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The urban transformation of the Spanish coast. Land Cover Change analysis 1990-2012

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Abstract

Historically human activities have unquestionably transformed the earth's surface. The seaside is probably the area that has suffered most from this process, due to the fact that great part of the world civilizations have settled in these regions. During the last decades, in which is also framed the study period of the present document (1900-2012), this alteration process has been intensified to never before seen levels, the produced land cover changes compromise or even destroy ecological values of the affected area. In the case of Spain, one of the main drivers of this process of transformation is the tourist industry with its consequent urban growth; which in many occasions is related to irregularities and corruption. As a response to this destruction, the scientific community reacted by creating the land system science in order to study the evolution and consequences of it; also the political sphere has tried to mitigate or at least limit this process with the creation of regulatory bodies, unfortunately without success.

Key words: seaside, land cover change, degradation, ecological values, urban growth, tourism industry

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1. Introduction

The earth is a constantly changing entity driven not only by natural factors, but also by anthropic ones. This second kind of changes are nowadays the most important ones, and suppose a greater alteration of the space. Human driven changes have been intensified since the mid of the 20th century, reaching their peak with the current period of globalization. This process is framed within the context of free market, characteristic of capitalism, based on accumulation of benefits in detriment of labour and natural resources exploitation (Blazquez, 2015).

Indeed, the coast, as an area or study, where untiring human pressure on its natural aspects has produced a very significant impact due to its high natural dynamism, coupled with a great spatial and temporal variability, which ends up translating into a great fragility (Prieto et al., 2013) and vulnerability (Hernández-Calvento, 2002); thus, revealing a symptomatic lack of regulation and management that allows the occurrence of these acts (OCDE, 1995; Roig-Munar et al., 2009). In fact, companies give more value to monetary measures, than to the environmental values (Murray, 2005); feature that is intrinsic to the market, based on a process of capital accumulation through the alienation and commodification of out-of-market areas (Harvey, 2004).

The tourism industry as well as the real state sector, following the logics of capital accumulation, often triggers its potential as one of the most important economic sectors, playing a key role in the transformation of natural spaces into artificialized ones (Mir-Gual, 2014; Prieto et al., 2013).

This alteration has been produced during decades, modifying in a significant way the coastal area. And, this alteration precisely creates the need for its study, with the aim of understanding the process that has occurred, as well as knowing the current state and possibly being able to establish corrective and/or management measures for the future. In fact, the territory is the asset over which the tourism activity is developed, once this is degraded, this sector will also be affected by it. Therefore, its preservation is highly recommendable for both: preserving the ecological values of the coast and preventing the degradation of coastal tourism.

Accordingly, the present dissertation, aims to analyse the evolution of the land cover change in a 1 km buffer from the Spanish coastline, between the 1990 (pre-housing boom) and 2012 (financial crisis), paying especial attention to the artificial land. The results and knowledge about the state of the question that will be obtained could be a starting point for developing management plans and regulations focused on solving or at least mitigating the effects of the artificialization process, as well as for future studies.

2. Literature review

The main topic treated in the present document is the evolution of the artificial land between two periods, 1990 which is before the housing boom, and the 2012, which coincides with the real estate burst and crisis. This topic about land cover change is not unique and strictly new; as it will be exposed in this section, it is possible to identify at different scales of study several authors that have written about land cover changes and related aspects.

Without further ado, after this reminder on the main theme of this document, let's begin with the explanation over ***land system science***, its definition and evolution. According to Verburg et al. (2015: 1) "*Land systems constitute the terrestrial component of the Earth system and encompass all processes and activities related to the human use of land, including socioeconomic, technological and organizational investments and arrangements, as well as the benefits gained from land and the unintended social and ecological outcomes of societal activities*"

Human driven changes on the environment, suppose wide ranging alterations on the structure and function of the earth system, which at the end also have consequences for the human well-being (Steffen et al., 2004). In fact, nowadays more than the 50% of the ice-free surface of the earth has been transformed by the hands of humans (Turner et al., 2007).

These global changes are the major research challenge for the human environment science (Omenn, 2006). In order to understand the complexity of the dynamics, it requires to see the whole process as coupled human-environment system (Kates et al., 2001). Several scientist communities are involved in this commitment, including remote sensing, political ecology, resource economics, landscape ecology, biogeography and others; forming in this way interdisciplinary teams. Each of these broad research communities has developed different ways to enter the land-change problem (Rindfuss et al., 2004).

The main objectives that these groups try to improve are (Turner et al., 2007):

a. Observation and monitoring of land changes.
b. Understanding these changes as a coupled human-environment system.
c. Spatial modelling of land change.
d. Assessment of system outcomes, like vulnerability, resilience or sustainability.

The birth of this science is relatively recent, with a life of about twenty years. Originated from the development/improvement of the computer industry, which has altered substantially the capacity to observe and monitor the land changes. At the beginning, land cover change was dominated by monitoring and modelling of ecological impacts and major land cover changes on natural systems (Turner et al., 1993; Lambin et al., 2000; Lambin and Geist, 2006); simultaneously, some efforts were made in terms of observing the land cover changes by remote sensing (Walsh and Crews-Meyer, 2002).

One milestone was the LUCC[1], project which was launched in 1994 as core project of the International Geosphere-Biosphere Programme (IGBP) in order to analyse how human and biophysical forces affects the land cover as well as the consequent social and environmental impacts of this process (IGBP, 2006). The result of the studies was the creation of a synthesis of case studies in which are identified the common driving factors of change and the causation patterns (Geist and Lambin, 2002, 2004). Parallel to that, some experts developed models that could predict future scenarios of land use changes (Verburg et al., 1999; Pontius et al., 2001).

Apart from the LUCC project, nearly simultaneously there was another project operating, The *Global Change and Terrestrial Ecosystems* (GCTE) which contributed with studies about terrestrial ecosystem changes on local, regional and global scales; like the increase of the greenhouse gases, changes in global and regional climate, habitat destruction and increase of invasive species (Pitelka et al., 2007). According to Verburg et al. (2015: 2) "*The overarching goal of the GCTE project was to project the effect of changes in climate, atmospheric composition, and land use on terrestrial ecosystem and to determine how these effects lead to feedbacks on the atmosphere and physical climate system.".*

With the pass of time, land use and land cover change studies have matured and become more integrative focusing on the main drivers as on the consequences/impacts of the land use modification. This process was potentiated by the information exchange between the mentioned interdisciplinary communities of different locations of the globe, which were working on similar questions; creating in this way a homogeneous and sustained science. This science has used and continuous using satellite photos through GIS[2] as main data sources, because they provide regular, trustable and "qualitative" information of every single place around the world. In terms of Land use/cover, the most relevant tool which is used nowadays, at least in the European Union, is the Corine Land Cover; which will be developed in the corresponding section of the document. Finally, to remain, land system science is the science field into which the present document may be inserted.

After the definition as well as evolution of this science it is nearly mandatory to expose some of the outstanding experts in the field at different scales. At international scale, two of the most well-known authors are Bill Lee Turner II, which is an American geographer, as well as their college and social demographer Ronald R. Rindfuss. Both have been developed in collaboration with other authors some articles about the land cover theme; one of the most important one is *Developing a science of land change: Challenges and methodological issues* (Rindfuss et al., 2004).

At European scale, probably one of the most important experts is the social ecologist Helmut Haberl. He is an expert of land use change, sustainability indicators and material and energy flow analysis. One example of his articles is *Land Use and Sustainability Indicators* (Haberl et al., 2004), in which in collaboration with other two authors try to identify indicators to predict the land cover change. In Spain, the Observatorio de la Sostenibilidad is an outstanding institution, which publishes annual reports about the land cover. In the last edition (Estévez et al.,2016), it presents an analysis of the land cover changes from the coast using three different four buffers 500m, 1km, 2km, 10km. This reports presents variety of detailed information related with the topic that matter of this document. Finally, in the case of the Balearic Islands one good example is the professor Toni Pons Esteve with his PhD thesis called *Tourism, insularity and urbanization at the Balearic Islands (1956-2006)* (Pons, 2016) in which the author analyses the territorial transformation, especially the urbanization in the Balearics during the mentioned period of time.

Once explained the scientific field in which the present document can be framed according to the topic; it is necessary to move one step forward, and explain facts about the ***coast***, which is the selected study area. Spain has a total of 8.000 km of coast, which suppose only the 4,25% of the total surface of the country counting a buffer of 5 km (table 1); it concentrates the 44% of the country population being more than 20 million persons (Estévez et al., 2016).

[1] LUCC: Land use and Land Cover Change Project (1994-2005).
[2] GIS: Geographic Informatics System.

Buffer	500m	1km	2km	5km	10km
Surface	277.082 ha	541.796 ha	990.965 ha	2.151.297 ha	3.635.865 ha
% over Spanish surface	0,55%	1,07%	1,96%	4,26%	7,21%

Table. 1 Spanish surface of coast area, hectares and %. Source: Estévez et al., 2016.

Related with this study area, which comprises the immediacy of the Spanish coast up to 1 km inland; area which is highly dynamic and fragile (Prieto et al., 2013; Mir-Gual, 2014). Due to these conditions, there exists a specific regulation which embrace part of this area, concretely the first 500 meters of the coast. The first version was the Coastal law 22/1988, July 28th (BOE, 1988), which aimed to protect and regulate the coastal area. The coastal law establishes the following zoning, based in three differentiated fringes (Fig. 1):

1. The first one is the maritime-terrestrial public domain (DPMT):
   It is an area of public domain integrated by assets which enjoys inalienable, imprescriptible and unencumbered character, granted by the constitution. In this document, the article 132.2 enounces the public property in the state; as well as, in the articles 3 & 4 of coastal law broadens the constitutional definition of public goods.
2. The second area is the Easement of protection:
   The Coastal Law establishes an administrative easement for the defence and integrity of the maritime-terrestrial public domain known as protection easement which is, generally, formed by an area of 100 meters of land measured from the inner boundary of the sea shore. In this area private property is allowed, but with limited facilities and works.
3. The third and last area is the influence zone:
   This area is 500 meters wide starting from the shore of the sea; in this zone the urban planning instruments should avoid the formation of architectural screens or accumulation of volumes, in such a way that the building density to be developed is according to the rest of the municipality.

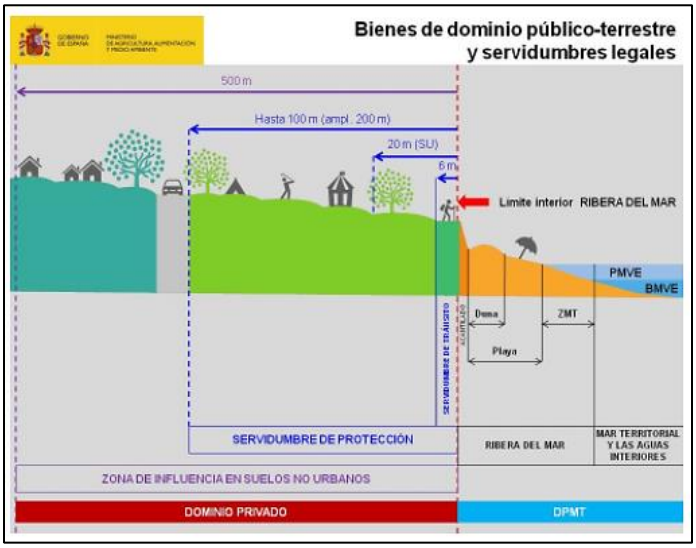

Fig. 1 Coastal law zoning. Source: MAGRAMA.

Since 1988 the coastal law has been modified. The last update is the creation of a new coastal law, 2/2013, May 29th, about the protection and the sustainable development of the coastal area (BOE, 2013). Roughly, this law which, according to MAGRAMA (2013) -Ministry of Agriculture, Fisheries and Environment-, in theory enhances the protection by limiting the uses of the area. But, in reality what it does is reduce the standards of protection, promulgate the privatization and reduction of the public use of the coast. Precisely the opposite of what the government express (Torres-Alfosea, 2016; El Pais, 2014). In fact, several experts criticizes the new version of the coastal law, probably one of the most important one is the document published by the AGE (Spanish Association of Geographers) where several geographers express in the field, detail all their complains and disagreements with the new law (AGE, 2015).

In the case of Spain, the coast area accommodates nearly the half of total population of the whole country and hosts much of the key economic sectors of the country, from which the most important one is the ***tourism sector*** (11, 7% of the GDP), with 57.4 million of international tourists in 2012; other activities are fishery, agriculture, aquiculture, removable energies, recreational use, etc. Clearly the tourism industry has a crucial predominance in the Spanish economy and on the space consumption and the consequent impacts on the environment (Estévez et al., 2016).

As it is logic, this huge amount of tourists every year need facilities and accommodation, therefore since the 1950's there has been a process of urbanization linked to tourism which Mullin (1991) defines as touristic urbanization. Understanding under this concept the creation of new cities with the sole purpose of leisure and recreation (Mullins, 2003; Qian, Feng, & Zhu, 2012). All this process in the concrete case of Spain is possible due to the country has suffered deep economic, social and political changes, passing from Franco's dictatorship to a liberal democracy which have had important environmental and territorial implications. During the period known as *Desarrollismo* (1960s-1970s), in the tourism sphere it was been created a figure called of *Zona de especial interés turístico nacional* (Special Zone of National Tourist Interest), declaration that meant a revaluation of the land and opening the possibility of future creation of tourist sites and its subsequent change of land use.

As pointed out with the previous example, processes of land cover change have several reasons why they occur, which are not only the economical, it is also necessary a favourable political regulation that allows this kind of urban growth, like the mentioned above situation during the Spanish dictatorship. Therefore, governance and political decisions have a direct impact on the environment (Verburg et al., 2015). The kind of governance that prioritises the economic profits over preservation and sustainability of the environment is defined as flow-centred governance (Sikor et al., 2013). Regulations and governance are important not only at country level, but also at regional and even local level are very significant in order to stop or at least slow down the urbanization process. But, most of the attempts at regional level have failed (DOT[3], POTA[4], POLA[5]…) and at local level many PGOU (Plan General de Ordenación Urbana- General Urban Plan) follow an expansionist philosophy with the declaration of developable land in lot of areas, this supposes a big threat for the future sustainability of the areas. Even, the previous coastal law approved in 1988, serves in a very limited way to protect the coast and finally the delimitation of the maritime-terrestrial public domain is still not finished. To this last mentioned aspect, we will make a deeper reference bellow in the document, because it affects and characterises the area of study (Estévez et al., 2016).

At this point it has already been explained the relation of the tourism industry with the coast as our study area, and the consequences on it. The last step is to explain some procedures/strategies which have been developed with the purpose of increasing the protection and viability of these regions, after recognition of the vulnerability of it. All these initiatives are covered by the term ***integrated coastal management***. According to the Environment Department of the European commission (2013) integrated coastal management "*aims for the coordinated application of the different policies affecting the coastal zone and related to activities such as nature protection, aquaculture, fisheries, agriculture, industry, off shore wind energy, shipping, tourism, development of infrastructure and mitigation and adaptation to climate change.*

In other words, integrated coastal management can be interpreted as the result of the confluence of two big challenges: the integrated and complex character of the territorial issues and the defiance of how to effectively relate knowledge and action (Farinós Dasí, 2011). The important point is that almost everything has its origin in an anthropic action, which has an impact on the environment, which returns to it, in the form of global processes (climate change) or particular processes (coastal erosion, coast line retraces, etc.). No matter how far we move away from the coast, the origin of the processes and effluents are located on the mainland and, at the end, everything returns or has an impact on the coast (Farinós Dasí, 2011).

[3] DOT: Directrices de Ordenación Territorial.
[4] POTA: Plan de Ordenación del Territorio de Andalucía.
[5] POLA: Plan Territorial Especial de Ordenación del Litoral de Asturias.

Traditionally has been understood as planning, all that territory that is inland, therefore recognized experts with long and proven trajectory coming from different fields have been working on the subject in order to overcome the problems in the planning. The summits hold by the OCDE in Paris and Tokyo (90's) lay the foundations to give a new orientation to planning, trying to acquire a more prospective, strategic and flexible character. Appointing in this way to an *indicative planning*, adapted to the characteristics and the needs of the moment and the space; thus arriving at this moment its conceptual maturity of the concept (Rodríguez Perea et al., 2012; Vallega, 1999). Some authors define this planning typology as "soft space" (Feludi, 2010).

From the beginning of 2000, indicative planning focus, not only takes into account the land emerged, but also contemplates the coast, recognizing its importance in hosting the greater part of the population and economic activities and its necessity to achieve a sustainable development of the area. In such a way, integrated coastal management supposes a step forward in this indicative planning (Farinós Dasí, 2011). The guiding principles Integrated Coastal Management according to the MAGRAMA are:

- Work in harmony with the natural processes.
- Adopt a global perspective in the approach to common problems.
- Involve all the interested parties.
- Base decision-making on data and actual information.
- Use all available tools as economic and legal tools, plans, information campaigns, Agenda 21 principles, voluntary agreements, good practices, etc.

In case of applying well these practices, it is covered the full cycle of processes that affect the place, information recollection, planning, decision-making, management, implementation and monitoring. Involving also all the other related stakeholders across the different sectors in order to get support of it and ensure the success of the different practices. In the case of the European Union and with the aim to even ensure a better viability of this this kind of procedure, it adopted a draft proposal for a Directive inserted into the framework for maritime spatial planning and integrated coastal management (European Commission, 2013).

A clear evidence from the support that these kind of practices get from the European Commission is the fact that between the 1996 and 1999 this entity started a series of 35 demonstration programs and 6 thematic studies (MAGRAMA, 2017). Those programs pursuit the following objectives: firstly, provide technical information about integrated coastal management; secondly, stimulate a broad debate around the actors involved in the planning, management and use of European coastal zones.

In the wake of the results and experiences from these programs, the European Commission adopted two documents: a) Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe (COM / 00/547 of 17 September 2000). This first document exposes the actuations that the Commission do with the aim to promote the integrated coastal management through community programs; b) Recommendation of the European Parliament and of the Council of 30 May 2002 on the implementation of Integrated Coastal Zone Management in Europe (2002/413 / EC). This second document stablishes the steps the member states has to follow when they undertake integrated coastal management strategies.

Until the moment it has been talked about the general context, at global or at least European scales, but even at country and autonomous level it is possible to find some examples of integrated coastal management initiatives. At Spanish level, it follows the above mentioned laws and guidelines given by the European Community, due to it is a member state of it. Upscaling a bit more, going to the autonomic level, in the case of the Balearic Islands, it exists an institution, the SOCIB (Balearic Islands Coastal Observing and Forecasting System), is a consortium with own legal entity, created through a join between the Government of the Balearic Islands (CAIB[6]) and

[6] CAIB: Comunitat Autònoma de les Illes Balears- Autonomous Community of the Balearic Islands.

the Spanish ministry of science and innovation (MICINN[7]). Dedicated to recollection and the model of coastal information (SOCIB).
After explaining all the necessary contextual background let's make a brief remind of the treated topics, which are: the land system science, the coast, the tourism and finally the integrated coastal management.

3. Methodology

For the developing process of the present document, it can be identified two different parts, but the first one, the *literature review*, as it is quite similar in the process in all the studies, it does not require to go over it with more detail, therefore it is a pretty "standardized" process. The most important part is the analytical one, based on own elaborated data by undertaking a geo-analytical process; using as start point raw data from the Corine Land Cover and other sources. It is so important because at the end it provides the information to answer to the main question of the dissertation: how the artificial land has changed in the Spanish coast between the 1990 and the 2012? As has already been glimpsed, this is the outstanding contribution part of the dissertation, but it also requires a series of raw information as starting point. The required information is following one:

- Corine Land Cover 1990.
- Corine Land Cover 2012.
- Spanish Coastline.
- NUTS II administrative limits of Spain (Autonomous Communities).

All these information is downloaded in Shapefile (Shp.) format, so that it can be opened with ARCGIS[8]. Both Corine Land Cover files, 1990 and 2012, are directly available in scale 1:100.000 on the Copernicus website[9]. The other two files, the Spanish coastline and the NUTS II administrative limits, are available in scale 1:25.000 on the IGN[10] website. These four different files, compose the initial information which is required to obtain the desired result.
Before explaining the data analysis process, it will be opened a parenthesis in order to introduce the Corine Land Cover geographic information database. In June1985 the European Environment Agency (EEA) launched the CORINE program (Coordination of Information on the Environment) to gather, coordinate and ensure the validity of the information about environment and natural resources of the State members of the European Union. Until the moment the used information of all member countries was heterogeneous, fragmented and from difficult access (Valera, 2011).
This information would also be useful for the implementation of policies and other purposes like maps of land erosion, climate models, etc. This would be done creating a new database of land uses and covers which is integrated in a Geographic Information System (GIS). The CLC is based on recollection, processing and analysis of satellite images (SPOT, LANDSAT) from the state members of the European Union (EU) using a uniform methodology in order to obtain consistent results that can be compared across the different countries (Copernicus, 2015).
The CORINE project has launched four different updates/versions: CLC1990, CLC2000, CLC2006 and CLC2012, following homogeneous technique and criteria, which according to Copernicus (2015) are:

- Minimum mapping unit (MMU): 25 ha (Status layer) 5 ha (Change year).
- Minimum width of linear elements: 100 m.
- Nomenclature: standard European level-3.
- Positional accuracy: better than 100 m.

[7] MICINN: Ministerio de economía, industria y competitividad.
[8] ARCGIS: Geographical information system software.
[9] http://land.copernicus.eu/pan-european/corine-land-cover
[10] IGN: Instituto Geográfico Nacional. http://centrodedescargas.cnig.es/CentroDescargas/index.jsp

- Thematic accuracy: > 85% (last to versions).
- Equivalent scale: 1:250,000 (status layer), 1: 100.000 (change layer).

The nomenclature is organized hierarchically in three levels of thematic detail belonging to five major groups (first number of the CLC code): Level 1: artificial surfaces; Level 2: agricultural areas; Level 3: forests and semi-natural areas; Level 4: wetlands and Level 5: water bodies. To these basic land cover classes, the nomenclature includes land uses classes, while some classes have a mixed land cover/land use character; these mixed classes are represented by the second and the third number of the three-number code used by CLC. As a result of this classification it exists a total of 44 classes on level-3 (Fig. 2) (Copernicus, 2015).

Fig. 2 CLC nomenclature. Source: Copernicus.

Since 2001, LUCAS project (Land Use/Cover Area frame Survey) is a complementary source of information to the CORINE (Valera, 2011). Formed by a network of small statistical sampling areas from different countries of the EU, which contain harmonized and detailed data about land uses and land covers and other environmental topics (EEA, 2010a).
Once in possession of the above mentioned initial information, land cover geographic information needs to be treated in order to extract the desired end information. This is carried out by opening the different Shapefiles with the ARCGIS software, which counts with tools to do all kind of operations required in order to obtain at the end the artificial land cover evolution. The steps that have to be followed are:

1) Creation of the 1km wide buffer from the coastline.
2) Creation of a clip from the main CLC shapefiles (1990, 2012) including all coastal autonomous communities (NUTS II) of Spain using the buffer as mask.

3) Elaborate a summary of the data of each of the resulting shapefiles from the previous stage, extracting the sum of the area of each Shapefile and the CLC code from both time series (1990, 2012). The result is a table which contains the surface of every land cover for both time series.
4) Preparation of the data for the geo-analysis, it is necessary to transform all the existent data, which are in vector format[11] , to raster format[12]. Once the files are already converted into raster format, the data need to be simplified, by reclassifying the information contained in each attribute table, reducing the number of classes by assigning to all possible only a label 1 of the CLC codification and avoiding the labels 2 and 3. In this form the possible land uses are reduced from the 43 possible to 5, which can be seen in the following figure (Fig. 3).
5) With the simplified the information, the following step is own analyse of the land cover change between 1990 and 2012; which is probably the most interesting part according to the objective of the present document. This is done with the raster calculator tool applying operation: $(raster\ reclassified\ 1990 \times 1) - (raster\ reclassified\ 2012 \times 10)$. The result of this operation is a new codification with the following classification (Table.2). Finally, these results allows us to interpret the legend of the layout maps, which is the last step of the process, to obtain the main land cover change map. But, in accordance with the objective of the present document, the evolution of the artificial land, only the codes -9, -8, -7, -6 and -5 are of interest. These results are expressed in km^2, for each of the ten studied coastal autonomous communities.

Unfortunately, the Corine Land Cover is not perfect either, it is also possible to identify errors, which at the end alters the results. The Corine is generated using direct cartography, taking as a reference a thematic cartography, using one reference of the initial date and one of the final; and the subsequent digitalization of the different polygons it makes it possible to obtain a land cover change map. But not always the results are perfectly coherent, in some of occasions there appears some changes that do not enter in the logic from the territory. These strange problematic changes are often linked to a thematic allocation error in one of the two cartographies used, or because of a poor legend codification to the polygons of ground cover, by a poor photointerpretation in the generation of cartographies or because of a lack of homogeneous criterion when deciding which category is assigned to a polygon in question. Linked to these possibilities, there are also errors related with appreciation that the photo-interpreters derived from the scale and the density of the legend (Barreira et al., 2012).

Therefore, some experts in the field have developed techniques to identify these thematic errors in cartography, because it is very important to have information with optimum quality, in order that the result of the works which have used this initial information are trustable in the best possible sense. Barreira et al. (2012) propose to identify the possible errors of the CLC cartography with the elaboration of a *crossover matrix* which allows the detection of different kind of changes between two satellite photos, using the guidelines of the European Environment Agency (EEA). Other authors follow different kind of techniques, but with the same aim. For instance, Bach et al. (2006) compares three cartographies from the same place but from different sources. Mas and Fernandez (2003) technique compares cartographies with different scale, dates and interpretation system. Finally, the last example, Pontius et al. (2004) use the technique of the crossover matrix to, like the explained example. As it has become clear with the existence of these different correction methodologies, is that it is corine has failures, but all these have a common main objective, which is to identify and correct the possible errors in the Corine cartography.

[11] Vector Format: kind of representation conformed by points, lines and polygons.
[12] Raster format: Kind of representation based on homogeneous square polygons, also called pixels or cells.

4. Results: Artificial land cover change in the Spanish coast, 1990-2012

Spain entered into the European Union only four years before (January 1st 1986) the beginning of our study period; this fact constituted the most complete and systematic process of liberalization, opening and rationalization of the Spanish economy since the autarchy period from Franco's Regime. This fact also supposed changes at political, social and cultural level. Another important fact necessary to mention, which is more related with the main topic from the present dissertation, is the *Spanish housing bubble*. Some experts argue that this process took place between 1997-2007 (Montiel et al., 2011). The main symptoms of this process are: the abnormal rise in prices well above the CPI[13] and income, which are mainly explained by external factors, such as the lack of building land, the tax benefits granted to the purchase of housing, immigration, speculation and reclassification of land, as well as credit excess. This mentioned abnormal price growth process is reflected by an increase of around 150% of the price in nominal terms, which corresponds to 100% in real terms (El Economista, 2006).

In parallel to the already mentioned symptoms, Spain was suffering a steady increase in public debt. The combination of both of the previous mentioned factors ended in 2008 with the "puncture" of the bubble and the entrance of Spain's worst crisis of their recent history; which is characterized by record numbers of unemployed, deflation, GDP degrowth, public and private indebtedness (Jerez Darias et al., 2012). The last aspect to highlight, that plays an important role, are the policies and regulations from each autonomous communities and even municipalities. That in general terms became more flexible and less restrictive, which traduces in vulnerability of part of the territory and an increase of the artificial land. Related with the regulations a fact to take into account are the high corruption rate in which 673 municipalities where involved supposing the 8,3% of total from Spain (Jerez Darias et al., 2012).

Therefore, coming up next it will be exposed the own results firstly, and then an attempt will be made to give an explanation of these by autonomous communities. But, before that, a clarification is required, which is that in the table 3, are not shown the complete results of each autonomous community, it exists a lot more detailed data available in the annex II. This only express a summary of the most relevant data at CLC level 1 for each autonomous community for both time series. Giving in this way useful information to get an overview about the general behaviour of the land cover change process. To analyse the behaviour of more specific patterns it is necessary to attend to the level II or even level III of the CLC, information which are available in the tables form the annex II of the present document.

[13] CPI: Consumer Price Index.

Autonomous communities			CLC Level I					Total surface
			Artificial surface	Agricultural areas	Forest and semi natural areas	Wetlands	Water bodies	
Asturias	Year	1990	21,53	171,33	67,80	1,70	9,64	272,00
		2012	29,84	141,86	90,22	0,62	9,47	272,00
	Variation	km2	8,31	-29,47	22,42	-1,08	-0,18	0,00
		%	38,61	-17,20	33,07	-63,47	-1,83	0,00
Andalusia	Year	1990	193,19	168,76	385,06	43,55	25,13	815,69
		2012	301,04	149,71	288,45	43,64	27,03	809,87
	Variation	km2	107,86	-19,05	-96,61	0,09	1,90	-5,81
		%	55,83	-11,29	-25,09	0,21	7,56	-0,71
Catalonia	Year	1990	170,82	129,94	143,71	23,04	16,50	484,01
		2012	201,08	97,66	150,31	21,64	13,56	484,25
	Variation	km2	30,26	-32,28	6,60	-1,39	-2,93	0,25
		%	17,71	-24,84	4,59	-6,05	-17,78	0,05
Cantabria	Year	1990	31,98	86,33	49,54	11,08	5,96	184,88
		2012	40,12	78,89	46,63	10,31	8,95	184,88
	Variation	km2	8,14	-7,44	-2,91	-0,77	2,98	0,00
		%	25,44	-8,62	-5,88	-6,94	50,06	0,00
canary Islands	Year	1990	125,03	224,96	794,57	0,32	16,17	1.161,05
		2012	173,16	166,42	807,92	0,64	12,92	1.161,05
	Variation	km2	48,13	-58,54	13,35	0,32	-3,26	0,00
		%	38,49	-26,02	1,68	101,38	-20,13	0,00
Galicia	Year	1990	160,66	300,38	472,39	15,33	40,91	989,67
		2012	167,81	286,83	489,43	11,16	34,74	989,97
	Variation	km2	7,16	-13,55	17,03	-4,17	-6,17	0,30
		%	4,45	-4,51	3,61	-27,19	-15,08	0,03
Balearic Islands	Year	1990	97,61	202,89	458,09	8,23	14,63	781,45
		2012	134,27	136,31	489,91	10,00	10,95	781,45
	Variation	km2	36,66	-66,58	31,82	1,77	-3,68	0,00
		%	37,56	-32,81	6,95	21,53	-25,15	0,00
Murcia	Year	1990	35,25	28,71	94,26	8,32	4,54	171,09
		2012	47,44	36,23	79,15	6,56	1,70	171,08
	Variation	km2	12,19	7,53	-15,11	-1,76	-2,84	0,00
		%	34,57	26,22	-16,03	-21,13	-62,64	0,00
Valencia	Year	1990	114,91	191,80	89,19	18,86	16,17	430,94
		2012	198,14	120,08	87,91	19,52	5,31	430,96
	Variation	km2	83,23	-71,72	-1,29	0,66	-10,86	0,02
		%	72,43	-37,39	-1,44	3,51	-67,18	0,01
Basque country	Year	1990	24,32	44,38	82,92	1,26	9,12	162,00
		2012	36,58	38,46	81,13	1,06	4,80	162,03
	Variation	km2	12,26	-5,92	-1,79	-0,20	-4,32	0,02
		%	50,43	-13,35	-2,16	-16,06	-47,36	0,01
Spain	Year	1990	**975,29**	**1.549,49**	**2.637,53**	**131,69**	**158,78**	**5.452,78**
		2012	**1.329,48**	**1.252,45**	**2.611,04**	**125,17**	**129,42**	**5.447,56**
	Variation	km2	**354,19**	**-297,04**	**-26,49**	**-6,52**	**-29,36**	**-5,22**
		%	**37,55**	**-14,98**	**-0,07**	**-1,42**	**-19,95**	**-0,06**

Table. 2 Land cover variation 1990-2012. Source: own elaboration from CLC data

In the table 3 we can be observed each of the five existent land cover categories contemplated by the CLC at level 1 represented by different colours in order to facilitate its interpretation. But according with the main aim of the present dissertation, the one which is more important and requires interpretation, is the first one in red, which represents the artificial land information for the different autonomous communities. The first important fact is that the total variation of the artificial land in the strip of the first kilometre from the coastline between the 1990 and the 2012 is about 354.19 km^2 which supposes an increase of 37.55%. The general data expresses clearly an increase of nearly a 40% of artificial surface in a 22 year time-lapse, it is quite significant in comparison with the other land covers, which follows the complete opposite tendency, the regression, with also very significant and troubling numbers approaching values up to 20% like the case of the water bodies; the -14.98% of the agricultural areas; -1.42% of the wetlands and finally the less dramatic data of -0.07% from the forest and semi natural areas.

After the exposition of the mentioned general variation facts, it is necessary to entry in more detail in the land cover object of study, ***artificial land***. The most important results of this CLC land cover typology are represented in the table above (Table. 4), there it can be observed four kind of data for both time periods and for each of the autonomous community from Spain. The four mentioned variables are: the total surface, expressed in km2; the artificial land surface, also expressed in km2; the third variable is the artificial land proportion of the study are, expressed in percentage; and finally the last variable is the artificial land change from 1990 to 2012, which is also expressed in percentage.

Autonomous Community			Total surface (Km^2)	Artificial land (Km^2)	Artificial land proportion (%)	Artificial land change 1990-2012 (%)
Asturias	Year	1990	272,00	21,53	7,91	38,61
		2012	272,00	29,84	10,97	
Andalusia	Year	1990	815,69	193,19	23,68	55,83
		2012	809,87	301,04	37,17	
Catalonia	Year	1990	484,01	170,82	35,29	17,71
		2012	484,25	201,08	41,52	
Cantabria	Year	1990	184,88	31,98	17,30	25,44
		2012	184,88	40,12	21,70	
canary Islands	Year	1990	1.161,05	125,03	10,77	38,49
		2012	1.161,05	173,16	14,91	
Galicia	Year	1990	989,67	160,66	16,23	4,45
		2012	989,97	167,81	16,95	
Balearic Islands	Year	1990	781,45	97,61	12,49	37,56
		2012	781,45	134,27	17,18	
Murcia	Year	1990	171,09	35,25	20,61	34,57
		2012	171,08	47,44	27,73	
Valencia	Year	1990	430,94	114,91	26,67	72,43
		2012	430,96	198,14	45,98	
Basque country	Year	1990	162,00	24,32	15,01	50,43
		2012	162,03	36,58	22,57	
Spain 1990			5.452,78	975,29	18,60	37,55
Spain 2012			5.447,56	1.329,48	25,67	

Table. 3 Artificial land proportion. Source: own elaboration.

Observing the table 4, the two more interesting variables are the artificial land proportion and the artificial land change from to 1990 to 2012. In this sense, let's begin analysing which autonomous communities have changed more during the 22 years time-lapse of study. In 1990 the autonomous communities that have a greater artificial land proportion were: Catalonia (35.29%), Valencia (26.67%), Andalusia (23.68%), Murcia (18.60%), Cantabria (17.30%), Galicia (16.23%), Basque country (15.01%), Balearic Islands (12.49%), Canary Islands (10.77%) and finally Asturias (7.91%). On the other hand, in 2012, the number have changed a bit, the autonomous communities with more artificial land in this second period were: Valencia (45.98%), Catalonia (41.52%), Andalusia (37.17%), Murcia (27.73%), Basque Country (22.57%), Cantabria (21.70%), Balearic Islands (17.18%), Galicia (16.95%), Canary Islands (14.91%) and finally, like in the previous time period, the last one is Asturias (10.97%). After these first results, in can be seen that some of the autonomous communities have suffered an important increase of the artificial land proportion in twenty two years. In order to facilitate the understanding of the aforementioned data, a graph is presented below (Fig. 3), which represents the proportion of artificial land from each autonomous community for both periods of study.
The exact proportion of growth registered in 2012 respect to the 1990, is observable in the last column of the table 4. As expressed, the autonomous community which has undergone a greater variation in their artificial land is Valencia with an increase of the 72.13%, followed by Andalusia (55.83%), the Basque Country (50.43%), Asturias (38.61%), Canary Islands (38.49%), Balearic Islands (37.56%), Murcia (34.57%), Cantabria (25.44%), Catalonia (17.71%) and finally Galicia (4.45%). These last results vary significantly in comparison with the artificial land proportion of the autonomous communities. This fact makes that some autonomous community which have high values of artificial land proportion in both periods of study; but the artificial land change is

very low. This is the case of Catalonia that in terms of artificial land cover was the first in 1990 and second in 2012; but in terms of land cover change it is nearly the last.

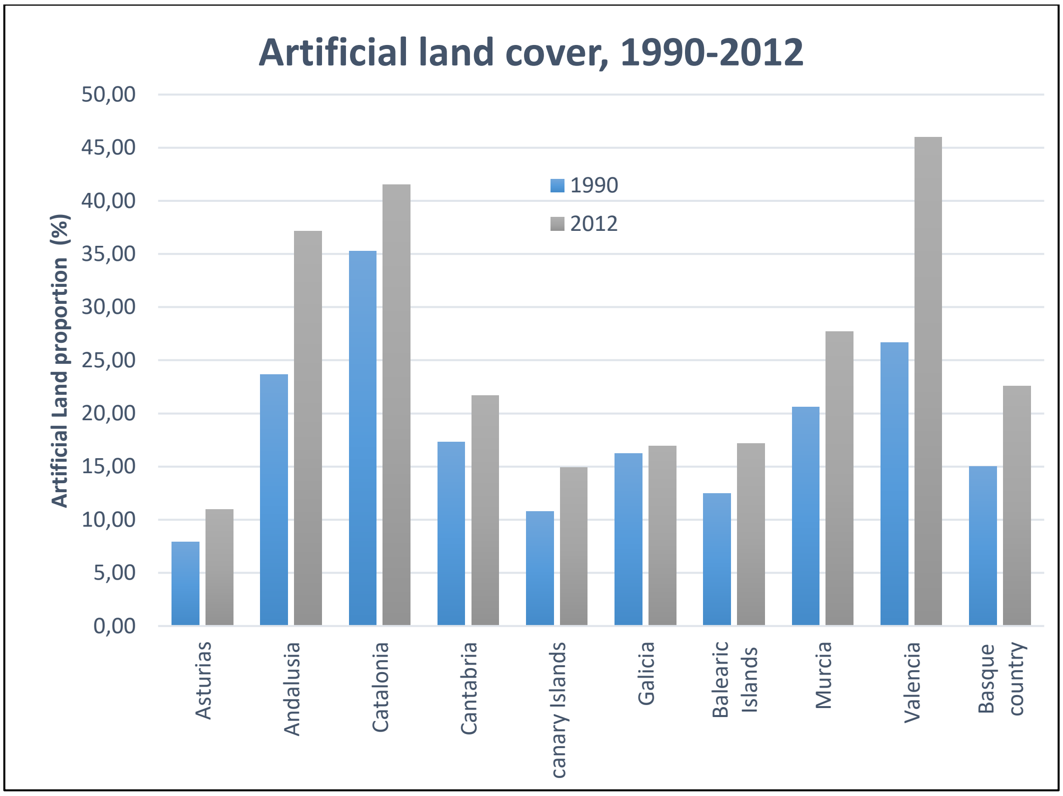

Fig. 3Artificial land proportion. Source: own elaboration.

Going one step further with the previously mentioned data, by the elaboration of dispersion diagram (Fig.4) using the following two variables: *artificial land cover % in 2012* and *artificial land cover change 1990-2012 (%)*. Each point of the cloud of points in figure 4 represents one of the studied autonomous communities; being the black point in the centre of the graph, the Spanish mean in terms of artificial land and artificial land cover change. All the other point differs in more or less degree from this mean. The present dispersion of the points indicates the inexistence of a clear pattern between the communities; fact which is supported by the result of the Coefficient of determination (R2), which in this case is quite low with a value of 0,1719; it means that the correlation between the two analysed variables is not very significant.

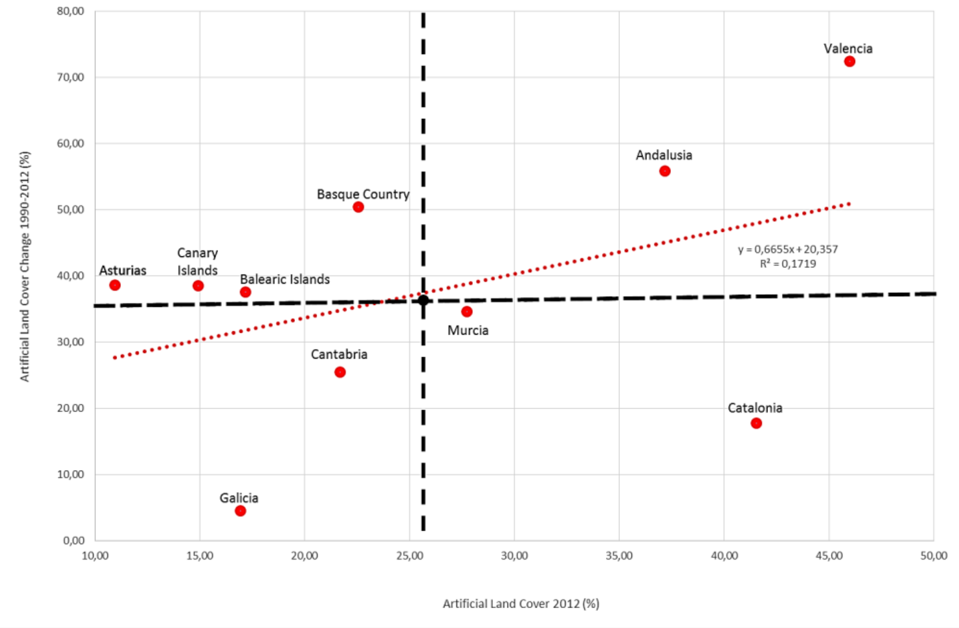

Fig. 4 Dispersion diagram. Source: own elaboration

Given the low correlation index in the dispersion diagram (Fig.4), it is interesting to prove if it exists more relation between some of the autonomous communities. Thus, the application of a Cluster analysis, understood as a set of multivariate techniques used to classify a set of individuals into homogeneous groups, using the same variables, clarifies this doubt, because it shows the existence of groups of autonomous communities with similar conditions. After the application of Ward Techniques, which is one typology of procedure, it is possible to identify four different groups of autonomous communities, which are more correlated to each other. The graphic representation of this aggrupation is possible to see in the Dendogram attached above (Fig.5).

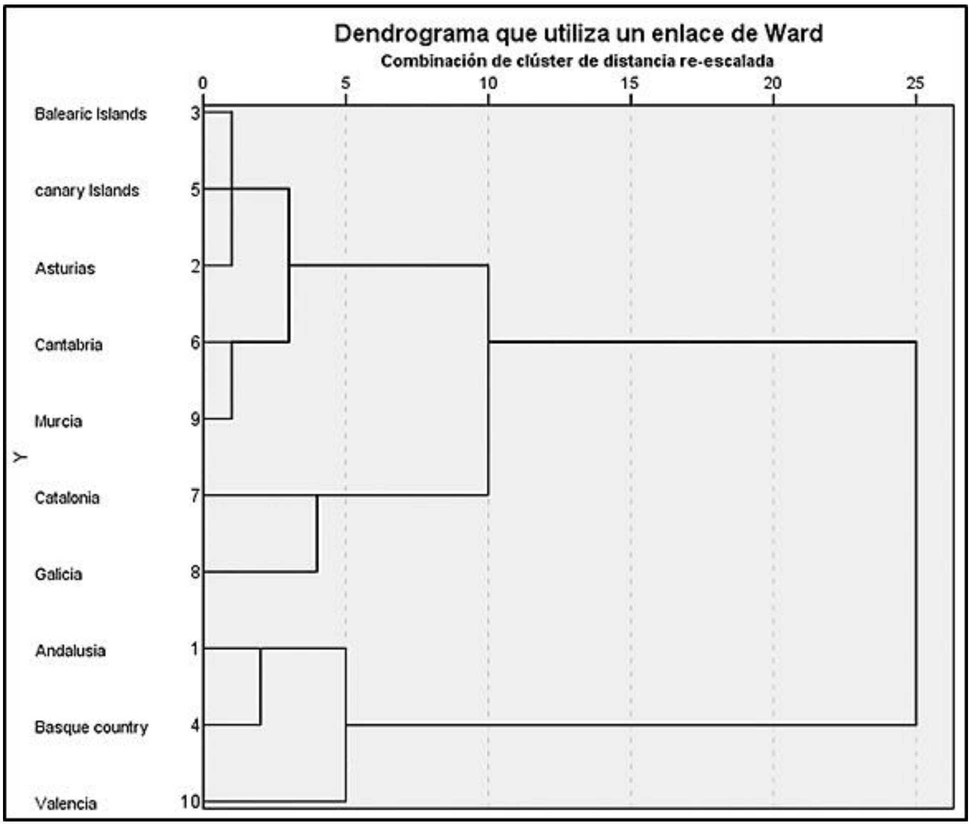

Fig. 5 Dendogram. Source: own elaboration.

As mentioned, the Dendogram, express the existence of four different groups of Autonomous Communities, which share similar characteristics between each other. The next lines exposes each of the four groups, as well as the autonomous communities that integrate each one of these with their corresponding brief and individualized explanation of the particular conditions therein, that possibly explain the causes and driving forces responsible of the results.

First group: lower proportion of artificial land cover in 2012 (below the Spanish average) and average land cover change 1990-2012 (about the Spanish average). This group is formed by Balearic Islands, Canary Islands and Asturias.

The ***Balearic Islands*** counts with 1.341 km of coastline, from which nearly 1.000 are cliff and rocky areas, affecting a total of 37 municipalities (Prieto et al., 2013). At present, in all the islands has imposed the route of tourist-real estate accumulation, as a productive monoculture, with a north-South gradient, in this sense Menorca presents a greater territorial preservation degree, and Ibiza is the most transformed one (Murray, 2003).

The insularity has had as a consequence the protection of the coast and a smaller construction tier with only a 13% of built coast, therefore it can be said that the Balearic Islands does not have followed the Mainland Mediterranean model (Prieto et al., 2013). In such way, the real estate bubble did not have as many effects as in other autonomous communities like Valencia. In fact, according to Murray (2013), the "brick fever" in the Balearic archipelago was partially mitigated by the adoption of certain regulatory measures in the early 2000s, especially urban moratoria, and the constant social pressure against tourism-real estate development. One example of it is the Law 4/2008 which protects 47ha threatened by urban projects (Aqua Mágica, Golf de Son Bosc…). On the other hand, during this decade, it can be found very liberal regulations and pro-construction, like the ones approved during the government of Jaume Matas (2003-2007). Other important factors are corruption and irregularities have also sprinkled this autonomous community, some of the most outstanding cases are Andratx, Palma Arena, etc.

The combination of these conditions has led to that during the study period the artificial land cover change in the first kilometre land is from the 37,56% passing from 97,61 km2 (1990) to 134,27 km2 (2012). Proof of this is that according to Greenpeace (2010), a total of 171.900 homes, 21 golf courses and five new marinas or extensions for 2,092 moorings where projected in the Balearic Coast. Positioning Calviá in 2.000 as the municipality with the greatest proportion of artificial land from the Balearics.

The ***Canary Islands*** count with 1.500 km of coast, from which the 66% are cliffs, 16% beaches and the rest artificialized land and marshes (Prieto et al., 2013). This autonomous community is affected by urban scandals, placing it in one of the first positions of state corruption; provoking in this way an increase of 38,49% of the artificial land in the last years as shown in our results. It exists five municipalities that have increased their urbanized area above 100%, therefore the housing stock has soared in the community. The worst part of this process has taken place in Fuerteventura, followed by Lanzarote and Tenerife. Another important factor are the tax incentives that have led to the development of a tourism sector. Also the construction of ports and golf courses in protected areas of all the islands with the exception of La Gomera, are the order of the day. The result is the existence of 64 black point in the coast side from the archipelago according to Greenpeace (2007).

Asturias is the last autonomous community in terms of artificial land proportion, but in the top three in terms of artificial land change. This autonomous community counts with 500 km of the most rugged and spectacular coastline of the country, but even that according to Greenpeace (2007) at urban level, one of the main problems is the POLA[14] which is only an excuse for the regional government to avoid the protection increase of natural areas even with the existence of urban speculation, especially with the creation of golf courses. Also at local level the Planes Generales de Ordenación Urbana del Litoral - General plans for urban coastal management, predict the construction of more than 30.000 new edifications. Therefore in 2006 the places where

[14] POLA: Plan de Ordenación del Litoral de Asturias.

the construction increases more where: Villaviciosa (95,31%), Avilés (42,34%), Gijón (28,1%), Castrillón (20,85%) and Llanes (8.23%). All these grow data are related with the development of projects like: Castropol, Selorio, La Talá, Ribadedeva, etc. These and other existent projects are reflected in the results (Annex II, Table. 2) with a land cover change 89,21% from the discontinuous urban fabric.

Second group: low land cover change 1990-2012 (below Spanish average) and average artificial land cover 2012. This group is formed by Cantabria and Murcia.

Cantabriat is in the top five autonomous communities in terms of artificial land proportion; but, one of the last in terms of land cover change. The 85% of the population from the population lives in the coast area, this has resulted in an unequal state of conservation of the coast, presenting an intercalation of privileged places and heavily altered sites. According to Greenpeace (2010), this fact is possible thanks to the existence of irrational policies that have allowed urban devastation in its coast and the inexistence the maritime-terrestrial public domain delimitation of the 90% of the territory. This has had as a result that in 2008 more than 50% of estuaries and intertidal zones had been filled with cement, gaining in this way more land extension to build; fact which our data also reflects. The most important key driver of the urbanization process is the residential tourism. The high degree of occupation has resulted in a drastic reduction in the protection of coastal areas, which are seriously threatened, from the nearly 300 km of coast, 134 km are protected, but most of these areas have not been adequately protected and there are numerous human activities that have affected them during the last decade; it is possible to find several examples of construction in theoretically protected area, like the following cases: Argoños, Escalante, San Vicente de la Barquera, Arnuero, etc. Even the POL[15], which sought to curb this destruction and urban speculation, couldn't do nothing because it only affect a third part of the municipalities, it is required an instrument that goes beyond urban planning.
Murcia presents its 250 km of coastline divided in only 8 municipalities. This coast presents very well conserved areas, and others that had suffered a great transformation process (Prieto et al., 2013). All the existing plans together aimed to build 800.000 new homes thanks to corruption and irregularities. Several are the cases in which the mentioned corruption plays the main role, some examples of affected municipalities and projects are: Alcázares, Águilas, Marina de Cope, etc. But, the corruption is not the only interesting fact, a third part of the houses from Murcia comes accompanied by a golf course (Greenpeace, 2007), aspect which is reflected in our results with an increase of 40,892.48% of the land dedicated to leisure and sport facilities. Also it is necessary to mention the construction of desalination plants, related with the huge water requirements of the regions. And finally the construction or enhancement of port facilities, some of them in protected areas like LICS[16] and ZEPAS[17].

Third group: very low land cover changes 1990-2012 (below Spanish average). Though, this group presents two very distinct cases such as Galicia with artificial land cover 2012 below the Spanish average and Catalonia with one of the highest rates of artificial land cover 2012.

Galicia counts with more than 1700 km of coastline, from which the 50% are cliffs, the 16% beaches and the rest marshes, wetland and artificial land (Prieto et al., 2013). In this case the main cause for the artificial land cover change, is again the political factor. Galicia has suffered the biggest land reclassification process in its recent history, according to Greenpeace (2007) 86 coastal municipalities have projected 800.000 new buildings. Moreover, the Xunta de Galicia, without the existence of the Plan Director de Puertos Deportivos (Master plan for marinas), has projected the creation of 4.000 new moorings.

[15] POL: Plan de Ordenación Litoral de Cantabria.
[16] LIC: lugar de interés científico.
[17] ZEPA: zona de especial protección para las aves.

Catalonia presents one of the most artificialized coast sides from Spain; in the own elaborated data this fact is also reflected through the first place in 1990 and second in 2012 in terms of artificial land proportion. On the other hand, the land cover change is not some much significant between the study period because of the high proportion of artificial land existent previous to the mentioned period. According to Greenpeace (2007), the 39% of the first kilometre of coast was already urbanized, and the prediction is to urbanise more, even at local level, in the General plans, the municipalities reclassified many non-urban land to urban, allowing in this form the creation of 100.000 new buildings. There are many examples of municipalities which have reclassified land, some of them are: l'Empordà, Roses, Tossa de Mar, Montroig del Camps, etc. Another important fact is the construction and enhancement of the port areas, with the creation of 6,000 new moorings until the year 2015. As in nearly the whole Spanish territory, all these examples of very lax regulation are due to corruption and speculation. At the ecological level the greatest impact caused by this process is the erosion and the impediment of arrival of new material due to the transformation done in the coastal edge. This mentioned process can be observed in the corresponding map (Annex II, Fig. 5).

Fourth group: high and very high land cover change 1990-2012 (above Spanish average). This group is formed by Andalusia, Basque Country and Valencia.

Andalusia is one of the autonomous communities which have more artificial land proportion as well as is in top five in terms of land cover change. According to Greenpeace (2010), the planning and management of the place are subjugated to the construction, tourism and chemistry industry, which shapes the regulation to their own profits. The Andalusian coast has been suffering for a long time the dictatorship imposed by the Sun and beach tourism, which at the same time is responsible for the majority of the urban plans from the different coastal localities. In 2007, during the midst of urban boom and near the bursting of the real estate bubble, the brick consumed an area of 12.81 ha per day of which 9.23 ha correspond to coastal space. Accounting in this form nearly 700.000 buildings, the major part in Almeria (320.000), Málaga (154.600), Huelva (126.750), Granada (54.000) and Cádiz (28.000). Watching our own data especially the mentioned houses correspond discontinuous urban fabric with a land cover change of 64.44%. Even the POTA[18] could not remedy or at least slow down this situation; in fact, the urban development has led to an exponential development of golf courses and marinas as the data also reflect with an increase of 189.20% of the sport and leisure facilities thanks to the projection of 156 new golf courses and 9.051 new moorings.

The ***Basque Country***, according with the object of study, is the most interesting case from the Spanish north sector. It counts with 250 km of coast line, from which only the 11% corresponds to beaches; affecting 26 municipalities which are in contact with the sea (Prieto et al., 2013). In terms of artificial land proportion, the Basque Country has quite significant rates over the 20%. On the other hand, the artificial land cover change presents rates over the 50% which is a significant number. According to Greenpeace (2007), the autonomous community has a new Land Use Law (Law 2/2006, September 21th) which is committed to the creation of sheltered housing. Even the existence of this new regulation, the review of all the General plans from de municipalities has revealed the availability of urban land for more than 100,000 buildings; with the following coastal areas being the most threatened: Getxo, Bakio, Lezama, Gatika, Sopelana and Berango. But, the worst part is not the availability of the land, it is the existence of several plans that has projected the construction of thousands of new houses, mostly related to the examples already mentioned. This fact is observable in the own elaborated results with an increase from the 343.91% of the urban fabric (Annex II, Table. 10). Furthermore, although the Basque Country already have more than 3,400 sports moorings, the construction continues. For instance, in Hondarribia 200 more piers will be built and in Orio there are already 296 new moorings. The previous mentioned facts are reflected and therefore it can be consulted in the annexes (Annex I, Fig. 3; Annex II, Table. 10).

[18] POTA: Plan de Ordenación territorial de Andalucía.

Valencia is one of the most paradigmatic cases. As the own elaborated data shows, Valencia is in the top two communities which presents more proportion of artificial land; and it is, with difference, the autonomous community with the highest growth rate throughout the study period with more than 72%. This case is especially linked with irregularities and injustices related with the legislation on urban planning in this Autonomous Community. According to Greenpeace (2010), the courts are saturated with accusations of urban planning or territorial planning irregularities. In fact, the High Court of Justice of the Valencian Community (TSJCV) studies about 800 cases. From the 542 municipalities that conform the autonomous community, between the 15-20% is located in the seaside and had suffered the massive irregular urbanization process; reaching the point, that the European Parliament monitors and opens legal actions against Spain. All this artificial land expansion process requires the transformation of other land covers, in this case the agricultural land is the most affected, by the transformation of the 25% of it into artificial land. The most impressive case is Torrevieja, where the reduction of agricultural, forest and semi natural areas reaches numbers from the 1600% in the two last decades. Apart from the irregular cases, the different regulation bodies are lax and allow or even unprotect some areas so that the destruction process is still guaranteed, a good example of that is the Reglamento de la Ordenación y Gestión Territorial y Urbanística (Territorial and Urban Planning and Management Regulation) or the Ley Reguladora de los Campos de Golf (Golf Course Regulation Law), which projects the creation of 43 new urbanization projects with golf course. The case of Valencia is very complex and plagued with irregularities, topic which in itself has much potential and controversy, but it is not the object of this study (Montiel et al., 2011).

5. Conclusions

The area of study hosts about 50% of the population of the country, as well as an important part of economic activities, among which tourism plays a key role, so that the pressure exerted on the place is much higher than other places of the country; not only the pressure is higher, the transformation degree is above the average from other locations. As seen in previous sections, this transformation process during the 22 years of study period is directly linked with mass tourism, urbanistic irregularities and corruption cases scattered throughout the state. Which in some cases allows the construction process of hundreds of thousands of houses, hundreds of golf courses and thousands of new moorings as well as new marinas.

Evidently, the construction of all these new facilities requires land consumption and the subsequent artificialization of it. In fact in 1990, the beginning of the study period, the artificial land proportion in the study area was 975.29 km^2 (18.60%), but in 2012, at the end of the study period, this surface was from 1.329.48 km^2 (25.67%), supposing a variation of 354.19 km^2 or the 37.55 % of increase of this kind of land cover; obviously the increase of this type of land has been possible due to the reduction of other typologies. This process has consequences/impacts for the environment arriving to the point of no return where the environment reaches an irreversible state. This alteration process of the coast caused by real estate development and tourism industry is such important that experts have created a specific term for it, the *Balearization*, which is defined by the creators as the destruction of the coast (Blázquez et al., 2011).

According to Estévez et al. (2016), the consequences of the exposed destruction process can be divided in four different categories depending on where they have their major impact. These categories are: *Social* (emergence of new urbanizations, lack of public services, increase of the employment rate, etc.); *Economic* (resource scarcity problems, tourism major income found, competition between sectors, etc.); and *Environmental* (effects on biodiversity and landscapes, occupation of fragile areas, significant increase of water consumption, etc.).

Another interesting aspect derived from the urban process, is that part of the protected areas in some cases have been reduced its extension and therefore the scope of its protection. From the 153,614.20 km^2 protected by Natura 2000 (Annex I, Fig. 6) in the whole Spanish territory (MAGRAMA), in the study area can be found 1,830.4 km2. Taking the total artificialized surface in the study area, 1,329.5 km^2, and the total surface of this area, 5,447.6 km^2; thus it remains a total surface of 2,287.68 km^2, which is potentially in danger to suffer a transformation process due to the current no protection. The exact distribution by autonomous Community of this available/unprotected land is expressed in the table below (Table. 4). Observing this table can extracted a series of very interesting conclusions; firstly, it is possible to appreciate a kind of north-south gradation, being this first one in which more land is available, in other words, the autonomous communities located in the north of Spain presents greater percentages of available land. Secondly, the available land (43%) at state level is superior to the currently artificialized land (24.41%), especially in the north of the country again. This last type of land, or at least part of it, is potentially useful as a brake on the process of artificialization, since it can be declared as protected or non-urban in the future. Thirdly, a fact which is interesting and at the same time throws a bit of hope, is that also the protected area (32.6%) at country level is higher than the currently artificialized surface (24.41%). One example of distribution of the three typologies of soil in the case of the Balearic Islands, can be seen in the Annex I, Figure 8.

	Artificial Land (%)	Natural Protected Areas (%)	Available Land (%)
Asturias	10,97	18,62	70,41
Andalusia	37,17	31,69	31,13
Catalonia	41,52	32,41	26,07
Cantabria	21,70	22,71	55,59
canary Islands	14,91	40,45	44,64
Galicia	16,95	23,05	60,00
Balearic Islands	17,18	49,45	33,37
Murcia	27,73	41,61	30,66
Valencia	45,98	20,81	33,21
Basque country	22,57	15,14	62,29
SPAIN	24,41	32,60	43,00

Table. 4 Seaside available land. Source: own elaboration.

On the other hand, it also exist a natural element of protection inherent to the territory, which is the morphological diversity of the coast (Annex I, Fig. 7). In areas where cliffs prevail, the construction of infrastructures and urban developments is much more complicated and expensive than in a sandy beach areas, creating in this way a kind of "natural brake" for this process. In addition the existing protective figures, are also to some extent a brake of such urban sprawl in the coast area, these figures can be seen on the corresponding map (Annex I, Fig. 6)

To sum up, it is indisputable that in the last two decades, in the study buffer, the presence of artificial land has increased, mainly motivated by urban expansion and commercial activities, especially related to tourism. All this process has had impacts on the environment, which have led to an inevitable need to change this consumerist trend of territory or the consequences will be even more serious and irreversible. But, it also exist some signs of hope, thanks to existence of the previously mentioned percentages, in which the protected surface as well as the available land still be greater than the already artificialized surface.
At last but not least, it should be highlighted *that Integrated Coastal Management* is crucial to reverse and prevent coastal impacts, while promoting a sustainable coastal resource use and development.

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Annex 1: cartography

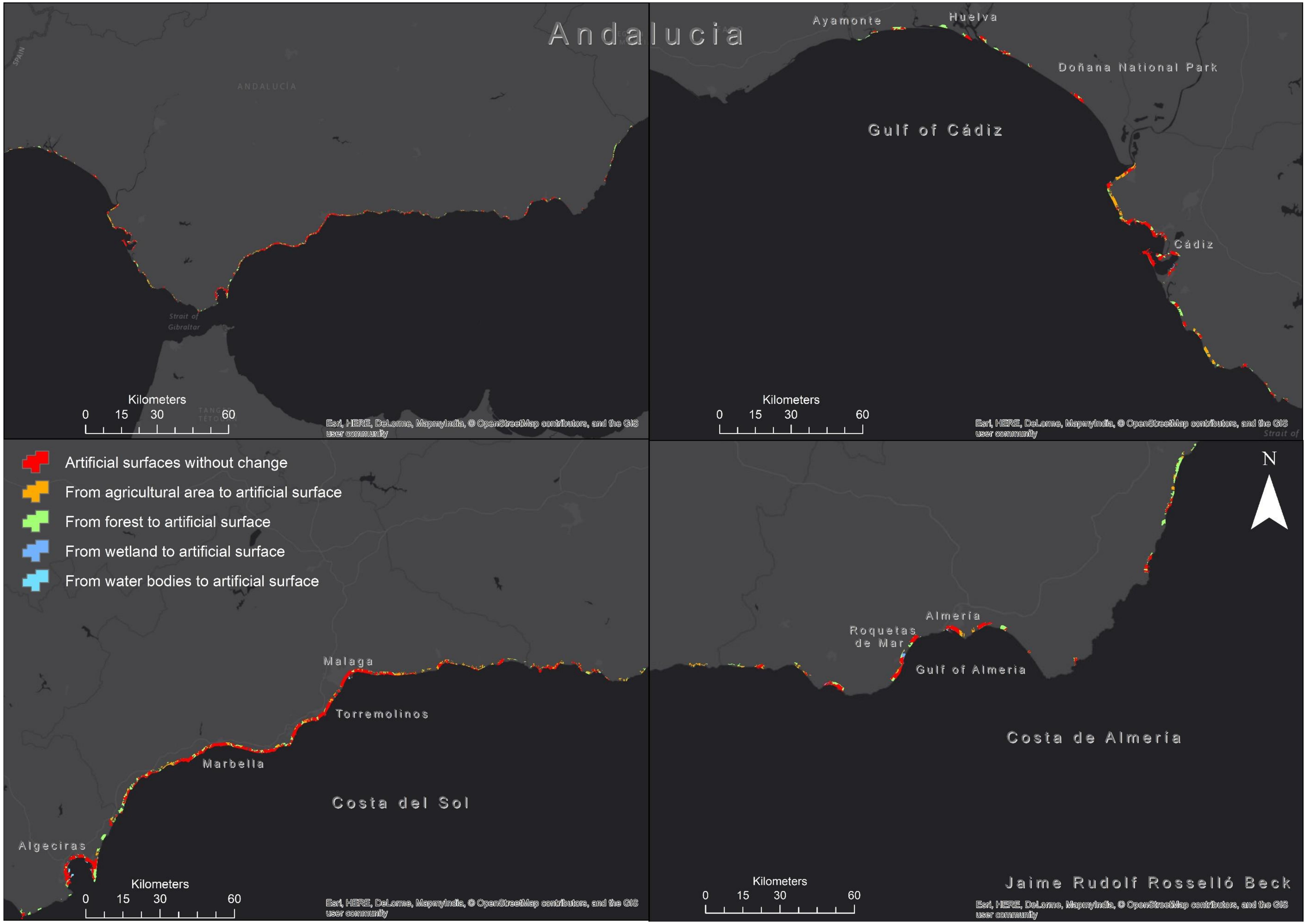

Fig. 1 Andalusia land cover map. Source: own elaboration.

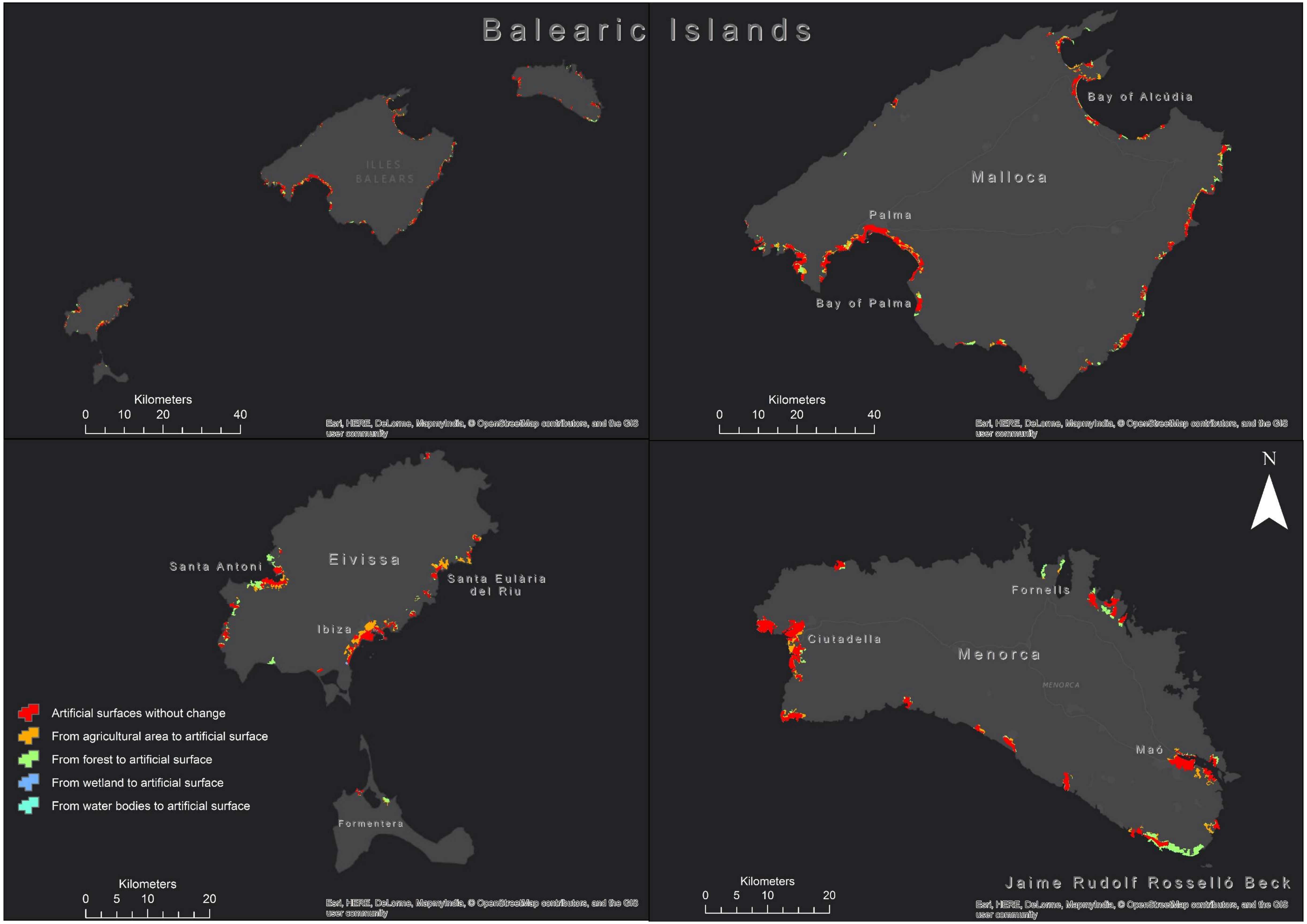

Fig. 2 Balearic Islands land cover map. Source: own elaboration.

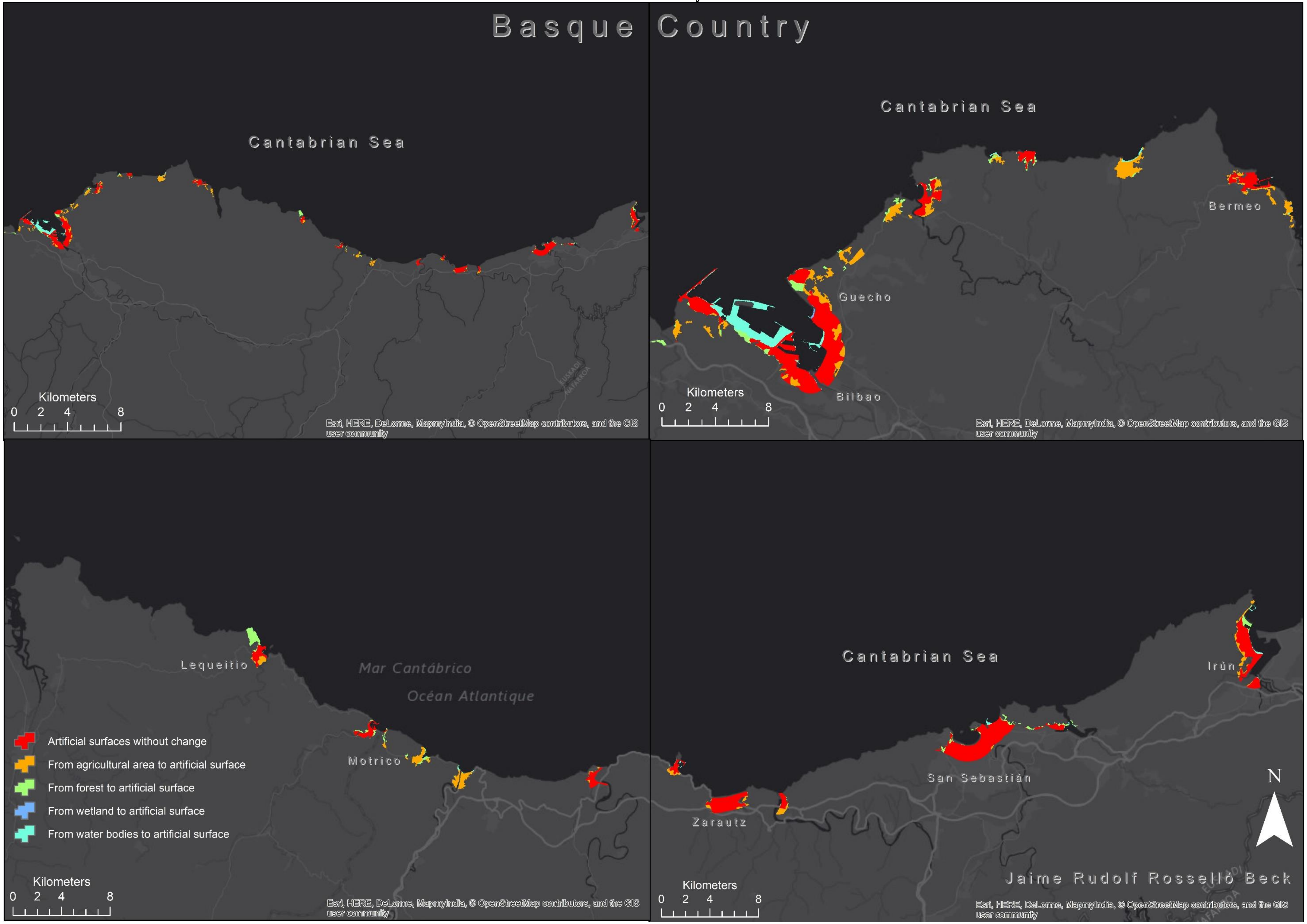

Fig. 3 Basque country land cover map. Source: own elaboration.

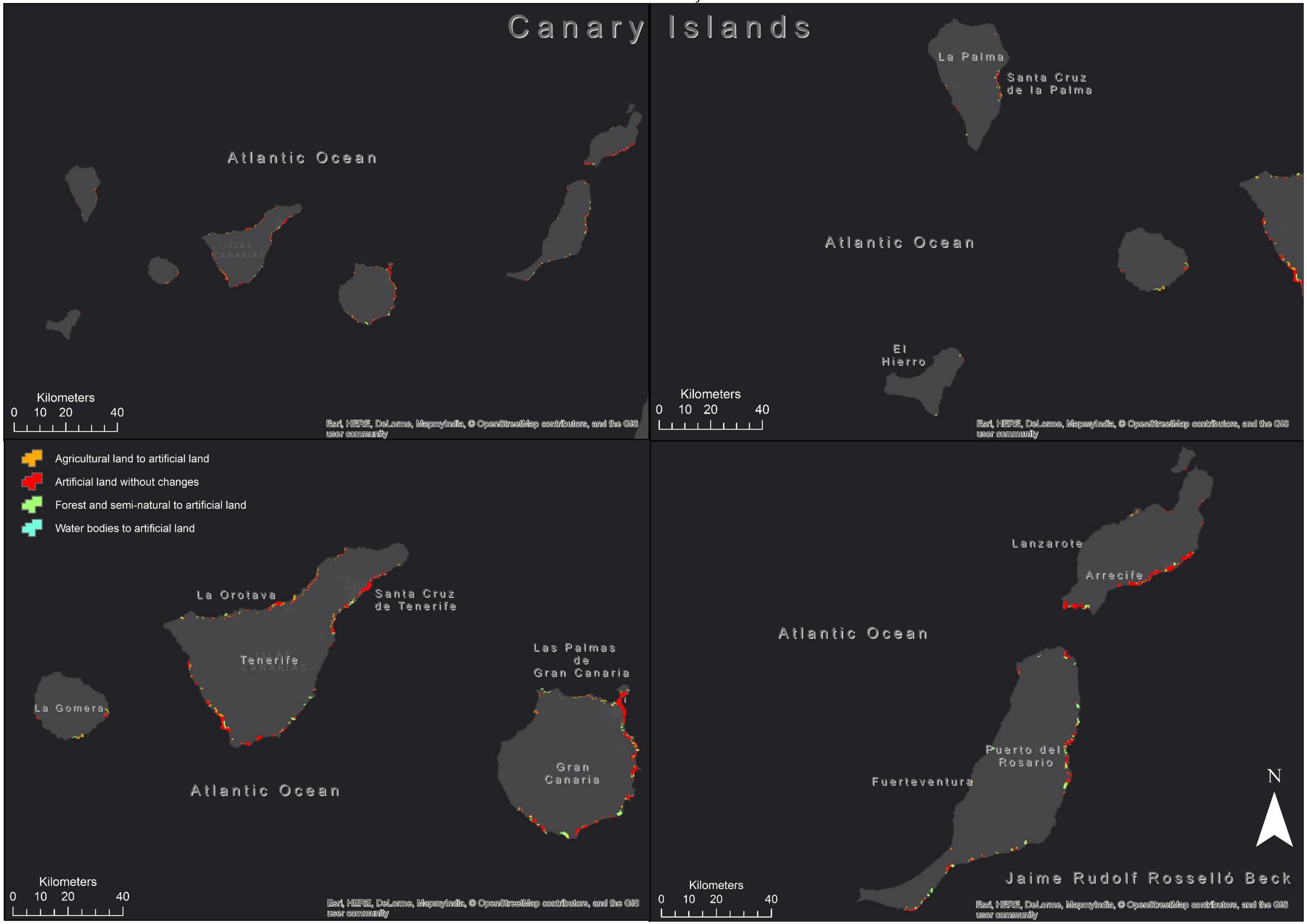

Fig. 4 Canary Islands land cover map. Source: own elaboration.

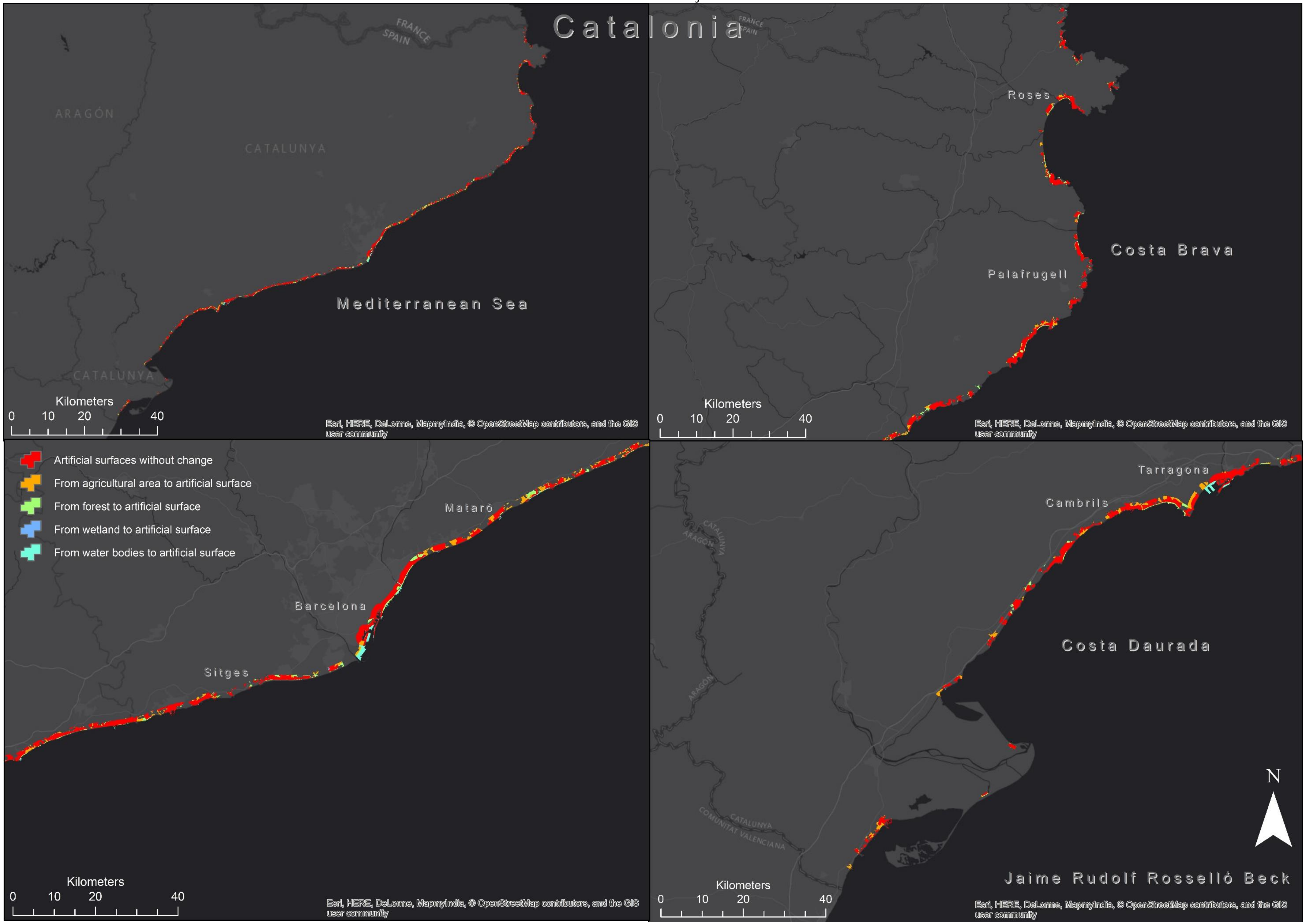

Fig. 5 Catalonia land cover map. Source: own elaboration.

Fig. 6 Protected areas of Spain. Source: MAGRAMA.

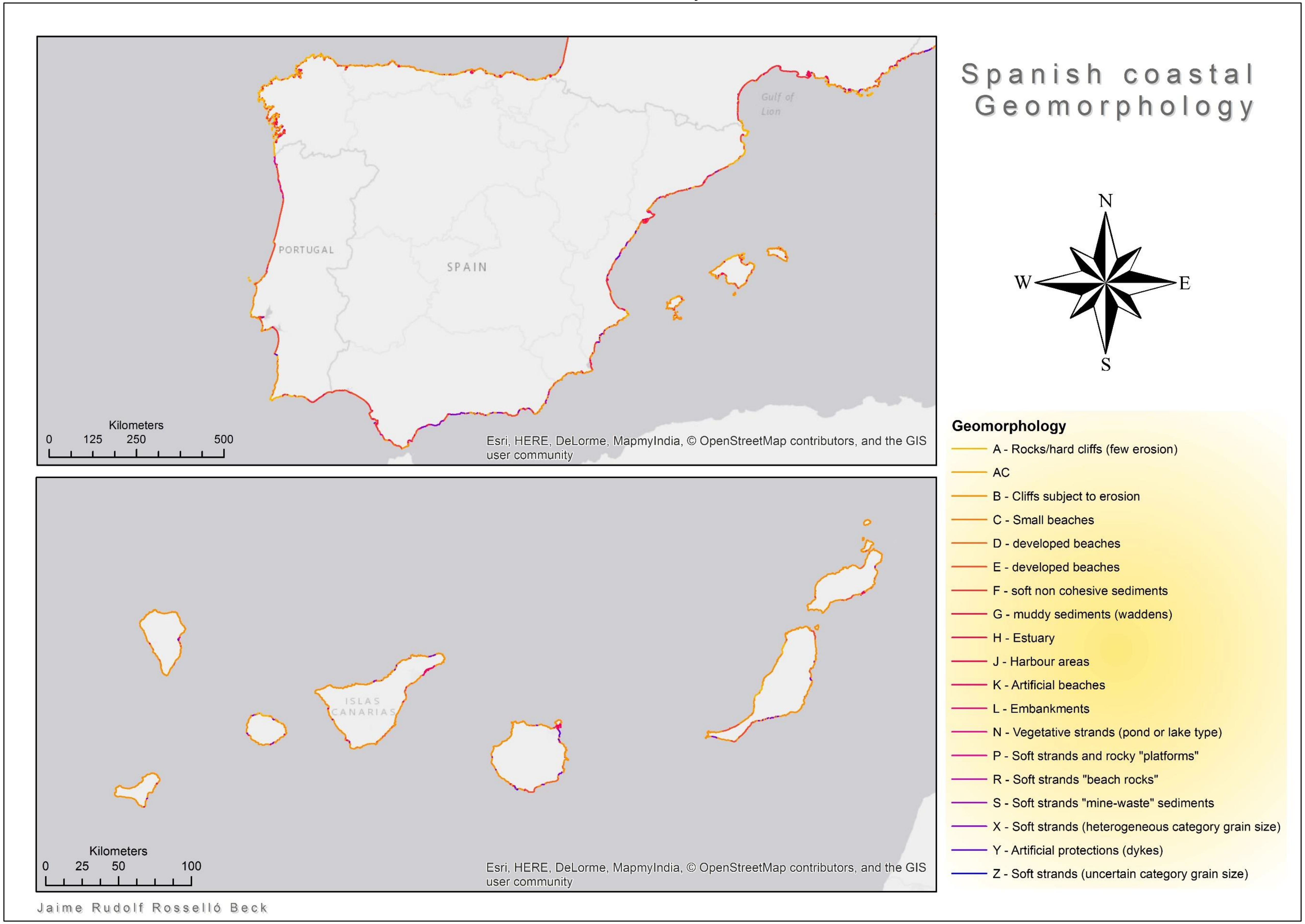

Fig. 7 Geomorphology map. Source: own elaboration.

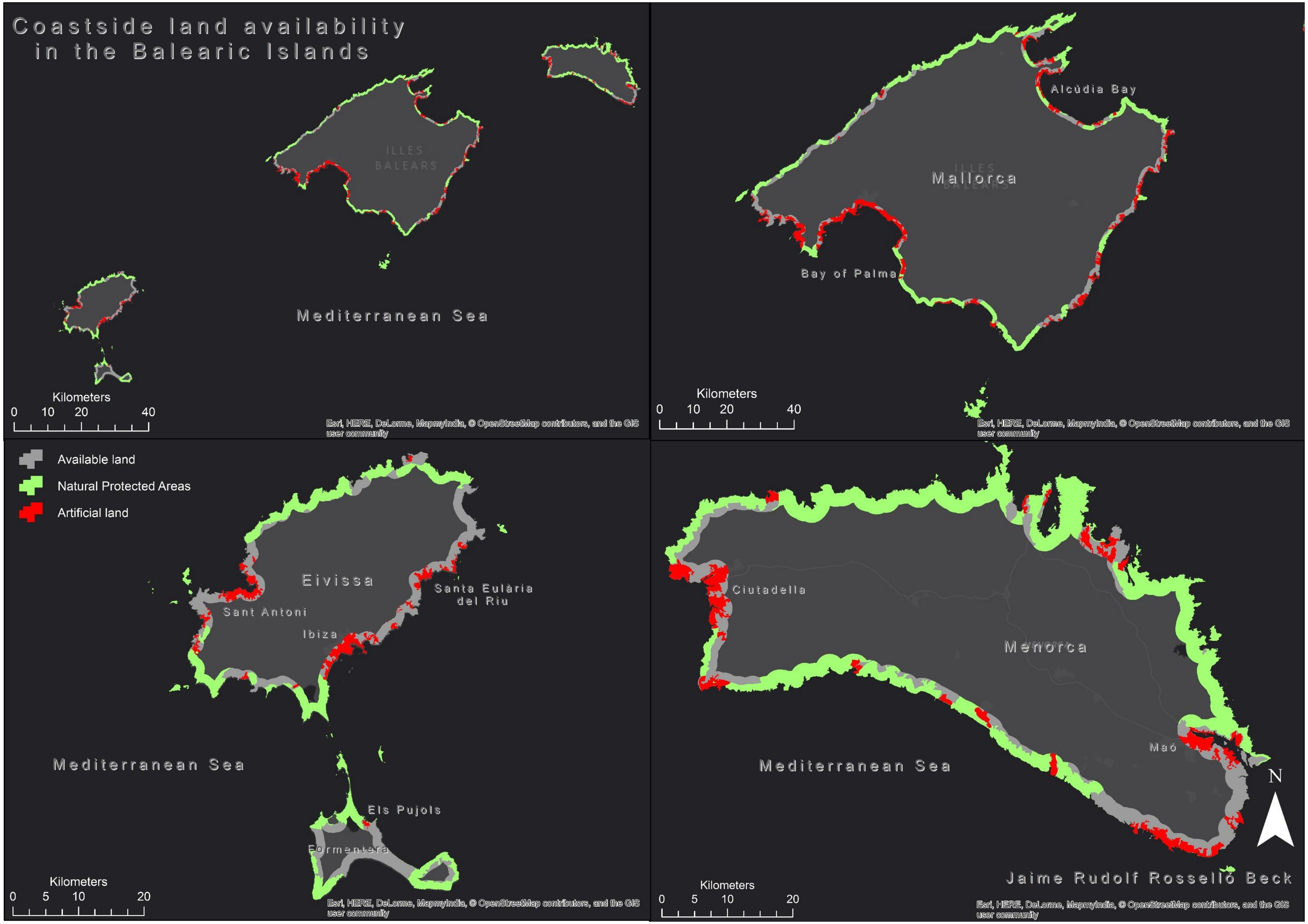

Fig. 8 Available land in the Balearic Islands. Source: own elaboration.

Annex 2: tables

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
Autnomous community: **Andalusia**											
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	69,08	8,47	85,49	10,56	16,41	23,75
				112	Discontinuous urban fabric	76,29	9,35	125,46	15,49	49,16	64,44
		12	Industrial, commercial and transport units	121	Industrial or commercial units	14,68	1,80	25,79	3,18	11,12	75,76
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	1,06	0,13	1,06	0,00
				123	Port areas	10,48	1,28	12,48	1,54	2,00	19,08
				124	Airports	2,79	0,34	1,92	0,24	-0,88	-31,46
		13	Mine, dump and construction sites	131	Mineral extraction sites	1,21	0,15	1,81	0,22	0,60	49,11
				132	Dump sites	5,81	0,71	0,00	0,00	-5,81	-100,00
				133	Construction sites	5,81	0,71	25,39	3,14	19,58	336,79
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,00	0,00	1,35	0,17	1,35	0,00
				142	Sport and leisure facilities	7,02	0,86	20,31	2,51	13,28	189,20
1	**Artificial surfaces**					**193,19**	**23,68**	**301,04**	**37,17**	**107,86**	**55,83**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	12,41	1,52	18,57	2,29	6,16	49,62
				212	Permanently irrigated land	69,28	8,49	61,47	7,59	-7,82	-11,28
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,42	0,05	0,18	0,02	-0,24	-57,97
				222	Fruit trees and berry plantations	20,53	2,52	10,70	1,32	-9,83	-47,89
				223	Olive groves	1,15	0,14	0,43	0,05	-0,71	-62,19
		23	Pastures	231	Pastures	0,00	0,00	35,31	4,36	35,31	0,00
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	38,26	4,69	0,00	0,00	-38,26	-100,00
				242	Complex cultivation patterns	26,70	3,27	8,87	1,10	-17,83	-66,77
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	0,00	0,00	12,30	1,52	12,30	0,00
				244	Agro-forestry areas	0,00	0,00	1,87	0,23	1,87	0,00
2	**Agricultural areas**					**168,76**	**20,69**	**149,71**	**18,49**	**-19,05**	**-11,29**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	3,32	0,41	7,94	0,98	4,62	138,98
				312	Coniferous forest	57,62	7,06	47,60	5,88	-10,02	-17,39
				313	Mixed forest	0,95	0,12	0,04	0,00	-0,91	-95,84
		32	/or herbaceous vegetation ass	321	Natural grasslands	19,64	2,41	31,69	3,91	12,05	61,37
				322	Landas y matorrales mesófilos	0,00	0,00	0,00	0,00	0,00	0,00
				323	Sclerophyllous vegetation	93,12	11,42	130,04	16,06	36,92	39,65
				324	Transitional woodland-shrub	46,25	5,67	16,82	2,08	-29,43	-63,63
		333	spaces with little or no veget	331	Beaches, dunes, sands	46,07	5,65	37,45	4,62	-8,62	-18,72
				332	Bare rocks	1,62	0,20	1,26	0,16	-0,36	-22,19
				333	Sparsely vegetated areas	115,72	14,19	15,62	1,93	-100,10	-86,50
				334	Burnt areas	0,76	0,09	0,00	0,00	-0,76	-100,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**385,06**	**47,21**	**288,45**	**35,62**	**-96,61**	**-25,09**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,93	0,11	0,23	0,03	-0,70	-75,08
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	17,27	2,12	31,09	3,84	13,83	80,08
				422	Salines	20,06	2,46	11,91	1,47	-8,15	-40,64
				423	Intertidal flats	5,29	0,65	0,41	0,05	-4,88	-92,33
4	**Wetlands**					**43,55**	**5,34**	**43,64**	**5,39**	**0,09**	**0,21**
5	Water bodies	51	Aguas continentales	511	Water courses	0,49	0,06	0,35	0,04	-0,14	-28,52
				512	Water bodies	0,36	0,04	2,27	0,28	1,91	536,79
		52	Marine waters	521	Coastal lagoons	0,31	0,04	0,00	0,00	-0,31	-100,00
				522	Estuaries	9,68	1,19	10,27	1,27	0,59	6,08
				523	Sea and ocean	14,29	1,75	14,14	1,75	-0,15	-1,04
5	**Water bodies**					**25,13**	**3,08**	**27,03**	**3,34**	**1,90**	**7,56**
TOTAL						**815,69**	**100,00**	**809,87**	**100,00**	**-5,81**	**-0,71**

Table. 1 Andalusia information. Source: own elaboration.

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
Autonomous community: **Asturias**											
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	9,38	3,45	6,30	2,32	-3,08	-32,81
				112	Discontinuous urban fabric	6,76	2,49	12,80	4,70	6,03	89,21
		12	Industrial, commercial and transport units	121	Industrial or commercial units	2,43	0,89	2,77	1,02	0,34	13,88
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	0,67	0,25	0,67	0,00
				123	Port areas	1,92	0,71	2,15	0,79	0,23	11,98
				124	Airports	0,20	0,07	0,33	0,12	0,13	67,85
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,58	0,21	0,03	0,01	-0,55	-95,47
				132	Dump sites	0,00	0,00	0,00	0,00	0,00	0,00
				133	Construction sites	0,00	0,00	2,48	0,91	2,48	0,00
		14	Artificial, non-agricultural	141	Green urban areas	0,25	0,09	0,28	0,10	0,02	8,69
				142	Sport and leisure facilities	0,00	0,00	2,03	0,75	2,03	0,00
1	**Artificial surfaces**					**21,53**	**7,91**	**29,84**	**10,97**	**8,31**	**38,61**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	0,00	0,00	89,35	32,85	89,35	0,00
				212	Permanently irrigated land	0,00	0,00	0,00	0,00	0,00	0,00
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	0,33	0,12	0,00	0,00	-0,33	-100,00
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	61,78	22,71	13,30	4,89	-48,48	-78,47
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	94,95	34,91	30,78	11,32	-64,17	-67,58
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	14,28	5,25	8,43	3,10	-5,85	-40,97
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**171,33**	**62,99**	**141,86**	**52,15**	**-29,47**	**-17,20**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	35,70	13,12	39,35	14,47	3,65	10,23
				312	Coniferous forest	15,19	5,58	5,15	1,89	-10,04	-66,11
				313	Mixed forest	1,51	0,56	13,35	4,91	11,84	783,76
		32	rbaceous vegetati	321	Natural grasslands	0,00	0,00	1,20	0,44	1,20	0,00
				322	Landas y matorrales mesófilos	9,99	3,67	24,50	9,01	14,52	145,37
				323	Sclerophyllous vegetation	0,00	0,00	0,00	0,00	0,00	0,00
				324	Transitional woodland-shrub	2,46	0,91	2,39	0,88	-0,07	-2,80
		333	s with little or no	331	Beaches, dunes, sands	2,96	1,09	3,22	1,19	0,27	9,05
				332	Bare rocks	0,00	0,00	1,05	0,39	1,05	0,00
				333	Sparsely vegetated areas	0,00	0,00	0,00	0,00	0,00	0,00
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**67,80**	**24,93**	**90,22**	**33,17**	**22,42**	**33,07**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,18	0,06	0,00	0,00	-0,18	-100,00
				412	Peat bogs	0,39	0,14	0,62	0,23	0,23	60,26
		42	Maritime wetlands	421	Salt marshes	1,14	0,42	0,00	0,00	-1,14	-100,00
				422	Salines	0,00	0,00	0,00	0,00	0,00	0,00
				423	Intertidal flats	0,00	0,00	0,00	0,00	0,00	0,00
4	**Wetlands**					**1,70**	**0,63**	**0,62**	**0,23**	**-1,08**	**-63,47**
5	Water bodies	51	guas continentale	511	Water courses	0,23	0,08	0,00	0,00	-0,23	-100,00
				512	Water bodies	0,00	0,00	0,25	0,09	0,25	0,00
		52	Marine waters	521	Coastal lagoons	0,00	0,00	0,00	0,00	0,00	0,00
				522	Estuaries	1,47	0,54	2,83	1,04	1,37	93,03
				523	Sea and ocean	7,95	2,92	6,38	2,35	-1,56	-19,69
5	**Water bodies**					**9,64**	**3,54**	**9,47**	**3,48**	**-0,18**	**-1,83**
TOTAL						**272,00**	**100,00**	**272,00**	**100,00**	**0,00**	**0,00**

Table. 2 Asturias information table. Source: own elaboration.

Autonomous community: **catalonia**											
CODE	**LABEL1**	**CODE**	**LABEL2**	**CODE**	**LABEL3**	**LAND COVER 1990 (km2)**	**LAND COVER 1990 (%)**	**LAND COVER 2012 (km2)**	**LAND COVER 2012 (%)**	**LAND COVER CHANGE 1990-2012 (Km2)**	**LAND COVER CHANGE 1990-2012 (%)**
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	39,96	8,26	34,42	7,11	-5,54	-13,87
				112	Discontinuous urban fabric	103,84	21,45	108,11	22,33	4,27	4,11
		12	Industrial, commercial and transport units	121	Industrial or commercial units	11,20	2,31	16,84	3,48	5,64	50,38
				122	Redes viarias, ferrovia rias y terrenos asociados	0,03	0,01	1,36	0,28	1,33	4598,16
				123	Port areas	8,95	1,85	11,66	2,41	2,71	30,31
				124	Airports	0,17	0,04	1,68	0,35	1,51	881,64
		13	Mine, dump and construction sites	131	Mineral extraction sites	1,40	0,29	0,72	0,15	-0,68	-48,72
				132	Dump sites	0,00	0,00	0,21	0,04	0,21	0,00
				133	Construction sites	0,00	0,00	2,95	0,61	2,95	0,00
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,84	0,17	5,93	1,22	5,09	608,73
				142	Sport and leisure facilities	4,44	0,92	17,21	3,55	12,77	287,77
1	**Artificial surfaces**					**170,82**	**35,29**	**201,08**	**41,52**	**30,26**	**17,71**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	4,64	0,96	3,48	0,72	-1,15	-24,89
				212	Permanently irrigated land	28,76	5,94	21,24	4,39	-7,52	-26,15
				213	Rice fields	29,41	6,08	28,65	5,92	-0,77	-2,61
		22	Permanent crops	221	Vineyards	2,54	0,52	2,90	0,60	0,36	14,21
				222	Fruit trees and berry plantations	10,84	2,24	8,65	1,79	-2,19	-20,23
				223	Olive groves	13,53	2,80	14,73	3,04	1,19	8,81
		23	Pastures	231	Pastures	0,00	0,00	6,88	1,42	6,88	0,00
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	20,74	4,28	6,32	1,31	-14,42	-69,52
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	19,48	4,02	4,82	1,00	-14,65	-75,24
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**129,94**	**26,85**	**97,66**	**20,17**	**-32,28**	**-24,84**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	0,03	0,01	9,22	1,90	9,18	27751,59
				312	Coniferous forest	22,31	4,61	38,26	7,90	15,95	71,48
				313	Mixed forest	2,15	0,45	0,20	0,04	-1,96	-90,80
		32	rub and/or herbaceous vegetation associatio	321	Natural grasslands	0,40	0,08	0,86	0,18	0,46	114,16
				322	Landas y matorrales mesófilos	0,00	0,00	0,00	0,00	0,00	0,00
				323	Sclerophyllous vegetation	55,25	11,42	71,12	14,69	15,87	28,72
				324	Transitional woodland-shrub	21,68	4,48	2,86	0,59	-18,82	-86,80
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	37,93	7,84	25,20	5,20	-12,73	-33,56
				332	Bare rocks	0,00	0,00	1,92	0,40	1,92	0,00
				333	Sparsely vegetated areas	3,94	0,81	0,67	0,14	-3,28	-83,13
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**143,71**	**29,69**	**150,31**	**31,04**	**6,60**	**4,59**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,00	0,00	0,00	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	14,56	3,01	12,68	2,62	-1,88	-12,92
				422	Salines	8,47	1,75	8,96	1,85	0,49	5,75
				423	Intertidal flats	0,00	0,00	0,00	0,00	0,00	0,00
4	**Wetlands**					**23,04**	**4,76**	**21,64**	**4,47**	**-1,39**	**-6,05**
5	Water bodies	51	Aguas continentales	511	Water courses	1,24	0,26	2,03	0,42	0,79	63,74
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	3,00	0,62	5,45	1,13	2,45	81,53
				522	Estuaries	0,00	0,00	0,00	0,00	0,00	0,00
				523	Sea and ocean	12,26	2,53	6,09	1,26	-6,17	-50,34
5	**Water bodies**					**16,50**	**3,41**	**13,56**	**2,80**	**-2,93**	**-17,78**
TOTAL						**484,01**	**100,00**	**484,25**	**100,00**	**0,25**	**0,05**

Table. 3 Catalonia information table. Source: own elaboration.

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
Autnomous community: **cantabria**											
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	9,67	5,23	7,86	4,25	-1,80	-18,67
				112	Discontinuous urban fabric	13,17	7,12	19,62	10,61	6,45	48,98
		12	Industrial, commercial and transport units	121	Industrial or commercial units	1,40	0,76	4,88	2,64	3,48	248,28
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	0,06	0,03	0,06	0,00
				123	Port areas	3,31	1,79	2,78	1,50	-0,53	-15,94
				124	Airports	1,76	0,95	1,83	0,99	0,07	3,89
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,76	0,41	0,52	0,28	-0,24	-31,41
				132	Dump sites	0,19	0,10	0,00	0,00	-0,19	-100,00
				133	Construction sites	0,62	0,34	0,00	0,00	-0,62	-100,00
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,40	0,22	0,62	0,34	0,22	56,07
				142	Sport and leisure facilities	0,71	0,38	1,94	1,05	1,24	174,92
1	**Artificial surfaces**					**31,98**	**17,30**	**40,12**	**21,70**	**8,14**	**25,44**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	0,19	0,11	0,00	0,00	-0,19	-100,00
				212	Permanently irrigated land	0,73	0,40	0,00	0,00	-0,73	-100,00
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	0,00	0,00	0,00	0,00	0,00	0,00
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	46,43	25,12	51,62	27,92	5,19	11,17
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	34,91	18,88	9,35	5,06	-25,56	-73,21
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	4,05	2,19	17,91	9,69	13,86	342,02
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**86,33**	**46,69**	**78,89**	**42,67**	**-7,44**	**-8,62**
3	Forest and semi natural areas	31	Foreststs	311	Broad-leaved forest	19,63	10,62	19,53	10,56	-0,10	-0,51
				312	Coniferous forest	1,46	0,79	1,55	0,84	0,09	6,36
				313	Mixed forest	0,96	0,52	0,34	0,18	-0,63	-65,06
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	0,00	0,00	0,00	0,00	0,00	0,00
				322	Landas y matorrales mesófilos	11,54	6,24	10,29	5,57	-1,24	-10,79
				323	Sclerophyllous vegetation	0,00	0,00	0,00	0,00	0,00	0,00
				324	Transitional woodland-shrub	4,52	2,45	0,88	0,48	-3,64	-80,47
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	7,17	3,88	7,29	3,94	0,12	1,66
				332	Bare rocks	0,00	0,00	1,39	0,75	1,39	0,00
				333	Sparsely vegetated areas	4,26	2,30	5,35	2,89	1,09	25,71
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**49,54**	**26,79**	**46,63**	**25,22**	**-2,91**	**-5,88**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,00	0,00	0,00	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	9,97	5,39	10,31	5,57	0,34	3,40
				422	Salines	0,00	0,00	0,00	0,00	0,00	0,00
				423	Intertidal flats	1,11	0,60	0,00	0,00	-1,11	-100,00
4	**Wetlands**					**11,08**	**5,99**	**10,31**	**5,57**	**-0,77**	**-6,94**
5	Water bodies	51	Aguas continentales	511	Water courses	0,00	0,00	0,00	0,00	0,00	0,00
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	0,79	0,42	0,00	0,00	-0,79	-100,00
				522	Estuaries	4,65	2,52	5,68	3,07	1,03	22,16
				523	Sea and ocean	0,53	0,28	3,27	1,77	2,74	520,80
5	**Water bodies**					**5,96**	**3,22**	**8,95**	**4,84**	**2,98**	**50,06**
TOTAL						**184,88**	**100,00**	**184,88**	**100,00**	**0,00**	**0,00**

Table. 4 Asturias information table. Source: own elaboration.

Autonomous community: **Canary islands**

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	75,49	6,50	38,70	3,33	-36,79	-48,73
				112	Discontinuous urban fabric	8,70	0,75	64,57	5,56	55,87	642,31
		12	Industrial, commercial and transport units	121	Industrial or commercial units	9,60	0,83	16,67	1,44	7,07	73,61
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	0,18	0,02	0,18	0,00
				123	Port areas	4,99	0,43	7,21	0,62	2,23	44,66
				124	Airports	8,09	0,70	10,14	0,87	2,05	25,32
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,77	0,07	3,38	0,29	2,61	339,29
				132	Dump sites	0,00	0,00	0,35	0,03	0,35	0,00
				133	Construction sites	14,91	1,28	18,38	1,58	3,46	23,23
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	1,15	0,10	1,44	0,12	0,29	25,54
				142	Sport and leisure facilities	1,33	0,11	12,14	1,05	10,81	810,05
1	**Artificial surfaces**					**125,03**	**10,77**	**173,16**	**14,91**	**48,13**	**38,49**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	93,31	8,04	29,81	2,57	-63,50	-68,05
				212	Permanently irrigated land	21,42	1,84	19,89	1,71	-1,53	-7,15
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	11,81	1,02	3,60	0,31	-8,21	-69,52
				222	Fruit trees and berry plantations	65,53	5,64	72,83	6,27	7,30	11,15
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	14,32	1,23	6,10	0,53	-8,22	-57,37
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,21	0,02	0,21	0,00
				242	Complex cultivation patterns	0,00	0,00	17,40	1,50	17,40	0,00
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	18,58	1,60	16,57	1,43	-2,01	-10,80
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**224,96**	**19,38**	**166,42**	**14,33**	**-58,54**	**-26,02**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	3,80	0,33	3,99	0,34	0,18	4,86
				312	Coniferous forest	2,00	0,17	8,20	0,71	6,20	310,18
				313	Mixed forest	0,00	0,00	0,46	0,04	0,46	0,00
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	0,00	0,00	19,78	1,70	19,78	0,00
				322	Landas y matorrales mesófilos	6,16	0,53	1,21	0,10	-4,96	-80,38
				323	Sclerophyllous vegetation	545,49	46,98	256,46	22,09	-289,03	-52,99
				324	Transitional woodland-shrub	0,00	0,00	1,05	0,09	1,05	0,00
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	65,89	5,68	71,74	6,18	5,85	8,88
				332	Bare rocks	62,37	5,37	146,41	12,61	84,04	134,76
				333	Sparsely vegetated areas	108,86	9,38	298,62	25,72	189,77	174,33
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**794,57**	**68,44**	**807,92**	**69,58**	**13,35**	**1,68**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,00	0,00	0,00	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	0,00	0,00	0,00	0,00	0,00	0,00
				422	Salines	0,32	0,03	0,64	0,06	0,32	101,38
				423	Intertidal flats	0,00	0,00	0,00	0,00	0,00	0,00
4	**Wetlands**					**0,32**	**0,03**	**0,64**	**0,06**	**0,32**	**101,38**
5	Water bodies	51	Aguas continentales	511	Water courses	0,00	0,00	0,00	0,00	0,00	0,00
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	0,29	0,03	0,35	0,03	0,06	21,52
				522	Estuaries	0,00	0,00	0,00	0,00	0,00	0,00
				523	Sea and ocean	15,88	1,37	12,56	1,08	-3,32	-20,90
5	**Water bodies**					**16,17**	**1,39**	**12,92**	**1,11**	**-3,26**	**-20,13**
TOTAL						**1.161,05**	**100,00**	**1.161,05**	**100,00**	**0,00**	**0,00**

Table. 5 Canary Islands information table. Source: own elaboration.

Autnomous community: **Galicia**											
CODE	**LABEL1**	**CODE**	**LABEL2**	**CODE**	**LABEL3**	**LAND COVER 1990 (km2)**	**LAND COVER 1990 (%)**	**LAND COVER 2012 (km2)**	**LAND COVER 2012 (%)**	**LAND COVER CHANGE 1990-2012 (Km2)**	**LAND COVER CHANGE 1990-2012 (%)**
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	18,80	1,90	30,69	3,10	11,89	63,26
				112	Discontinuous urban fabric	126,38	12,77	111,29	11,24	-15,10	-11,94
		12	Industrial, commercial and transport units	121	Industrial or commercial units	3,21	0,32	9,59	0,97	6,39	199,08
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	0,38	0,04	0,38	0,00
				123	Port areas	10,72	1,08	8,62	0,87	-2,09	-19,53
				124	Airports	0,00	0,00	0,00	0,00	0,00	0,00
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,94	0,10	1,22	0,12	0,28	29,13
				132	Dump sites	0,18	0,02	0,15	0,02	-0,03	-16,04
				133	Construction sites	0,00	0,00	2,85	0,29	2,85	0,00
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,00	0,00	1,92	0,19	1,92	0,00
				142	Sport and leisure facilities	0,43	0,04	1,09	0,11	0,67	156,68
1	**Artificial surfaces**					**160,66**	**16,23**	**167,81**	**16,95**	**7,16**	**4,45**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	0,00	0,00	0,78	0,08	0,78	0,00
				212	Permanently irrigated land	0,00	0,00	0,00	0,00	0,00	0,00
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	0,00	0,00	0,00	0,00	0,00	0,00
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	0,00	0,00	3,04	0,31	3,04	0,00
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	236,69	23,92	235,59	23,80	-1,10	-0,46
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	63,69	6,44	47,42	4,79	-16,27	-25,55
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**300,38**	**30,35**	**286,83**	**28,97**	**-13,55**	**-4,51**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	67,59	6,83	137,18	13,86	69,59	102,97
				312	Coniferous forest	1,93	0,19	75,94	7,67	74,02	3839,68
				313	Mixed forest	157,01	15,86	47,98	4,85	-109,03	-69,44
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	83,54	8,44	7,25	0,73	-76,28	-91,32
				322	Landas y matorrales mesófilos	49,45	5,00	154,26	15,58	104,81	211,96
				323	Sclerophyllous vegetation	0,00	0,00	0,00	0,00	0,00	0,00
				324	Transitional woodland-shrub	80,04	8,09	19,90	2,01	-60,13	-75,13
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	26,58	2,69	23,26	2,35	-3,32	-12,48
				332	Bare rocks	0,00	0,00	3,73	0,38	3,73	0,00
				333	Sparsely vegetated areas	6,05	0,61	19,92	2,01	13,87	229,29
				334	Burnt areas	0,22	0,02	0,00	0,00	-0,22	-100,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**472,39**	**47,73**	**489,43**	**49,44**	**17,03**	**3,61**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,00	0,00	0,00	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	8,70	0,88	7,48	0,76	-1,21	-13,93
				422	Salines	0,00	0,00	0,00	0,00	0,00	0,00
				423	Intertidal flats	6,63	0,67	3,68	0,37	-2,96	-44,57
4	**Wetlands**					**15,33**	**1,55**	**11,16**	**1,13**	**-4,17**	**-27,19**
5	Water bodies	51	Aguas continentales	511	Water courses	0,11	0,01	1,68	0,17	1,57	1368,26
				512	Water bodies	0,22	0,02	0,25	0,03	0,04	17,44
		52	Marine waters	521	Coastal lagoons	2,30	0,23	1,52	0,15	-0,78	-34,03
				522	Estuaries	3,39	0,34	5,49	0,55	2,10	61,96
				523	Sea and ocean	34,88	3,52	25,79	2,61	-9,09	-26,06
5	**Water bodies**					**40,91**	**4,13**	**34,74**	**3,51**	**-6,17**	**-15,08**
TOTAL						**989,67**	**100,00**	**989,97**	**100,00**	**0,30**	**0,03**

Table. 6 Galicia information table. Source: own elaboration.

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
Autonomous community: **Balearic Islands**											
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	30,10	3,85	25,06	3,21	-5,04	-16,75
				112	Discontinuous urban fabric	55,83	7,15	85,18	10,90	29,34	52,55
		12	Industrial, commercial and transport units	121	Industrial or commercial units	1,21	0,16	2,99	0,38	1,78	146,94
				122	Redes viarias, ferrovia rias y terrenos asociados	1,33	0,17	0,28	0,04	-1,05	-78,66
				123	Port areas	2,36	0,30	3,75	0,48	1,39	58,76
				124	Airports	0,71	0,09	1,47	0,19	0,76	108,21
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,62	0,08	0,00	0,00	-0,62	-100,00
				132	Dump sites	0,00	0,00	0,02	0,00	0,02	0,00
				133	Construction sites	5,26	0,67	2,63	0,34	-2,64	-50,10
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,00	0,00	0,35	0,04	0,35	0,00
				142	Sport and leisure facilities	0,18	0,02	12,55	1,61	12,37	6801,24
1	**Artificial surfaces**					**97,61**	**12,49**	**134,27**	**17,18**	**36,66**	**37,56**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	56,27	7,20	43,43	5,56	-12,84	-22,82
				212	Permanently irrigated land	11,23	1,44	2,94	0,38	-8,29	-73,83
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	18,20	2,33	16,45	2,11	-1,74	-9,58
				223	Olive groves	7,50	0,96	5,98	0,77	-1,51	-20,20
		23	Pastures	231	Pastures	8,48	1,08	5,54	0,71	-2,93	-34,62
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	27,11	3,47	0,45	0,06	-26,66	-98,34
				242	Complex cultivation patterns	28,11	3,60	18,35	2,35	-9,76	-34,71
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	45,99	5,89	43,16	5,52	-2,83	-6,15
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**202,89**	**25,96**	**136,31**	**17,44**	**-66,58**	**-32,81**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	3,57	0,46	12,84	1,64	9,27	259,79
				312	Coniferous forest	176,51	22,59	161,93	20,72	-14,58	-8,26
				313	Mixed forest	9,10	1,16	39,80	5,09	30,71	337,55
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	12,95	1,66	8,40	1,08	-4,54	-35,10
				322	Landas y matorrales mesófilos	0,00	0,00	0,00	0,00	0,00	0,00
				323	Sclerophyllous vegetation	146,43	18,74	180,41	23,09	33,98	23,21
				324	Transitional woodland-shrub	90,92	11,64	42,36	5,42	-48,56	-53,41
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	7,07	0,90	3,06	0,39	-4,00	-56,68
				332	Bare rocks	11,06	1,42	1,39	0,18	-9,67	-87,40
				333	Sparsely vegetated areas	0,49	0,06	36,29	4,64	35,81	7366,71
				334	Burnt areas	0,00	0,00	3,42	0,44	3,42	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**458,09**	**58,62**	**489,91**	**62,69**	**31,82**	**6,95**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,76	0,10	0,76	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	4,83	0,62	5,62	0,72	0,78	16,24
				422	Salines	3,40	0,44	3,62	0,46	0,22	6,61
				423	Intertidal flats	0,00	0,00	0,00	0,00	0,00	0,00
4	**Wetlands**					**8,23**	**1,05**	**10,00**	**1,28**	**1,77**	**21,53**
5	Water bodies	51	Aguas continentales	511	Water courses	0,00	0,00	0,10	0,01	0,10	0,00
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	3,49	0,45	3,00	0,38	-0,49	-14,15
				522	Estuaries	0,00	0,00	0,00	0,00	0,00	0,00
				523	Sea and ocean	11,14	1,43	7,86	1,01	-3,29	-29,49
5	**Water bodies**					**14,63**	**1,87**	**10,95**	**1,40**	**-3,68**	**-25,15**
TOTAL						**781,45**	**100,00**	**781,45**	**100,00**	**0,00**	**0,00**

Table. 7 Balearic Islands information table. Source: own elaboration.

Autnomous community: **Murcia**											
CODE	**LABEL1**	**CODE**	**LABEL2**	**CODE**	**LABEL3**	**LAND COVER 1990 (km2)**	**LAND COVER 1990 (%)**	**LAND COVER 2012 (km2)**	**LAND COVER 2012 (%)**	**LAND COVER CHANGE 1990-2012 (Km2)**	**LAND COVER CHANGE 1990-2012 (%)**
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	12,93	7,56	21,59	12,62	8,66	66,96
				112	Discontinuous urban fabric	16,50	9,64	13,75	8,03	-2,75	-16,69
		12	Industrial, commercial and transport units	121	Industrial or commercial units	1,06	0,62	4,18	2,44	3,13	295,99
				122	Redes viarias, ferrovia rias y terrenos asociados	0,00	0,00	0,00	0,00	0,00	0,00
				123	Port areas	1,79	1,05	1,38	0,81	-0,41	-22,95
				124	Airports	1,28	0,75	1,96	1,15	0,68	52,91
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,09	0,05	0,13	0,08	0,04	40,47
				132	Dump sites	1,08	0,63	0,99	0,58	-0,09	-8,06
				133	Construction sites	0,52	0,30	2,60	1,52	2,08	400,83
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,00	0,00	0,00	0,00	0,00	0,00
				142	Sport and leisure facilities	0,00	0,00	0,86	0,50	0,86	40892,48
1	**Artificial surfaces**					**35,25**	**20,61**	**47,44**	**27,73**	**12,19**	**34,57**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	10,06	5,88	2,05	1,20	-8,01	-79,63
				212	Permanently irrigated land	14,90	8,71	17,46	10,20	2,56	17,20
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	0,50	0,29	3,25	1,90	2,74	543,82
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	0,00	0,00	13,05	7,63	13,05	0,00
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	1,61	0,94	0,17	0,10	-1,44	-89,51
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	1,64	0,96	0,26	0,15	-1,37	-83,93
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**28,71**	**16,78**	**36,23**	**21,18**	**7,53**	**26,22**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	0,00	0,00	0,00	0,00	0,00	0,00
				312	Coniferous forest	2,43	1,42	7,34	4,29	4,91	201,55
				313	Mixed forest	0,00	0,00	0,00	0,00	0,00	0,00
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	0,00	0,00	32,66	19,09	32,66	0,00
				322	Landas y matorrales mesófilos	0,00	0,00	0,00	0,00	0,00	0,00
				323	Sclerophyllous vegetation	69,33	40,52	35,56	20,79	-33,76	-48,70
				324	Transitional woodland-shrub	4,71	2,76	0,00	0,00	-4,71	-100,00
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	9,61	5,62	1,14	0,67	-8,48	-88,16
				332	Bare rocks	0,00	0,00	0,25	0,15	0,25	0,00
				333	Sparsely vegetated areas	8,17	4,78	2,20	1,29	-5,97	-73,07
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**94,26**	**55,10**	**79,15**	**46,26**	**-15,11**	**-16,03**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,44	0,26	0,38	0,22	-0,06	-12,92
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	1,46	0,85	0,00	0,00	-1,46	-100,00
				422	Salines	6,09	3,56	5,84	3,41	-0,24	-4,03
				423	Intertidal flats	0,34	0,20	0,34	0,20	0,00	0,31
4	**Wetlands**					**8,32**	**4,86**	**6,56**	**3,84**	**-1,76**	**-21,13**
5	Water bodies	51	Aguas continentales	511	Water courses	0,00	0,00	0,00	0,00	0,00	0,00
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	1,40	0,82	0,00	0,00	-1,40	-100,00
				522	Estuaries	0,00	0,00	0,00	0,00	0,00	0,00
				523	Sea and ocean	3,14	1,83	1,70	0,99	-1,44	-45,90
5	**Water bodies**					**4,54**	**2,65**	**1,70**	**0,99**	**-2,84**	**-62,64**
TOTAL						**171,09**	**100,00**	**171,08**	**100,00**	**0,00**	**0,00**

Table. 8 Murcia information table. Source: own elaboration.

CODE	LABEL1	CODE	LABEL2	CODE	LABEL3	LAND COVER 1990 (km2)	LAND COVER 1990 (%)	LAND COVER 2012 (km2)	LAND COVER 2012 (%)	LAND COVER CHANGE 1990-2012 (Km2)	LAND COVER CHANGE 1990-2012 (%)
Autonomous community: **Valnecia**											
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	38,15	8,85	42,99	9,97	4,84	12,67
				112	Discontinuous urban fabric	60,76	14,10	115,73	26,85	54,97	90,48
		12	Industrial, commercial and transport units	121	Industrial or commercial units	4,77	1,11	13,75	3,19	8,98	188,36
				122	Redes viarias, ferrovia rias y terrenos asociados	6,25	1,45	0,25	0,06	-6,00	-95,93
				123	Port areas	0,36	0,08	11,69	2,71	11,33	3133,77
				124	Airports	0,38	0,09	0,54	0,13	0,16	43,28
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,00	0,00	0,00	0,00	0,00	0,00
				132	Dump sites	0,00	0,00	0,17	0,04	0,17	0,00
				133	Construction sites	1,82	0,42	9,11	2,11	7,29	401,20
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,32	0,07	1,08	0,25	0,76	238,47
				142	Sport and leisure facilities	2,10	0,49	2,82	0,65	0,72	34,16
1	**Artificial surfaces**					**114,91**	**26,67**	**198,14**	**45,98**	**83,23**	**72,43**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	1,70	0,39	0,00	0,00	-1,70	-100,00
				212	Permanently irrigated land	24,39	5,66	19,13	4,44	-5,26	-21,57
				213	Rice fields	8,06	1,87	6,59	1,53	-1,47	-18,24
		22	Permanent crops	221	Vineyards	1,92	0,45	0,63	0,15	-1,29	-67,30
				222	Fruit trees and berry plantations	89,61	20,79	41,38	9,60	-48,23	-53,82
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	0,00	0,00	19,39	4,50	19,39	0,00
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	53,56	12,43	23,27	5,40	-30,28	-56,55
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	12,57	2,92	9,70	2,25	-2,87	-22,80
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**191,80**	**44,51**	**120,08**	**27,86**	**-71,72**	**-37,39**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	0,00	0,00	0,00	0,00	0,00	0,00
				312	Coniferous forest	15,76	3,66	27,71	6,43	11,95	75,84
				313	Mixed forest	0,00	0,00	0,00	0,00	0,00	0,00
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	8,58	1,99	31,79	7,38	23,21	270,48
				322	Landas y matorrales mesófilos	0,00	0,00	0,00	0,00	0,00	0,00
				323	Sclerophyllous vegetation	33,86	7,86	14,16	3,29	-19,70	-58,18
				324	Transitional woodland-shrub	14,35	3,33	2,92	0,68	-11,44	-79,67
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	14,33	3,32	4,32	1,00	-10,01	-69,86
				332	Bare rocks	1,87	0,43	3,43	0,79	1,55	82,74
				333	Sparsely vegetated areas	0,44	0,10	3,58	0,83	3,14	711,06
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**89,19**	**20,70**	**87,91**	**20,40**	**-1,29**	**-1,44**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,28	0,06	0,04	0,01	-0,23	-84,13
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	11,64	2,70	13,16	3,05	1,52	13,06
				422	Salines	6,94	1,61	6,32	1,47	-0,62	-9,00
				423	Intertidal flats	0,00	0,00	0,00	0,00	0,00	0,00
4	**Wetlands**					**18,86**	**4,38**	**19,52**	**4,53**	**0,66**	**3,51**
5	Water bodies	51	Aguas continentales	511	Water courses	0,19	0,04	0,59	0,14	0,41	217,35
				512	Water bodies	0,00	0,00	0,00	0,00	0,00	0,00
		52	Marine waters	521	Coastal lagoons	0,17	0,04	1,54	0,36	1,36	787,64
				522	Estuaries	0,00	0,00	0,25	0,06	0,25	0,00
				523	Sea and ocean	15,81	3,67	2,93	0,68	-12,88	-81,46
5	**Water bodies**					**16,17**	**3,75**	**5,31**	**1,23**	**-10,86**	**-67,18**
	TOTAL					**430,94**	**100,00**	**430,96**	**100,00**	**0,02**	**0,01**

Table. 9 Valencia information table. Source: own elaboration.

Autonomous community: **Basque country**											
CODE	**LABEL1**	**CODE**	**LABEL2**	**CODE**	**LABEL3**	**LAND COVER 1990 (km2)**	**LAND COVER 1990 (%)**	**LAND COVER 2012 (km2)**	**LAND COVER 2012 (%)**	**LAND COVER CHANGE 1990-2012 (Km2)**	**LAND COVER CHANGE 1990-2012 (%)**
1	Artificial surfaces	11	Urban fabric	111	Continuous urban fabric	15,18	9,37	10,08	6,22	-5,10	-33,60
				112	Discontinuous urban fabric	3,20	1,97	14,19	8,76	10,99	343,91
		12	Industrial, commercial and transport units	121	Industrial or commercial units	1,38	0,85	3,79	2,34	2,42	175,48
				122	Redes viarias, ferrovia rias y terrenos asociados	0,28	0,17	0,25	0,15	-0,03	-11,04
				123	Port areas	2,76	1,70	4,61	2,85	1,86	67,28
				124	Airports	0,42	0,26	0,53	0,33	0,11	26,55
		13	Mine, dump and construction sites	131	Mineral extraction sites	0,00	0,00	0,42	0,26	0,42	0,00
				132	Dump sites	0,00	0,00	0,00	0,00	0,00	0,00
				133	Construction sites	0,00	0,00	0,88	0,54	0,88	0,00
		14	Artificial, non-agricultural vegetated areas	141	Green urban areas	0,21	0,13	0,46	0,29	0,25	119,30
				142	Sport and leisure facilities	0,90	0,56	1,36	0,84	0,46	50,99
1	**Artificial surfaces**					**24,32**	**15,01**	**36,58**	**22,57**	**12,26**	**50,43**
2	Agricultural areas	211	Arable land	211	Non-irrigated arable land	0,00	0,00	0,00	0,00	0,00	0,00
				212	Permanently irrigated land	0,00	0,00	0,00	0,00	0,00	0,00
				213	Rice fields	0,00	0,00	0,00	0,00	0,00	0,00
		22	Permanent crops	221	Vineyards	0,00	0,00	0,00	0,00	0,00	0,00
				222	Fruit trees and berry plantations	0,00	0,00	0,00	0,00	0,00	0,00
				223	Olive groves	0,00	0,00	0,00	0,00	0,00	0,00
		23	Pastures	231	Pastures	44,32	27,36	34,15	21,08	-10,17	-22,94
		24	Heterogeneous agricultural areas	241	Annual crops associated with permanent crops	0,00	0,00	0,00	0,00	0,00	0,00
				242	Complex cultivation patterns	0,07	0,04	0,46	0,28	0,39	580,49
				243	Land principally occupied by agriculture, with significant areas of natural vegetation	0,00	0,00	3,85	2,38	3,85	0,00
				244	Agro-forestry areas	0,00	0,00	0,00	0,00	0,00	0,00
2	**Agricultural areas**					**44,38**	**27,40**	**38,46**	**23,74**	**-5,92**	**-13,35**
3	Forest and semi natural areas	31	Forests	311	Broad-leaved forest	5,87	3,62	23,19	14,31	17,32	295,25
				312	Coniferous forest	15,27	9,42	11,44	7,06	-3,83	-25,08
				313	Mixed forest	8,24	5,08	10,51	6,48	2,27	27,56
		32	Scrub and/or herbaceous vegetation associations	321	Natural grasslands	3,63	2,24	14,62	9,03	10,99	302,31
				322	Landas y matorrales mesófilos	31,50	19,44	12,52	7,73	-18,98	-60,26
				323	Sclerophyllous vegetation	0,00	0,00	0,00	0,00	0,00	0,00
				324	Transitional woodland-shrub	15,31	9,45	4,90	3,02	-10,41	-68,00
		333	Open spaces with little or no vegetation	331	Beaches, dunes, sands	1,54	0,95	0,87	0,54	-0,67	-43,64
				332	Bare rocks	1,56	0,96	3,09	1,91	1,52	97,53
				333	Sparsely vegetated areas	0,00	0,00	0,00	0,00	0,00	0,00
				334	Burnt areas	0,00	0,00	0,00	0,00	0,00	0,00
				335	Glaciers and perpetual snow	0,00	0,00	0,00	0,00	0,00	0,00
3	**Forest and semi natural areas**					**82,92**	**51,18**	**81,13**	**50,07**	**-1,79**	**-2,16**
4	Wetlands	41	Inland wetlands	411	Inland marshes	0,00	0,00	0,00	0,00	0,00	0,00
				412	Peat bogs	0,00	0,00	0,00	0,00	0,00	0,00
		42	Maritime wetlands	421	Salt marshes	0,00	0,00	0,68	0,42	0,68	0,00
				422	Salines	0,00	0,00	0,00	0,00	0,00	0,00
				423	Intertidal flats	1,26	0,78	0,38	0,23	-0,89	-70,24
4	**Wetlands**					**1,26**	**0,78**	**1,06**	**0,65**	**-0,20**	**-16,06**
5	Water bodies	51	Aguas continentales	511	Water courses	0,16	0,10	0,93	0,58	0,78	498,95
				512	Water bodies	0,29	0,18	0,00	0,00	-0,29	-100,00
		52	Marine waters	521	Coastal lagoons	0,00	0,00	0,00	0,00	0,00	0,00
				522	Estuaries	1,97	1,22	1,94	1,20	-0,03	-1,50
				523	Sea and ocean	6,70	4,14	1,92	1,19	-4,78	-71,31
5	**Water bodies**					**9,12**	**5,63**	**4,80**	**2,96**	**-4,32**	**-47,36**
TOTAL						**162,00**	**100,00**	**162,03**	**100,00**	**0,02**	**0,01**

Table. 10 Basque country information table. Source: own elaboration.