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MSc thesis Environmental Sciences

Chair Group: Environmental System Analysis

Quantifying ecosystem services for the Tourism Sector in the Region of Peloponnese, Greece.

Aikaterini Ioli Tripidaki

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Summary

Ecosystem services (E.S.) contribute significant to human welfare. The incorporation of their values into the national accounts (ecosystem accounting) is important as it indicates the relation between natural capital and economic activities and is therefore essential for a more accurate and integrated decision making. In this thesis was achieved a quantification, in both physical and monetary terms, of the cultural service tourism for forest and permanent crops land use types (which showed the highest influence in the actual visits of a destination, among other LU types) under the framework of SEEA EEA. This valuation was aiming further to be used for the contribution of better decision makings considering land cover and land use change. The selected study area was Peloponnese, which is the largest peninsula in Greece. Peloponnese appeared to be a promising input for achieving the aim of this study, due to the variation of the combinations of different ecosystem types in combination with high number of tourist destinations and the data availability. For achieving this quantification the effect of the different ecosystem characteristics, referring to land use types and elevation (for the incorporation of the element of mountainous areas which is not covered from the LU classification used), were examined in relation to the actual visits. Forest and permanent crops LU types found to have the highest influence on actual visits of a destination with positive 0.3552 and positive 0.2165 correlation values respectively. The results of forest having high influence on the actual visits were in accordance to the literature. Further on a physical and monetary value per year and per municipality was attributed, for the contribution in tourism sector, to each m^2 of those two LU types that showed higher influence to the actual visits. For this quantification the value of the actual visits of a destination was used instead of the Recreation Opportunity Spectrum (ROS) .This value was a given as a known input to this study from a touristic agency. The actual visits could be correlated with the ROS concept. The main difference is that actual visits are the real number and therefore it might be more accurate than ROS when taking into account the limitations of ROS. Overnight stays per m^2 per year and per municipality was the unit used for the physical quantification. For accounting only for people travelling for the natural areas (such as caves, lakes, mountains, parks, forest) the categories of the destinations identified were connected with the percentage of visitors spending time for relevant activities. Therefore the final value was a percentage of the value of the overnight stays per municipality by taking into account the people traveling for nature and the percentage of the correlation of the respectively land use type with the actual visits. Considering the monetary valuation the resource rent (RR) and the Gross Value Added (GVA) were calculated separately for each m^2 of the LU types that showed significant relation with the actual visits, per year and per municipality. The RR and the GVA were calculated first in a municipal level and furthermore they were distributed to units of the two LU types considering the physical quantification. The values of RR found for forest, varied between 0.000093euros/m^2 and 0.97725 euros/m^2. While the RR found for permanent crops range from 0.00022 euros/m^2 to 0.30771 euros/m^2. There was not found relevant literature to support the values of the permanent crops. Although regarding the valuation of forest for providing recreational ecosystem services, the values found to be comparable with most of the literature. Despite that all of the literature studies have used different valuation methods such as travel costs

and willingness to pay. The values calculated for forests found to be comparable with most of the literature. But the biggest uncertainty of this thesis should also be considered. The uncertainty of the exact coordinates of 30% of the touristic destinations due to the lack of appropriate mapping, in combination with the lack of more specific information regarding the characteristics of the destinations, creates more uncertainties regarding the results of this thesis.

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1. Introduction

Ecosystems are important for the welfare of a society through the multiple services that they provide. Those services are known as ecosystem services (ES) and they indicate the contribution of the ecosystems to human society and economy (UN et al., 2014). Recently, a rapid growth on research and policy interest on ecosystem services and on the quantification of those services is observed.

ES can be derived only when there is a direct or an indirect interaction between both natural capital and human capital (Haines-Young and Potschin, 2010a). There are multiple definitions and classifications of E.S. according to the different points of view or different discipline's perspectives (Costanza, 2008, Fisher et. al., 2009, Schröter et. al., 2014). The categorization can be generally determined on whether the aim of the framework is the description and mapping of E.S., quantification and recording, or for valuation purposes of E.S. and for prediction the consequences of policy and for contributing in a more accurate decision making (Rhodes, et. al., 2016).

In achieving any of those classification purposes the analysis of ES would focus on a description of a stage or stages of the chain from ecosystem type to the economic valuation of E.S. This chain can be described by four main stages, which are: the E.S. processes and function, the E.S. services and final outputs, the socioeconomic goods and benefits and finally the monetary valuation of the E.S (Figure1).

The first dominant international classification for the description of definition of E.S. and the links between the ecosystem processes and the socioeconomic benefits (Stage 1 to 3, Figure 1) was initiated by the Millennium Ecosystem Assessment (MA) (MEA, 2005). One of the drawbacks of the MA framework was the lack of incorporation of the economic relation of the biodiversity loss and environmental degradation. The Economics of Ecosystems and Biodiversity (TEEB) framework tried to fill this gap tried, in which an effort was made to bridge the ecological with the economical perspective (TEEB, 2010) by including mainly stage 2 and 3 (Figure 1) since the combination of both in a cooperative way considered essential in order to have a clear image of any trade off in policy and decision making level (Polasky and Segerson, 2009). In order to enhance more the role of biodiversity and ecosystem services to the economic benefits, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) was developed and implemented. The main drawback of IPBES framework was that apart from focusing in international scale, instead of also to a local level, it does not include any non-leaving natural capital (soil, water and other natural resources) and therefore this perspective is not considered so appropriate for revealing a complete connection between the natural capital and the human welfare (Díaz et al., 2015).

Further on various multipurpose classification systems were developed for E.S. which tried to serve all of the three main goals mentioned. The Common International Classification for Ecosystem Services (CICES) (Haines-Young and Potschin, 2010b) (mainly stage 2and 3, Figure 1) and the Final Ecosystem Goods and Services (FEGS-CS) which was initiated by the United States Environmental Protection Agency (US EPA) (Landers and Nahlik, 2013) and the associated National Ecosystem Service Classification System (NESCS) (US EPA, 2015) (stage 2and 3, Figure 1) were the most dominant.

Finally a framework which engaged all the 4 stages, with final purpose the monetary valuation of the E.S. is the SEEA EEA framework. The SEEA EEA classification was an interim version of CICES and updated further to SEEA EEA Version 5.0 on 2017.

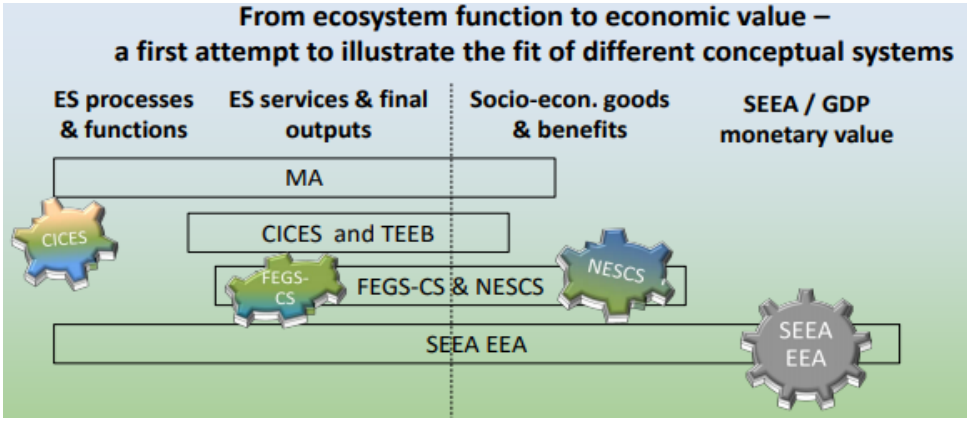

Figure 1: The Figure provide the illustration of the different E.S. frameworks to the four main stages of the chain from ecosystem type to the economic valuation of E.S. (Rhodes, 2016)

Since this thesis is focusing on the quantification of E.S. in both monetary and physical terms the SEEA-EEA classification will be used, as is appropriate for this type of quantification. According to SEEA-EEA ecosystem services can be classified into three categories: provisioning services, which include food, materials, regulating services such as climate regulation, carbon sequestration, water purification and the cultural services such as tourism and recreation (CICES- SEEA).

Ecosystem Services Accounting

ESs have shown a significant relation with the economic development of an area (Hein, 2011 and ten Brink et al., 2011). Therefore the knowledge of the actual value of the economic benefit that is derived from this human and ecosystem capital interaction is essential in order to make accurate comparison between different available options for development and therefore a more complete decision making, regarding the economic development of an area (Hein, 2011 and ten Brink et al., 2011).

The problem arises when not all of the types of natural capital can be quantified and when there is not a clear relation of the significance of their contribution to the human welfare. That lack of an official quantification of the ecosystem services leads to an exclusion of the benefits from those services into the decision making. In addition, it is likely to result in 'non optimal decisions' to an economic system that exert high pressure on the environment, through not-controlled waste disposal or, through land use changes which further affects negatively the economic activity of the future due to change or reduction of the ecosystem services provided within an area (Daily, 1997).

Pressure for the need of an accounting system for ecosystem services derives lately also from the policy sector. Numerous policies, require the valuation of ecosystem services in order to achieve their aims, such as the Europe 2020 strategy and the EU Biodiversity Strategy for 2020 (action 5) (European Commission, 2011a and 2011b). Since decision

making processes are related to economic growth, the common unit in order to be comparable with any other activity found in the national accounts is a monetary unit.

Therefore, since 1970s various efforts, such as the "green accounting", were carried out, in order to incorporate the values of the ecosystem services into the System of National Accounts (SNA). SNA correspond to the current existing traditional national economic accounting. In 1970s and 1980s the development of an empirical approach resulted in the Handbook of National Accounting: "System for Integrated Environmental and Economic Accounting" (SEEA), which was developed by United Nations Statistical Commission (UNSC) and released in 1993, meeting the requirements of the first UN Conference and development. In 2012, this single System of Environmental and Economic Accounting (SEEA) of the UNSC recognized as an international statistical standard. Later in June of 2013, within the framework of SEEA, the development of Experimental Ecosystem Accounting (EEA) was approved. The System for Environmental Experimental Ecosystem Accounting guidelines (SEEA EEA) is the first guideline for ecosystem accounting from UN for the assessment of the relation of also non-market valued ecosystem services with the current economic system of a study area. SEEA EEA considers the ecosystem services as contribution to both economic and any other human activity, and therefore is aiming to both physical and monetary quantification (Obst et al., 2016, UNEP et al. 2015).

As ES are a production of natural, human social and build capital (Haines-Young and Potschin, 2010a) for the quantification of ES the characteristics- aspects of both natural and human capital should analyzed as different combinations entail to different services and thus to different benefits. Figure 2 provides a cascade model which shows the connection between ecosystems- ecosystem services and the benefits to the economy and society, ecosystem services provision (Haines-Young and Potschin, 2012a after Potschin and Haines-Young, 2011).

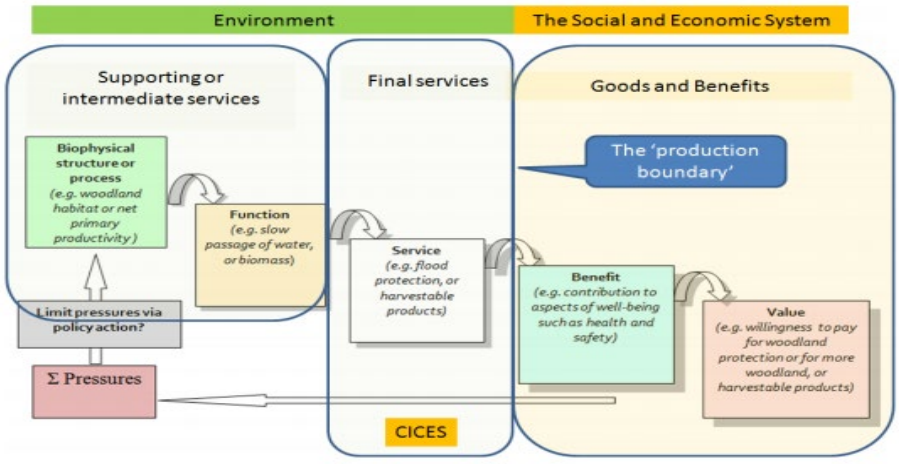

Figure 2: A cascade model which shows the connection between ecosystems- ecosystem services and the benefits to the economy and society, ecosystem services provision. (Haines-Young and Potschin, 2012a after Potschin and Haines-Young, 2011)

Physical quantification

Quantification in monetary terms is the final aim when referring to valuation of ES in order to incorporate them to the National Accounts. This quantification can be achieved by the use of the value of the benefit to the society and this value can be measured first in physical terms. Therefore physical quantification is required as an intermediate step for the monetary quantification. Although the appropriate framework for valuation of a lot of ES is still under development when also the valuation process is facing a lot of challenges (as mentioned above). Therefore in that cases the physical quantification can help for the better understanding of the benefit and in some cases it is considered enough to be taken into consideration for decision making contexts (Haines-Young & Potschin, 2012a).

Monetary valuation

Stocks

With the term stock is considered the ecosystem capital and usually in natural accounting is related with certain ecosystem assets that are described by land use types and therefore each asset can be assessed about its capability to provide ecosystem services in a specific point of time (Hein et al. 2016).

For the valuation of the stocks the SEEA is using the Net Present Value (NPV) of the potential ecosystem services from the stocks- assets identified but there are also other approaches available (Badura et al. 2017).

Flows

With the term flows are described the services produced from certain type of ecosystem and they can be measured within a certain period of time.

For the valuation of the flows- ecosystem services, there are also multiple approaches which are preferred depended on the perspective of the valuation or the research and the data available. The valuation methods of the SEEA EEA can be classified in two main approaches. These are: the market-based or cost-based approach and the revealed actual visits method approach. The market based approach include the resource rent method, the production function (or cost or profit function), the replacement costs, the damage cost/defensive expenditure, the averting behavior and the payment for ecosystem services (PES) schemes methodologies. Whereas the revealed actual visits approach includes the hedonic pricing method and the marginal values from travel cost demand functions method (Obst et al., 2016, Badura et al. 2017).

This thesis is focused on the valuation of ES and therefore of the valuation of flows.

Cultural ecosystem services- tourism

The valuation methodologies for both provisioning and regulating services have developed faster than the valuation methodologies of the cultural ES. This happened due to the nature of the consumption and production processes of provisioning and regulating ES that makes them easier to get integrated into the economic system (Abson, 2011). Therefore among all

the ES, cultural ES found to be the most difficult in valuation as they considered more complex than the rest of the ES (Haines-Young and Potschin, 2012b). Cultural ES are "non-material" services and they are characterized by intangible dimensions since they are known to be everywhere and nowhere (Chan et. al., 2012).

There are five main aspects that make the valuation of cultural ES more complex and more difficult than the rest of the ES. The first has to do with the interconnected benefits that can be derived from a certain ecosystem. This means that specific outputs that the ecosystem provides can be used for different purposes which correspond to either material or non material benefits or sometimes to both. Their complexity makes it difficult to distinguish between which benefit correspond to which of the services (Chan et. al., 2011, Chan et. al., 2012) and this sometime leads to double counting of the service flows (Fu et. al., 2011).

The second difficulty refers to the aspect of incommensurability of the values of cultural ecosystem services in comparison with the values of other services. Therefore questions arise in relation with how possible it is to measure and compare cultural ES among them but also among other ES (Raz, 1986).

The third difficulty has to do with plurality of values that people attribute to the ecosystems. The value that a person can attribute to an ES might not be constant as is depended from multiple factors such as contemplation, deliberation or for example the way that the benefits are presented from the perspective of another person (Peterson and Flanders 2002, Spash 2008). Also the valuation methodologies used in order to obtain a monetary value (which is the current comparable unit for ES in order to be comparable also with the rest of the economic activities) do not entail to a value that would be the appropriate one to represent the ES for decision making (Sagoff, 1998).

The fourth one refers to which exactly are the boundaries of the analysis. Ecosystems have specific locations in the map although the societal part that receives the benefit might be in another location further away from the ecosystem boundaries. And for that reason effort for the incorporation of all the significantly involved with the specific ES stakeholders is important (Meffe et. al., 2012)

Finally the last concern is whether attributing a monetary value to the cultural ES is in contrary with the main target of ES services valuation with is the protection of the welfare and wellbeing of the society. This concern derives from the query of whether the cultural ES will be considered as luxury goods since the action itself would determine the capability of a person to have it according to his or her financial condition (Maslow, 1943, Martinez-Alier, 1995, Marvier, 2006).

Tourism is a typical cultural ES, and the challenges mentioned for achieving the valuation process of the cultural ES exist also for tourism, since it is also incorporate a lot of different values. Although tourism is a lucrative sector and contributes significantly to a lot of countries GDP. This makes tourism to appear as interesting and feasible for the incorporation of its value to the national account, and therefore there are already market data available (Mariani et al.,

2016). The benefits from the touristic activity can be calculated for governmental oriented areas (such as for municipal level or for prefecture) but are not yet distributed into the different ecosystems. As market data are available, resource rent approach is suitable for the monetary valuation of ecosystems contribution in tourism sector. It can be calculated by the subtraction of intermediate, labor and investment-capital costs from the gross revenue (UNSD, 2017).

For the distribution of the benefit to the different ecosystems within a governmental oriented area, the tool used under the SEEA EEA framework is the modified Recreation Opportunity Spectrum (ROS).

ROS was developed initially by the USDA Forest Service, for managing the recreation opportunities in national forests (Brown et. al., 1978).Since then ROS has been accepted worldwide and its use was not restricted only to forest areas, but it has also been used for assessing outdoor recreation opportunities for different areas- ecosystems with a wider range of geological characteristics (Oishi, 2013). Actually ROS provides a framework for analyzing the connection between the visitors experience and the characteristics of recreation opportunities that each area provides. This is done by a classification of the areas of interest from natural (primitive) to urban with the use of environmental (including remoteness, area size and evidence of humans), social (including users density) and managerial (including the level of development of managerial regimentation and noticeability) factors, which entail to the categorization of the areas into six different types; the Primitive, the Semi-primitive Non-Motorized, the Semi -Primitive Motorized, the Roaded Natural, the Rural and the Urban ROS classes (Brown, et.al., 1978).

ROS has been under various modifications in order to serve different research purposes. Such modifications have resulted in different types of the ROS tool such as the Ecotourism Opportunity Spectrum (ECOS) (Khalid et al., 2010), the Tourism Opportunity Spectrum (TOS) (Butler and Waldbrook, 1991), the Water Recreation Opportunity Spectrum (WROS) (Aukerman and Haas, 2004), the Forest Recreation Opportunity Spectrum (FROS) (Xiao et al., 2012) or other adapted ROS which would meet the needs of the respective study.

The modified ROS, adapted to the needs of the cultural ecosystem services, can be seen as a function of the potential of each ecosystem to provide the service with the possibility of reaching a touristic destination. The potential provision of the service can be measured with the use of the recreational potential indicator (RPI). The recreational potential is depended from four factors (Paracchini et al., 2014). Those factors are the managerial level, the level of naturalness, the characterization of the area as protected area (such as Natural 2000) and the water attractiveness (Paracchini et al., 2014, Burkhard and Maes, 2017). When calculating the RPI for urban areas an extra factor is taken into account, the use of green and blue technology (Burkhard and Maes, 2017), but in this study it will not be considered as the research is focused only on natural and semi-natural ecosystems and not cities.

The disadvantage of ROS methodology is that the exact relation between the ROS and the RPI, as well as the relation between ROS and remoteness for each destination has not been

determined yet. The limited number of studies which are dealing with the determination of ROS for valuation of cultural ecosystem services, consider the components of the RPI to have equal weight and the classes for remoteness have been addressed through experts judgment (Paracchini et. al., 2014 and Paracchini et. al., 2016).

In the current study in order to overcome the limitations of ROS and since more data were available, another indicator for distribution of the benefit was used named as actual visits. "Actual visits" is a name that was created for this thesis and the value was given as a relative value of the order of the destinations from a touristic agency and therefore it was used instead of ROS. This value of the actual visits was used further for the identification of its relation with the ecosystem types.

The capacity of different types of ecosystems to provide E.S. with relation to the ROS (which in that case was named as actual visits), is not the first time that has been examined. The actual visits or preference of the landscape have been analyzed by multiple studies. Although the variation of different disciplinary approaches used for each study, makes the comparison among them difficult, and therefore it cannot be obtained a high validated outcome (Lothian, 1999, Bateman et. al., 2006).

Problem statement

The valuation processes of cultural ES such as tourism and recreation are still under development due to their complexity. This complexity has to do (as mentioned analytically in subsection of cultural ES) with the problems of the interconnected benefits, the incommensurability and the plurality of the values, the real boundaries and of the study area and the quandary of whether a valuation will make this benefits of those services to considered as a luxury and not be accessible to certain people. Those challenges make the quantification of the cultural ES difficult and have entail to a non-clear yet connection between the amount of cultural benefits and the ecosystem types which provide those benefits.

Purpose of the study

Therefore this study is aiming on the quantification, in both physical and monetary terms, of the cultural service tourism from the different ecosystem types (land use types) under the framework of SEEA EEA. By focusing on this specific ES, as market values are available this study can overcome the challenge of incommensurability and plurality of the values in a relative scale (as only accommodation and food services economic surplus was taken into account). Double counting problems from interconnected benefits in that case are also not going to be addressed since this thesis if focusing only in one ES provided. Concerning the last challenge of luxury goods, the valuation of the cultural service tourism from different land use types is aiming on further use for decision making and not for everyday trade offs for

individual use. For the realization of this purpose the following research questions needed to be answered:

1a. How LU type and elevation affect the actual visits of a destination?

1b. Which LU types and/ or elevation influence more the actual visits?

2a. How many overnight stays per year are being attributed to each destination (as a unit) for its contribution in tourism sector?

2b. How many overnight stays per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits?

3a. How many euros per year are being attributed to each destination (as a unit) for its contribution in tourism sector?

3b. How many euros per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits?

2. Methodology

2.1. Case study description

Peloponnese, the largest peninsula in Greece, was selected as study area for this thesis. Peloponnese in contrast with the Greek islands does not have intensive tourism in a certain small special and temporal period. It attracts visitors to its multiple available destinations throughout the whole year. The variation of the combinations of different ecosystem types in combination with high number of tourist destinations and the data availability (due to the Greek language) made it an area with promising input in order to achieve the aim of this study.

2.1.1. Peloponnese

Peloponnese is located in the southern part Greece and is the biggest peninsula of the country covering 21,549.6 km^2. It is separated from the rest of the mainland but it is not an island because it is connected only by a small piece of land with the rest of the central part, the Isthmus of Corinth.

The area of Peloponnese consists of the administrative region of Peloponnese together with parts of other two administrative regions, the one of West Greece region and the Attica region (Figure 3). The area of Peloponnese is divided in seven administrative sub-regions: Achaea, Corinthia, Argolida, Arcadia and Laconia, which are included in the Peloponnese

region and Messinia and Ilia which are included in the West Greece region. Those sub regions are divided further into 36 municipalities in total.

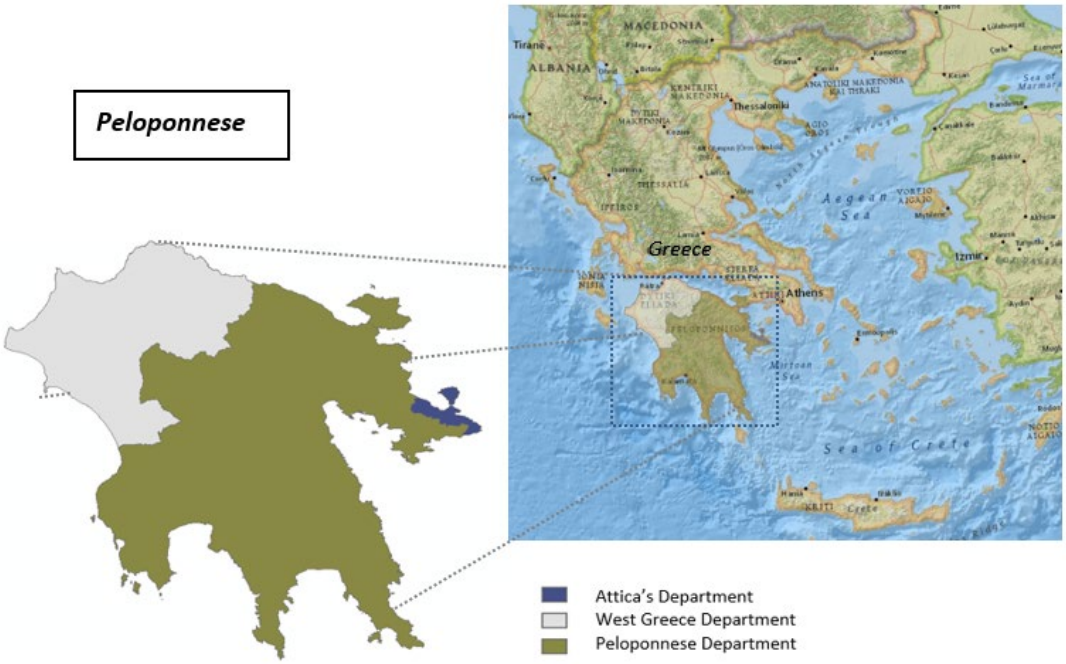

Figure 3: The study area Peloponnese with the 3 municipal departments.

The area can be characterized as mountainous with deeply indented coasts. The highest mountain reaches the 2407m (the Taygetos mountain) Directly after comes the mountains Kilini, Aroania, Erimanthos, Pentelia, Mainalon and Parnon with 2376m, 2355m, 2224m, 2112m, 1981m and 1935m respectively. Peloponnese has three big rivers, Alfeios in the west (110m), Evrotas in the south (82m) and Pineios in the west (70m).

2.1.2. Visualization in arcGIS

The three administrative regions, Peloponnese, West Greece and the Attica region were imported as shapefiles to arcGIS. Shapefiles with regional, sub regional and municipal level administration boundaries were retrieved from geodata.gov (http://geodata.gov.gr). Therefore the West Greece and the Attica region shapefiles were clipped into geographical region of Peloponnese (Figure 4).

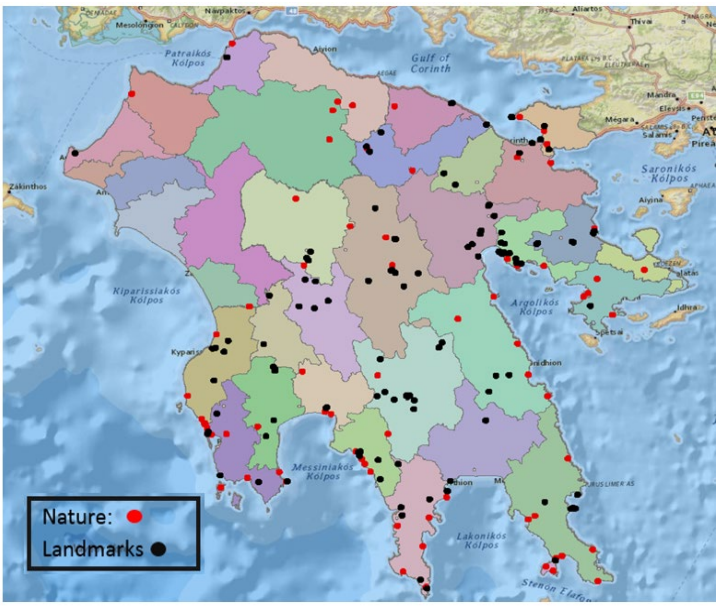

Figure 4: Visualization of Peloponnese with the 36 municipalities and the Nature and Landmarks locations with red and black dots respectively.

2.2. Input data

2.2.1. Touristic destinations

Since the tourism activity was seen from the perspective of ecosystem services, each destination was considered as a unit which was consisted from one or a combination of land use types (ecosystem types). The destinations where divided into three categories according to their "nature". Those categories names as "Nature", "Landmarks" and "Museums". Destinations within the "Nature" category are locations which included areas with water bodies, beaches, mountains etc. Destinations within the "Landmarks" category are considered areas visited by people due to religious and cultural heritage assets. Finally, destination within the category of "museums" were considered any museum that was a point of attraction. It was considered that the ambient environment played an important role in the final actual visits of the location of any of the three touristic destination types.

The touristic destinations were retrieved from a travel agency site, the "tripAdvisor" (https://www.tripadvisor.com/Attractions-g189483-Activities-Peloponnese.html). This was the only available provider (the data are available online) with all the possible preferred destinations (by naming them) in the region of Peloponnese which included the order of actual visits (which is explained further how it was used as an input in the subchapter chapter of actual visits), which was the essential attribute of a tourist destination for this thesis project.

For the natural destinations data retrieved from the tripAdvisor named as "Nature and Parks" (named like that from the site). Within this list, areas were categorized as Water bodies, Beaches, Caverns and Caves, Hiking Trails, Geologic Formations, Waterfalls, Canyons, Parks,

Mountains, Playgrounds, Forests, Hot Springs and Geysers, Islands, Nature and Wildlife Areas, Ski and Snowboard Areas.

For the semi-natural destinations data retrieved from the tripAdvisor named as "Sights and Landmarks". Within the this list, areas were categorized as Ancient Ruins, Churches & Cathedrals, Historic Sites, Points of Interest and Landmarks, Sacred and Religious Sites Castles, Architectural Buildings, Lookouts, Historic Walking Areas, Monuments and Statues, Observation Decks and Towers, Cemeteries, Lighthouses, Mysterious Sites, Scenic Walking Areas, Bridges, Farms, Educational sites, Piers and Boardwalks, Scenic Drives.

Another category that was available on tripAdvisor, was taken into account in this study as another semi-natural ecosystem destination type was the museums. This was because due to the visitors description, the ambient view and the surrounding environment of the museums might influence the actual visits value of the location.

The exact location of the destinations mentioned above was found through the identification of the central coordinates (latitude, longitude) of each destination. This was achieved mainly via https://www.latlong.net/ and Google maps for most of the places. Although for the rest of the data, a number of approximately 30% of the locations, were not mapped before and therefore the coordinates of those places was found by the description of the location of the places from the contact with the people working in the local authorities or from comments from the site or from observation by the naked eye from some local maps. Therefore this approximately 30% of the data with not mapped before coordinates, might create an unknown uncertainty on the results. Because due to the complexity of land use cover of the study area, a possible slight deviation from the real coordinates entail to another location with other land use type combination.

The initial number of the locations found directly from the site on those categories were 90 destinations from the category Nature and Parks, 156 destinations from the category Sights and Landmarks and 53 destinations of the category museums. The final number of the locations used in this thesis was limited down to 81 destinations from the category Nature and Parks 42 of which were beaches, 128 destination from the category Sights and Landmarks and 45 destinations from the museums category. This reduction of the initial number of destinations found were due to the fact that some of the places and mainly a lot of natural places (excluding the beaches) were lacking either specific information regarding the location, or the name and the description mentioned in tripAdvisor weren't enough for the identification of the exact coordinate. Other reasons for that, was the lack of specific name (for example Agios Georgios- might be multiple places with that name) or also that were nature spots identified without actual visits value.

Visualization in arcGIS

For the visualization of locations the arcGIS version 6.3 was used. All the final locations were transferred into an arcGIS map through by importing the coordinates found from excel to GIS. But longitude and latitude coordinates correspond to point features. For the creation of the areas- boundaries of each ecosystem, were created a shapefile with non -dissolved buffers with a radius of 200m and another shapefile with buffers using radius of 500m. These sizes were considered appropriate for being representative of each destination as the original size of the some of the biggest and smallest areas were measured through the Google maps, by taking into account also the distances among municipalities. It is important to note that these created new areas do not represent the real shape of the destinations found, but it can give a good approximation of the area covered.

Actual visits

As mentioned in the introduction chapter, the actual visits (even derived from a touristic agency) are more accurate than the calculated ROS. This is because the number of actual visits is a real estimation of how much tourists the place gets. And since this is the final value, it incorporates all the aspects of ROS such as distance (ability to reach the destination), naturalness, real attractiveness of the location. Therefore those actual visits were used instead of ROS for the further distribution of the benefit to the ecosystems (see introduction chapter). The value of actual visits of each destination retrieved directly from the online travel agency tripAdvisor (https://www.tripadvisor.com/Attractions-g189483-Activities-Peloponnese.html). This touristic agency site provides a final order of the destinations and also number of reviews together with the ranking (from 1 to 5) of each destination. The final order of the destinations was used as actual visits. Because few of the destinations do not contain all information (final order), for the purposes of the thesis was made the graph between the final actual visits (final order) and the reviews for each of the 1 to 5 ranking classes, for all the known values for the three categories (natural, cultural heritage and museums). Therefore the final actual visits of the each of the locations with unknown actual visits value was calculated form the graph trend line. But, not all the visitors are using the internet and contribute in rating the location. This is a percentage of the real actual visits. Although this number of people contributing in the internet ranking is not known, was made the estimation that this order is valid for the rest of the visitors. Therefore this value that was named for the purpose of this thesis as actual visits indicate a percentage and it was used as so for the rest of the thesis.

2.2.2. Ecosystems identification: CLC and DEM

Corine LU

For the identification of the ecosystem type of each area was used the Corine Land Use classification (CLC). There are various land cover classifications, but Corine was selected since it is used for many ecosystem accounting studies and the Corine data are easily available and accessible. Although in case that comparison needed between the other different classifications systems the corresponded classes can be found in "Land cover classification in the revised SEEA, in the 13th EEA Meeting of the London Group on Environmental Accounting, draft for discussion, from Weber,(2010).

Therefore initially the imported CLC vector shapefile was clipped into the study area. The shapefiles of all the datasets, study area, location points and location areas and the Corine LU classification, were converted with the batch project tool to the same local projection coordinates. Therefore the union system used for assessing all the data sets was the Projected Coordinate System:WGS_1984_UTM_Zone_34N with Projection: Transverse Mercator with Linear Unit: meter by using the tool of batch project from the data management. This conversion was done as UTM local projections are considered more accurate for calculations within a country level since they designed for the respective zones, in contrast to WGS84 with linear unit: degrees, in which earth's center is considered the center point (Figure 5).

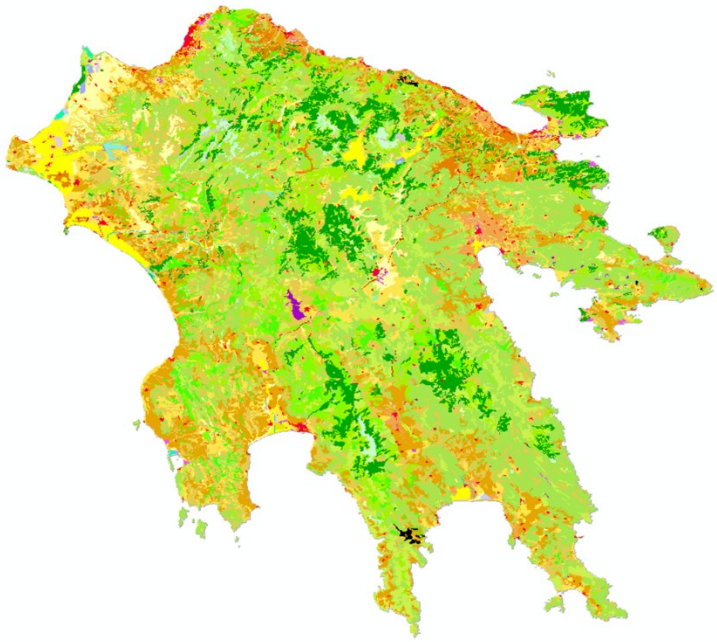

Figure 5: Visualization of LU classes in the study area from the 3rd level of the Corine LU classification.

The Corine classification provides 3 levels of classification. The level 1 is consisted from 5 main classes, the level 2 is consisted of 15 classes and the third level contains even more specific information about the land use cover and its consisted from 44 classes. In this study it was initially used the more detailed (3rd level) of classification, but for the 2nd approach of the 1st

research question (as explained in the methodology chapter of this research question) a new grouped classification which was based on the existing CLC was used, which was created for the purposes of this study as can be seen in table 1 and table 2. An extra LU class was added for the purposes of the study, which was indicated by the code 1 (LU_1) and represented the parts of the locations identified outside of the borders of the study area. All of the cases with LU_1 were examined and found that involved only coastal areas and therefore all of the locations with LU_1 correspond to the land use asset: sea. This would entail in grouping the Corine LU_523 which correspond sea and ocean with the created LU_1 and examine it as one unified category of LU. Although, the level of accuracy of the coordinates (even for the mapped-known locations) in combination with the small deviation of the different layers (which were retrieved from different datasets, and therefore even if they had been converted to the same local projection system they shown a small deviation- see Figure 7) would might entail to either much bigger or much smaller percentages of sea and ocean coverage of the destinations than the real coverage. Therefore it was decided not to include further in the study the sea and ocean and the out of the boarder LU (LU_523 and LU_1).

The new grouped LU categorization that was done for this thesis was done based on the combination between the level 1 of Corine LU classification and on the estimation that these are the categories that the visitors can clearly distinguish between each other. Therefore the permanent crops were separated from the agriculture areas group because they were expected to have different influence on tourists actual visits based also on literature review. In the Tables 1-2 the Corine LU types identified in Nature and Landmarks areas are presented and also the new grouped classes which were created for this thesis.

Table 1: CLC classes identified for the Nature dataset (on the left) and the new created grouped categorization for this thesis

	CLC_CODE	LABEL3	LABEL2	LABEL1	Grouped for thesis label	Grouped for thesis code
1	111	Continuous urban fabric	Urban fabric	Artificial surfaces	Artificial surfaces	100
2	112	Discontinuous urban fabric				
3	123	Port areas	Industrial, commercial and transport units			
4	133	Construction sites	Mine, dump and construction sites			
5	142	Sport and leisure facilities	Artificial, non-agricultural vegetated areas			
6	211	Non-irrigated arable land	Arable land	Agricultural areas	Agricultural areas	200
7	222	Fruit trees and berry plantations	Permanent crops		Permanent crops	220
8	223	Olive groves				
9	231	Pastures	Pastures		Agricultural areas	200
10	242	Complex cultivation patterns	Heterogeneous agricultural areas			
11	243	Land principally occupied by agr				
12	311	Broad-leaved forest	Forests	Forest and semi natural areas	Forest and semi natural areas	300
13	312	Coniferous forest				
14	313	Mixed forest				
15	321	Natural grasslands	Scrub and/or herbaceous vegetation associations			
16	323	Sclerophyllous vegetation				
17	324	Transitional woodland-shrub				
18	331	Beaches, dunes, sands	Open spaces with little or no vegetation			
19	333	Sparsely vegetated areas				
20	411	Inland marshes	Inland wetlands	Wetlands	Wetlands	400
21	421	Salt marshes	Maritime wetlands			
22	512	Water bodies	Inland waters	Water bodies	Water bodies	500
23	521	Coastal lagoons	Marine waters			
24	523	Sea and ocean	Marine waters		Sea Ocean	520
	1	Out of the border (sea)			Areas out of the border	1
						NOT INCLUDED

Table 2: CLC classes identified for the Landmarks dataset (on the left) and the new created grouped categorization for this thesis

	CLC_CODE	LABEL3	LABEL2	LABEL1	Grouped for thesis label	Grouped for thesis code
1	111	Continuous urban fabric	Urban fabric	Artificial surfaces	Artificial surfaces	100
2	112	Discontinuous urban fabric				
3	121	Industrial or commercial units	Industrial, commercial and transport units			
4	122	Road and rail networks and assoc				
5	123	Port areas				
6	142	Sport and leisure facilities	Artificial, non-agricultural vegetated areas			
7	211	Non-irrigated arable land	Arable land	Agricultural areas	Agricultural areas	200
8	212	Permanently irrigated land				
9	221	Vineyards	Permanent crops		Permanent crops	220
10	222	Fruit trees and berry plantations				
11	223	Olive groves				
12	231	Pastures	Pastures		Agricultural areas	200
13	242	Complex cultivation patterns	Heterogeneous agricultural areas			
14	243	Land principally occupied by agri				
15	311	Broad-leaved forest	Forests	Forest and semi natural areas	Forest and semi natural areas	300
16	312	Coniferous forest				
17	313	Mixed forest				
18	321	Natural grasslands	Scrub and/or herbaceous vegetation associations			
19	323	Sclerophyllous vegetation				
20	324	Transitional woodland-shrub				
21	331	Beaches, dunes, sands	Open spaces with little or no vegetation			
22	411	Inland marshes	Inland wetlands	Wetlands	Wetlands	400
23	421	Salt marshes	Maritime wetlands			
24	512	Water bodies	Inland waters	Water bodies	Water bodies	500
25	521	Coastal lagoons	Marine waters			
26	523	Sea and ocean	Marine waters		Sea Ocean	520
	1	Out of the border (sea)			Areas out of the border	1

NOT INCLUDED

Elevation

Corine LU classification does not include the element of mountains. The maps available for arcGIS use that can provide the information of this geomorphological element are the Digital Elevation Models (DEM) which indicate the elevation of each location. Therefore in this study it was used a raster local EU- DEM v1.1 e50n10 (GeoTIFF file). This shapefile was also converted to the Projected Coordinate System: WGS_1984_UTM_Zone_34N with Projection: Transverse Mercator with Linear Unit: meter and was scaled down to the study area (Figure 6).

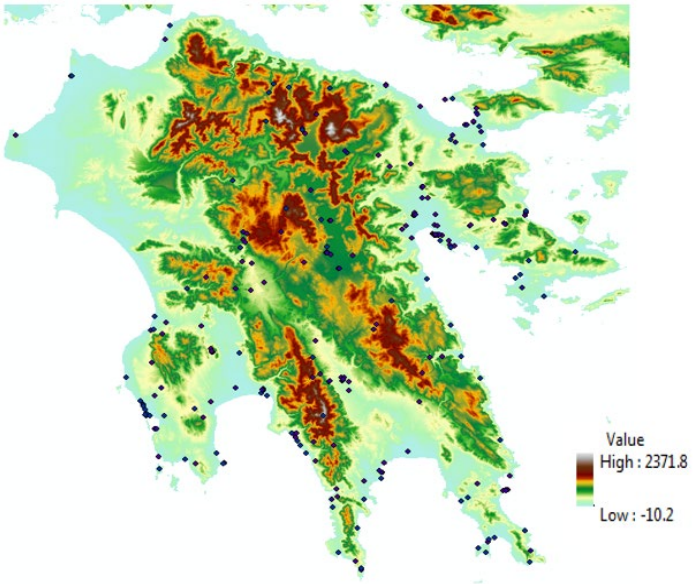

Figure 6: Visualization of the altitude through the whole Peloponnese area from the digital elevation map (DEM) with all the destinations identified. Colours represent the altitude of each location. The lowest altitudes are presented with light blue , light yellow and green represent a bit higher values, yellow correspond to medium values and brown and white represent the very high altitude values.

2.3. RQ1a: How LU type and elevation affect the actual visits of a destination

For the identification of the level of influence of the elevation and of each of LU type to the actual visits, two different approaches were used. With the first approach it was examined the effect between each one of the LU types identified in contrast with the value of actual visits. Also the effect of elevation to the actual visits was examined separately as well. With the second approach, it was identified the influence of the combination of different land use types and elevation to the actual visits.

It is important to mention that for both approaches since it was done the conversion of all the destinations from points to polygons (circles with 500m radius) all the destination types include from now on and for the rest of the study the surrounding land use types. This was done intentionally since the effect the combination of the different ecosystems types of the destination was examined. For this reason in the results it will appear beaches with percentage of agriculture land use type for example and is not considered as error since it reveal the relation of the combination of the ecosystem assets (LU types) to the tourist behavior.

2.3.1. Individual influence of each LU type to the actual visits

Corine LU coverage- actual visits relationship

For the examination of the influence of LU types individually to the actual visits, each of the LU type from the third level of CLC (table1 and 2) identified were analyzed and grouped later for further comparisons.

For the identification of the LU type of each area it should be decided which of the of the two created destinations polygons data sets were appropriate to use. The one with 200m radius data set or the other with 500m radius data set polygons. The real size locations and the deviation of the meters (accuracy) in the arcMap due to the different layers determine this decision. Regarding the distances of the locations, when the polygons of 200m radius and the polygons with 500m radius compared with the real size of the areas (which was not circle and was known in most of the cases) both of sizes selected considered rational (not too far from the central point but far enough to include the view and the influence of the surrounding landscape to the visitors actual visits). Although regarding the different layers in the arcGIS, even after clipping all the shapefiles to the study area and converted them to the same local coordinates as mentioned above, there was still observed a slight difference (not completely overlay) between the layers from the different sources (Figure 7).

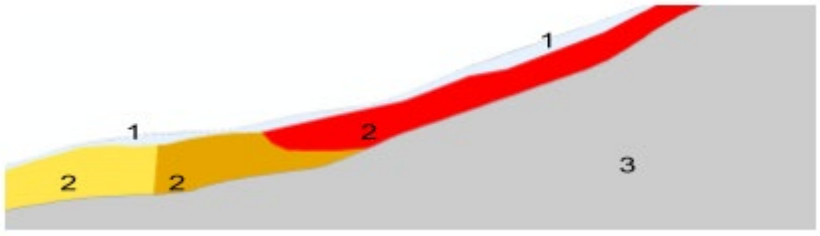

Figure 7: Present the deviations between the boundaries from the different data sources, even when converted to the same projection system. Numbers correspond to the three different layers.

The union study area layer of Peloponnese is presented with the light blue and number 1 as seen in the Figure 7. The Corine LU classification is the coloured layer (yellow, orange, red) and the number 2 is represented the Corine LU classification layer. And lastly with the grey colour and number 3 are represented the municipality boundaries (Figure 7). From the measurements it is observed a 0 to 100m error from layer 1 to layer 2 and a 0 to 200 m maximum error deviation from layer 2 to layer 3.

Due to this deviation between the layers it was considered more appropriate to work with the destinations areas with the radius of 500m instead of the 200m.

Therefore with the use of the identity tool, were created three new data sets that were including the LU cover type for each of the three destination categories (nature, landmarks, museums) with radius 500m.

The new attribute tables of the created shapefiles were converted to excel and therefore it was calculated the percentage of each LU type coverage for each destination area. The destinations areas were distinguished by a different "count" number, which indicate the actual visits value. Although there are four locations from which the calculations for the LU type was not taken into account, since they had the same actual visits value. Those are the location with actual visits value 28 from the nature datasets and 32 from the sites and landmarks datasets.

Furthermore it was analyzed the relation between LU type coverage and actual visits for each of the LU type identified in the data set. The Nature dataset was separated into two further groups. The beaches and the non- beaches areas (the rest of the natural areas).

Elevation- actual visits relationship

The elevation values from the raster DEM was extracted for each destination (points-feature data sets). The values form the attribute table assessed further in excel in order to see any potential relationship. The influence between the elevation and actual visits was observed among all of each three different destination types (landmarks, nature and museums) and also by dividing each destination type into 4 categories with the actual visits, form 1 to 25 (low actual visits values), from 26 to 50 (low medium actual visits values), 51 to 75 (high medium actual visits values) and from 76 to 100 (high actual visits values).

2.3.2. Correlation between the combination of ecosystem features and actual visits

The study area is consisted from a complex combination of different LU types and from a variation of elevation values. Therefore the destinations identified were characterized also from diversity in LU composition and different elevation characteristics. Therefore multiple regression analysis with the statistical model SPSS was used to identify any potential relationship between those multiple combinations of LU types and elevation values in combination with the actual visits.

The multiple regression was done with using the actual visits as the depended value (y) and the elevation values together with the different LU types from the new grouped category (which was created for this thesis as shown in table 1 and 2.) as the independent variables. Therefore the total independent variables used were seven. Variable X1 correspond to artificial surfaces (LU_100), variable X2 correspond to agricultural areas (LU_200), variable X3 correspond to permanent crops (LU_220), variable X4 correspond to forest and semi natural areas (LU_300), variable X5 correspond to wetlands (LU_400), variable X6 correspond to water bodies(LU_500) and variable X7 correspond to elevation values (from DEM).

For the examination of the input data and the variables decided to be used in relation to the regression made, it was used the 4 assumptions in the SPSS model. The first was the Multicollinearity assumption in order whether there is at least some correlation observed between the independent and the dependent variable and also whether there are not more than two correlations among the dependent variables that are too high (>0.7) because this

will might have negative impact in the regression analysis as it would indicate low significance between the variables and therefore wrong beta and indicate that one of those two variable should be excluded. This can be seen from the Pearson Correlation table output. The second assumption was the Collinearity diagnostics. With the Collinearity diagnostics can be checked any other potential multicollinearity problem that was not seen in the correlation output table. This result was checked from the Tolerance and the Variance Inflation Factor (VIF) value that are included in the output table of the coefficients in the Collinearity statistics. Tolerance value explain how much of the variability is not explained by other variables and therefore if the value is too low (<0.1) this would indicate a problem of multicollinearity between variables. VIF value is actually the opposite of tolerance value and therefore it is considered a problem on the variables selected when is above 10 (>10).The third assumption made was to check for Normality, Linearity and Outliers, though the normal probability plot (p-p plot and scatter plot) in order to see the distribution of the data. In that case also outliers can be checked by have <-3.3 or>3.3 value in the scatter plot. The mahalanobis distance was selected to present as an output next to the data in order to distinguish which are the data that are outliers in case they are outliers. The data outliers would have a mahalanobis distance bigger than the critical value. The critical value is determined by the number of independent variables and in that case that the number of independent factors is 7 the critical value is 24.3. For checking whether the existing outliers might have any big impact on the regression model cook's distance was also selected to appear in the output and in case maximum cook's distance is bigger than 1 then the is considered a problem to the model. For the fourth assumption the evaluation of the regression model was checked that it can be checked from the R^2 and from the p-value which shows the significance of the regression and also the significance of the model for each factor. The R^2 which can be found on the model summary output table reveals how much out of 1 the independent variables selected are explaining the model. From the other side the p value or the significance indicates how true and accurate the model's prediction is. In that case was considered significant results the ones with p value lower than 0.05 which indicated that the regression is accurate 95% or more. Finally there is a significance value for each of the independent variables which are written in the coefficients table next to the standardized beta coefficients, which indicate how accurate the model had predicted the beta coefficient (relation with the dependent variable) for each of the independent variables.

The regression was done with the three different data sets Nature, Landmarks and Museums with three different methods. The first method includes one regression for each one of the three data sets in the whole range of actual visits values. Although because of the wide range of actual visits values the relationship between the variables were examined further with five other regressions while they were divided into five subcategories of each of the data sets. These categories indicate different scales of actual visits from 1 to 20 (lowest actual visits), from 21 to 40 (medium low actual visits), from 41 to 60 (medium actual visits), from 61 to 80 (medium high actual visits) and from 81 to 100 (high actual visits). Additionally a last methodology was used by doing one regression per all of the range of each ones of the groups (Nature, Landmarks, Museums) by using the same value for the depended factor

y (actual visits) every 20 actual visits values (like the categorization done in the 2nd methodology) as explained in Figure 8.

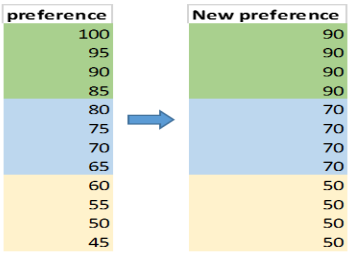

Figure 8: Numbering of the independent value -actual visits (that is named as new actual visits) according to the 3rd regression methodology, which was one single regression to the whole group with categories.

Finally the locations of the Landmarks category categorized further according to their identity into Cultural sites and into Religious locations in order to increase the accuracy of the regression by keeping the "non-examined" indicators as constant as possible between the points. The Nature data set were divided only into beaches and non-beaches locations, but the non-beaches locations were not categorized further since the number of places with similar identity did not allow it.

2.4. RQ1b: Which LU types and/ or elevation influence more the actual visits?

From the results of the regression it was calculated which of the LU types and or the elevation had higher influence to the actual visits. From all the regressions the results obtained from the data set with high actual visits that also had significant p- value.

2.5. RQ2: Quantification of E.S. for tourism in physical terms.

The quantification in physical terms was done for the destinations (polygons of r=500m) themselves which include a combination of ecosystem factors, but also for each of the LU type or elevation, that showed significant relation with the actual visits value per m2 per each municipality per year.

The unit used for the physical quantification was the number of overnight stays that each ecosystem type can attract per year and per municipality. The number of overnight stays considered more accurate than the number of tourist coming due to the fact that in a lot of cases according to the data found from the Hellenic Statistical Authority (ELSTAT), tourists stay one or more days at their destination. Therefore the number of overnight stays per municipality was taken from the Hellenic Statistical Authority (ELSTAT) for the year 2013 (since this was the year that the reasoning for visiting Greece was available).

According to the framework of SEEA EEA the values or quantities are distributed spatially according to the characteristics that influence the result and in the case of tourism the distribution was achieved according to ROS value that was an output of the function of the values of all elements related. In that case as mentioned the actual visits will be used instead of ROS. For this reason he actual visits value was used as the weighting factor for the

distribution of the amount of overnight stays that visit Peloponnese for nature, landmarks and museums. It should be noted that the value of overnight stays is a relative unit, as this is provided from the accommodation services. So it does not have to do with staying all night in the destination, but a relative number of times (when referring to a lot of overnight stays) and a relative value for hours. Although since not all the tourists are visiting Peloponnese for those purposes, the examination of the touristic behavior was analyzed first.

According to the study of initiative of the Greek Tourism Confederation (InSETE, 2015) there are three main reasons for visiting Greece, with first being the "Sun and Sea" which covers the 61.9% of the total overnight stays, the "Culture and religion" which covers the 12.55% and the "City break" which covers the 3.9% of the overnight stays in the year 2013. With a residual of 21.6% of overnight stays covered for other purposes. Those three categories were including specific activities (different activities were provided for each category). The activities related to each of the three categories (sun and sea, cultural and religion and city break) are provided in the tables 3, 4 and 5. The percentages of people from each category that where following the activity were given from the InSETE. Although these percentages derived from responses that included multiple answers (so their sum was not 100% as one person could do 1 or more activities). Therefore the percentages for each activity were normalized from 0 to 100. Later on each of the destinations used in that thesis (nature-non beaches, beaches, landmarks, museums) were connected with related activities. This connection was achieved according to whether the activity would concern or take place in the specific location or not. Those connections together with the percentages can be found in tables 3, 4 and 5 for each of the three categories respectively. Finally the sum of the percentages of the related activities was taken into account for the calculation of the overnight stays for beaches nature, landmarks and museums within those three visiting activities

Table 3: Activities related with visiting Greece for Sun and Sea and the connection with the related location category**.**

Sun and sea category	perc. %	related locations
Relaxation	16	
sunbathing	15	Beaches
swimming	15	Beaches
Enjoyment of food and drink	11	
exploring landscapes and nature	9	Nature
sightseeing / excursions	9	Landmarks
shopping	6	
Walking / hiking	5	Nature
Hospitality experience	4	
Social life, parties	4	
Visit unspoiled natural landscapes	3	Nature
Night life, clubbing	1	
Body Fitness	1	
Other sports and activities	1	
Golf	0	
Other	0	

Therefore people visiting Nature from Sun and Sea category are the 18%, the people visiting the beaches consist the 30% of the category and 9% of the category visits Landmarks.

Table 4: Activities related with visiting Greece for Culture and religion and the connection with the related location category**.**

Culture and religion category·	perc %	related locations
Sightseeing	17	Landmarks
Visit of cities	14	
Explore the landscape	13	Nature
Relaxation	12	
Visit to museums, exhibitions	9	museums
Enjoy food & drink	9	
Knowing the way of life	8	
Exploring nature	6	Nature
Swimming / sunbathing	6	Beaches
Adventurous experiences	3	Nature
Other	0	

Therefore people visiting Nature from Culture and religion category are the 23%, people visiting the beaches consist the 6% of the category and 17% of the category visits Landmarks. Museum attractions consists the 9% of this category.

Table 5: Activities related with visiting Greece for City break and the connection with the related location category**.**

City Break category- Activities	perc%	related locations
Sightseeing	21	city landmarks
Relaxation, enjoyment of the place	20	
Enjoyment of food and drink	16	
Visit to museums, exhibitions	15	city museums
Shopping	12	
Visit to parks	6	
Visit to theaters, concerts	3	
Nightlife, clubbing	3	
Visits to friends / relatives	2	
Visit to sporting events	1	
Visit to festivals	1	
Other	0	

People visiting Landmarks that are close to a city or town from City break category are the 21%, people visiting the city's museums consist the 15% of the category.

Since as observed from the table 5, the destinations which are located within a city they categorized differently, in this study the locations that were identified closer to cities or towns (within a distance of 5km), were located in a different categorization for this quantification. Therefore measuring the distance from the city or town, the shapefiles from Open Street Map was used and uploaded in ArcGIS which provided input about roads, cities, towns, etc. (http://download.geofabrik.de/europe/greece.html).

Therefore the overnight stays for each municipality will be divided into the 3 different driving forces for visiting Greece (sun and sea, culture and religion and city break category) according to the percentages found.

2.5.1. RQ2a: How many overnight stays per year are being attributed to each destination (as a unit) for its contribution in tourism sector

For the quantification in physical terms of the destinations as one ecosystem , initially the overnight stays for each municipality were divided according to the 3 different driving forces for visiting Greece mentioned above (sun and sea, culture and religion and city break category) according to the percentages found. Furthermore from this number of overnight stays per visiting category, it was calculated the percentage of overnight stays that is engaged with this location destination (landmarks, city landmarks, nature, city parks, beaches, museums, city museums) according to the weighting factor of the relevant activity found above. Next it was calculated the final overnight stays for each visiting category by assigning the actual visits value as the weighting factor for the overnight stays distribution between the places. Finally the sum of overnight stays of all the three visiting categories for each location, gives the physical quantification in terms of overnight stays per year per municipality for each location- destination.

2.5.2. RQ2b: How many overnight stays per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits?

The results of the regression that showed significant relation between the LU types and the actual visits where used for the quantification. Significant considered the results with probability value (p-value) lower than 0.06. Within the significant relation the LU types selected of which the quantification for tourism E.S. was done were the LU types which also their correlation with the actual visits had p- value lower than 0.6.

Then the percentage of overnight stays per municipality that visiting Peloponnese for nature was used, as the calculation provided in the section 2.4. that is explained through the related activities. This percentage is 14% which derives from the 18% from Sun and Sea category (which consists the 62% of the total overnight stays) and 23% from Culture and Religion category (which consists the 13% of the total overnight stays). And this percentage was multiplied by the total overnight stays per municipality to create the number of overnight stays per municipality that can be attributed to overnight stays only for nature.

Furthermore the normalized values from the standardized beta coefficients from the regression value which showed the correlation between the LU types was multiplied with the overnight stays from each municipality. This outcome provides the quantification of the contribution of the total LU area type per municipality per year.

Lastly the total area (m^2) of each LU type used in the quantification per municipality was calculated from the outputs of the overlay CLC and municipality layers from ArcGIS. This value was divided from the municipal overnight stays for nature found for each LU type in order to scale down the value to Overnight stays per m^2. After that the results were transported to ArcGIS for the visualization.

2.6. RQ 3: Monetary valuation

The monetary quantification translates the contribution of ecosystems to tourism into monetary values under the economic system of the current years in Greece, according to the **resource rent approach**. By following the resource rent method, the value of tourism (E.S.) can be calculated as the residual of the total revenue, after all costs for capital and labour have been subtracted (SEEA CF, paragraph 5.118, UN et al., 2014b) (formula1).

Formula 1:

RR= GVA – LC – CC

Where RR: Resource Rent. GVA: Gross Added Value for the touristic sector. In that case include data referring to accommodation and food services (the input data are analyzed further on in that chapter). LC: Labor costs in the tourist sector. Labor costs will be calculated from the total amount of employees in touristic sector multiplied by the average salary. CC: Capital (Investment) Costs for the touristic sector.

The monetary quantification was achieved again both for the destinations themselves as an ecosystem and for the LU types that found to contribute significant to the actual visits.

Initially it was calculated the RR per municipality and then it was attributed under the framework of SEEA EEA to the different ecosystems by the use of values of the physical quantification

The touristic activities- services that contribute (negative or positive) to the economy are divided in 10 fields according to the Statistical Classification of Economic Activities "ΣΤΑΚΟΔ-08" (ELSTAT, IOBE). Those are the accommodation (field No 55, which contributes with 45.3% of the total revenue), the food service activities (field No 56, which contributes 18% of the total revenue), the maritime transports (field No 50, which contributes 9% of the total revenue),the road transports (field No 49, which contributes 7,1% of the total revenue), the air transports (field No 51, which contributes 5.4% of the total revenue), the trade (field No 47, which contributes 4.9% of the total revenue),the recreation (field No 93, which contributes 3.8% of the total revenue), the travel agencies (field No 79, which contributes 3.7% of the total revenue), the car rentals (field No 77.1, which contributes 1.8% of the total revenue) and the conferences (field No 82, which contributes 1% of the total revenue) (ΚΕΠΕ -IOBE, SETE intelligence). The calculation of the GVA can be achieved when only all the sub data required (from the formula 1) are referring to the same field or the fields in order to be comparable. In the national accounts the touristic economic data for Peloponnese are restricted to the main two economic touristic fields, the accommodation field and the food services, which are the ones that contribute more than half of the total touristic activity.

The Gross Added Value (GVA) in Greece is given in prefecture level and the touristic sector was considered to correspond with the field of "Accommodation and food services activities". As mentioned in the section of the description of the area of this study, Peloponnese is divided into 7 prefectures. In order to distribute the GVA values of each prefecture to the municipalities, the value of the capacity of overnight stays per municipality was used as a weighting factor. The capacity of overnight stays of each municipality was selected since its considered representative of the facilities provided for tourism per municipality. In that case numbers available for the facilities are values for accommodation. But since the number or percentage of hotels from each prefecture which is allocated to each municipality is not available always available, the occupancy rate of "beds" and the percentage of functional available "beds" was used. And since the available "beds" or hotels in not known in that governmental level, the overnight stays of each municipality was assumed to be equal to the "beds" being occupied. Below is presented the equation used for the calculation of the capacity of overnight stays of each municipality (formula 2a, b).

Formula 2a:

$$\frac{\text{Overnight stays of each municipality}}{X} = \frac{\text{Occupancy rate}}{100}$$

Formula 2b:

$$\frac{Y}{X} = \frac{\text{functional available "beds" rate}}{100}$$

Where X: represents the Total available overnight stays. Y: correspond to the capacity of total function available beds and therefore also to the capacity of overnight stays of each municipality

The total amount of employees in touristic sector per municipality is not available. Although an estimation of this number was calculated by the use of the percentage of people working in tourism sector per region. According to ELSTAT and IOBE (2013), 0.6% of the total

employees in Peloponnese region are working on accommodation services and 0.9% of the total employees in West Greece region are working on accommodation services. These values distributed to each municipality. The number of people working per municipality was retrieved form the Regional Operational Program for the Peloponnese- ΠΕΠ "Peloponnesos" 2014-1020 regarding the region of Peloponnese. Therefore the multiplication of the total number of people working for each municipality with the percentage (0.6%) of people working in accommodation gave the number of people working in accommodation for each municipality for Peloponnese region. Considering the region of West Greece only data per prefecture were available from the Greek statistic agency ELSTAT. Therefore the distribution of the people working in the accommodation services sector among the municipalities of West Greece was achieved by the use of the capacity of overnight stays in percentage (which is explained above, and used also for the GVA distribution). Finally for the calculation of the Labor costs (LC) in the tourist sector, the total amount of employees found per municipality was multiplied with the average salary. The salary of the employees can vary according to their position in the business. According to the "Collective agreement on the conditions of remuneration and employment of workers in hotel businesses throughout the country" (Π.Κ.: 14/31.12.2013) the basic salaries of employees in tourism sector will be depended on their category. According to this plan there are four categories, the category A which include Receptionist, maître, maître assistant, concierge A, night concierge A, buffet A, head of rooms and communal space and cook A. In category B are included the head of washing and linen, receptionist B, concierge B, dining room waiter (bayonet), bartender or barmaid and cook B. Category C concerns, waiter assistants, housekeeper, concierge on shift, concierge or buffet/restaurant assistant, cook C and chambermaid. The category D involve people working in laundries, cleaners of communal areas, dressmakers, scullion, and head and assistant medical practitioners. The basic salaries corresponding to each category from A to D are 838.48€, 820.80€, 804.55€ and 768.84€ respectively (Π.Κ.: 14/31.12.2013). The basic salary corresponds to the lower potential salaries. Although since the percentages of people working in each category is not known, in that thesis the value used for salary was the average number of the basic salaries of the four working categories mentioned (the value of 808.2€ per month). Therefore the results might be considered as the minimum expected numbers.

Regarding the CC (Capital Costs), data were available as Gross Investments per sector and per region (higher governmental level than the prefecture). The Gross Investments are divided in less economic sectors than the GVA and therefore the field of "Accommodation and food services activities" is incorporated to another sector together with the fields wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage. Although the total amount of yearly investments in the tourism sector is known and valued with 200 thousand euros (SETE intelligence, 2017). Therefore this value was extracted from the total amount of investments in the sector given, and resulted to the amount of Gross Investments in "Accommodation and food services activities" per region for each year. The year of 2012 (one year before the rest of the data) selected since it consider some time for the application of the investments. Specifically the 3.4 million euros were spend in the whole Greece for Gross Investments in the year 2012 (ELSTAT, 2017). Therefore the investments on tourism sector

(200 thousand euros) correspond to 5.9% of the investments of this economic sector. Thus the Gross Investments in tourism in Peloponnese can be extracted from the given value of the relevant economic sector that is provided form ELSTAT. For the part of West Greece that is in Peloponnese, by the use again of the capacity of overnight stays per prefecture was used to extract the value of Gross Investments. This capacity of overnight stays per prefecture was achieved in the same way as was calculated for the municipalities, but in that case also data for the whole region of West Greece needed. Furthermore the distribution to each municipality was achieved with the use of capacity of overnight stays per municipality (that indicate the infrastructure capacity as mentioned above) as a weighting factor.

Finally the resource rent was calculated for each municipality. From municipality level, the distribution of the resource rent of each destination within this governmental oriented area was calculated with the use of the percentage of the result of the physical quantification as the weighting factor. The percentage of overnight stays for each destination within a municipality as a percentage of the total overnight stays per municipality was used as a weighting factor because as mentioned in the methodology of the physical quantification not all of the travelers are visiting those destinations. The Figure 9a and 9b provide a summary of this methodology for the calculation of the RR for each municipality.

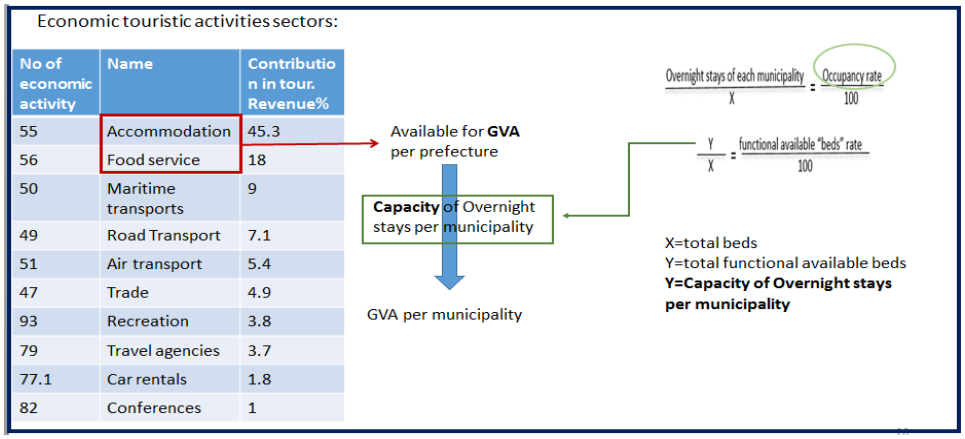

Figure 9a: A summary of the 1st part of the methodology for the calculation of the RR per municipality

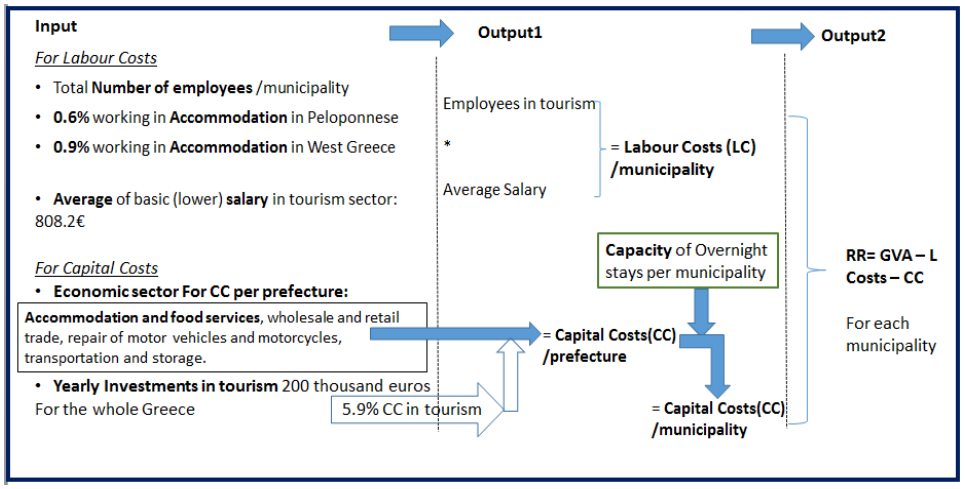

Figure 9b: A summary of the 2nd part of the methodology for the calculation of the RR per municipality

2.6.1 RQ3a: How many euros per year are being attributed to each destination (as a unit) for its contribution in tourism sector

From the monetary data produced the distribution of the calculated RR to each destination as a unit within the municipalities was calculates by attributing percentage of overnight stays found in the chapter 2.5.1. that correspond to those type of activities and from the actual visits.

2.6.2. RQ3b: How many euros per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits

For the monetary valuation it was used exactly the same procedure as for the physical quantification, with the difference that instead of overnight stays it was used the resource rent (RR) and the Gross Value Added (GVA). Therefore the valuation in monetary terms for the LU types which their correlation with the actual visits appears to be significant were presented in terms of both RR and GVA.

3. Results

3.1. RQ1a: How LU type and elevation affect the actual visits of a destination.

3.1.1. Relation between each of the LU type and elevation with the actual visits of a destination

Corine LU coverage- actual visits relationship

All the LU types of level 3 CLC but also from grouped combinations identified, were related with the actual visits value. Although, the increase in the LU coverage did not show any clear relationship to almost none of the data sets.

Nature data set

The only clear relation obtained with more than three observation points (destinations) is the one for the Complex cultivation patterns (LU_242). As shown in the Figure 10 for the non-beaches (orange dots) nature destinations there is observed a significant positive correlation between the increase in LU percentage with the increase in actual visits with an

R^2=0.7452. This observation obtained from only 4 observations (destinations). The blue dots in the graph represent destinations that are included in the beaches nature category and their actual visits do not show any effect from the percentage of the LU coverage.

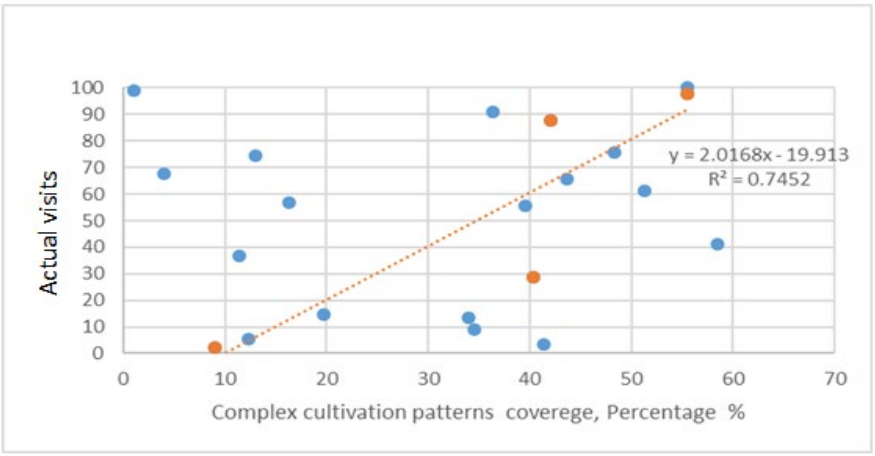

Figure 10: The relation between the increase in Complex cultivation pattern areas (LU_242) with the actual visits value. The blue dots represent destinations that are areas with beaches and the orange dots represent the non-beaches nature locations.

Landmarks data set

The only clear relation obtained with more than three observation points (destinations) is the one for the grouped category of Industrial commercial and transport units without ports (LU_121 and LU_122). As shown in the Figure 11 landmarks destinations there is observed a slight negative correlation between the increase in LU percentage with the increase in actual visits with an R^2=0.9041. This observation obtained from only 5 observations (destinations).

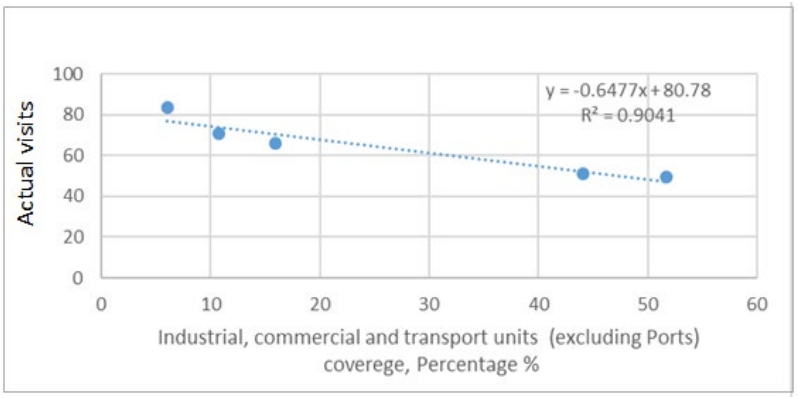

Figure 11: Present the relation between the increase in Industrial commercial and transport units without ports (LU_121 and LU_122) with the actual visits value.

Elevation- actual visits relationship

According to the results of the elevation value of the destinations, there wasn't observed any clear relation between the altitude and the tourist actual visits to neither of the three destination categories.

3.1.2. Correlation between the combination of ecosystem features and actual visits

In the following tables are presented the summary of the results from the regression for the Nature non beaches destinations (Tables 6,7,8) , for the beaches destinations(table 9,10,11), for the Landmarks cultural destinations (table 12,13,14) and for the Landmarks religious sites destinations (table 15,16,17). The complete and more detailed results are provided in the additional files of the thesis that can be found in the ESA department. For each data sets mentioned above, first is presented the multiple regressions made for each of the actual visits subcategories created. Secondly are presented the single regressions for the whole data set, and lastly are presented the single regression with grouped categories for the whole data set.

In all the regression tables is presented the standardized beta coefficients of each independent variable (LU_100=artificial surfaces, LU_200=agricultural areas, LU_220=permanent crops, LU_300= forests and semi natural areas, LU_400= wetlands, LU_500=water bodies and the last variable = elevation) together with the p-value of the respected variable next to the beta coefficients of each variable. Finally at the last 3 columns of the tables is presented the models accuracy by indicating the number of observation (destinations used), the R2 and the p-value (significance) of the whole regression. With yellow colour there are emphasized the results that have p- value lower than 0.06.
It is generally observed that the multiple regressions that made for each of the actual visits subcategories have significant higher R^2 (values higher than 0.5) in contrast with the single regressions for the other two approaches (with R^2 values lower than 0.3) in all of the datasets apart from the Cultural Landmarks.

Significant values found mainly in the non-beaches natural areas data set. Since the part of the natural capital and not the human capital is examined in that study in relation to the ecosystem services, the data set of Nature non-beaches was selected to be used further for the analysis of the next research questions. In the Nature category from the results of the grouped in five subcategories of actual visits there are three regressions that are significant. The group with the medium high actual visits was selected as it was the one with higher significant actual visits values, since the study is focusing on the identification of the ecosystem elements that contribute to high actual visits scores. The normalization of the standardized beta coefficients gives a value of 0.20122 for artificial surfaces (LU_100) in correlation with the actual visits, a 0.1994 correlation with agricultural areas (LU_200), a 0.2165 correlation for permanent crops (LU_220) and the higher correlation with value of 0.3552 with forest areas (LU_300).

Since the forests areas and the permanent crops have the highest significant correlation with the actual visits, those LU types were used further for the physical and monetary

quantification.

It should be noted that in those tables the actual visits are referred as “preference”. This is just a name that was given initially to the depended value for the regressions in the SPSS.

Natural areas: Non- beaches

In the following table are presented the results of the multiple regressions for each of the three methodologies mentioned. With yellow are presented the regressions and the factors that are significant.

Table 6: Separate regressions with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observa	R^2	significance
81 to 100 (highest)	-2,201	0,207	-3,264	0,196	-2,844	0,209	-3,753	0,148			-3,951	0,206	0,229	0,68	9	0,838	0,411
61 to 80 (medium high)	1,017	0,045	1,008	0,058	1,094	0,037	1,795	0,024					-0,14	0,959	8	0,977	0,057
41 to 60 (medium)	-0,65	0	0,466	0	-0,991	0	0,81	0					-0,786	0	6	1	0
21 to 40 (medium low)	-1,665	0,074	-0,497	0,396	-1,357	0,042	-2,3	0,047	-1,2196	0,047			0,68	0,074	10	0,863	0,187
1 to 20 (lowest)	-0,549	0									-0,207	0	0,651	0	4	1	0

Table 7: Regression for the whole actual visits range (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	0,23	0,361	0,477	0,05	0,16	0,499	0,24	0,45	-0,104	0,58	0,285	0,234	0,107	0,629	37	0,169	0,562

Table 8: Regression for the whole actual visits range with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	0,199	0,424	0,44	0,066	0,152	0,513	0,224	0,476	-0,151	0,418	0,291	0,219	0,17	0,438	37	0,187	0,481

Natural areas: Beaches

In the following table are presented the results of the multiple regressions for each of the three methodologies mentioned. With yellow are presented the regressions and the factors that are significant.

Table 9: Separate regressions with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
81 to 100 (highest)	-0,103	0,945	0,304	0,847	0,391	0,622	-0,004	0,997	0,738	0,27			0,527	0,495	9	0,893	0,287
61 to 80 (medium high)	0,14	0,976	0,013	0,98	0,134	0,792	-0,707	0,383			0,229	0,634	0,35	0,959	10	0,572	0,692
41 to 60 (medium)	0,149	0,813	-0,29	0,825	-0,293	0,618	0,254	0,861			0,096	0,887	-0,161	0,843	10	0,297	0,949
21 to 40 (medium low)	0,703	0,146	0,751	0,362	1,0503	0,095	0,06	0,978					-0,257	0,675	7	0,984	0,21
1 to 20 (lowest)	0,755	0	0,914	0	-0,825								1,43	0	5	1	0

Table 10: Regression for the whole actual visits range (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	0,201	0,316	-0,209	0,312	-0,377	0,047	-0,091	0,701	0,126	0,604	0,07	0,786	0,079	0,666	41	0,271	0,132

Table 11: Regression for the whole actual visits range with categories (actual visits are named here as preference)

Standarized coefficients																	
Standarized coefficients	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	0,238	0,241	-0,133	0,522	-0,297	0,117	-0,014	0,952	0,152	0,536	0,119	0,647	0,015	0,934	41	0,256	0,164

Landmarks: Cultural areas

In the following table are presented the results of the multiple regressions for each of the three methodologies mentioned. With yellow are presented the regressions and the factors that are significant.

Table 12: Separate regressions with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
81 to 100 (highest)	0,035	0,927	0,282	0,439	-0,165	0,566	0,484	0,193	-0,127				-0,159	0,673	19	0,213	0,769
61 to 80 (medium high)	-0,265	0,543	-0,017	0,967	-0,023	0,945	0,066	0,872			-0,121	0,743	-0,124	0,745	19	0,116	0,944
41 to 60 (medium)	-0,107	0,76	-0,276	0,478	0,062	0,849	0,235	0,442					-0,464	0,098	20	0,362	0,228
21 to 40 (medium low)	-0,044	0,914	-0,649	0,148	0,063	0,883	-0,83	0,23					0,844	0,187	11	0,465	0,559
1 to 20 (lowest)	0,257	0,402	0,667	0,152	1,059	0,027	0,974	0,034			-0,096	0,736	-0,33	0,352	17	0,611	0,086

Table 13: Regression for the whole actual visits range (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	-0,027	0,835	-0,206	0,137	-0,215	0,087	-0,471	.0.002	0,019	0,861	0,055	0,613	0,005	0,971	86	0,193	0,016

Table 14: Regression for the whole actual visits range with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	-0,038	0,768	-0,221	0,117	-0,186	0,145	-0,422	0,005	-0,011	0,918	-0,032	0,772	-0,033	0,805	86	0,168	0,039

Landmarks: Religious areas

In the following table are presented the results of the multiple regressions for each of the three methodologies mentioned. With yellow are presented the regressions and the factors that are significant.

Table 15: Separate regressions with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
81 to 100 (highest)			1,22	0,209	0,251	0,443	5,49	0,128					-5,156	0,126	6	0,998	0,068
61 to 80 (medium high)	3,105	0,137	13,782	0,215	-4,855	0,219	18,8	2,14					-16,923	0,236	9	0,645	0,504
41 to 60 (medium)	0,48	0	-0,643	0	-0,305	0							-0,319	0	5	1	0
21 to 40 (medium low)	-0,424	0,168	-0,419	0,123	-0,57	0,5	0,026	0,938					0,106	0,721	16	0,529	0,129
1 to 20 (lowest)	0,319	0,401	-1.128	0,104	1,052	0,136					-0,37	0,277	-0,055	0,903	9	0,795	0,259

Table 16: Regression for the whole actual visits range (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	-0,022	0,921	0,059	0,758	-0,429	0,011	0,114	0,701			-0,125	0,399	-0,458	0,047	45	0,249	0,076

Table 17: Regression for the whole actual visits range with categories (actual visits are named here as preference)

Standarized coefficients															Model		
Preference	LU_100	significance of factors	LU_200	significance	LU_220	significance	LU_300	significance	LU_400	significance	LU_500	significance	elevation	significance	No of observations	R^2	significance
	-0,069	0,749	-0,003	0,987	-0,473	0,004	0,048	0,868			-0,168	0,249	-0,423	0,061	45	0,281	0,04

3.2. RQ1b: Which LU types and/ or elevation influence more the actual visits

According to the results of RQ1a from the regressions it was observed that mainly in the data set of Nature were found significant results (see p-value, significance). Therefore it was decided to continue with this category of data. Regarding the different regression approaches the ones that were done to a smaller group of observations (locations) had higher R^2 which indicate that it was a good categorization of the destinations since they would have in common (as constant values) also other external factors. Since the thesis is focusing on which are the land use types that contribute more in high actual visits the regressions above 60 as actual visits (it is referred as preference in the tables) was taken into account. Although, significant results were observed only in the second higher category with actual visits. This was the category with actual visits with values from 61 to 80. From that it was observed that forests (LU_300) had the higher influence on the actual visits, followed by the permanent crops (LU_220). After normalization of the standardized beta coefficients was observed that the correlation between forests and actual visits is 0.3552 and the correlation between permanent crops and actual visits is 0.2165.

3.3. RQ 2: Physical quantification

3.3.1 RQ2a: How many overnight stays per year are being attributed to each destination (as a unit) for its contribution in tourism sector

The results of the physical quantification per destination are presented in excel attached but they cannot used further for this thesis. They are located in the file: RQ2_Data for physical quantification/ Physical quantification for each location per municipality/Physical quantification per municipalitynew

3.3.2. RQ2b: How many overnight stays per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits

The overnight stays per m^2 of LU type per year and per municipality was used as the unit for the physical quantification of E.S. in tourism sector.

Results for forest areas LU_300

Table 18: Results from the physical quantification of units of forest per year per municipality.

FID_Municipality	Municipality Name	Total area (m2)	Total Ostays per mun for forest	Ostays for forests /m2	Ostays in Forest*10^(-6) /m2
0	Mykinwn	1217995161	1030	8.4588E-07	0.8
1	Ilidas	69633182	1081	1.5519E-05	15.5
2	Egialias	740669778	3284	4.4336E-06	4.4
3	Eastern Mani	629612204	3580	5.6855E-06	5.7
4	Ancient Olympia Andr.	664143717	5503	8.2862E-06	8.3
5	Andravidas Kylinis	107050287	16172	0.00015107	151.1
6	Velou Vochas Nemeas	789594447	2345	2.9695E-06	3.0
7	Northern Kynouria	1005929395	437	4.3464E-07	0.4
8	Gortinia	1022552566	1112	1.0871E-06	1.1
9	Western Achaia	202437403	8476	4.1868E-05	41.9
10	western Mani	431856921	3851	8.918E-06	8.9
12	Epidavrou	574460475	546	9.4996E-07	0.9
13	Ermionidas	469628498	13441	2.862E-05	28.6
14	Kalavriton Erimanthou	1578892565	1449	9.1796E-07	0.9
15	Evrota	1276091929	403	3.1556E-07	0.3
16	Zacharos	217704575	495	2.2757E-06	2.3
17	Kalamatas	474428590	12711	2.6792E-05	26.8
18	Korinthion	541762326	2170	4.0045E-06	4.0
19	Loutrakiou St. Theodoron	2957760	24435	0.00826123	8261.2
20	Megalopolis	815836391	501	6.1429E-07	0.6
21	Messinis	204681464	5976	2.9195E-05	29.2
22	Monemvasias	1115500310	4064	3.6434E-06	3.6
23	Nafplieon	791060467	18966	2.3975E-05	24.0
24	Southern Kynouria	1460075377	493	3.3741E-07	0.3
25	Ksilokastrou Evrostinis	342817150	2092	6.1037E-06	6.1
26	Ichalias	342245102	0	0	0.0
27	Patreon	254321093	14009	5.5084E-05	55.1
28	Piniou	23191974	1490	6.4228E-05	64.2
29	Porou	203370430	0	0	0.0
30	Pylou Nestoros	190432312	3357	1.7631E-05	17.6
31	Pirgou	91937772	7540	8.2015E-05	82.0
32	Sykionion	742132544	563	7.587E-07	0.8
33	Spartis	2030405519	3164	1.5582E-06	1.6
34	Tripolis	1862224643	2490	1.3369E-06	1.3
35	Trifilias	340485199	2320	6.8143E-06	6.8
36	Trizinias	518407955	0	0	0.0

According to the results the values varied between $3.156*10^{-7}$ to 0.00826 overnight stays with average 0.0002685 overnight stays per m^2 of forest per year per municipality. In municipalities that have zero value not all of the data were available for calculation. The spatial distribution of the overnight stays to each of the m^2 of forest per year can be seen in the Figure 12.

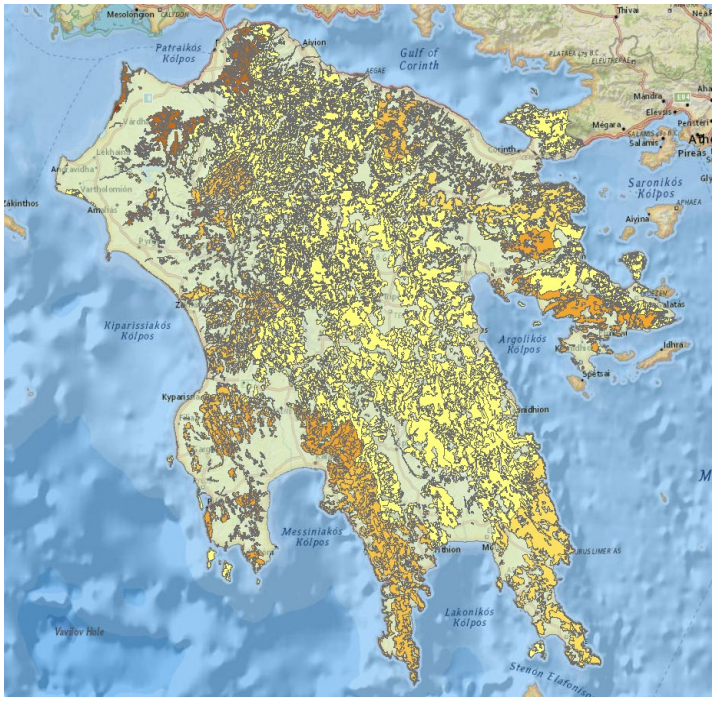

Figure 12: Overnight stays for LU_300 per municipality per m^2 per year.From yellow to darks red are presented the values for each municipality, from the minimum (yellow) to the maximum (red).

Results for areas with permanent crops LU_220

Table 19: Results from the physical quantification of units of permanent crops per year per municipality

FID_Munici	Municipality Name	Total area (m2)	Total Ostays per mun for Perm Crops	Ostays in Perm Crops /m2	Ostays in Perm Crops*10^(-6) /m2
0	Mykinwn	310615553	628	2.02E-06	2
1	Ilidas	57548419	659	1.14E-05	11
2	Egialias	181148739	2001	1.1E-05	11
3	Eastern Mani	131137096	2182	1.66E-05	17
4	Ancient Olympia Andr.	238221813	3354	1.41E-05	14
5	Andravidas Kylinis	27084773	9856	0.000364	364
6	Velou Vochas Nemeas	223569079	1429	6.39E-06	6
7	Northern Kynouria	75100652	266	3.55E-06	4
8	Gortinia	55342368	678	1.22E-05	12
9	Western Achaia	74214420	5166	6.96E-05	70
10	western Mani	38240147	2347	6.14E-05	61
12	Epidavrou	69291276	333	4.8E-06	5
13	Ermionidas	69134453	8192	0.000118	118
14	Kalavriton Erimanthou	62813790	883	1.41E-05	14
15	Evrota	235975218	245	1.04E-06	1
16	Zacharos	75352768	302	4.01E-06	4
17	Kalamatas	109592379	7747	7.07E-05	71
18	Korinthion	154059814	1322	8.58E-06	9
19	Loutrakiou St. Theodoron	5724957	14892	0.002601	2601
20	Megalopolis	6535845	305	4.67E-05	47
21	Messinis	172466561	3642	2.11E-05	21
22	Monemvasias	150587611	2477	1.64E-05	16
23	Nafplieon	192620402	11559	6E-05	60
24	Southern Kynouria	13659197	300	2.2E-05	22
25	Ksilokastrou Evrostinis	107692775	1275	1.18E-05	12
26	Ichalias	141141248	0	0	0
27	Patreon	67743606	8538	0.000126	126
28	Piniou	39967687	908	2.27E-05	23
29	Porou	7580736	0	0	0
30	Pylou Nestoros	178766475	2046	1.14E-05	11
31	Pirgou	108152649	4596	4.25E-05	42
32	Sykionion	143087120	343	2.4E-06	2
33	Spartis	232158141	1928	8.31E-06	8
34	Tripolis	14102715	1517	0.000108	108
35	Trifilias	219319481	1414	6.45E-06	6
36	Trizinias	41535065	0	0	0

According to the results the values varied between 1.04 $*10^{-6}$ to 0.0026 overnight stays with average 0.00012 overnight stays per m^2 of permanent crops per year per municipality. In municipalities that is zero not all of the data were available for calculation. The spatial distribution of the overnight stays to each of the m^2 of permanent crops per year can be

seen in the Figure 13.

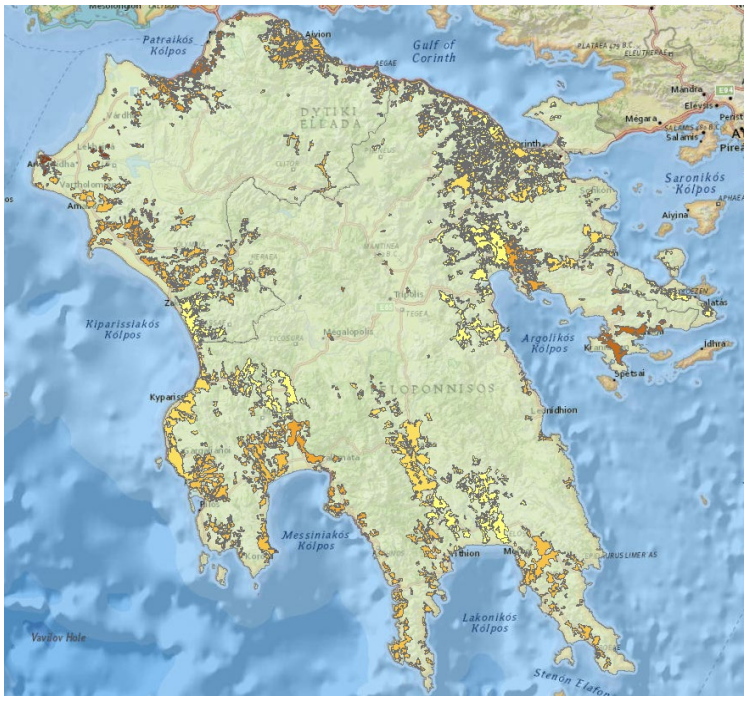

Figure 13: Overnight stays for LU_220 per municipality per m^2 per year. From yellow to darks red are presented the values for each municipality, from the minimum (yellow) to the maximum (red).

3.4. RQ 3: Monetary valuation

3.4.1. RQ3a: How many euros per year are being attributed to each destination (as a unit) for its contribution in tourism sector

The results of the monetary valuation are attached to the excel file. They can be found in the file: RQ3_Data for monetary quantification and RQ2b/Monetary valuation per municipalityNEW.

3.4.2. RQ3b: How many euros per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits

Results for Forests areas LU_300

Table 20: Results from the monetary quantification of units of forest per year per municipality

FID_Munici	Municipality Name	Total area (m2)	Total RR per mun for forest	Total GVA per mun for forest	RR for forest in €/ m2	GVA for forest in €/ m2	RR for forest*10^(-3) in €/ m2	GVAfor forest *10^(-3) in €/ m2
0	Mykinwn	1217995161	114	118	9.33E-05	9.67E-05	0.1	0.1
1	Ilidas	69633182	125	127	0.001802	0.001827	1.8	1.8
2	Egialias	740669778	1307	1385	0.001764	0.001869	1.8	1.9
3	Eastern Mani	629612204	696	700	0.001106	0.001112	1.1	1.1
4	Ancient Olympia Andr.	664143717	750	759	0.001129	0.001143	1.1	1.1
5	Andravidas Kylinis	107050287	1003	1016	0.009373	0.009489	9.4	9.5
6	Velou Vochas Nemeas	789594447	188	191	0.000238	0.000242	0.2	0.2
7	Northern Kynouria	1005929395	399	401	0.000396	0.000399	0.4	0.4
8	Gortinia	1022552566	643	647	0.000629	0.000632	0.6	0.6
9	Western Achaia	202437403	1437	1523	0.0071	0.007523	7.1	7.5
10	western Mani	431856921	657	660	0.001522	0.001529	1.5	1.5
12	Epidavrou	574460475	170	171	0.000296	0.000298	0.3	0.3
13	Ermionidas	469628498	1832	1842	0.003901	0.003922	3.9	3.9
14	Kalavriton Erimanthou	1578892565	570	604	0.000361	0.000383	0.4	0.4
15	Evrota	1276091929	205	208	0.000161	0.000163	0.2	0.2
16	Zacharos	217704575	192	194	0.000881	0.000892	0.9	0.9
17	Kalamatas	474428590	2272	2286	0.004789	0.004819	4.8	4.8
18	Korinthion	541762326	289	296	0.000534	0.000547	0.5	0.5
19	Loutrakiou St. Theodoron	2957760	2890	2915	0.977245	0.985405	977.2	985.4
20	Megalopolis	815836391	198	200	0.000243	0.000245	0.2	0.2
21	Messinis	204681464	948	953	0.00463	0.004656	4.6	4.7
22	Monemvasias	1115500310	1042	1048	0.000934	0.00094	0.9	0.9
23	Nafplieon	791060467	2490	2504	0.003147	0.003165	3.1	3.2
24	Southern Kynouria	1460075377	181	183	0.000124	0.000125	0.1	0.1
25	Ksilokastrou Evrostinis	342817150	450	455	0.001312	0.001326	1.3	1.3
26	Ichalias	342245102	0	0	0	0	0.0	0.0
27	Patreon	254321093	3882	4113	0.015263	0.016173	15.3	16.2
28	Piniou	23191974	259	262	0.011175	0.011313	11.2	11.3
29	Porou	203370430	0	0	0	0	0.0	0.0
30	Pylou Nestoros	190432312	338	341	0.001775	0.001791	1.8	1.8
31	Pirgou	91937772	717	731	0.0078	0.007956	7.8	8.0
32	Sykionion	742132544	127	130	0.000172	0.000176	0.2	0.2
33	Spartis	2030405519	686	692	0.000338	0.000341	0.3	0.3
34	Tripolis	1862224643	756	763	0.000406	0.00041	0.4	0.4
35	Trifilias	340485199	788	793	0.002313	0.002329	2.3	2.3
36	Trizinias	518407955	0	0	0	0	0.0	0.0

According to the results the values of Resource Rent (RR) varied between $9.33*10^{-5}$ to 0.97725 euros with average 0.03221 euros per m^2 of forest per year per municipality. In municipalities that is zero not all of the monetary data were available for calculation. The spatial distribution of the RR to each of the m^2 of forest per year can be seen in the Figure 14.

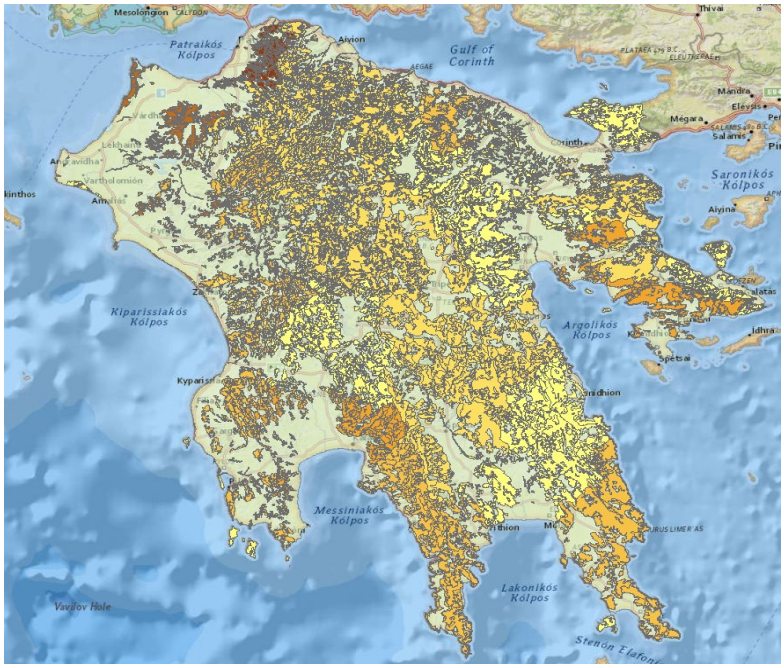

Figure 14: RR in euros for LU_300 per municipality per m^2per year. From yellow to darks red are presented the values for each municipality, from the minimum (yellow) to the maximum (red).

According to the results the values of GVA varied between $9.67*10^{-5}$ to 0.9854 euros with average 0.03252 euros per m^2 of forest per year per municipality. The spatial distribution of the GVA to each of the m^2 of forest per year can be seen in the Figure 15.

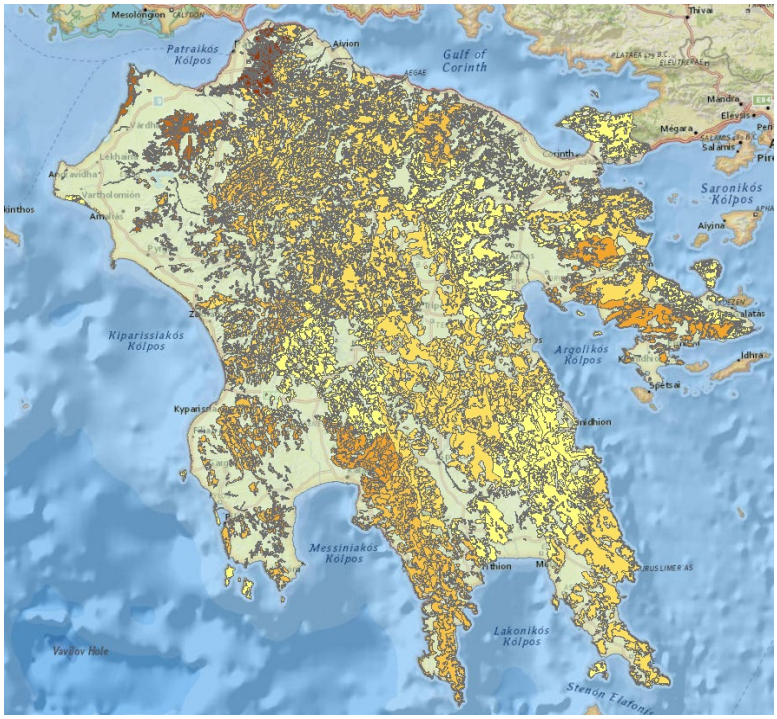

Figure 15: GVA in euros for LU_300 per municipality per unit of m^2 per year. From yellow to darks red are presented the values for each municipality, from the minimum (yellow) to the maximum (red).

Results for areas with permanent crops LU_220

Table 21: Monetary quantification of units of the land cover permanent crops per year per municipality

FID_Municici	Municipality Name	Total area (m2)	Total RR per mun for Perm Crops	Total GVA per mun for Perm Crops	RR in Perm Crops in €/ m2	GVA in Perm Crops in €/ m2	RR in Perm Crops *10^(-3) in €/ m2	GVA in Perm Crops*10 ^(-3) in €/ m2
0	Mykinwn	310615553	69	72	0.000223	0.00023	0.2	0.2
1	Ilidas	57548419	76	78	0.001329	0.00135	1.3	1.3
2	Egialias	181148739	796	844	0.004397	0.00466	4.4	4.7
3	Eastern Mani	131137096	424	427	0.003235	0.00325	3.2	3.3
4	Ancient Olympia Andr.	238221813	457	462	0.001918	0.00194	1.9	1.9
5	Andravidas Kylinis	27084773	612	619	0.022577	0.02286	22.6	22.9
6	Velou Vochas Nemeas	223569079	114	117	0.000511	0.00052	0.5	0.5
7	Northern Kynouria	75100652	243	244	0.003234	0.00325	3.2	3.3
8	Gortinia	55342368	392	394	0.007086	0.00712	7.1	7.1
9	Western Achaia	74214420	876	928	0.011804	0.01251	11.8	12.5
10	western Mani	38240147	401	402	0.010477	0.01052	10.5	10.5
12	Epidavrou	69291276	104	104	0.001494	0.00151	1.5	1.5
13	Ermionidas	69134453	1117	1123	0.016151	0.01624	16.2	16.2
14	Kalaviton Erimanthou	62813790	348	368	0.005535	0.00587	5.5	5.9
15	Evrota	235975218	125	127	0.000531	0.00054	0.5	0.5
16	Zacharos	75352768	117	118	0.001551	0.00157	1.6	1.6
17	Kalamatas	109592379	1385	1393	0.012636	0.01271	12.6	12.7
18	Korinthion	154059814	176	181	0.001144	0.00117	1.1	1.2
19	Loutrakiou St. Theodoron	5724957	1762	1776	0.307714	0.31028	307.7	310.3
20	Megalopolis	6535845	121	122	0.018476	0.01862	18.5	18.6
21	Messinis	172466561	578	581	0.003349	0.00337	3.3	3.4
22	Monemvasias	150587611	635	639	0.004217	0.00424	4.2	4.2
23	Nafplieon	192620402	1517	1526	0.007877	0.00792	7.9	7.9
24	Southern Kynouria	13659197	110	111	0.008081	0.00814	8.1	8.1
25	Ksilokastrou Evrostinis	107692775	274	277	0.002545	0.00257	2.5	2.6
26	Ichalias	141141248	0	0	0	0	0.0	0.0
27	Patreon	67743606	2366	2507	0.034923	0.037	34.9	37.0
28	Piniou	39967687	158	160	0.003952	0.004	4.0	4.0
29	Porou	7580736	0	0	0	0	0.0	0.0
30	Pylou Nestoros	178766475	206	208	0.001153	0.00116	1.2	1.2
31	Pirgou	108152649	437	446	0.004041	0.00412	4.0	4.1
32	Sykionion	143087120	78	79	0.000543	0.00056	0.5	0.6
33	Spartis	232158141	418	422	0.001802	0.00182	1.8	1.8
34	Tripolis	14102715	461	465	0.032664	0.03298	32.7	33.0
35	Trifilias	219319481	480	483	0.002188	0.0022	2.2	2.2
36	Trizinias	41535065	0	0	0	0	0	0

According to the results the values of Resource Rent (RR) varied between 0.00022 euros to 0.30771 euros with average 0.01634 euros per m^2 of permanent crops per year per municipality. In municipalities that is zero not all of the monetary data were available for calculation. The spatial distribution of the RR to each of the m^2 of permanent crops per year can be seen in the Figure 16.

Figure 16: RR in euros for LU_220 per municipality per m^2per year. From yellow to dark red are presented the values for each municipality, from the minimum (yellow) to the maximum (red).

According to the results the values of GVA varied between 0.00023 euros to 0.31028 euros with average 0.01657 euros per m^2 of permanent crops per year per municipality. The spatial distribution of the GVA to each of the m^2 of permanent crops per year can be seen in the Figure 17.

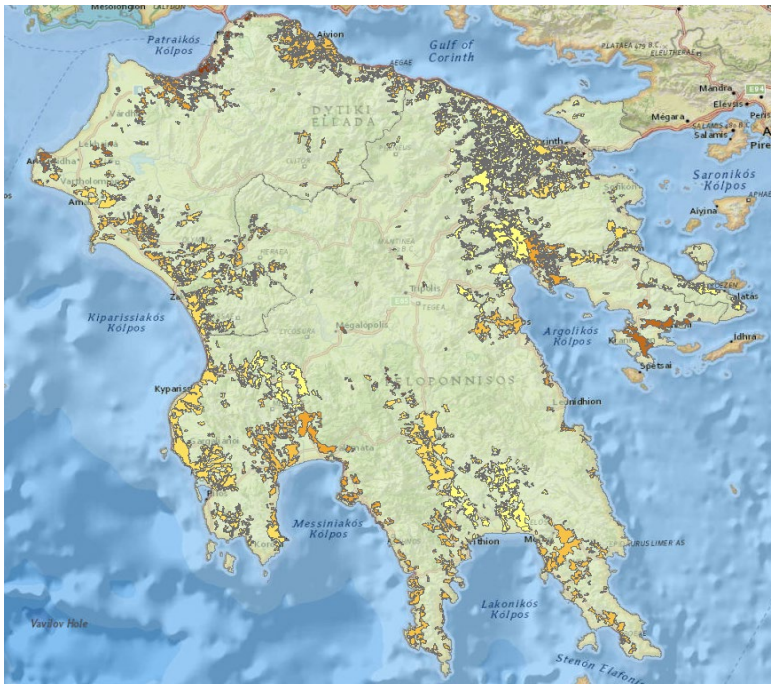

Figure 17: GVA in euros for LU_220 per municipality per m^2 per year. From yellow to dark red are presented the values for each municipality, from the minimum (yellow) to the maximum (red)

4. Discussion

4.1. RQ1a and b: How LU type and elevation affect the actual visits of a destination and Which LU types and/ or elevation influence more the actual visits

4.1.1. Individual influence of each LU type to the actual visits

The positive correlation revealed from the dataset of Nature between actual visits and complex cultivation systems is not in accordance with the theory since complex cultivation systems have found to have a score of two out of five for providing recreational ecosystem services (Burkhard, et. al., 2009). Although the number of points is also not very significant in order to justify the result.

Regarding the slightly negative trend that is observed in the Landmarks data set between industrial commercial and transport units (but by excluding the ports) is partly in accordance with the theory as industrial and commercial units were scored with zero out of 5 potential to provide recreational ecosystem services, while ports are scored with 1 out of 5 (Burkhard, et. al., 2009).

Although since the land use of the study area and of the destinations identified and used for the analyses, the second methodology for this research question which can provide an overview of the effect of the combination of the LU types to the actual visits appear to be more appropriate for this study.

4.1.2. Correlation between the combination of land use types and actual visits

From the regression results are observed differences on the different approaches. The higher R^2 in most of the multiple regressions fixed per actual visits category in contrast to the very low R^2 of the single regressions to the whole group might be explained that the closer the destinations are together in the actual visits they might have some more common external factors. With external factors is meant any other possible independent variables that have taken into account in that project. For instance one possible example to this explanation could be that places with middle to high actual visits values might have good managerial services (in case those services exist) in contrast to low actual visits that the managerial services might not be sufficient for the visitors, as also observed from comments in tripadvisor on some destinations. Therefore grouping the actual visits in smaller subscales might help reducing the uncertainty due to unknown factors which haven't taken into account into the study yet.

Considering the outcome of those results that the forest and the permanent crops contribute the most in the final touristic actual visits are in accordance with the literature as forests, permanent crops together with any LU type that include the water aspect (water courses, water bodies, coastal lagoons) found to have the potential to provide 5 out of 5

recreation services (Burkhard, et. al., 2009). The results regarding the forest as the factor that contributes the most to the actual visits of a destination are in accordance also with other studies such as the Altera (2001). The Altera study was provides results regarding the preference of Dutch people to visit different land use types. According to those Altera results, the Dutch appear also to prefer forest areas most among various different ecosystem types (Coeterier, 2002). The same study found the agricultural land as the least preferred, although there was not done a further discrimination of permanent crops as a separate LU type from agriculture as it was examined in the current thesis.

Although, regardless the high R^2 of the data set that was selected for the examination of the rest of the research questions (for the quantification in physical and monetary terms) the maximum cook's distance found to be bigger than 1. This means that the outlier data affect a lot the result of the regression and therefore makes it even less accurate. Although, in that case, it was impossible to remove the outliers because then the total number of values would be significantly lowered and it would not be enough for creating a significant outcome. For increasing the accuracy of those results it might needed more numbers of destinations with common and more specific known characteristics in order to maintain the external factors as constant as possible and also to have a significant number of samples to obtain a more accurate result.

4.2. RQ2a and 3a: How many overnight stays and euros per year are being attributed to each destination (as a unit) for its contribution in tourism sector

The results of the physical and monetary quantification per destination were calculated for this thesis. The initial aim of this methodology was to compare the values among the different destinations based on their land use type and their nature characteristics (in case they were for example in the same category of parks). Although the amount of destinations in combination with their completely different land uses type combination made this methodology not appropriate in order to continue further. Although keeping this values might be useful for future research in cases there are comparable destinations.

4.3. RQ2b and 3b: How many overnight stays and euros per year and per municipality are being attributed, for the contribution in tourism sector, to each m^2 of the LU type that showed higher influence to the actual visits

Both physical and monetary quantification according to the approach followed for those research questions was based on the regression results. The values indicate the contribution of each LU (forest and permanent crops) not over the total overnight stays to each municipality but from the percentage of the visitors travelling in the study area only for

Natural places which according to the information collected consists the 14.032% (from the sum of the percentages of the activities connected with Sun and Sea and with Cultural heritage) of the total overnight stays per municipality.

Factors that would make the value lower of any other study for recreation is that monetary values are retrieved from money that is really gained from the touristic activity and exist in the national accounts but for the governmental oriented areas and not for the different ecosystem types. In contrast to other studies that obtain monetary values through other valuation methodologies such as willingness to pay, choice experience, travel costs etc. Another fact that contribute to a lower or medium calculated values in this thesis is the only the touristic sectors of accommodation and food service were taken into account that consist the approximately 60 % of the touristic economic activity instead of the total. Other assumptions made regarding the movement of the tourists might also influence the result, since it was considered that all the overnight stays or income per municipality correspond to locations within the same municipality. Although in the travel distances of Peloponnese are not so big between different municipalities and in a lot of cases visitors that traveling by car or visitors coming with booked package trips they visit different destinations that belong to different municipalities in one trip duration although usually they stay in the same place for accommodation but they according to information from touristic agencies.

Considering the literature valuation of the permanent crops, there was not found relevant information, as usually the agricultural areas did not include a separate category for permanent crops. And the literature regarding agriculture had shown lower visits from tourists as seen also in Altera study (2001). This lower visits in agricultural areas is not clear observed from the results of this study since there were not enough locations with this land use type that had high actual visits. Although an explanation for the high contribution of permanent crops and therefore their quantification values might be explained since according to the map these crops are located mainly only a bit further from the coastline, in the whole extent of the study area. Therefore since according to the DEM the areas near the coastline do not have high altitudes might be more easily accessible. This in combination that the permanent crops exist in all over this “parallel” coastline, it might result that the people might visit the locations because of other reasons and because they are easily accessible but the permanent crops are present there regardless. Although from the other hand there haven’t found studies that consider the presence of permanent crops as nutria influence to the visits of a place.

When looking at the literature considering the valuation of the forest areas for recreation services a global value of all forests types was found in the study of Krieger, (2001) which was an output of a combination of multiple different studies with different valuation methods. This study found that the global value of forests for recreation was 26.7 $/acre which equals to 0.00565 euros /m^2. A more recent study, that used cases from Italy and Germany, that Italy has a similar land use cover with Greece, valued the forest for providing recreational services with 3000 euros/ha that correspond to 0.3 euros/m^2 by the use of travel costs as a valuation method (Busch et. al., 2012). Finally the technical report of EU with title “A database of the recreational value of European forests”, (2015) by the use of

other valuation methodologies than RR, such as willingness to pay, travel costs, entail to an outcome of a minimum value of forest for recreation 0.000007 euros /m^2 to a maximum 203.337 euros /m^2 (Quintano and Barredo 2015). The results of the current thesis found to be approximately close to the range of the values found in the literature mentioned. Although in the case of the technical report of EU the theoretical maximum value exceed a lot the calculated value (table 22).

Table 22: Comparison of the monetary quantification results with the literature found for recreation opportunities in forests

RR found in this thesis for forest	euros/m2	RR Krieger, (2001) for forest	euros/m2	RR Bush et al, (2012) for forest	euros/m2	RR EU report, (2015) for forest	euros/m2
min	0.000093	min	-	min	-	min	0.000007
max	0.97725	max	-	max	-	max	203.337
average	0.03221	average	0.00565	average	0.3	average	1.4569
medium without outlier		medium without outlier		medium without outlier		medium without outlier	0.2324

Regardless the uncertainties of this thesis the calculated values were expected to vary from the theoretical one due to the different valuation approaches. In the case of that thesis only market values were used, which were also already exist in the national accounts of Greece but for the municipal levels. In contrast with the values found in literature in which other valuation methodologies were used such willingness to pay and travel costs.

The values calculated for forests found to be comparable with most of the literature. But the biggest uncertainty of this thesis should also be considered. This uncertainty derives from the uncertain coordinates of the approximately 30% of the total destinations. Due to the complexity of the ecosystem in Peloponnese a change in coordinates might entail to a completely different LU composition of the data and therefore the deviation from the results is not possible to predict. Therefore an accurate mapping of all the touristic destinations examined is essential. This means that the output values are not ready to be used for decision making purposes.

5. Conclusion

In this thesis was achieved a quantification, in both physical and monetary terms, of the cultural service tourism for forest and permanent crops land use types (which showed the highest influence in the actual visits of a destination, among other LU types) in the region of Peloponnese in Greece, under the framework of SEEA EEA. For achieving this quantification the effect of the different ecosystem characteristics, referring to land use types and elevation (for the incorporation of the element of mountainous areas which is not covered from the LU classification used), were examined in relation to the actual visits.

Forest and permanent crops LU types found to have the highest influence on actual visits of a destination with positive 0.3552 and positive 0.2165 correlation values respectively. Those results of the forest having important influence on the actual visits were in accordance to the literature. The physical and monetary value per year and per municipality was attributed, for the contribution in tourism sector, to each m^2 of those two LU types that showed higher influence to the actual visits. For this quantification, the value of the actual visits of a destination was used instead of the Recreation Opportunity Spectrum (ROS), as this value found to be given from a touristic agency, and its use could minimizing the uncertainties due to ROS.

The physical quantification was measured in overnight stays per m^2 per year and per municipality while the monetary valuation was found separately for the resource rent (RR) and the Gross Value Added (GVA) of each m^2 of forest and permanent crops, per year and per municipality. The values of RR found for forest, varied between 0.000093euros/m^2 and 0.97725 euros/m^2. While the values of GVA for forest range from 0.0000967euros/m^2 to 0.9854euros/m^2 The RR for permanent crops range from 0.00022 euros/m^2 to 0.30771 euros/m^2. While the values of GVA for permanent crops range from 0.00023 euros/m^2 to 0.31028 euros/m^2. Since in the literature the permanent crops were not examined as a separate category from agriculture in most of the studies, there was not found relevant literature to support the values of the permanent crops. Considering the valuation of forest for providing recreational ecosystem services the values found from the literature were in general in accordance with the calculated monetary values in this thesis. Despite the fact that all of the literature studies have used valuation methods other than RR.

The limitations of this research do not make the results yet appropriate to be used for decision making purposes. There were two main limitations which therefore entail to a higher uncertainty of the values. The first concerns the lack of thoroughly mapping of all the destinations mentioned in the travel agencies, while a deviation in the coordinates might create highly uncertain results in areas with complex land use types. The second limitation is related with the lack of information provided for specific characteristics of the destinations. Although a more thorough examination of the locations which would include more information regarding the managerial levels and also further research for more mapping of the areas with uncertain coordinates, could entail to a more realistic outcome.

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