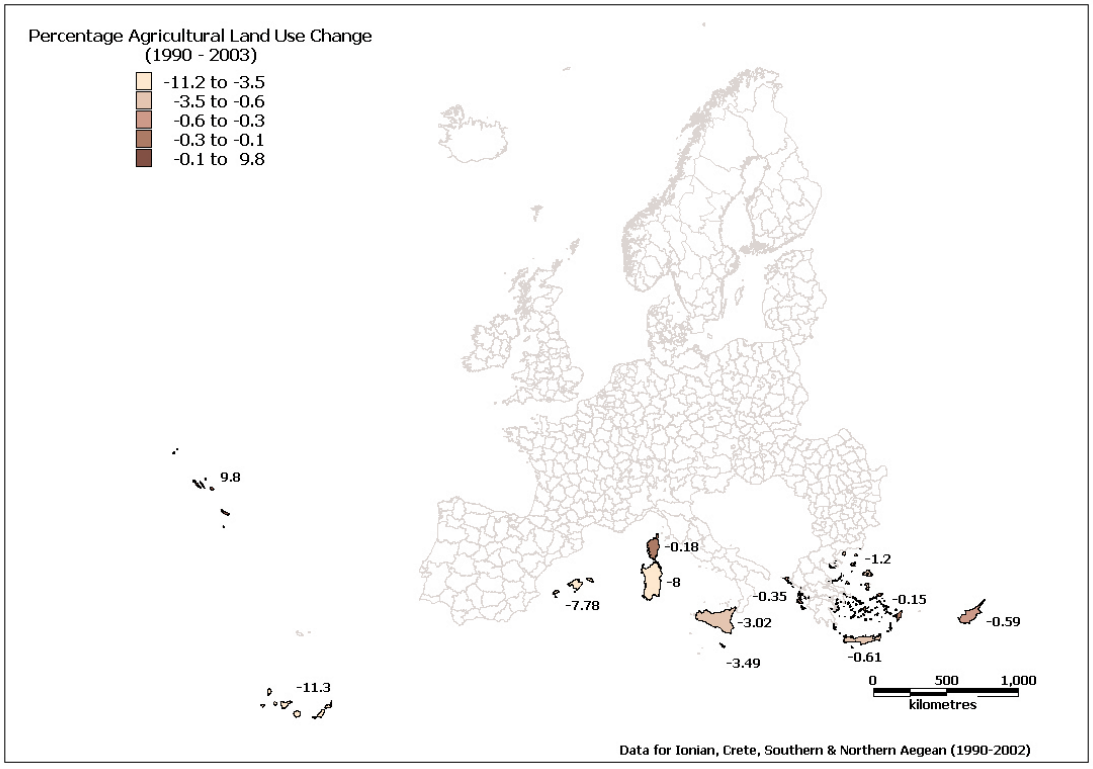
Source: Eurostat, Gotland - www.eurisles.org, Saarema - University of Tartu

Fig 25 Daily tourist population per square km (2004)



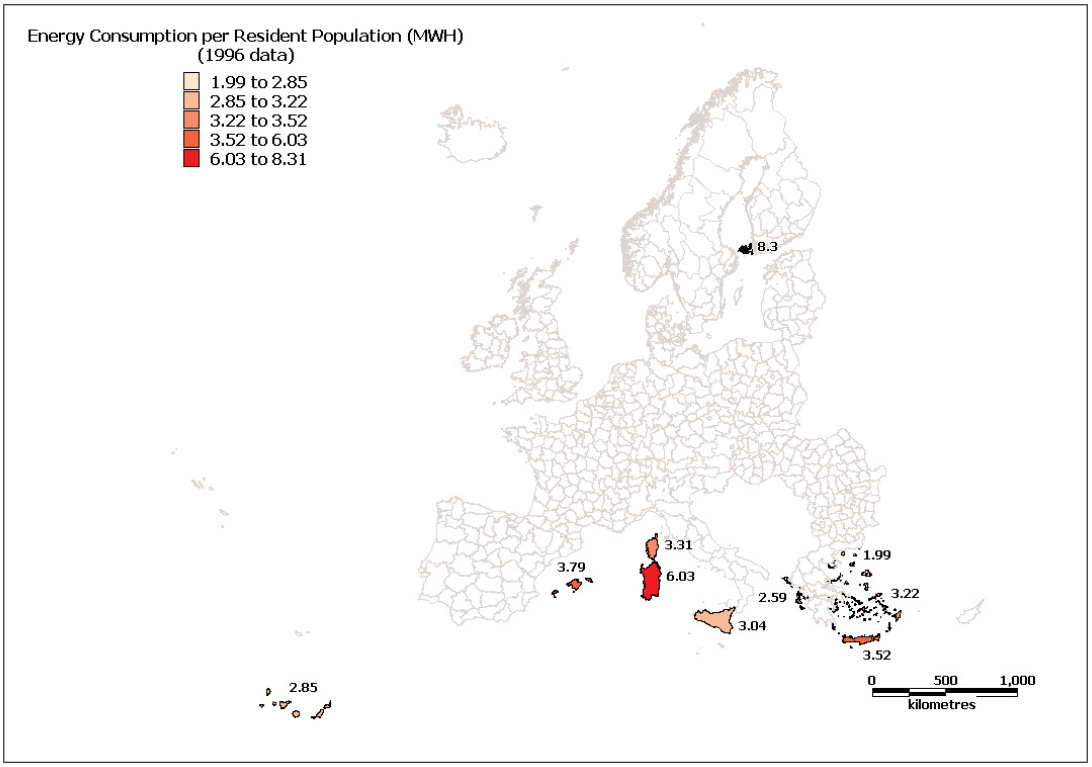
Source: Eurisles, 2002

Fig 26 Virtual distance (based on travel time) from centre of Europe (Maastricht)



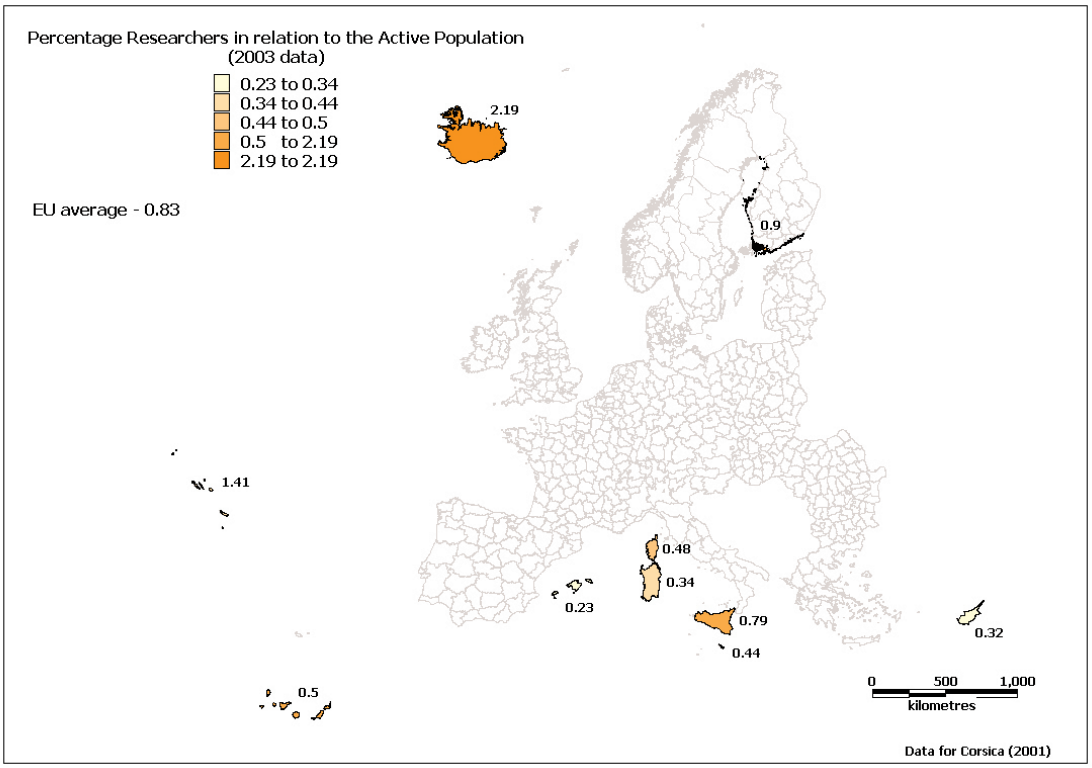
Source: Eurostat; CIHEAM, 1993

Fig 27 % agricultural land use change (1990-2003)



Source: Eurostat

Fig 28 Energy consumption per resident population (MWh) (1996)



Source: Eurostat

Fig 29 Percentage of researchers in relation to active population (2003)

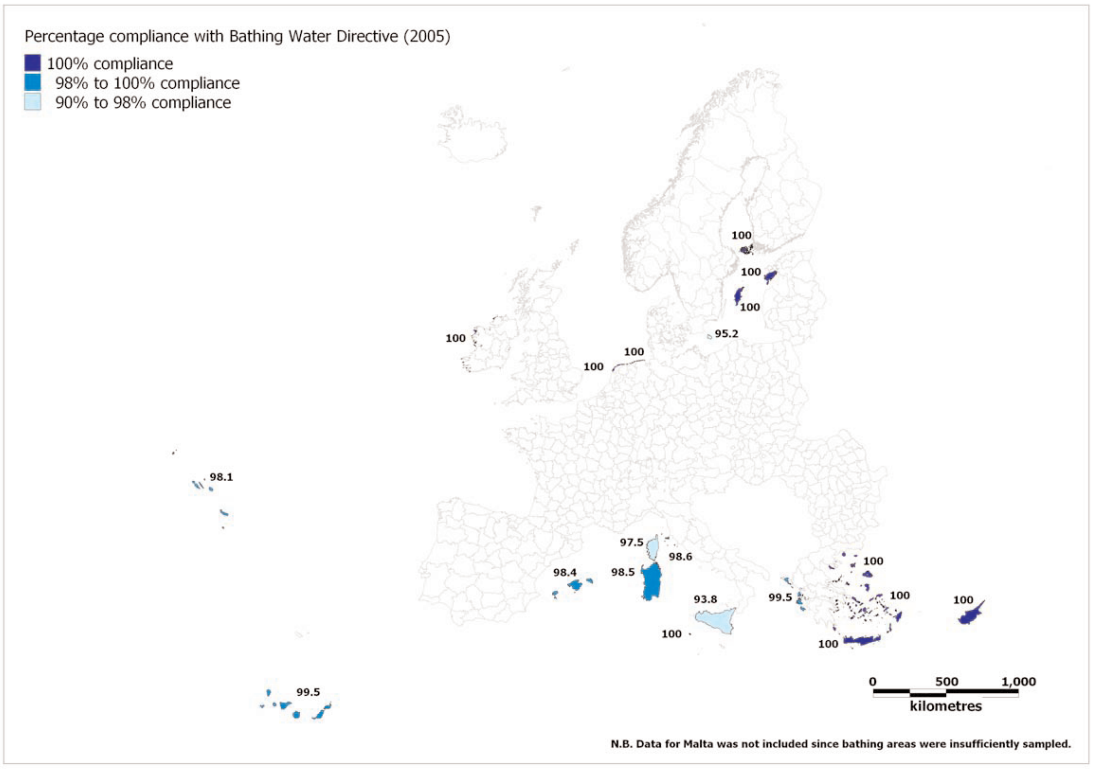


Fig 30 Percentage compliance with Bathing Water Directive (2005)

Main partners involved in this publications are:
The Brandenburg University of Technology Cottbus, DE
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The Institute of Landscape Ecology ILE-SAS, SK
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The University Tartu, EE
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