# Regional Science Inquiry


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# Regional Science Inquiry, Vol. X, (3), 2018
## "Coastal and Maritime Planning Developments in the Greek Context"

Guest Editors
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**Editorial part I**

The present *Special Issue* of the *Regional Science Inquiry Journal* is a collection of five papers, presented at the 2nd Euro-Mediterranean Conference and Exhibition 2017 on "Smart, Inclusive and Resilient Small and Medium-sized Cities and Island Communities in the Mediterranean: Exploring Current Research Paths and Experience-based Evidence" (Heraklion-Crete, September 28-29).

This Conference was part of an effort to establish and promote long lasting cooperation among communities, research institutions and academia, industry and policy makers that has started in 2014 and has led to the development of a virtual network, namely the Smart Cities Mediterranean Cluster. The scope of this cooperation is to promote smart and sustainable pathways that are adjusted to the peculiarities of small and medium-sized cities and communities as well as insular regions in the Mediterranean; and support them to cope with the key challenges and risks such communities are nowadays confronted with.

The focus of the Special Issue is on *"Coastal and Maritime Planning Developments in the Greek Context"*. The glue among the following selected papers is their specific interest in coastal and marine environments, seeking to promote sustainability objectives in either the coastal or the marine environment or even both. Moreover, these reflect works that focus on different coastal and marine-related case studies of the Greek territory, representing pieces of work of an emerging planning interest and a field of a challenging planning activity, of multidisciplinary and interdisciplinary nature, which is expected to be of great importance in the near future in a country like Greece. The reason for that lies in the specific attributes of this country, disposing a shoreline of 13.676 km length and an extensive coastal zone area as well as a number of open seas and hundreds of insular communities floating in these seas. Moreover, the whole Greek territory, but also the Mediterranean as a whole, is considered as a hotspot area in terms of sea rise, biodiversity loss, urbanization, migration, etc.

Along these lines, in the following is provided a short description of the scope and focus of each of these papers as well as people contributing to their accomplishment.

In the *first paper*, *Apostolos Lagarias and John Sayas* explore *urban sprawl trend* in coastal environments as a critical issue for reaching urban sustainability objectives. This trend cross-cuts the European territory in general and the Mediterranean in particular. Indeed, urban sprawl seems to be a rapidly evolving phenomenon in the Mediterranean region due to the intense tourism development and coastalization, with severe impacts on agricultural and natural landloss. The evolution of urban sprawl in the Mediterranean was studied by means of 14 coastal medium-sized cities in Spain, Italy, Greece, Mediterranean France and Malta, in an effort to explore and analyze different typologies of urban form and structure. Based on recent data from European databases, soil sealing degree profiles were estimated and the distribution of different urban land uses was analyzed for 2006, using a set of spatial metrics. Urban growth between 1990 and 2014 is estimated based on data from the Global Human Settlement Layer (GHSL). Results reveal important differences between the 14 cities in terms of urban form and structure. Geomorphology, different levels of population growth and tourism development, differences in the historical and socioeconomic context can, among others, justify this differentiation.

In the second paper, Margarita Angelidou, Christina Balla, Anna Manousaridou, Stylianos Marmeloudis and Dimitrios Nalmpantis deal with a quite important planning objective in contemporary urban unstable environments, the one of urban resilience. As a case study, the western coastal front of Thessaloniki is considered, a medium-sized and partially developed

city in northern Greece, seeking to investigate whether this area features elements of resilience and what opportunities can be harnessed towards this end. In doing so, they shed light on the concept of resilience through literature research; and identify four primary principles of resilience-driven development. These are: (i) existence of resilience-focused spatial planning attributes (redundancy, modularity, buffering, connectivity, existence of legally binding land-use or zoning plans); (ii) presence of a highly adaptive urban spatial management mix, (iii) reflectiveness and ability to learn from past experience and resilience challenges; and (iv) civic engagement, largely facilitated by means of smart city applications. Principles of resilience-driven development are used for identifying whether these are realized in the study area through the currently applicable urban, regional, transportation and environmental planning and management frameworks. As a result, the authors highlight specific aspects of resilience that call for urgent attention and make suggestions regarding policy integration concerns.

In the *third paper*, *Efthimios Bakogiannis, Avgi Vassi, Georgia Christodoulopoulou and Maria Siti* attempt to illuminate the integrated view through which planning interventions in coastal areas should be perceived, by establishing links between the terrestrial and marine part for serving sustainability objectives and increasing the added value of these interventions.The focus is on a *coastal port city*, the *city of Piraeus*, one of the biggest ports in the Mediterranean Sea. Port activities and related pressures emerging from the marine part, but also car-based mobility pattern of the city (terrestrial part), are testing resilience of the specific urban environment and, among others, its transport infrastructure. Speaking of passenger port traffic, although Piraeus has advantageous geographical position, a lot of important archaeological sites and a beautiful shoreline, thousands of passengers use the city as a transport corridor for reaching Athens area. In shifting, in a sustainable way, this transportation burden to opportunity, reinforcing traditional economic activities related to the maritime economy and taking advantage of the new cruise terminal planned in Piraeus, a re-orientation of the city's image is adopted, rendering it a coastal and maritime tourism destination. This will be facilitated by launching a Bike Sharing System (BSS) as a mean but also an excellent tourist attraction, along with the city's other advantages. Along these lines, this paper deals with *BSS as a smart tool* that directly benefits the local economy. It elaborates on emerging strengths and challenges with respect to BSS, gathering evidence-based knowledge from European BSS and using it in Piraeus case study, in order to embed it in the BSS planning effort and increase its impact by offering a more sustainable urban mobility pattern for citizens and visitors.

In the *fourth paper*, *Eleni Gkadolou, Mavra Stithou and Vassiliki Vassilopoulou* bring to the forefront the issue of the steadily increasing interest and related demand for *sea space* by different sectors, which results in increasing complexity and raises important issues with regards to conflict management and assessment of cumulative impacts of related activities on marine ecosystems. At the core of this work lays the sustainable management of maritime and coastal areas, as reflected in the new institutional structures promoted by the European Union (Marine Strategy Framework Directive – MSFD and Maritime Spatial Planning – MSP). Having as a geographical focus the Aegean Sea (Greece), the goal is to identify areas, which would be mostly benefited by spatial planning. Conflicts between existing uses are discussed along with the cumulative impacts of these uses on a key priority habitat, the seagrass *Posidonia oceanica* that provides important services to human well-being. Then the study links impacts with the value of a key service provided by seagrasses, carbon sequestration. Finally, it discusses the potential of such a joint analysis to support prioritization of areas or stressors of concern. In this context, limitations and challenges arising due to the inherent complexity of the involved factors and parameters are acknowledged.

In the *fifth paper*, *Nikoleta Panagou, Athina Kokkali and Anastasia Stratigea* argue that marine/coastal spatial planning, delineating spatial distribution of uses in marine/coastal environments should, when planning at the local level, be integrated into terrestrial planning in order development priorities and visions of the terrestrial part to be properly accommodated in the marine/coastal planning and vice versa. Towards this end, as a first step they gather experience from European Marine Spatial Planning studies conducted at macro-regions with regards to methodological approaches as well as stakeholders' engagement

contexts adopted. This experience was used for streamlining an integrated participatory methodological approach, enabling the concurrent confrontation of territorial and maritime/coastal planning issues and policy making. Along these lines, well established planning tools (MICMAC and MACTOR models) that are capable of handling the issue of integration of land and marine environments into one system as well as the integration of views, interests, stakes etc. of terrestrial and maritime stakeholders were tested in a specific insular case study example, the Zakynthos Island, Greece. Use of such tools can provide valuable information as to the: alternative future development paths of each single case study concerned and respective demand for terrestrial and coastal/marine uses, thus depicting potential conflicts or supporting synergies' creation; power structures of stakeholders and the way they perceive planning objectives (convergence – divergence). This information can lead to knowledgeable handling of subsequent steps of the integrated planning process, strengthening validity and robustness of the planning exercise as a whole and leading to more informed policy decisions.

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**Editorial part II**

The present issue of RSI Journal includes a number of scientific papers related to regional policy issues which are expected to interest a wide range of scholars and policy-makers on an academic, methodological or practical level.

More specifically, this issue includes the following reviewed papers:

6th *Changes in the number of visitors' overnight stays in hotel accommodations and campsites in the thirteen administrative regions of Greece: A shift share analysis approach (By Georgios Xanthos and Nikolaos Rodousakis)*. This paper aims to divide the percentage change of the number of overnight stays that took place in hotel and campsite accommodations in the thirteen Greek administrative regions between the years 2003 and 2015 into separate components, by applying the shift share method. Arrivals and overnight stays' data for domestic and international visitors were used for the division of the percentage change of the total number of overnight stays.

*7th A Note on Schumpeterian Competition in the Creative Class and Innovation Policy (By Amitrajeet A. Batabyal and Seung Jick Yoo).*This article study innovation policy in a region in which the members of the creative class engage in Schumpeterian competition and thereby extend aspects of the recent analysis in Batabyal and Yoo (2017). Using the language of these researchers, the creative class is broadly composed of existing and candidate entrepreneurs.

*8th A Measurement Issue Regarding the Link between a Region's Creative Infrastructure and its Income (By Amitrajeet A. Batabyal and Seung Jick Yoo).* This paper studies the creative capital. The creative capital possessed by the members of the creative class in region is either acquired through education or present innately in these members. Therefore, the creative infrastructure $(CI_i)$ in the region is the sum of a part $(CI_j^E)$ representing creative capital obtained through education and a second part $(CI_j^I)$ denoting creative capital present innately in the creative class members. A researcher wishes to estimate the true relationship between the region's log income per creative class member $(y_i)$ and its creative infrastructure

*9th Opportunities and limitations of regional authorities' use of public administration tools for economic development (By Galina Yakovlevna Belyakova and Tatyana Nikolaevna Vorobyeve).* This article outlines the authors' understanding of the formulation of the regional economic policy. Within the framework of the research, the authors examine regional authorities' willingness to successfully implement the strategic goals of economic development. The methodological basis of the systematic, logical, and comparative analysis allows examining the opportunities and limitations of regional authorities' influence on the development of the regional economy. The article highlights the need for improving the existing instruments of public administration (state regulation) that can contribute to the development of the economy. In this regard, the authors emphasize the problem of defining sectoral and consolidated registers of public authorities' regulatory competencies involved in the constituent entities of the Russian Federation, and the formation of the state regulatory policy. The practical significance of the article is related to the possibility of using the research results to enhance regional authorities' capabilities to influence the development of the economy.

*10th Investment in Innovation and Education: An Efficiency Benchmarking Analysis in Europe (By Kokkinou Aikaterini, Korres George and Dionysopoulou Panagiota).* Sustainable development is a key concept within the Innovation and Education Investment policy of the European Union. As technical efficiency enhancement becomes an increasingly important issue within Europe and worldwide, policy planning should draw attention towards a wide range of production ideas, component technologies and complementary socio-economic capabilities. Within this framework, it is rather difficult for any single economy to incorporate and take advantage of the relevant technological advances in economy, as well as the underlying conditions in innovation and education investments. This means that the actions of policy planning involve the targeted development of specialized knowledge assets, which are integrated from a wider range of investment areas. This paper analyses, through a

benchmarking approach, investment in innovation and education in Europe, creating a spectrum of policy implications.

*11th Illegal constructions in the post-memorandum Greece. Changes and constants in a chronic phenomenon (By Nikolaos Yoyas).* The paper gives a brief description and enhances the debate on illegal constructions and urban planning in the Greece. More specific, during the last decade, that followed the issue of five consecutive laws regarding their integration in the country´s official urban planning in the period 2009-2017, has led to a short-lived race of declaring and legitimizing illegal, constructions on behalf of the hundreds of thousands of popular owners. This institutional reform becomes, increasingly, significant in combination with the contemporary fiscal reform and the relevant tax burdening of realty owners. The timeless popular investment shelter of building ownership, for the first time after WWII, loses its immunity and becomes an unbearable tax weight, transforming popular illegal constructions into the national tool for transforming the country´s real-estate map.

*12th The macroeconomic impact of regional minimum wages: A cross-province data evidence from Indonesia (By Khairul Amri).* The main purpose of this study is to determine the causality relationship between economic growth, regional minimum wages (RMWs), unemployment rate and labor force participation rate (LFP). Using cross-section data set of 27 provinces from Indonesia for the period of 2003-2015, data analyzed using panel co-integration test, panel vector error correction model, and Granger causality test. Panel co-integration test indicates that there is a long-run relationship between the variables. In the long-run, LFP positively related to the economic growth, and negatively related to RMWs. The unemployment is positively related to both the economic growth and RMWs. In the short-run, $RMW_S$ has a significant and positive effect on economic growth. The unemployment and LFP have a negative and significant effect on RMWs. LFP has a negative and significant effect on unemployment and RMWs has a positive and significant effect on LFP. Furthermore, economic growth has a negative and significant effect on LFP. The result of Granger causality test points out that there is a bidirectional causality relationship between economic growth and RMWs and between RMWs and LFP. In addition, unemployment rate causes RMWs, and LFP causes unemployment

Finally, the Journal wants to thank each one and all of the contributors and we strongly wish that this issue will provide a pathway for further academic and scientific dialogue.

On behalf of the Editorial Board
**Dr. Christos D. Genitsaropoulos**

# Articles

# URBAN SPRAWL IN THE MEDITERRANEAN: EVIDENCE FROM COASTAL MEDIUM-SIZED CITIES

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**Abstract**

Urban sprawl processes taking place in European cities constitute an important problem opposing sustainable growth and environmental protection. This is particularly evident in the Mediterranean, where intense tourism development and coastalization continuously impose urban land pressures on agricultural areas and natural land. In the present study a set of 14 coastal medium-sized cities of Spain, Italy, Greece, Mediterranean France and Malta is used to explore recent urban sprawl trends and to analyze different typologies of urban form and structure. Based on recent data from European databases (Urban Atlas, Corine Land Cover and the Imperviousness-Soil Sealing Degree dataset), soil sealing degree profiles are estimated and the distribution of different urban land uses is analyzed for year 2006 using a set of spatial metrics. Urban growth between 1990 and 2014 is estimated based on data from the Global Human Settlement Layer (GHSL). Results reveal important differences between the cities in terms of urban form and structure. Geomorphology, different levels of population growth and tourism development, differences in the historical and socioeconomic context constitute among others, the reasons for this differentiation.

**Keywords:** Urban sprawl, Urban form, Coastalization, Medium-sized cities, Soil sealing, Land use

**JEL classification:** R110, R140

## 1. Introduction

Recent urbanization taking place along the coastal areas of the Mediterranean usually in the form of low dense urban expansion and sprawl, constitute an important issue changing radically the traditional compact structure of Mediterranean cities. It is certain that the distinct political, social and cultural history of Mediterranean cities plays an important role in the way urban growth has taken place. The Mediterranean has been an area of intense urbanization since the antiquity, but it is only recently that such extensive urban land pressures and sprawl are observed (Catalan et al. 2008).

Coastalization, periurbanization and mass tourism development are three important processes reshaping the form of Mediterranean cities. Coastalization is a term referring to the concentration of population and economic activities in the coastal areas, leading to a densification of urban development along the coast but also extending many kilometers to the inland. As Membrado (2015) point outs by examining a 10-km-deep coastal strip, the Mediterranean coast of Spain is mainly occupied by urban sprawl. Coastalization is also related to mass tourism development in the Mediterranean, which accounted for 58 million arrivals in 1970, growing to 314 million arrivals in 2014 and according to Plan Bleu projections show that this trend is expected to grow up to even 500 million in 2030 (Fosse & Le Tellier, 2017).

In the same time urban population continues to grow. In 1960 the urban population represented 57% of the whole EU-Mediterranean population, whereas in 2010 around 76% (Horizon 2020 Mediterranean report). What is more important is that the way population is distributed around the cities is changing and important periurbanization trends are observed. Urban areas spread along agricultural and natural land, increasing human pressure on the natural environment, creating more need for infrastructure. The traditional compact structure

of cities is gradually changing with central areas presenting population loses and people moving to suburban areas with urban land expanding in agricultural and natural areas, posing important pressures on the vulnerable ecosystem of the Mediterranean as a whole. If we also take into account issues like water pollution, forest fires, earthquakes, floods, environmental degradation and climate change, all of which are directly related to urban development, we clearly understand the importance of the issue.

Although a lot of work is already published on these issues (Munoz, 2003; Sayas, 2006; Catalán et al., 2008; Garcia-Palomares, 2010; Chorianopoulos et al., 2010; Salvati et al., 2013; Salvati & Morelli, 2014, Salvati & De Rosa, 2014; Vaz and Nijkamp, 2014, Tombolini et al. 2015 etc.) the need for a more thorough analysis of urban sprawl in the Mediterranean is urgent. The recent economic crisis has importantly affected all Southern European countries since 2008 and the previous growth-wave seems to slow down. However, the need to evaluate recent changes and to target policies aiming to control this sprawling process remains important. During the past three decades the problem of sprawl has become evident in the case of Mediterranean cities, and along with coastalization, tourism development and new infrastructure taking place in periurban areas, poses a threat to the Mediterranean ecosystem, consuming important land resources and causing environmental degradation. Planning policy facilitated this dynamic, as regional administrations did not implement regional land planning instruments leading to urban expansion without coordinated planning (Valdunciel, 2014). Recently, the policy implications and strategies put in effect in Mediterranean cities (Paul & Tonts, 2005; Archibugi, 2006; Salvati, 2013) promote polycentric structure and sprawl containment; however, it is debatable whether this target has been reached.

Recent databases monitoring urban land changes and providing high resolution data on urban form and structure, make possible the calculation of metrics and indices evaluating urban land pressures and sprawl in a better way. In the context of this paper we focus on a set of 14 medium-sized cities located along the coast of Mediterranean, in Greece, Italy, Malta, Spain and Mediterranean France (Côte d'Azur area). The choice of using cities located only on the EU part of the Northern Mediterranean Coast (and not in Turkey, South Mediterranean countries etc.) was based on the fact that these cities share a more or less common model of urban development in spatial and socioeconomic terms. Moreover, recent comparable data on land use distribution are available for these cities as they are included in the European database of Urban Atlas. Medium-sized cities constitute an important part of the European urban system as a whole and given some conditions could present certain potential in terms of their efficiency, growth, productivity and could adapt successful urban development strategies more easily than large urban agglomerations. On the other hand medium-sized cities could be more vulnerable in terms of economic competition resource management and efficient response to rapid changes.

The need to quantify and evaluate changes in urban patterns is urgent in order to establish a more sustainable way of urban growth. Using a set of methods and based on recent data from European databases (Urban Atlas, Corine Land Cover and the high resolution Imperviousness-Soil Sealing Degree Raster dataset) we aim to explore recent urban sprawl trends and to analyze different typologies of urban form and structure. Soil sealing degree profiles are analyzed in order to identify low density development and to compare its share against denser, compactly developed areas. The distribution of different urban land use categories in each city is also discussed, and a set of spatial metrics is used to analyze their geometrical and distributional characteristics. Spatial metrics have been used extensively to describe the aggregation, dispersion and proximity patterns of the different land uses in an urban area. Estimations are based on discrete areas characterized by a specific land use (patches). Applications on the use of metrics for urban analysis include Herold et al. (2002), Weng (2007), Ramachandra et al. (2012), Schwarz (2010), Aguilera et al, 2009, Prastacos et al. (2017) among others. Finally, based on recently released the Global Human Settlement Layer (GHSL, Paresi et al., 2015) and specifically the GHSL built-up grid, urban growth trends are estimated for the period 1975-2014 and are compared with population growth.

The paper is organized into five sections. First the general context of urban sprawl in the Mediterranean is presented and the basic processes driving urban changes are outlined (section 2). In a next section (section 3) the data and methods used are presented, while in section 4, the case study areas and the results are presented. In a fifth section, results are

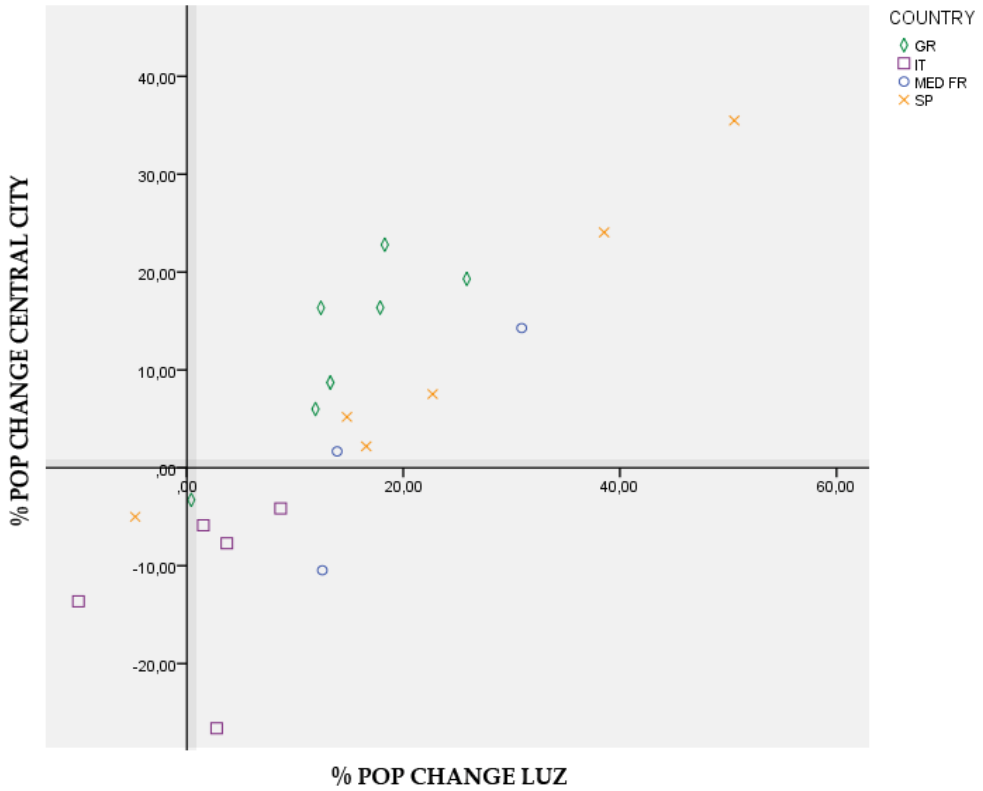
discussed, the differences between the cities are identified and explained, and a summary of the conclusions is presented.

## 2. Urban sprawl in the Mediterranean: the general context

The term 'urban sprawl' refers to a form of low density and usually discontinuous and uncoordinated development expanding at agricultural areas at a rate that by far outreaches population growth. During the past decades, urban sprawl in the Mediterranean changes the traditional compact character of cities, with new structures scattered in periurban areas in the form of low density development, usually expanding in an uncoordinated way. High losses of agricultural land, suburbanization, massive new transport infrastructure (Catalán et al, 2008) as well as relocation of commercial and industrial facilities in periurban areas, are some of processes taking place.

Although Mediterranean cities continue to attract more people, central city areas in many cases present a decrease in population as people move from the congested centers towards the periphery of the city in newly developed housing. In Madrid and Barcelona, population located in the central areas decreases during the period 1981-2001 and then a re-urbanization process is observed, while in the meantime the total population of the larger urban zone (LUZ) as a whole grows by 37% and 19.5% respectively (in the case of Madrid this corresponds to over 1.7 million people). Population in the central municipality of Athens decreased by 14% between 1991 and 2011, while total population of LUZ area increased by 8.7%. In almost all major Italian cities, central population decreases gradually since the '80s (in Milan, Naples and Turin the decrease rate is over 20%). These data clearly show the ongoing suburbanization process.

**Figure 1: Population changes in cites of Greece and Italy and Spain (past 2 decades)**



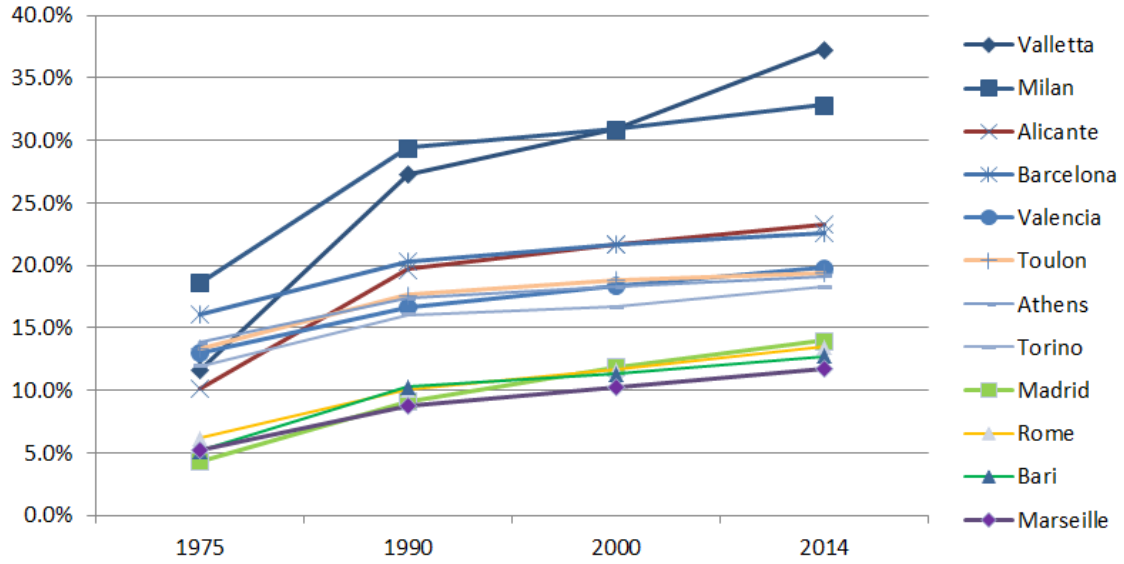

Source: Elaboration on data from www.citypopulation.de (census data)

However, the case of medium-sized cities is different, as central city areas (especially in Greece and Spain) retain or even increase their population. Figure 2 presents rates of population change compared between the central city areas and the LUZ areas (1991-2001 period for Spain, Italy and Greece, 1982-1999 period for France) for a selection of medium to large cities (Cities over 1 million are excluded). The Italian cities form a distinct group as they present population decrease in the central city area accompanied by a stability or slight

increase of population in the LUZ area. Most of the Greek and Spanish cities on the other hand (except for Kavala and Bilbao) present considerable increase of population both in the center and the LUZ area. In the case of Greek cities population growth in the central area is generally more important than in the LUZ area, while in the case of Spanish cities the growth rates are almost equally balanced. In the case of the Mediterranean French cities, only Montpellier presents considerable increase in the central city area, while LUZ population grows by at least 10% in all cities.

The suburbanization process has been accompanied by a spectacular expansion of urban land. This can be shown by figure 2, where urban growth data for a sample of cities are estimated from the Global Human Settlement Layer (GHSL, period 1975-2014). The most important growth rate is observed in Valletta where the percentage of urban land increases from 11.6% of the total LUZ area in 1975 to 37.3% in 2014. On the overall, data show that most urban areas in Spain, Italy, Malta and Southern France double their size in a period of 30 years. The only exception appears to be the case of Greece, where urban land growth appears to be more modest. It becomes clear that as this expansion takes in most cases the form of low density periurban development, the urban land pressures imposed on the agricultural land and the natural areas are very important.

**Figure 2: Urban land expansion in selected Mediterranean cities between 1975-2014, % of built-up land inside the LUZ area**




Source: Elaboration on data from GHSL built-up grid

Numerous studies have been trying to analyze recent urban changes in the Mediterranean in a quantitative way, while the hypothesis of a 'hybrid' type of process leading to a transition from compact to more dispersed growth and a sharp divide between the compact central areas and the sprawling hinterland has been stated (Díaz-Pacheco, 2014). Studying a set of 15 European cities, Kasanko et al. (2006) find out that cities of South Europe form a distinguishable group, with research findings confirming that Southern European cities have started to experience rapid urban expansion but that they remain very compact in comparison to other European cities. Tomobolini et al. (2015) comparing three major Mediterranean cities (Athens, Rome and Barcelona) identify different patterns of urban expansion, as Athens appears to be more compact and Rome more dispersed, with Barcelona being an intermediate situation with a polynucleated structure. Vaz and Nijkamp (2014) examining the regional dynamics in the region of Venice in Italy, and connecting them to recent land use changes, find out that inter-regional pulls work as urban sprawl attractor.

According to Membrado (2015) recent economic growth in Spain was mainly based on the construction sector, leading to the Spanish housing bubble 1997-2007 with local developers constructing thousands of single-family homes. A similar case is identified in Greece, where lack of planning regulations protecting periurban land promoted a low dense uncoordinated form of development. The general model of periurban growth in Greece is characterized as unplanned and in certain cases illegal expansion in areas outside of the city plan, based on

self-financed housing, with limited public expenditure for urban infrastructure (Kourliouros, 1997). This process led to a rapid increase of housing prices, which collapsed gradually since 2006 and mainly after 2008 as a result of the global financial crisis. House prices in Greece decreased heavily during the past 10 years and construction activity practically collapsed (decreasing from almost 26 million sqm. of constructed space in 2005 to 1,3 million in 2015).

In general, the Mediterranean case of sprawl is characterized by important particularities and is recognized to be considerably different from the US model or Northern-European type of sprawl (Leontidou, 1990). Tombolini et al. (2015) mention that inner districts in Mediterranean cities have retained high population density and in most cases there is a marked urban-rural divide. Dura-Guimera (2003) identifies certain particularities of the Mediterranean cities such as the fact that recent sprawl took place in the context of the postindustrial and globalization era, the role of migration from the Third World countries and the presence of tourism as a major factor of urban and suburban growth. Immigrants usually occupy central locations in the city as natives move out towards the suburbs and this procedure has an important effect in housing prices, also leading to an important re-distribution of social classes across space (Arapoglou & Sayas, 2009). Catalan et al. (2008) point out the role of medium-sized cities located close to large urban centers and the way they can absorb the negative effects of dispersion and lead to polycentric structure. This can mostly be seen Spain and Italy, but in Greece a network of former agricultural settlement also exists and usually acts as a nucleus of new development.

Despite the 'idiosyncratic' character of Mediterranean sprawl (Sayas, 2006), it has been recognized as an important problem and certain planning policies have been introduced in all countries and also on the European level. Paul & Tonts (2005) analyzing policies applied in Barcelona to contain sprawl, mention that while numerous territorial strategies and plans have attempted to guide development in the rural-urban fringe of Barcelona, their success has generally been limited. In Spain the so-called 'tsunami' of urbanization (Díaz-Pacheco, 2014) has taken in most cases the form of large scale development in a more organized and planned manner, with new suburban areas designed in the form small towns located in the periphery of large cities, along with clearly defined industrial and commercial zones. Díaz-Pacheco (2014) mentions that this process was related to a legislative framework which facilitated the entry of vast quantities of land onto the market and permitting municipal administrations to find a method of financing and economic reactivation that made possible the sale of great quantities of land.

In Greece, the lack of a regulatory framework controlling urban land expansion in the periurban areas, has led to a totally different form of growth based on unplanned, discontinuous and usually illegally built housing in areas outside the city plan. In the meantime commercial uses started relocating from central cities towards the periphery usually in the form of malls, radically changing the periurban landscape. This process was accompanied by new transport infrastructure, which in the case of Athens was further reinforced by the organization of the Olympic games in 2004. It was not until very recently that urban planning in peripheral communities of Greek cities has been at stake, defining zones for the expansion of existing periurban settlements and regulating land uses in order to protect vulnerable ecosystems and natural areas, as well as to protect highly productive agricultural land.

## 3. Data and Methodology

### 3.1. Data

Land use data for this study come from Corine Land Cover (CLC) and Urban Atlas (UA). Corine Land Cover provides land use data for a wide temporal range starting from 1990, and included 44 land use categories organized in 5 broader categories of Artificial surfaces, Agricultural areas, Forest and semi-natural areas, Wetlands and Water bodies. A spatial resolution of 100x100m is used for urban areas and 250 x 250m for agricultural areas, while the minimum mapping unit is 25ha for areal phenomena and 100m for linear features. The low spatial resolution in relation to the fact that urban fabric areas are divided into only 2

categories depicting continuous built-up areas and discontinuous built-up areas, makes the use of CLC data problematic in the analysis of urban sprawl.

UA was created by the Environmental European Agency (EEA) starting from 2006 (temporal reference 2005-2007) and recently updated for 2012. Minimum mapping unit is 0,25ha for artificial areas and 1ha for non-artificial areas. UA 2006 covers all cities with a population over 100,000 (305 cities) in 27 European countries, while the list has been extended for 2012 (temporal reference 2011-2013), covering all cities with a population over 50,000. Twenty different land use types are distinguished and urban fabric areas are classified into five categories based on land cover density as expressed by the soil sealing degree.

The Imperviousness-Soil Sealing Degree dataset is also used in this study (EEA, 2011). This is a raster dataset produced in the frame of GMES precursor activities and Geoland2, and are distributed by EEA in the framework of the Copernicus land monitoring service, covering both urban and agricultural areas in 39 countries. The data are updated every three years and already available for 2006, 2009 and 2012 at a resolution of 20m or 100m. Soil sealing degree ranges from 0-100, 0 representing a cell that is completely unsealed, and 100 representing a cell fully built-up or covered with artificial structures.

**Table 1. Spatial datasets used in the study**

| Database | Data source | Data type / projection | Spatial resolution | Coverage | Dates available | Information |
|---|---|---|---|---|---|---|
| Corine Land Cover (CLC) | EEA | Raster, Shape file (ETRS89, LAEA) | 100m, MMU= 25 ha | all Europe & Turkey | 1990, 2000, 2006, 2012 | 44 land use categories |
| Urban Atlas (UA) | EEA | Shape file (ETRS89, LAEA) | MMU= 0.25 ha (artificial structures) | 27 EU countries / cities over 100,000 (2006) and 50,000 (2012) | 2006, 2012 | 20 land use categories (26 for 2012) |
| Imperviousness-Soil Sealing Degree (ISSD) | EEA | Raster (ETRS89, LAEA) | 20m /100m | 39 countries (28 EU plus11 more) | 2006, 2009, 2012 | Imperviousness degree (0-100) |
| Global Human Settlement Layer (GHSL) | Joint Research Centre (JRC) | Raster (Spherical Mercator, EPSG:3857) | 20m (approximately) | all earth | 1975, 1990, 2000, 2014 | Built-up areas (0 = no built-up 1 = built-up) |

To examine changes in built-up areas, the Global Human Settlement Layer (GHSL) as provided by the Joint Research Centre (JRC) is used. This is a raster dataset projected in Spherical Mercator (EPSG:3857) approximately at a resolution of 20m, covering the whole world. Data are reproduced for years 1975, 1990, 2000, 2014 depicting built-up areas. Information about all the land use/land cover datasets used in the study is presented in Table 1. Population data came from the City Population database (https://www.citypopulation.de/) where temporal data are available and data are collected come from national census data. Two levels are distinguished: City population (usually referring to the central municipality), and a larger zone corresponding to urban agglomeration/province or LUZ area, depending on data availability. For the Greek cities, population data come from the National Statistical Service.

### 3.2. Methods

Several methods are used to analyze different typologies of urban form and structure in the case study cities. Using the UA data, the distribution of different urban land use categories are estimated for 2006, and spatial metrics are used to quantify their geometrical/distributional

characteristics and their mixture. Using the ISSD data, soil sealing degree profiles are estimated for year 2006. Urban growth is estimated based on data from the Global Human Settlement Layer (GHSL) in the period 1975-2014.

Soil sealing describes the covering of soil through urban development. The soil sealing (imperviousness) profiles for each area are estimated for year 2006. The original soil sealing raster of 20m resolution was resampled at 60m (mean value of the 3x3 original cells). In this way, the map represents better the scale of the urban block rather than the scale of individual buildings/structures. Areas with zero soil sealing are excluded and the soil sealing degree (S.D.) is categorized to 10 categories (S.D. 1-10, S.D. 11-20 etc). The sprawling type of development could best be identified by using a threshold of 30% regarding the sealing degree.

Using the Urban Atlas data we estimate the distribution of different land uses and also a set of spatial metrics describing their distributional and geometrical characteristics. From the original 20 classes of the UA dataset only the urban fabric classes were used, plus the industrial/commercial/public buildings class and the urban areas/sports and leisure facilities (Table 2). All other land use classes were treated as background so as not to distort the results. Using a specific methodology, individual patches of each land use type were identified by reclassifying the local road network the dominant neighboring land use (Prastacos et al., 2017; Lagarias & Sayas, 2017). According to this rule, roads with a width larger 20m still separate neighboring land uses, while in all other cases the division of nearby blocks of the same land use imposed by the local road network is eliminated. The FRAGSTATS software was used McGarigal et al., (2012) for the estimation of the following spatial metrics:

- Patch Density (PD): the number of patches divided by the total area.
- Mean Patch Size (MPS): the mean size (area) of the patches.
- Euclidean Nearest-Neighbor Distance (ENN): the mean distance to the nearest neighboring patch of the same class, calculated as the shortest edge-to-edge distance.
- Interspersion and Juxtaposition Index (LJI): A measure of the distribution of adjacencies among unique patch types. The range is 0-100, approaching 100 when all patch types are equally adjacent to all other patch types.

**Table 2. Basic land use classes in UA and as used in the current analysis**

| UA Class | Land Use Class (spatial metrics) |
|---|---|
| 11100 Continuous Urban Fabric (S.D. > 80%) | Class 1: Dense Urban Fabric |
| 11210 Discontinuous Dense Urban Fabric (50% < S.D. < 80%) | Class 2: Medium Dense Urban Fabric |
| 11220 Discontinuous Medium Density Urban Fabric (30% < S.D. < 50%) | Class 3. Low to Medium Dense Urban Fabric |
| 11230 Discontinuous Low Density Urban Fabric (10% < S.D. < 30%)<br>11240 Discontinuous Very Low Density Urban Fabric (S.D. < 10%)<br>11300 Isolated structures | Class 4: Low Dense Urban Fabric |
| 12100 Industrial, commercial, public military, private and transport units | Class 5: Industrial, Commercial & Public |
| 14100 Green urban areas<br>14200 Sports and leisure facilities | Class 6: Green/Sport Areas |

## 4. Case study and results

### 4.1. Case study areas

14 cities are compared in this study, located in coastal areas of Greece, Italy, Spain and Mediterranean France (figure 3). Medium-size cities were selected with population ranging from a minimum of 70,000 to a maximum of 850,000 people (population size referring to the LUZ area). Some basic information about the cities are presented in Table 2, and the land use

maps based on UA 2006 data are presented in Figure 4. Data show that selected cities present important rates of growth in terms of population and urban land. According to data from the GHSL database, urban land increased by 36.6% in Valletta in a period of just 25 years, while in all cities, growth rates are over 9%. In the same period, population growth is important and especially in the case of Spanish cities it exceeds 20%. Population growth is modest (less than 10%) only in the Italian cities and in Kavala in Greece. Population density is high in most cases but shows important variation. Greek cities present similar densities ranging from 58-84 people/ha, while in the case of Malaga, Toulon and Bari, densities exceed 100 people/ha and the insular communities of Cagliari and Palma di Mallorca present the lowest densities (< 50 people/ha). This difference observed in densities could be a result of the way LUZ areas are defined. In Table 1 we used the LUZ areas as defined initially in Urban Audit, so that the population and land use data correspond exactly to the same spatial reference. However, in the land use analysis that follows in the next section (as well as in the maps of figure 3) we preferred to use the LUZ areas as revised with the release of UA 2012 (http://land.copernicus.eu/local/urban-atlas/urban-atlas-2012).

**Figure 3: Map of Mediterranean basin, indicating the location of the 14 cities of the case study**

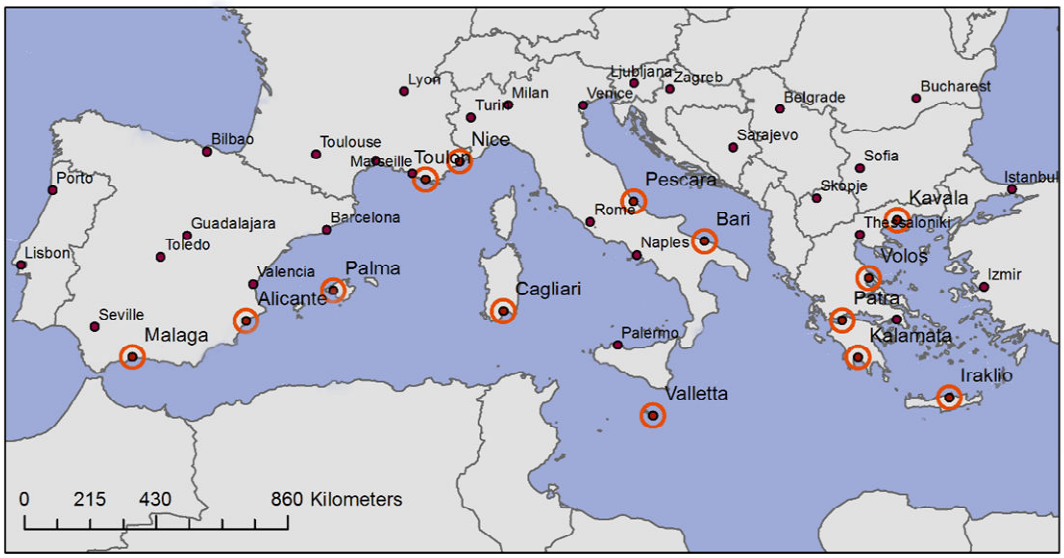



**Table 2. Basic data about the 14 cities**

| CITIES | Population[1] | Population Density[2] | Total area (LUZ) | % Artificial area | % Urban growth 1990-2014[3] | % Population Growth[4] |
|---|---|---|---|---|---|---|
| Patra (Gr) | 233,909 | 84.0 | 50,750 | 10.7 | 14.0 | 11.9 |
| Heraklion (Gr) | 206,909 | 60.8 | 60,440 | 10.2 | 11.6 | 25.9 |
| Volos (Gr) | 139,051 | 68.6 | 30,460 | 13.9 | 9.2 | 13.3 |
| Kavala (Gr) | 75,073 | 68.1 | 44,189 | 7.1 | 24.6 | 0.4 |
| Kalamata (Gr) | 72,258 | 58.2 | 35,158 | 6.2 | 23.9 | 12.4 |
| Malaga (Sp) | 850,556 | 125.9 | 152,185 | 16.7 | 22.8 | 22.7 |
| Palma de Mallorca (Sp) | 680,516 | 48.2 | 201,843 | 12.1 | 19.2 | 50.6 |
| Alicante (Sp) | 464,061 | 87.1 | 35,581 | 21.9 | 18.3 | 38.5 |
| Nice (Fr) | 847,750 | 65.9 | 104,973 | 44.2 | 9.9 | 13.9 |
| Toulon (Fr) | 547,844 | 107.5 | 309,704 | 37.9 | 12.4 | 12.5 |
| Bari (It) | 577,283 | 204.3 | 75,526 | 5.9 | 24.1 | 3.7 |
| Cagliari (It) | 467,788 | 36.1 | 16,054 | 9.0 | 19.5 | 2.8 |
| Pescara I) | 231,545 | 62.4 | 167,028 | 11.2 | 12.1 | 8.7 |
| Valletta (Mt) | 381,675 | 98.0 | 24,677 | 35.7 | 36.6 | 10.6 |

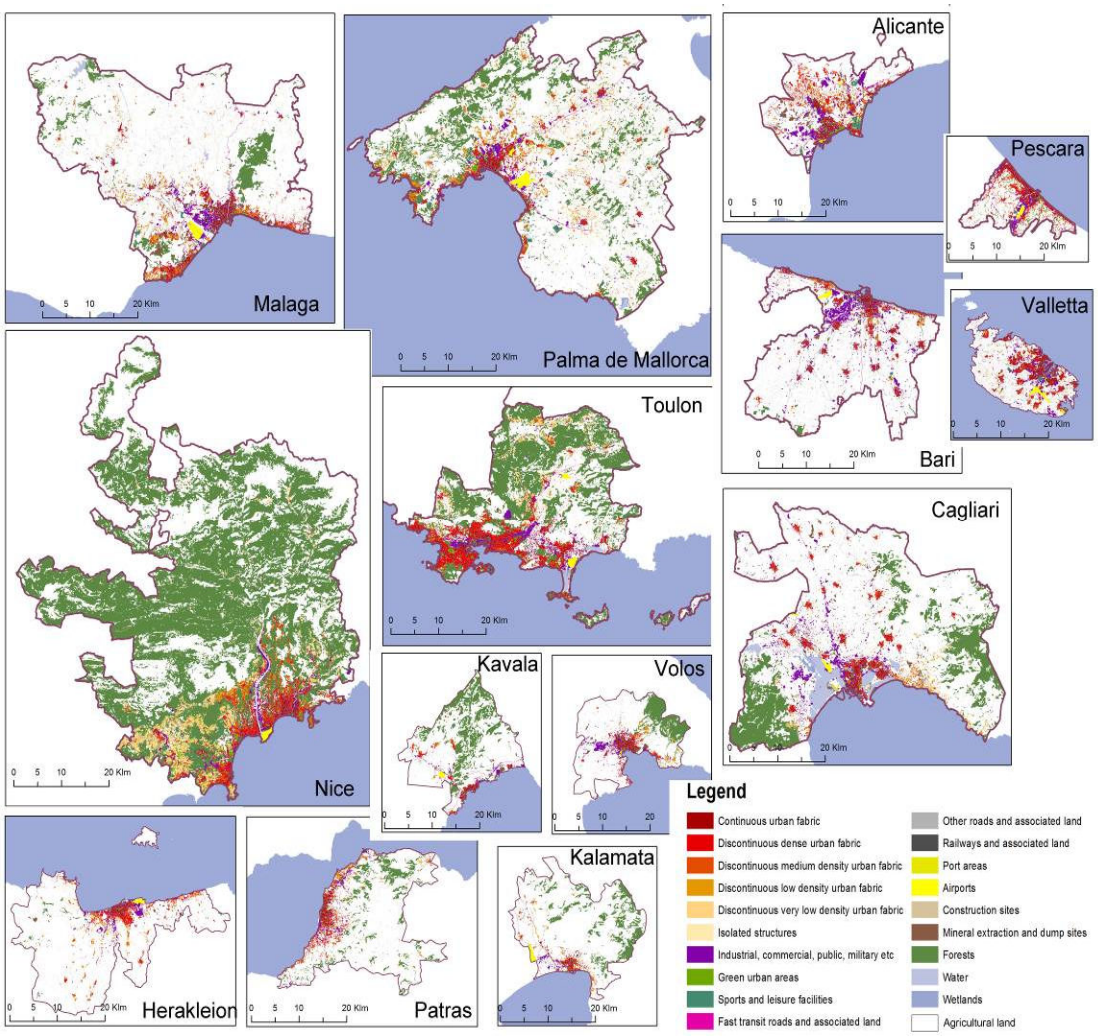
1. Most recent data from Eurostat, on the LUZ level as defined in Urban Audit.

2. Estimated by dividing total LUZ population to urban fabric land as presented in UA 2006

3. Estimated through the GHSL database

4. Population changes estimated between the last censuses for each Country (1991-2011 for Greece, Italy and Spain, 1982-1999 for France, 1995-2011 for Malta) through www.citypopulation.de (on the level of urban agglomeration, province or LUZ area).

**Figure 4: Land use maps of the cities in the case study**




Source: UA, 2006 (revised version)

Geomorphology plays an important role in shaping urban form. In the Mediterranean rugged topography and sloping landscapes reduce the availability of buildable land, promoting urban growth mainly along the sea coasts or in the main lowland (Tombolini et al., 2015). In Nice, the LUZ area covers a vast mountainous hinterland mainly covered up by forests, a fact that constrains urban growth mainly along the coast and the Valley of Paillon River; while a similar case is observed in Toulon. In Malaga a large plain opens up towards the west and this is reflected in the form of the city which expands mainly towards this direction. A similar asymmetrical development is observed in Palma de Mallorca towards the east, while in Alicante (located in the touristic area of Costa Blanca) urban growth towards the hinterland is not bounded by any physical barrier. In Greece, LUZ areas are considerably smaller and in the case of Volos, Patras and Kavala, development is bounded between the sea and the mountains, resulting to more compact structure. In Heraklion and Kalamata urban land expands more freely towards the hinterland. Finally, in Valletta the whole island is covered by the LUZ area, and the urban areas occupy almost all the northern coast and expand towards the central part of the island, leaving only the southern coast undeveloped.

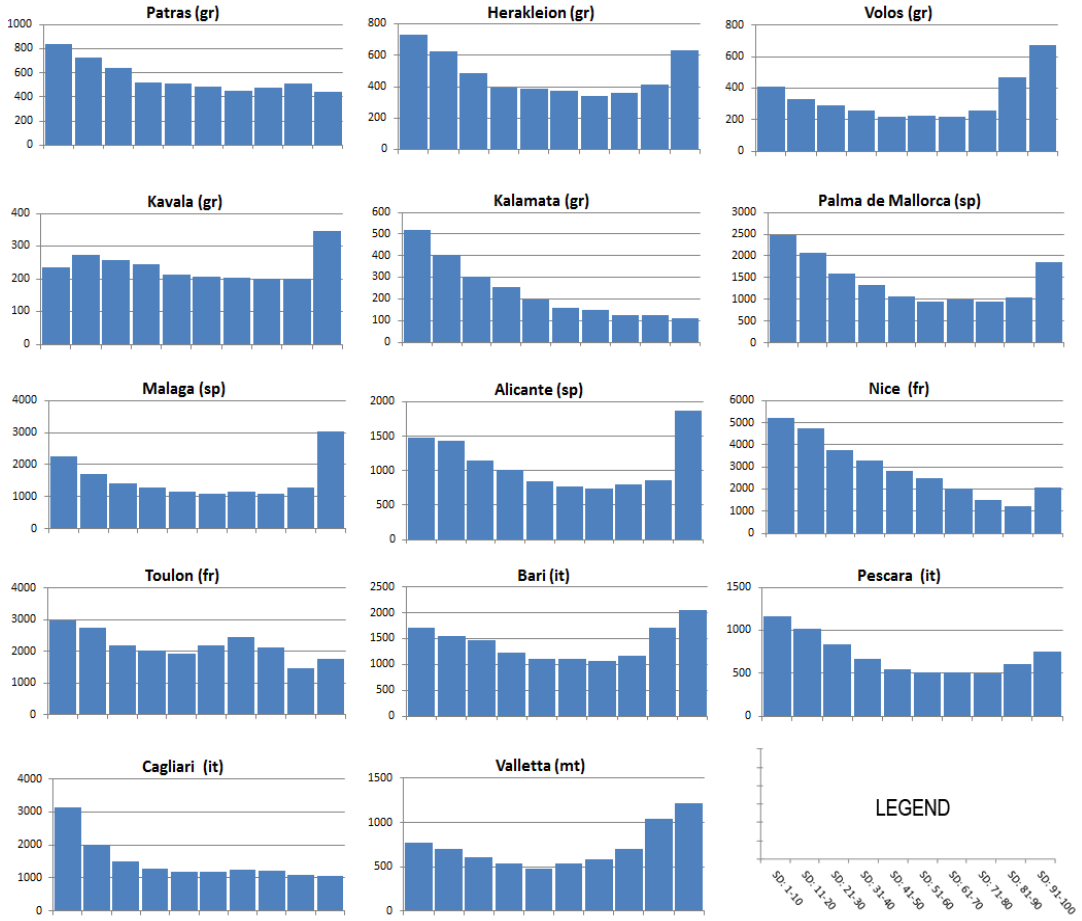
## 4.2. Results

### 4.2.1. Soil sealing degree profiles – Urban fabric densities

Based on the ISSD dataset for 2006, the soil sealing degree profiles were estimated. Figure 5 presents the graphs for the 14 cities. Data show that Nice, Cagliari, Palma de Mallorca and

Kalamata are the most sprawling cities, with soil sealing degree profiles asymmetrical to the left. Low density development (as identified by S.D. < 30) is over 52% in Kalamata, 47% in Nice, 45% in Cagliari 43% in Palma de Mallorca. On the other side lie Volos and Valletta which appear to be the most compact cities as their profiles are asymmetrical to the right. High density development (S.D. > 70) is maximized for Volos (42)% and Valletta (41%), followed by Malaga (35%), Bari (34%), Alicante (32%) and Kavala (31%). Cities like Heraklion and Bari form a more symmetrical, U-shaped curve presenting a balance between high and low density development, while in Toulon the distribution is more equal between the different sealing degree categories with medium density covering an important part of the city, and the curve forming a local peak at the range S.D. 50-80.

**Figure 5: Soil sealing degree profiles for the 14 cities (2006, ISSD dataset)**



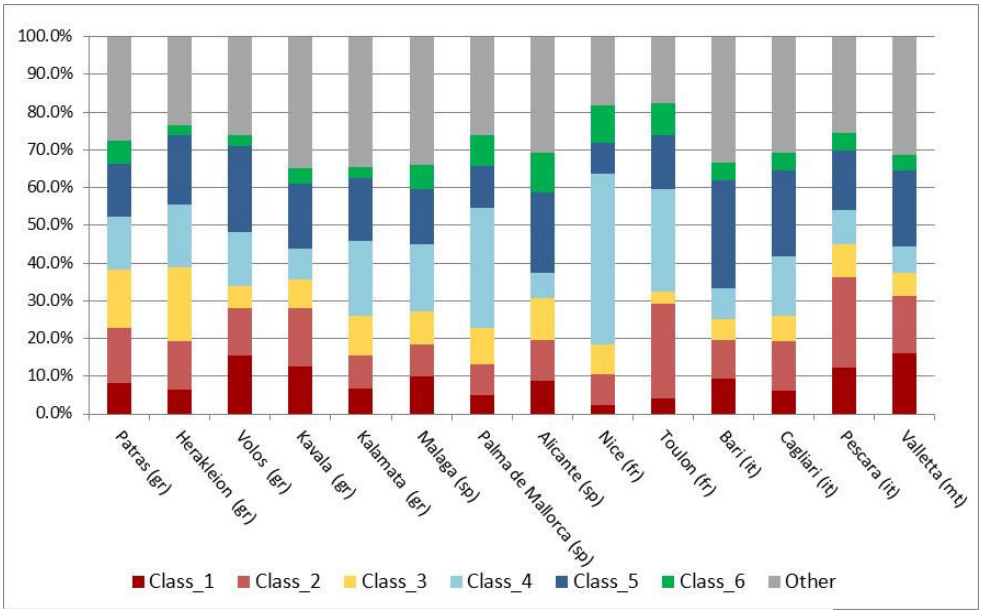

### 4.2.2. Land use patterns

The distribution of different land use categories shows that UF ranges from 40% to 65% for all cites except for Alicante and Bari where it falls beneath 40% (Figure 6). In Bari this is mainly due to high concentration of industrial/commercial land uses which cover almost all the southwestern part of the city, while in Alicante there are important areas covered by green/sport areas (and also touristic/leisure facilities) on the western sector. In Toulon, Nice, Palma de Mallorca, the urban land is mainly residential (urban fabric land), and percentages of industrial/commercial are relatively low while in cities like Volos, Bari, Cagliari and Alicante the percentage of industrial/commercial uses exceeds 20%. Volos, Kavala, Valletta an Pescara appear to be the more compact cities as class 1 (high density urban fabric) accounts for 12-16% of total artificial land.

The estimation of a set of spatial metrics (PD, MPS, ENN, LJI) for the different land use categories (class level) as well as the landscape as a whole (mean value for all classes), helps us quantify the geometrical/distributional characteristics of land use patches as well as their mixture. In Valletta, Pescara, Palma de Mallorca, Bari, Alicante and Toulon, the overall density of urban patches (PD) is higher (Figure 7), and this is an index of more intense development within the LUZ area. We observe that PD4 is the highest in most cases, showing

that patches of class 4 (low density development) are more numerous. On the other hand, the abundance of patches of class 1 and 2 (medium/high density urban fabric) is lower. This is a result of the fact that built-up areas of class 1 and 2 are usually more clustered together forming larger patches.

**Figure 6: Land Use distribution (% of total artificial land)**




Source: Elaboration on data from UA database, 2006 (classes defined as in Table 2)

This can be seen from the Mean Patch Size graph (Figure 8), where the MPS1 is in most cities the highest. An exception is observed in the case of Toulon and Nice, where MPS is maximized for class 2, a fact that shows that areas of medium density form larger patches. For classes 3 and 4 representing low dense development and sprawl, the MPS are relatively high in Nice, Heraklion, Alicante, Kavala and Toulon. This shows that low density areas are more clustered together at least on the local level. Industrial/commercial areas appear to form larger spatial entities in the case of Alicante and all French and Italian cities, along with Valletta. Large scale tourism development is also considered in class 6 and this probably justifies the high values for MPS6 in Alicante, Malaga and Palma de Mallorca, where tourism development along with parks and sport facilities forms continuous zones along the coast.

**Figure 7: Patch density**

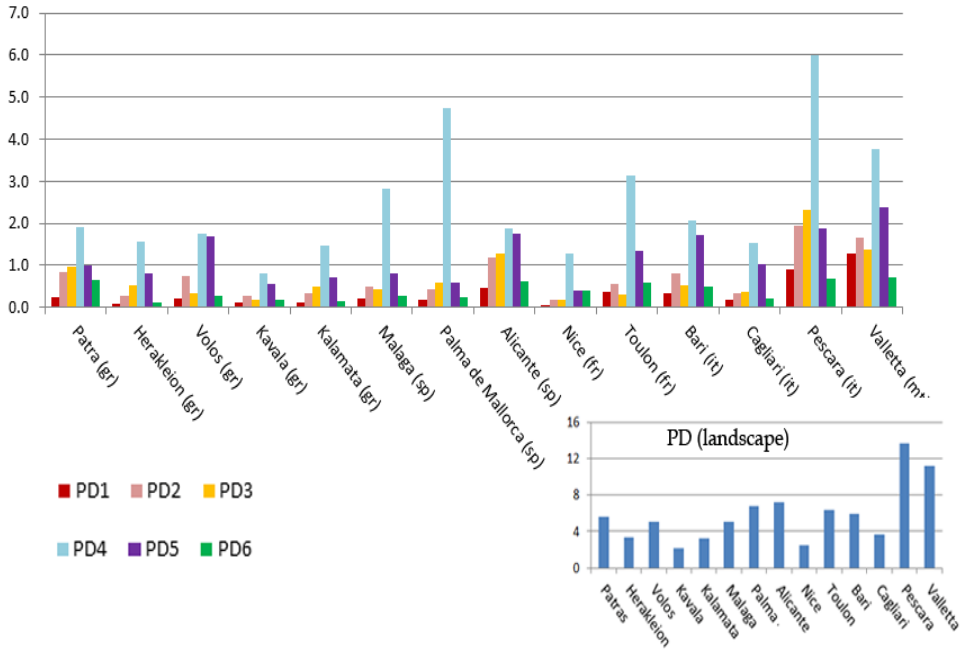
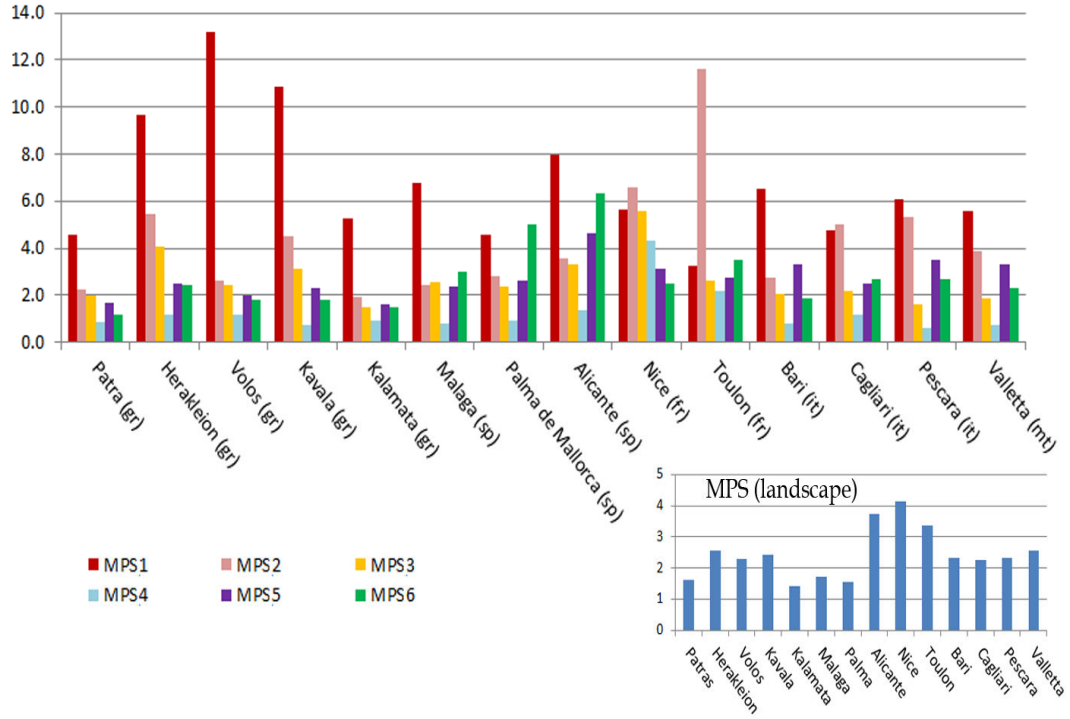
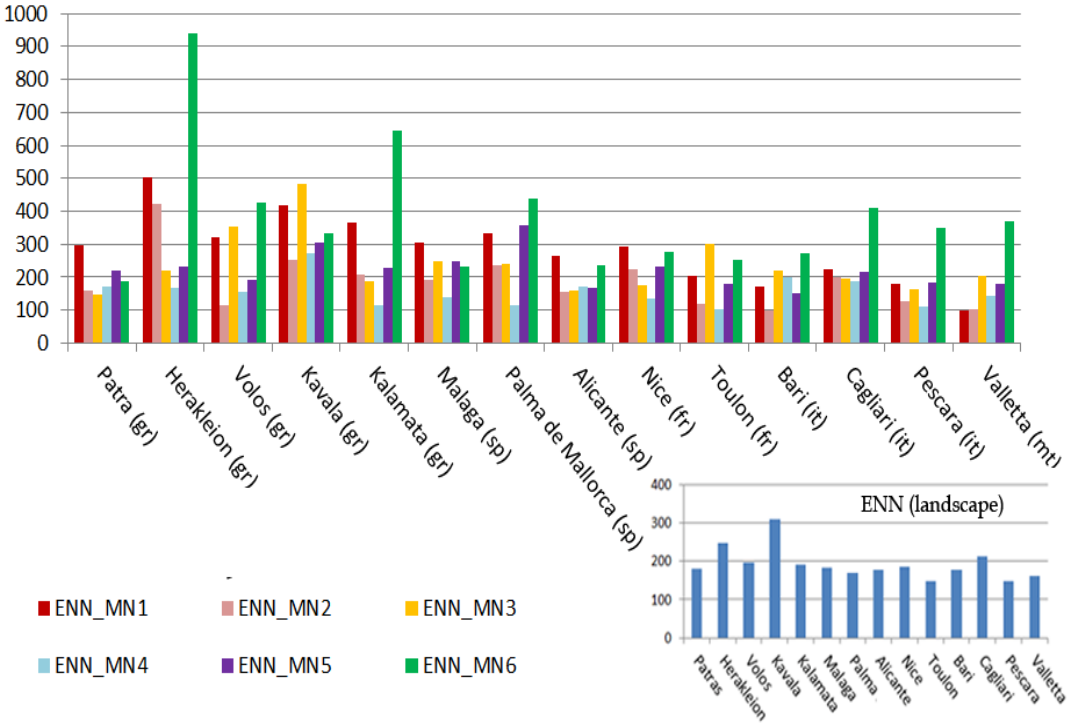


**Figure 8: Mean Patch Size**



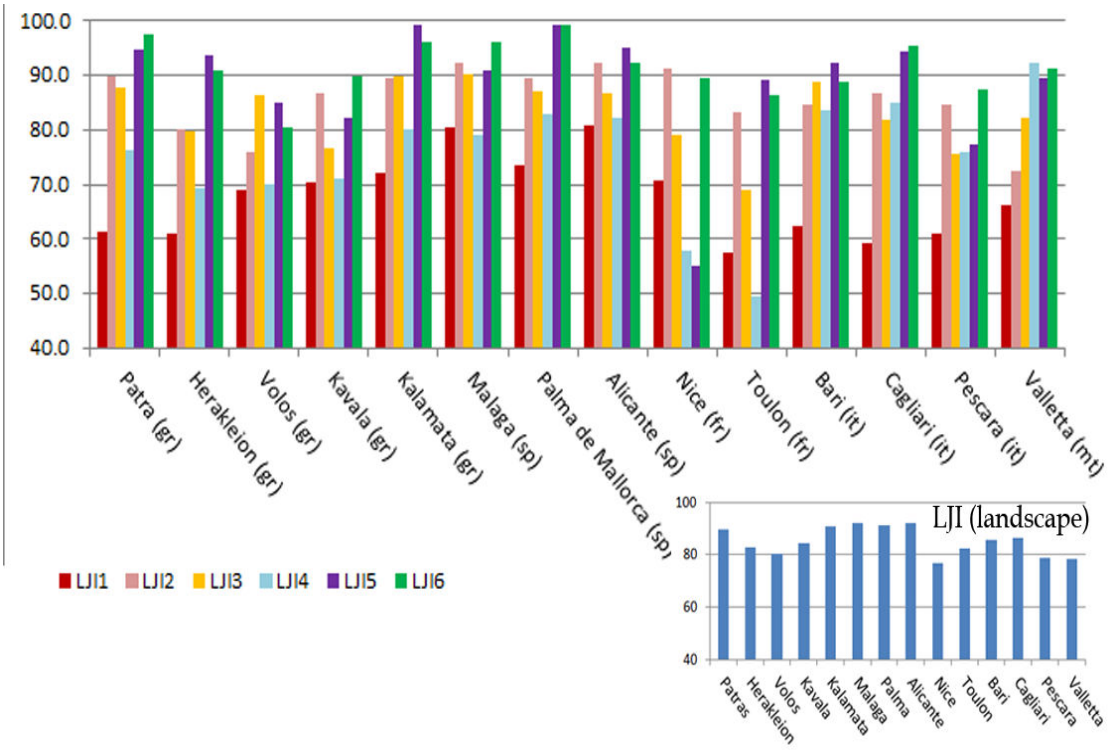

Considering the ENN metrics (Figure 9), important information is obtained regarding the distribution of urban patches across space. ENN values as a mean are higher in the case of Greek cities, (especially Heraklion and Kavala) and also in Cagliari. In most cities the patches of the same type are more closely located to each other belong to classes 3 and 4. This is a result to a homogeneous dispersion of low densities areas across space, leading to smaller nearest-neighbor distances. Medium and high density areas are usually located in central areas of the city and in the core areas of periurban settlements. Industrial/commercial facilities are more dispersed in the case of Palma de Mallorca, Valletta, Cagliari and almost all Greek cities, and this shows that organized zones for such uses have not been planned effectively.

**Figure 9: Patch distances**



Regarding patch mixture, LJI landscape values show that on the overall the Spanish cities along with Patras and Kalamata are characterized by the highest land use mixture (Figure 10). Different land uses are more separated in Nice, Volos, Heraklion, Valletta and Pescara. Patches of classes 5 and 6 are more clustered together presenting low mixture with the other land use classes. This is particularly evident in Palma de Mallorca, Alicante, Patra, Kalamata, Cagliari and Valletta. Urban fabric classes are more intermixed, with classes 2 and 3 presenting the lowest mixture with other land use classes, and class 1 the highest.

**Figure 10: Patch adjacencies/mixture**



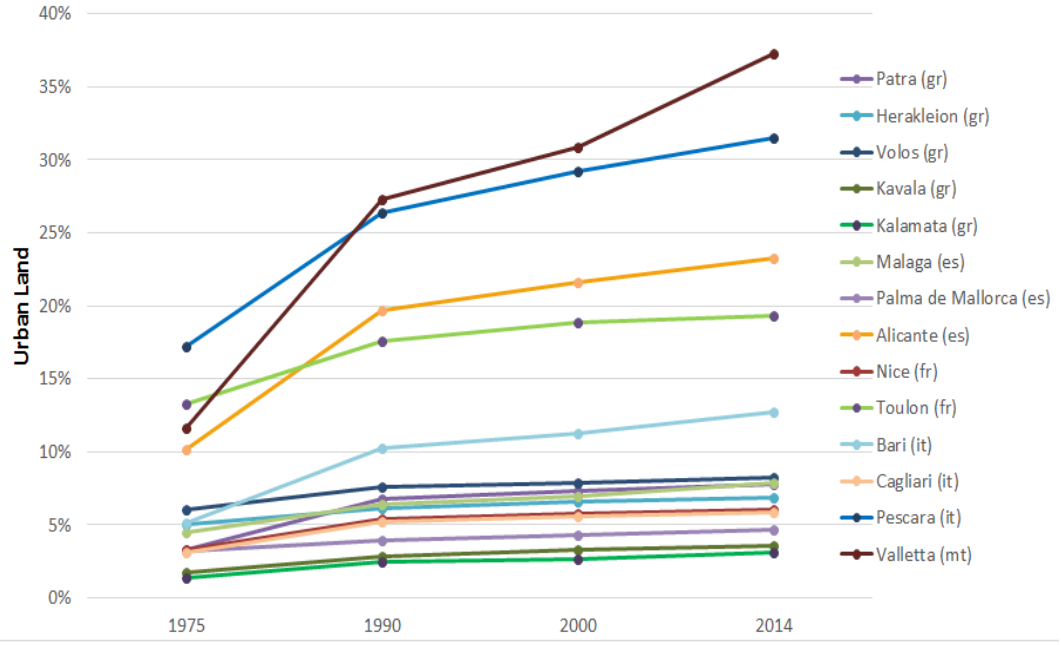

### 4.2.3. Urban growth trends

According to CLC data, the rate of urban land growth in the period 1990-2012 (considering only urban fabric and industrial/commercial areas) is the highest in the case of Alicante (95%), Palma and Malaga (49%) while for the Greek and Italian cities the rates range from 8-30%. However, as CLC does not depict in detail low density areas with scattered development, and also usually ignores infill in already developed areas, these data are not considered very accountable. Therefore, urban growth trends were evaluated in two different ways: a) by considering the GHSL data for a period covering the past three decades (1975-2004) and showing the long-term trends of urban expansion in the case study areas b) by considering the more recent changes in the period 2006-2012 based on UA data, referring to differing land use categories and distinguishing between high density, medium density and low density areas.

GHSL data are presented in Figure 11. Valletta presents the most impressive growth in terms of urban land growing from 11.6% to 37.3%. This means that more than one third of the total island area is covered by artificial structures). Pescara also presents rapid urbanization trends with urban land expanding at a rate of 53% in the period 1975-1990 and then dropping to the level of 10% and 8%. Generally for most cities the growth-wave seems to gradually slow down, after the first period, however in certain cases (Kalamata, Bari, Alicante, Palma de Mallorca, Valletta) the rates of growth continue to be important (over 12% in the period 2000-2014). Patras and Kalamata appear to be the cities with the most rapid urban expansion in Greece, while in Spain the same holds for Alicante and in Italy for Bari. Heraklion, Volos and Toulon are the three cities with the lowest rates of growth, less than 45% in the period 1975-2014.

Recent changes in period 2006-2012 can be examined by taking into account the UA data (Table 4). The increase of artificial area in the period 2006-2012 ranges from 0.6% in Alicante to 12% in Kavala (in the case of Kavala, this corresponds to only 137 ha of new urban land, mainly attributed to industrial/commercial areas and construction sites). Urban fabric grows by less than 10% in all cities except for Patras, Malaga and Pescara.

**Figure 11: Urban land growth in the period 1975-2014**



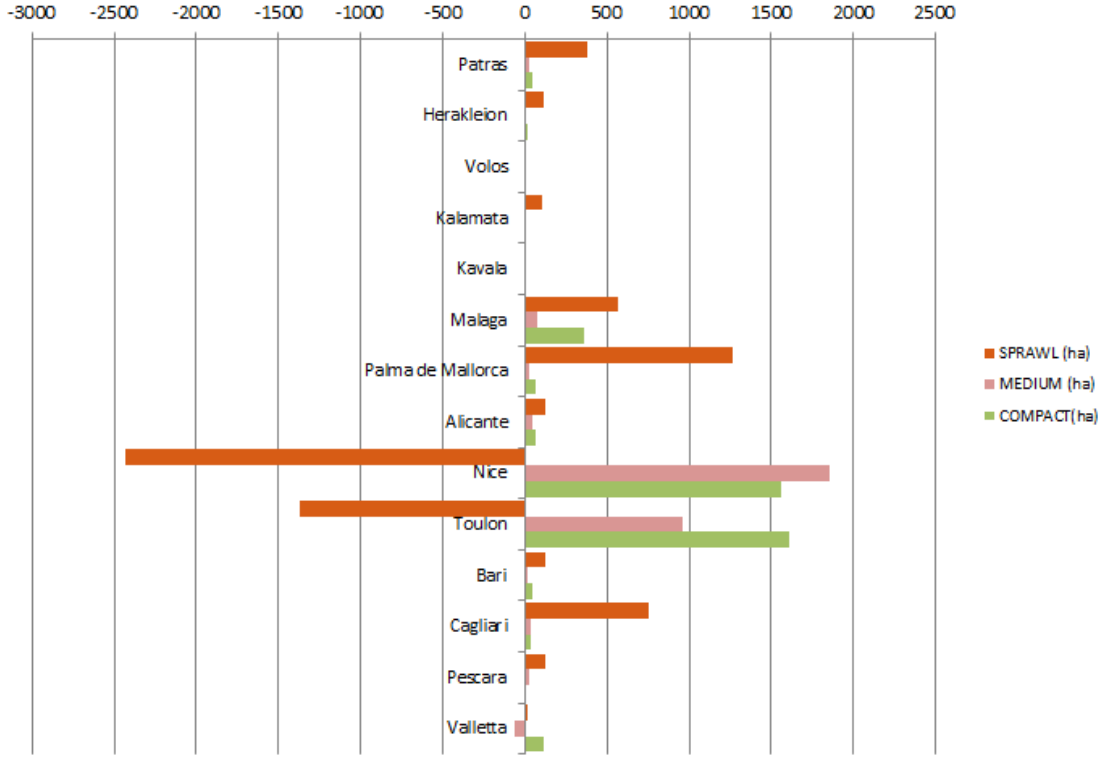

Source: Elaboration on data from GHSL database

In Volos and Valletta the rate of growth drops to less than 2% for artificial area and urban fabric land. While for Volos this could be expected due to the very compact structure of the city and the economic crisis that affected all Greek cities since 2008, for Valletta this fact shows that after decades of rapid growth, a saturation point has been reached. Industrial and commercial areas continue to grow at a rate of more than 15% in cities like Cagliari, Palma de Mallorca and Patras. This fact shows that the expansion of such facilities in the periurban areas remains an important procedure related to urban growth.

**Table 4. Land use changes 2006-2012 (UA data)**

| CHANGES | % artifi-cial area | % urban fabric | % high dense (class 1+2) | % medium dense | % low dense | % indust./co-mmer. |
|---|---|---|---|---|---|---|
| Patra (Gr) | 11.2 | 15.3 | 3.7 | 2.8 | 48.3 | 16.1 |
| Heraklion (Gr) | 2.1 | 3.7 | 1.1 | 0.4 | 10.5 | 4.4 |
| Volos (Gr) | 1.4 | 0.5 | 0.1 | 0.1 | 1.4 | 2.5 |
| Kavala (Gr) | 12.0 | 9.8 | 1.7 | 2.6 | 19.9 | 5.0 |
| Kalamata (Gr) | 5.4 | 1.7 | 0.9 | 2.9 | 3.2 | 11.3 |
| Malaga (Sp) | 11.4 | 12.4 | 10.8 | 5.0 | 17.5 | 11.0 |
| Palma de Mallorca (Sp) | 8.0 | 9.5 | 1.9 | 1.2 | 15.2 | 18.0 |
| Alicante (Sp) | 0.6 | 5.1 | 2.8 | 3.0 | 15.1 | 5.0 |
| Nice (Fr) | 5.1 | 8.0 | 21.8 | 121.8 | -20.0 | 4.5 |
| Toulon (Fr) | 2.8 | 4.3 | 41.2 | 66.2 | -15.0 | 5.5 |
| Bari (It) | 4.3 | 4.1 | 1.7 | 2.2 | 10.8 | 11.2 |
| Cagliari (It) | 4.5 | 4.8 | 0.5 | 4.0 | 22.9 | 17.1 |
| Pescara (It) | 10.5 | 11.2 | 0.9 | 3.4 | 27.1 | 13.0 |
| Valletta (Mt) | 1.8 | 1.5 | 4.0 | -12.5 | 2.5 | 1.5 |

**Figure 12. Changes in *ha* per-urban-fabric-type for the period of 2006-2012 (Data based on UA).**




Source: Elaboration on data from UA database, 2006, 2012

Figure 12 shows the changes in urban fabric land distinguishing between different categories of built-up densities (Classes 1,2 were combined to account for 'Compact' areas, Class 3 accounts for Medium density areas, and Class 4 accounts for 'Sprawl'). Areas characterized by low density, sprawling development continue to grow at a high rate, while only in the French cities and partly in Malaga important newly developed compact areas appear. In most cities urban fabric expansion takes the form of low dense development which grows by 48.3% in Patra, 20% in Kavala, 17.5% in Malaga, 15% in Palma de Mallorca and Alicante, 23% in Cagliari and 27% in Pescara. The case of French cities is different since there is a densification of urban areas, with low dense areas decreasing and high and medium dense areas increasing in Nice and Toulon, as a total of 1367 ha in Toulon (20% of low density areas) and 2434 in Nice (15% of low density areas) change category from low dense development to medium or high dense development. This densification is important since it shows an intensification process, increasing compactness.

## 5. Discussion and Conclusions

Results reveal important similarities as well as certain differences between the case study cities. Geomorphology, different levels of population growth and tourism development, differences in the historical and socioeconomic context as well as the different urban planning policies applied, constitute among others, the reasons for this differentiation.

In the case of Spanish cities, population growth remains important since the '90s, while in Italy it is more modest. In Heraklion, Volos, Patras, Palma de Mallorca and Alicante population growth is more important than urban land growth. Therefore, the urban expansion is up to a certain degree justified by need to provide space and infrastructure for a growing population. In Palma new development had to provide space for almost 200,000 new residents, while in Alicante for about 135,000, as in both cities population was growing at a rate of at least 2% per year since the '90s. During the same period the urban land expanded only by 0.7% per year. A similar situation is presented in Heraklion, Patras and Volos, where population growth is more important than urban land expansion.

Valletta and Pescara present a relatively compact structure, with an important percentage of high density areas, but they are also expanding at a high rate. Low density development although small as a percentage, appears to be fragmented and discontinuous as identified by

the relevant spatial metrics. High density development is also important in Volos, Malaga, Bari, Alicante and Kavala. On the other hand, Palma, Nice, Cagliari, and Kalamata appear to be the most sprawling cities, with high percentages of low density development. Bari appears to be the city with the highest share of industrial/commercial uses most of them located in the south-western sector of the city but also dispersed in the wider area. In Alicante, Malaga and Palma de Mallorca, tourism development along with parks and sport facilities forms continuous zones along the coast.

The two French cities present a different typology with large clusters of medium density areas and important percentages of low density development. Moreover, a process of densification and infill has been identified for the most recent period. Low levels of land use intermixture and the formation of homogeneous large urban clusters are also characteristics of Nice and Toulon. Greek cities are characterized by compact central areas and periurban development taking place discontinuously, in most cases being organized around existing periurban settlements. Urban growth rates are in most cases lower than the other cities of the case study. Kalamata is a small city affected by tourism development along the coast, and is characterized by low density development and sprawl. On the other hand is Volos, a compact city with a considerable slowdown in terms of urban expansion. In Spanish cities high population growth is related to important urban land expansion. Spatial metrics show that the Spanish cities are characterized by the highest land use mixture.

Generally, for most cities the growth-wave seems to gradually slow down, after the first period, however in certain cases (Kalamata, Bari, Alicante, Palma de Mallorca and Valletta) the rates of growth continue to be important. However, urban sprawl remains an important process reshaping the form of Mediterranean cities. During the period of 2006-2012, the largest share of urban growth takes the form of low density development which in certain cities is highly fragmented and dispersed.

To highlight our general conclusions, we could note that using high resolution land-use data, the monitoring of urban changes and the evaluation of recent urban sprawl trends is made possible. As the growth-wave seems to gradually slow down during the past years, it appears to be the right time to evaluate the new emerging form of Mediterranean cities and to target policies for the future, in order to contain sprawl and to promote a more compact and sustainable way of urban growth.

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# SPATIAL PLANNING FOR URBAN RESILIENCE. ASSESSING CURRENT PROSPECTS THOUGH A MULTILEVEL APPROACH AND A USE CASE IN NORTHERN GREECE

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**Abstract**

This paper presents a part of ongoing research into the resilience potential of the western coastal front of Thessaloniki, a medium sized city in northern Greece. It aims to assess whether and to what extent the western coastal front of Thessaloniki, Greece, currently a partially developed area, features elements of resilience and what opportunities can be harnessed to this end. We set out by describing the concept of 'urban resilience' drawing upon recently published literature. As primary principles of resilience-driven development, we identify (i) the existence of resilience-focused spatial planning attributes (redundancy, modularity, buffering, connectivity, existence of legally binding land-use or zoning plans) (ii) the presence of a highly adaptive urban spatial management mix, (iii) reflectiveness and the ability to learn from past experience and resilience challenges and (iv) civic engagement, largely facilitated by means of smart city applications. We then shift our focus to the characteristics of the study area. In order to investigate the extent to which the identified from the literature factors affecting urban resilience apply in this area, a profiling of the study area is made, followed by an in-depth analysis of whether and how the identified principles of resilience-driven development are realized through the current urban, regional, transportation and environmental planning and management frameworks applicable to the area. We close with highlighting specific aspects of resilience that call for urgent attention and by making comments and recommendations regarding policy integration needs.

**Keywords:** Urban, Regional, Transport, Environment, Planning, Management
**JEL classification:** R00, R1, R4, R5, R11, R14, R19, R40, R49, R52, R58

## 1. Introduction

In recent years, urban, regional, transportation and environmental planning, design and management professionals and policy makers have been realising increasingly that ad hoc planning and management are counter-conducive to safety in urban environments. In reality, no risk can be completely avoided only by means of mitigation. In this context, the conception of 'resilience' seeks to promote the capability of urban systems to adapt and innovate on an ongoing basis, enabling them to withstand shocks and stresses. Altogether, planning for spatial resilience introduces a more sustainable and flexible development paradigm (Lu & Stead, 2013).

Unfortunately, the challenges associated with urban resilience render Greece and Greek cities ideal study cases about how urban resilience can be jeopardised in the face of shocks and stresses. Greece underwent major structural changes in recent decades due to extensive de-industrialization. The Greek debt and immigrant crises of 2009 and 2015 respectively posed transformative challenges on the previously existing urban sociotechnical systems of Greek cities. The above were complimented by other, less severe stressors and disasters, appearing mostly as a result of poor infrastructure maintenance and lack of urban renewal initiatives due to domestic financing deficits.

Accounting for this situation, this paper presents part of ongoing research into the resilience potential of the western coastal front of Thessaloniki, a medium sized city in northern Greece. In doing so, this paper aims to introduce a multilevel approach to assessing the prospects for urban resilience, and further assess whether and to what extent the existing spatial planning provisions for the western coastal front of Thessaloniki, Greece, conform with the principles of resilience-focused development. This paper focuses specifically on the theme of urban resilience as a holistic approach to development. We acknowledge the intricate dimensions of resilience that span economy, society and the environment; however, in this paper we address these dimensions through the integrated lens of urban resilience.

The structure of this paper is as follows: Section 2 presents the major literature regarding spatial planning factors affecting resilience in urban areas. Section 3 introduces an urban resilience assessment framework and presents the research methodology used in this piece of research. Section 4 presents the results of the conducted research. Section 5 features the conclusions and recommendations rising from the performed analysis.

## 2. A literature review of the spatial planning and management factors affecting resilience in urban areas

### 2.1. The notion of resilience in urban areas

As a notion, resilience has been used for decades in the fields of physics and psychology. Broadly speaking, it is used to describe the ability of a system to revert to a condition of equilibrium after a shock or stress. It was first introduced in ecology science by Holling (1973) to describe the ability of ecological systems to absorb changes and re-structure toward a new equilibrium state.

Soon after that, the idea of resilience penetrated policy making for development and started appearing in national and local development policy agendas (Evans, 2011; Martin-Breen & Anderies, 2011). In recent years, strategic frameworks of urban resilience have been created by major organisastions, such as the Organisation for Economic Co-operation and Development (OECD, 2016), the European Commission (EC) (Lechner, 2015) and the Rockfeller Foundation in association with ARUP (The Rockfeller Foundation and ARUP, 2015). Today, resilience propositions and frameworks can be found in a very broad variety of development related areas, spanning economy, environment, and society.

Nevetheless, resilience is considered to be a highly contested and ambiguous term. The bibliometric analysis by Meerow et al. (2016) found 25 different definitions of 'urban resilience'. Other research by Desouza and Flanery (2013) and Beilin, Reichelt, & Sysak (2013) also notices difficulties of definition, as well as challenges in the setting of strategic objectives (e.g. *'to what must cities be resilient?'*). Moreover, there is a tendency to interpret urban resilience according to the expertise of the involved professionals (Stumpp, 2013).

A commonly used definition of urban resilience is the one of OECD (2016), popular due to its completeness and comprehensibility: *'Resilient cities are those able to absorb, adapt, transform and prepare for past and future shocks and stresses in order to ensure sustainable development, well-being and inclusive growth'*. The emphasis of this approach is on the different capabilities of resilient cities (prepare, absorb, adapt, transform), the different types of challenges to urban resilience (shocks, chronic stresses) and the relevance of a range of factors (economic, social, environmental, institutional) that affect urban resilience positively or negatively. Threats facing urban resilience can either refer to sudden shocks, or stressful conditions which accumulate over time, posing chronic pressures on urban systems (Lechner, 2015; Martin-Breen & Anderies, 2011).

The meaning of resilience may differ across cities, just like cities are unique themselves. Despite the existence of several methodologies, enhancement of resilience in a city framework should be regarded as an ongoing process that calls for calibration depending on the specific internal and external features of each city. Hence, urban resilience strategies should focus on continuously optimizing the combination and utilisation of measures and urban resources under a systems' approach (Desouza & Flanery, 2013; Martin-Breen & Anderies, 2011).

### 2.2. Resilience oriented spatial planning and design

The resilience literature puts forward a series of spatial planning and design attributes that are conducive to urban resilience. These include redundancy, modularity, buffering, connectivity and the existence of legally binding land-use or zoning plans. Specifically, redundancy refers to the availability of reserve resources in times of crisis. It enhances the capacity of urban systems to accommodate increased demand for a specific service in periods of pressure or crisis (Ahern, 2010, 2011; Desouza and Flanery, 2013; Eraydin and Taşan-Kok, 2013; Godschalk, 2004; OECD, 2016; Wardekker, de Jong, Knoop, & van der Sluijs, 2010; Wilkinson, 2011). It is a very important resilience attribute, in the sense that it enhances the ability of urban systems to resist shocks and stresses and faciliates rapid recovery (The Rockfeller Foundation and ARUP, 2015). Modularity is a planning and design related attribute of resilience in urban systems which enhances compartmentalisation and autonomisation and compliments redundancy (Ahern, 2010, 2011; Desouza & Flanery, 2013; Eraydin & Taşan-Kok, 2013; Godschalk, 2004; Lechner, 2015; Wardekker et al., 2010; Wilkinson, 2011). Through modularity, risks are spread across different geographical areas, urban systems and time zones, which can be better controlled through distributed control and decision making points (Ahern, 2011; Martin-Breen & Anderies, 2011). Complimentary to the previous, the next identified planning and management related attribute of resilience in urban systems is buffering (Desouza & Flanery, 2013; Fleischhauer, 2008; Wardekker et al., 2010; Wilkinson, 2011). The practice of buffering refers to the provisioning of land use-free zones or zones where a very limited range of land uses is allowed. These areas are intended to act as 'buffers' to a potential spreading of a stress or crisis, preventing transmission to adjancent urbanised areas, and/or provide a 'quick way out' or gathering points as a response to crisis situations (Fleischhauer, 2008). Modularity and buffering do not necessarily point to loss of connectivity, however. In fact, connectivity is one more of the planning related attributes of resilience in urban systems identified through this excersise (Ahern, 2010, 2011; Cumming, 2011; Desouza & Flanery, 2013; Eraydin and Taşan-Kok, 2013; Godschalk, 2004; Wilkinson, 2011). It is important because it allows for help and coordination networks to be developed and become active and it creates new opportunities for self-organization (Desouza & Flanery, 2013; Wilkinson, 2011). Moreover, connectivity allows for the development of linkages between seemingly different layers of urban systems – for example citizen services and urban transportation systems. Finally, legally binding land-use or zoning plans are one more planning tool that can be used in spatial planning for resilience (Fleischhauer, 2008). Application examples can be found in inhabited areas in high risk of becoming affected by industrial accidents and settlements in proximity to highly protected natural ecosystems.

### 2.3. Highly adaptive urban spatial management mix

In recent years, planners increasingly came to understand that ad hoc planning and management cannot fully guarantee urban safety. Ability to adapt is possibly the most important precondition for urban resilience in this regard: a resilient system should be able to adapt dynamically in the face of change, even if this means that it will function in a different way (Lechner, 2015). Urban systems become more resilient when they are allowed to restructure, develop and innovate, while they are more exposed to stressors when they are static, inflexible and conservative (Fernandes & Chamusca, 2014). This adaptation can be thought of as cyclic, taking place across so-called 'adaptive cycles', referring to a continuous transition between states of growth and exploitation, conservation, collapse or release, and renewal and reorganisation (Carpenter, Walker, Anderies, & Abel, 2001; Holling, 2001). Recoursefulness, in the sense of being able to use the resources available at any time to

restore service functionality, enforces the adaptation capability of urban sytems (OECD, 2016; The Rockfeller Foundation and ARUP, 2015). The same is valid for the capability to innovate, which allows new ways of thinking to emerge (Walker & Salt, 2012). The significance of adaptive planning for resilience can be better understood if we consider the fact that urban identity and urban landscapes themselves are not static. Instead, they develop at different paces, on different scales, and in different directions (Beilin et al., 2013; Collier et al., 2013; Evans, 2011; Kafkalas, Vitopoulou, Gemenetzi, Giannakou, & Tasopoulou, 2015; Martin-Breen & Anderies, 2011; OECD, 2016). Altogether, the presence of a highly adaptive urban spatial management mix implies that there is a need for integration of the multi-level (urban, regional) and multi-sectoral (transport, environment) planning aspects for resilience.

### 2.4. Reflectiveness and ability to learn from past experience and resilience challenges

Reflectiveness, in the sense of being able to learn from past experience and adapt standards and behaviour accordingly is one of the major characteristics of sustainability (Ahern, 2010, 2011; Desouza & Flanery, 2013; Eraydin & Taşan-Kok, 2013; Evans, 2011; Godschalk, 2004; OECD, 2016; The Rockfeller Foundation and ARUP, 2015; Wilkinson, 2011). In planning for resilience, planners and planning authorities should be able to discern the processes and events that pose risks to the social and environmental metabolism of the city (Ahern, 2011). Many of the intractable challenges of resilience in urban environments are rooted in the ways that cities have developed in the past, in ageing infrastructure and geopolitical conditions (Collier et al., 2013). It is thus essential to make proper use of experiential knowledge when strategising for urban resilience (Folke, 2006; Wilkinson, 2011) and use strategic foresight to increase the level of preparedness in the face of unexpected events (Desouza & Flanery, 2013; Wardekker et al., 2010; Wilkinson, 2011).

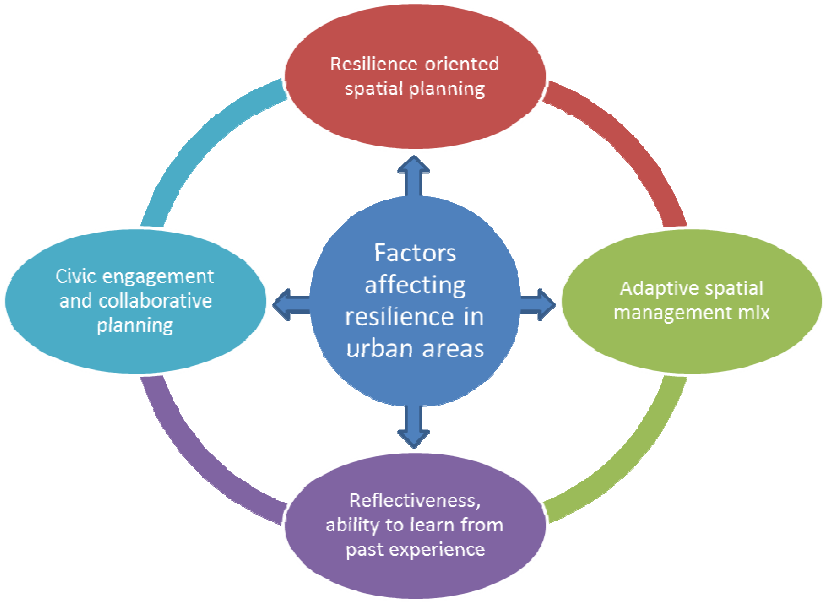
### 2.5. Civic engagement and collaborative planning

Urban resilience requires the capability of a city and its inhabitants to learn continuously and adapt to changing circumstances (Collier et al., 2013; Newman et al., 2009). Emphasis is also given to the enhancement of broad scale collaboration and knowledge exchange toward enhancing resilience in urban systems (Kafkalas et al., 2015; Martin-Breen & Anderies, 2011; OECD, 2016; The Rockfeller Foundation and ARUP, 2015; United Nations Office for Disaster Risk Reduction, 2012, 2015). In recent years it has been realised increasingly that economic resilience is closely tied to social resilience (Fischer, 2015; OECD, 2016; Stigson, 2015; The Rockfeller Foundation and ARUP, 2015; United Nations Office for Disaster Risk Reduction, 2012) and that public participation advances the creation of alliances between stakeholders, an element that is crucial for urban resilience (Desouza & Flanery, 2013; Godschalk, 2004; United Nations Office for Disaster Risk Reduction, 2012; 2015). Moreover, knowledge coming from non-experts, citizens and their communities carries high added value in the urban management mix (Angelidou & Psaltoglou, 2017; Collier et al., 2013) –citizens and their communities can act as tacit and localised knowledge transmitters and co-developers of identity, culture and conscience, while maintaining increased levels of flexibility and adaptivity (Beilin et al., 2013; Cumming, 2011; Giovannini, 2015; Lechner, 2015). An inclusive approach toward urban resilience enforces frequent and tight information feedback loops, allowing the urban system to normalise disturbances and become more stable (Walker & Salt, 2012; Wardekker et al., 2010). It also drives the emergence of innovative and more participatory business models in funding for resilience (The World Bank, 2015; United Nations Office for Disaster Risk Reduction, 2015). Social inclusion and participation has inherent implications for spatial planning, with positive or negative effects on accessibility to public infrastructure, ghettoization, and decline in urban areas. The role of advanced technology is especially important with regards to urban flexibility, as smart city solutions and applications can monitor urban functions on a real time basis (Angelidou, 2017; 2015; 2014). Data can then be used in urban systems to adjust their behaviour accordingly (The Rockfeller Foundation and ARUP, 2015).

### 2.6. An integrated framework for urban and environmental planning and design for resilience

From the above analysis we infer that in the context of resilience, urban areas should be seen as integrated socio-ecological systems (Evans, 2011). An integrated spatial planning for resilience framework accounts for a series of principles as featured in Figure 1.

**Figure 1: Dimensions of an integrated resilience spatial planning in urban areas.**




Source: authors' elaboration

This framework accounts for the identified factors affecting urban resilience, as they emerged from the analysed literature. More specifically, as the four major factors affecting resilience in urban areas, we identify (i) resilience oriented spatial planning, (ii) a highly adaptive spatial management mix, (iii) reflectiveness and the ability to learn from past experience and resilience challenges and finally (iv) civic engagement and collaborative planning. In the following section we explain how this analysis of the literature was used to assess the current prospects for urban resilience though a multilevel approach in a use case in northern Greece.

## 3. Research methodology

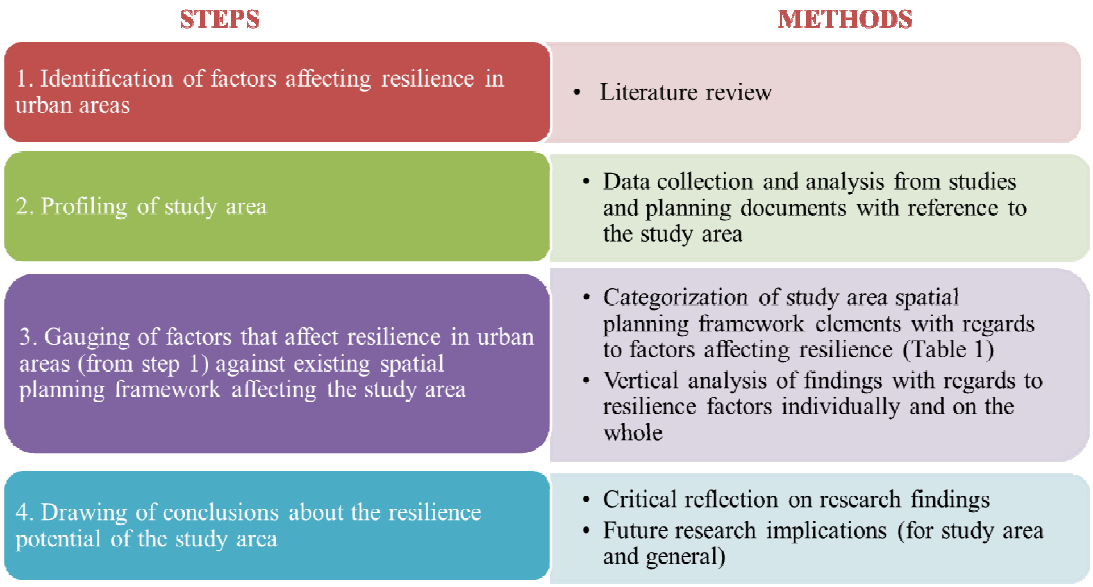
As mentioned, this paper presents an effort to perform a holistic assessment of the resilience potential of the western coastal front of Thessaloniki, Greece. The city of Thessaloniki spans more than two thousand years of history since its official inauguration, while only during the past 100 years it has undergone an incredibly large number of events that threatened its resilience, including a citywide fire in 1917, world and civil wars, international migration and abrupt population exchanges in the first half of the 20$^{th}$ century, a seven year dictatorship (1967-1974), extensive and largely uncontrolled deindustrialisation and urbanisation during the second half of the 20$^{th}$ century. The city was also acutely affected by the European debt crisis beginning in 2009. Today Thessaloniki suffers from limited economic and cultural dynamism, decay of the local entrepreneurial ecosystem, and loss of a large fraction of its intellectual capital (Labrianidis, 2011). Although this situation is in full progress in Thessaloniki and most Greek cities, many of the above mentioned resilience threats of the past were tackled successfully. Compared to other Greek cities, Thessaloniki presents an ideal case study for resilience assessment at many levels. The city has for decades been compelled to operate within a highly centralised and complex governance system. In addition, the potential to become an economic hub in the Balkan area is far from being realised (Labrianidis, 2011; Williams, Vorley, & Ketikidis, 2013).

The specific area of the western coastal front of Thessaloniki, currently only partially developed, was selected for a number of reasons: (i) it is part of the so-called coastal front of the Broader Thessaloniki Area, with a coastal length of approximately 50km, that for decades

has been attracting discussion regarding its high fragmentation and underexploited potential in social and economic terms and (ii) the western part of the Broader Thessaloniki Area hosts major transport and energy infrastructures of supra-local importance and is an area well known for its conflicting land uses.

Our approach to the assessment of the resilience of the western coastal front of Thessaloniki is methodologically featured in Figure 2:

**Figure 2: Research methodology followed in this research (source: authors' elaboration)**




Source: authors' elaboration

More particularly, Step 1. 'Identification of factors affecting resilience in urban areas' was performed through the literature review of section 2 of this paper. In this step we identified four factors affecting urban resilience, namely:

- Resilience oriented spatial planning
- Adaptive urban spatial management mix
- Reflectiveness, ability to learn from past experience
- Civic engagement and collaborative planning

In Step 2, 'Profiling of study area', we collected and analysed twenty spatial planning and management documents with reference to the study area, covering a period from 1975 up to today and focusing on different administrative levels (international, national, regional, municipal) and topics (urban planning, regional planning, transport planning, environmental management, resilience management). They are presented in the following Table 1 with their spatial level of reference (Municipal Unit, Municipal, Metropolitan, Prefectural, Regional, National, European, Global):

**Table 1. Spatial planning and management documents examined and spatial level of reference**

| Spatial planning and management documents | Spatial level |
|---|---|
| General Urban Plan of the Municipal Unit of Echedoros, Municipality of Delta (2011) | Municipal unit |
| General Urban Plan of the Municipal Unit of Chalastra, Municipality of Delta (2010) | Municipal unit |
| General Urban Plan of the Municipal Unit of Menemeni, Municipality of Ampelokipoi-Menemeni (2016) | Municipal unit |
| Municipality of Delta, Operational Programme 2014-2019, Phase 1: Strategic Planning (Municipality of Delta, 2015) | Municipal |
| Municipality of Delta, Operational Programme 2012-2014, Phase 1: Strategic Planning (Municipality of Delta, 2012) | Municipal |

| Spatial planning and management documents | Spatial level |
|---|---|
| Municipality of Ampelokipoi-Menemeni, Operational Programme 2014-2019, Phase 1: Strategic Planning (Municipality of Ampelokipoi-Menemeni, 2015) | Municipal |
| Municipality of Ampelokipoi-Menemeni, Operational Programme 2011-2014, Phase 1: Strategic Planning (Municipality of Ampelokipoi-Menemeni, 2015) | Municipal |
| Resilient Thessaloniki Strategy (Municipality of Thessaloniki, 2017) | Metropolitan |
| Action Plan for the Western Coastal Front of Thessaloniki (Region of Central Macedonia, 2016) | Metropolitan |
| Study for the pollution of Thermaikos Gulf and Immediate Mitigation Proposals (in Greek) (Fytianos, 2008) | Metropolitan |
| Unified Transport and Infrastructure Master Plan for the Broader Thessaloniki Region until 2020 (Greek Ministry of Transport, 2010) | Metropolitan |
| Sustainable Urban Mobility Plan for the Metropolitan Region of Thessaloniki (Thessaloniki's Integrated Transport Authority, 2013) | Metropolitan |
| New regulatory plan of the Prefecture of Thessaloniki -under development- (Greek Ministry of Environment and Energy, 2011) | Prefectural |
| Regional Framework for Spatial Planning and Sustainable Development of Central Macedonia (Greek Ministry of Environment and Energy, 2004a; 2013) | Regional |
| Regional Operational Program of Central Macedonia (Greek Ministry of Economy and Development, 2014a) | Regional |
| Regional Innovation Strategy for Smart Specialisation of Central Macedonia (Greek ministry of Economy and Development, 2014b) | Regional |
| Seismic Risks Map for Greece (Greek Ministry of Environment and Energy, 2004b) | National |
| Natura 2000 network of protected areas (European Commission, 2006) | European |
| EU Floods Directive (2007/60/EC) (European Commission, 2007) | European |
| Ramsar Convention (Ramsar Convention Secretariat, 1971) | Global |

Source: authors' elaboration

Some of the above studies were accessed online, while others were acquired through their owning authorities. We also scanned thoroughly the websites of the Municipality of Delta (2017) and Ampelokipoi-Menemeni (2017) for any relevant information.

In Step 3, 'Gauging of factors that affect resilience in urban areas against existing spatial planning framework affecting the study area', we arranged the study area spatial planning framework elements identified in Step 2 regarding the factors affecting urban resilience identified in Step 1. A table was created (Appendix, Table 3), gauging the above studies against the identified major resilience principles, using the model as seen in Table 2:

**Table 2. Model table created to support the analysis of the research findings**

| Dimensions affecting urban resilience (from literature) | | | |
|---|---|---|---|
| Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
| Study/Regulation 1 | …….. | …….. | …….. |
| Study/Regulation 2 | …….. | …….. | …….. |
| ……. | …….. | …….. | …….. |

Source: authors' elaboration

Finally, in Step 4, 'Drawing of conclusions about the resilience potential of the study area', we performed a critical reflection on the findings of the research performed and

considered future research implications, both for the study area and in general. The outcomes of this step are featured in section 5 of this paper.

## 4. Findings

### 4.1. Profile

The study area is located in Greece and more specifically the western part of the city of Thessaloniki. It refers to the western coastal front of Thessaloniki, starting from the end of the city's commercial and touristic harbour at the edge of Thessaloniki's Central Business District (CBD) and ends at river Loudia's delta, west and outside the city core, as seen in Figure 3. One part of the study area belongs to the Municipality of Delta (about 46,000 residents based on the 2011 Census of the Greek Statistical Authority) and another smaller part belongs to the municipality of Ampelokipoi-Menemeni (about 90,000 residents based on the 2011 Census of the Greek Statistical Authority). Both municipalities are considered peri-urban to the core city.

**Figure 3: The boundaries of study area**


Source: authors' elaboration from Google Maps

The study area hosts multiple and highly conflicting land uses. Specifically, it hosts dense and sprawled urban agglomerations; it is located close to important, supra-local urban infrastructures for education, mobility and energy production, while it also includes major protected wetlands and natural environments. In recent years, this area has attracted major interest from policy makers, spatial planners and other urban stakeholders due to its underdeveloped potential and high stakes resulting from land use conflicts, which could cause potentially detrimental effects to the entire Thessaloniki region (Region of Central Macedonia, 2016).

In terms of inhabited environment, the study area includes the settlement of Kalochori, belonging to the Municipality of Delta, counting 4.672 permanent residents (based on the 2011 Census of the Greek Statistical Authority). Kalochori was created as a refugee settlement in 1922, when refugees arrived here from western and northern Thrace. The urban plan of Kalochori, as seen in Figure 4, is characterized by uniformity based on a modular, rectangular grid – the so-called 'Hippodamian plan'. There is one main entrance and main exit from the settlement, but evidently entrance and exit can take place through many, uncontrolled secondary roads. The settlement is crossed by two major roads with an increased concentration of commercial uses. The most striking observation regarding the settlement of Kalochori is the extended sprawl of industrial and related commercial uses outside but very close to the settlement boundaries. The settlement is also situated close to the Industrial Area of Kalochori.

**Figure 4: The settlement of Kalochori in the study area**


Source: authors' elaboration from Google Maps

The broader area is host to other large industrial facilities and activities of the secondary sector, as well. The largest facilities which are located in the study area are the facilities of Hellenic Petroleum S. A. in Kalochori, the TITAN cement industry jetty, the musculatures in Axios's and Loudias's deltas, the Wastewater Treatment Plant of Thessaloniki in Sindos area, the livestock units and the tannery of Gallikos river.

In addition, the site includes very significant supra local infrastructure networks. It is bounded by PATHE (Patras – Athina – Thessaloniki – Euzoni motorway), and contains a complex local network of secondary road systems. Moreover, it is crossed by the city's supra local commercial and passenger rail network. The area includes a water supply network and a separate drainage network. Finally, the energy network in the study area is significant. It includes low and medium pressure gas pipelines, as well as a crude oil pipeline across the north-eastern boundaries of the study area (Municipality of Delta, Municipality of Ampelokipoi-Menemeni).

In terms of natural environment, the area includes a large number of rivers (Loudias, Gallikos, Axios and Dendropotamos) which have their delta in the study area, wetlands, areas belonging to the NATURA - Ramsar 2000 program, as well as a rich marine environment (Kalochori's lagoon, sand dunes, salt mines, Thermaikos sea).

### 4.2. Resilience oriented spatial planning

With regards to the first characteristic of spatial planning for resilience, 'resilience oriented spatial planning', the analysis (Appendix, Table 3), shows that spatial planning on the municipal level, referring to urban planning in the Greek spatial planning system, incorporates some significant elements of resilience -although not all of them. Specifically, modularity is achieved through the designation of urban unities and neighbourhoods, as foreseen by the national urban planning framework. Strict land use restrictions are imposed on high risk areas, and buffering zones free of use between urbanized settlements and industrial areas are planned. Emphasis is also given to increasing supra-local connectivity by means of transport infrastructure. No special provision to secure redundancy of urban and rural resources is made. The economic and operational management programmes of municipalities' concerned lack a focus on enforcing spatial planning for resilience other than promoting a certain degree of modularity through economic diversification across commercial areas and highlighting local characteristics as comparative advantage.

On the metropolitan level, the Resilient Thessaloniki Strategy (Municipality of Thessaloniki, 2017) identifies key issues related to spatial structure as critical for resilience in the area, including: (i) the role of public and open spaces as places that foster interaction, collaboration and inclusivity; (ii) the importance of neighbourhood based economic diversification; (iii) the need to develop a robust polycentric governance system; and (iv) the need to enhance connectivity by means of sustainable, transit oriented development and smart urban logistics across the metropolitan area.

Advancing to the regional level, the distance between resilience and spatial planning appears to increase. Directions on this level become strategic and planned and less associated to space. Polycentric governance and the designation of environmentally protected zones and

areas for the organization of productive and entrepreneurial activities are the foremost space management-related attributes. Economic diversification, compact urbanization and connectivity are seen as drivers of cohesion, development and competitiveness. Two noteworthy observations are that policies at this level provision urban regeneration programmes in specific areas and introduce integrated environmental and crisis management frameworks. Nevertheless, the granularity of measures at this level is low and disassociated with space.

Environmental management frameworks appear to focus on the regulation of natural ecosystems and environmentally protected areas rather than address anthropogenic effects on the natural environment. This observation is alarming, considering that environmental problems due to the existence of dense or sprawled productive activities and dense transport infrastructure have been in the forefront of interest of the local citizens and the local press for decades.

On the transportation planning level, connectivity is a major objective of the Unified Transport and Infrastructure Master Plan (Greek Ministry of Transport, 2010), especially regarding the road network. Redundancy and buffering are achieved through internal and external ring roads and connecting roads between them and the national road network. Regarding fixed route transportation systems, a planned light rail line seems to offer poor redundancy. The same goes for organized parking places and multimodal transport stations. Modularity is achieved by splitting the city's transportation masterplan into smaller transportation projects that can function autonomously.

### 4.3. Adaptive spatial management mix

An alarming observation emerges regarding the adaptation capabilities enhanced through the analysed spatial and environmental plans and regulations with an effect in the area (Appendix, Table 3): almost none of these plans includes provisions for improving the adaptive capabilities of local systems.

Resilient Thessaloniki's Strategy (Municipality of Thessaloniki, 2017) mentions the need to establish monitoring systems for local governance and environmental resilience, as a basis for continuously adapting the city's approach to resilience. No specific indicators and monitoring mechanisms are highlighted. On the other hand, regional and metropolitan transport management is by nature geared towards adaptivity attributes. The Unified Transport and Infrastructure Master Plan for the Broader Thessaloniki Region until 2020 (Greek Ministry of Transport, 2010) seeks, among others, to create a variety of available transportation modes and increased import/export options. The Sustainable Urban Mobility Plan for the Metropolitan Region of Thessaloniki (Thessaloniki's Integrated Transport Authority, 2013) introduces a periodic procedure of stakeholder engagement and recalibration of the approach toward sustainable mobility.

With regards to the existence of an adaptive spatial urban management mix, we discern that adaptivity is mostly present in transport management frameworks which by nature are geared toward multimodality and offer a variety of transportation options. Yet, with regards to transport management there is little room for flexibility and innovation in times of crisis. Spatial and environmental planning frameworks fail to introduce the capability to adapt, innovate and reconfigure in the face of resilience threats. There is also lack of an integrated approach to land, marine and inland waters' environment, despite the fact that the study area is a coastal urban region, additionally hosting protected wetlands and natural environments as well as a number of rivers and their deltas.

### 4.4. Reflectiveness, ability to learn from past experience

In terms of the third urban resilience-enforcing factor that emerged from the literature, the ability to reflect on and learn from past experience, the results of the analysis are mixed (Appendix, Table 3).

Specifically, experiential knowledge is largely neglected on the municipal planning level. The included municipalities General Urban Plans and Operational Programmes do not account for experiential knowledge.

The only exception is the Operational Programme of the Municipality of Ampelokipoi-Menemeni until 2019 (Municipality of Ampelokipoi-Menemeni, 2015), whereby specific earlier pressures on society, demography and quality of life have been taken into account in the design of the current programme.

The "Resilient Thessaloniki Strategy" (Municipality of Thessaloniki, 2017) acknowledges past resilience challenges that were overcome in the city, as proof for its inherent resilience capability. However, the strategy does not explicitly identify the mechanisms that were activated to overcome those challenges.

On the regional planning level, the plans that were analysed adopt a general approach with regards to reflectiveness and past experience. This approach translates into natural, historical and cultural heritage resources as assets that need to be managed in order to increase economic competitiveness in the area. Nevertheless, the element of identifying past challenges in the region, how they were overcome, and what helpful 'lessons' can be deduced for today, is absent.

Environmental management regulations emphasize the need to establish databases and environmental monitoring systems that will allow more informed environmental risk assessment and actions that are more responsive to the challenges and needs of the local physical environment.

On the transportation planning level, the situation appears to contribute to the leveraging past experience. The need to achieve consensus and high degrees of integration is stressed, in contrast to previous practices. Moreover, the Sustainable Urban Mobility Plan for the Metropolitan Region of Thessaloniki (Thessaloniki's Integrated Transport Authority, 2013) adopts a continuous approach to assessing sustainable urban mobility through the examination of previous experiences and each step taken.

As a general inference, one can argue that reflectiveness and the ability to learn from past experience in the policy and planning framework for the western coastal front area of Thessaloniki are utilized in a fragmented and theoretical way. In addition, they are focused on monitoring current events rather than closely examining past events and their implications for today's practices.

### 4.5. Civic engagement and collaborative planning

Advancing to the last urban resilience element identified, referring to urban stakeholder empowerment through equal representation, co-design and collaboration, as well the encouragement the development of help and support networks and the role that digital tools can play, the situation appears to be more promising, although there is lot of room for improvement (Appendix, Table 3).

More specifically, on the municipal planning and management level, collaboration with citizens is either completely ignored or sparsely and vaguely mentioned. Emphasis is rather placed on institutional stakeholders (local social and economic institutions, administrative entities, educational institutions, international networks) as potential collaborators.

The Resilient Thessaloniki Strategy (Municipality of Thessaloniki, 2017) is exemplary in regard to civic engagement and collaborative planning. The strategy envisions Thessaloniki as a place for vibrant multi-stakeholder representation, civic innovation and inclusivity. Co-creation and urban stakeholder engagement, as well as the establishment of collaboration networks among them, are major pillars of the strategy. Open urban data and technology tools are seen as catalytic forces behind the development of robust approaches to sustainability.

On the regional planning level, civic engagement is mostly enacted through national law requirements for public consultation. The approaches analysed target mainly institutional stakeholders, who are expected to participate in the development and implementation of civil protection and security plans and communicate them to their constituencies. Digital growth is envisioned as a major intervention axis, to be realized by increasing open data availability, systems interoperability, smart city applications and services' availability and finally, by enhancing the digital skills and accessibility of the population. However, civil society is seen as the end node of the information line, primarily seen as the end consumer of policies, rather than a co-creator. Altogether, programmes and actions to promote social inclusion, economic competitiveness and environmental protection appear loosely connected to digital growth.

Across the entire environmental management level, the need to establish robust environmental monitoring systems using digital tools is stressed but there is no provision for civic engagement and broad scale collaboration to mitigate resilience threats.

On the transportation planning level, an 'open to all' approach is provisioned, which is again mainly addressed to institutional stakeholders, rather than citizens.

Altogether, it can be argued that engagement and collaborative planning for urban resilience takes place mainly in consort with institutional stakeholders. Although this observation can be justified on the regional governance level (the basic role of regional authorities is to deliver and customize national policy directions to the lower tiers of government), it is especially surprising and alarming for municipal governance as municipalities represent the foremost level of urban governance on which citizens are expected to engage in public dialogue, communicate local knowledge and organize in mutual help networks and communities. In addition, the opportunities and capabilities rising from 'smart' growth and digital tools are largely underexploited.

## 5. Conclusions

In this paper, we analysed the resilience potential of the western coastal front of Thessaloniki by identifying the constituting elements of urban resilience and investigating whether and how these elements have been incorporated in the spatial planning framework (urban, regional, transportation, environmental) as it applies to the area. Our findings show that specific aspects of urban resilience-oriented spatial planning, including modularity, land use restrictions, buffering and connectivity, are relatively well incorporated in current provisions. However, redundancy –possibly the most important characteristic- is consistently neglected across all spatial planning scales. The lack of redundancy in all current planning and management frameworks reduces the ability of the area to withstand shocks and stresses and accommodate increased demand in a time of crisis. We also made an alarming observation that almost none of the analysed spatial and environmental plans and regulations that apply to the area enforces the adaptive capabilities of local systems. This weakness deprives local citizens, institutions, and systems, of the ability to innovate, use their resources differently and pursue alternative routes for organization in times of crisis. Moreover, despite the availability of a wealth of past experiences, learning from past resilience challenges is also neglected in the current spatial planning and management framework. This deprives the western coastal front of Thessaloniki of the opportunity to be better prepared and employ relevant solutions to become more resilient. Finally, participatory governance is realized only partially, focusing on institutional stakeholders rather than citizens, and leverages only sparsely the opportunities arising from digital social innovation tools.

Unfortunately, the cycle of non-resilience tends to be magnified in times when resilience is needed the most. In times when resilience is impeded by factors such as lack of funding required for implementing development projects, lack of awareness and reflectiveness and a general state of disorganisation, the need to break out of the non-resilience cycle appears to be the most pressing. The lack of financing for urban development projects is especially problematic, as it hinders the creation of proof of concept, i.e. implemented projects that could influence thinking about urban development and drive citizens and their communities to become agents of change.

Another important observation has to do with the systemic transfer of resilience (or non-resilience) across urban systems: poor environmental management poses threats to public services' resilience, poor transport management generates social resilience threats, and so on. It is impossible to create a resilient system in a place where other, non-resilient systems exist. All the above raise questions about what decisions need to made and what actions need to be pursued in order to escape the non-resilience cycle. In all cases, it is clear that a systemic approach is required to improve urban resilience and that urban resilience is closely tied to all social, economic and environmental aspects.

A major observation to make is that there are large disparities and a high degree of fragmentation among the different scales of governance and planning frameworks (local, metropolitan, regional, national, international). An integrated approach to resilience is lacking in each scale, let alone across them. Metropolitan governance in Thessaloniki appears to be the most important missing link that would allow the transfer of regionally imposed, strategic

and tactical resilience principles to the local (urban) operational level. Many of the challenges encountered in the area, such as environmental pollution and sprawl of light industrial activities, surpass municipal boundaries and are issues that call for attention from higher level jurisdictions. An integrated management of environmentally sensitive and highly productive areas beyond municipal boundaries, which would be normally imposed on the metropolitan level, is missing. As a result, municipalities are left to struggle in their own capacity with resilience threatening factors.

Moreover, urban, regional, transportation and environmental planning appear to address different aspects of resilience. Specifically, transport management frameworks mainly address resilience from the standpoint of connectivity. Regional development frameworks address resilience as an issue of local economic diversification and organization of economic activities in zones. Urban and municipal plans address resilience through the designation of urban unities and neighbourhoods (modularity), controlling land use in high risk areas and introducing buffering zones. These buffering zones, however, cannot be considered generous by any means. The lack of common understanding and consequently the adoption of a common approach about urban resilience hinders the constitution of a unified, integrated approach that would allow for coordinated mitigation of resilience threats. This would be especially important for the area studied, which combines significant land, marine and inland waters' environments.

A final question is related to the enforcement and the implementation of the framework analysed in this paper. The provision of a spatial planning framework enforcing urban resilience is only the first step to enhance resilience. Next, however, this framework needs to be designed and implemented in order to adopt a complete approach to resilience. Moreover, this approach should allow for room for constant recalibration to reflect recent developments and current opinions. All of the above point to the conclusion that a shift in thinking for spatial planning and the provision of institutional regulations are required in order to enhance the resilience potential of the western coastal front of Thessaloniki.

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## 6. Appendix

**Table 3. Research findings**

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| General Urban Plan of the Municipal Unit of Echedoros, Municipality of Delta (2011): Municipal unit; Urban planning | - modularity through urban unities<br>- strict land use restrictions in designated areas<br>- buffering zones between urbanized settlements and industrial areas<br>- supra-local connectivity through major transport infrastructure<br>- no measures for redundancy | no provision in this area | no experiential knowledge accounted for | no specific provision for civic engagement and broad scale collaboration apart from minimum law requirements for public consultation |
| General Urban Plan of the Municipal Unit of Chalastra, Municipality of Delta (2010): Municipal unit; Urban planning | - modularity through urban unities<br>- strict land use restrictions in designated areas<br>- designation of as Special Protection Areas<br>- supra-local connectivity through major transport infrastructure<br>- no measures for redundancy | no provision in this area | no experiential knowledge accounted for | no specific provision for civic engagement and broad scale collaboration apart from minimum law requirements for public consultation |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| General Urban Plan of the Municipal Unit of Menemeni, Municipality of Ampelokipoi-Menemeni (2016): Municipal unit; Urban planning | - modularity through urban unities<br>- strict land use restrictions in designated areas<br>- designation of as Special Protection Areas<br>- supra-local connectivity through major transport infrastructure<br>- no measures for redundancy | no provision in this area | no experiential knowledge accounted for | no specific provision for civic engagement and broad scale collaboration apart from minimum law requirements for public consultation |
| Municipality of Delta, Operational Programme 2014-2019 (Municipality of Delta, 2015): Municipal; Operational planning | identical to previous programming period (2012-2014) | identical to previous programming period | identical to previous programming period | identical to previous programming period |
| Municipality of Delta, Operational Programme 2012-2014 (Municipality of Delta, 2012): Municipal; Operational planning | - modularity through economic diversification<br>- land use restrictions in rural areas<br>- buffer zones<br>- supra local connectivity<br>- no measures for redundancy | no provision in this area | no experiential knowledge accounted for. Data collection about local circumstances and citizen needs, for more informed policy interventions. | collaboration with citizens sparsely and vaguely mentioned. Institutional stakeholders as potential collaborators. |
| Municipality of Ampelokipoi-Menemeni, Operational Programme 2014-2019 (Municipality of Ampelokipoi – Menemeni, 2015): Municipal; Operational planning | - reorganization of land uses<br>- building restrictions for rationalization of residential development and gradual consolidation of saturated regions | no provision in this area | earlier pressures have been taken into account in the design, such as the reduction of household size and the visual barrier effect | collaboration with stakeholders such as elected bodies, officials, local actors and community groups. |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Municipality of Ampelokipoi-Menemeni, Operational Programme 2011-2014 (Municipality of Ampelokipoi – Menemeni, 2015): Municipal; Operational planning | no provision in this area | no provision in this area | no experimental knowledge accounted for | - potential development of co-operation with institutional actors<br>- no citizen participation |
| Resilient Thessaloniki Strategy (Municipality of Thessaloniki, 2017): Metropolitan; Planning for resilience | - no spatial planning measures foreseen<br>- key issues related to spatial structure identified as critical for resilience: (i) the role of public and open spaces as places that foster collaboration and inclusivity, (ii) the importance of neighbourhood based economic diversification, (iii) the need to develop a robust polycentric governance system and (iv) the need to enhance connectivity by means of sustainable, transit oriented development | - no adaptation capability enhancement<br>- data driven monitoring systems (governance & environment) for calibration of the city's approach | - current resilience threatening challenges identified in the way that the city has developed up to today.<br>- identifies past resilience challenges that were overcome but does not explicitly investigate the resilience mechanisms put in action | - Thessaloniki as a place for vibrant multi-stakeholder representation, civic innovation and inclusivity<br>- co-creation, urban stakeholder engagement, establishment of collaboration networks<br>- open urban data and technology tools as catalytic forces behind the development of robust approaches to sustainability |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Action Plan for the Western Coastal Front of Thessaloniki (Region of Central Macedonia, 2016): Metropolitan; Regional planning | - land use control<br>- organization of productive and entrepreneurial activities in designated areas<br>- protection of environmentally sensitive areas<br>- upgrading and integration of urban infrastructure, especially for improving protection against environmental threats | no provision in this area | -preservation of historical and cultural assets<br>- other than the above, no experiential knowledge accounted for | no provision in this area |
| Study for the pollution of Thermaikos Gulf and Immediate Mitigation Proposals (in Greek) (Fytianos, 2008): Metropolitan; Environmental management | - classification and assessment of environmental load from productive activities<br>- delimitation of sensitive river basin districts and development of alternative crops and irrigation<br>- development of breeding ground for unification of the free-keeping of animals | no provision in this area | creation of database to collect information about polluted sites (municipal waste, industrial waste water, agricultural and animal waste, etc.) of the water recipients that end up in the Thermaikos Gulf | there is no specific provision for civic engagement and broad scale collaboration |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Unified Transport and Infrastructure Master Plan for the Broader Thessaloniki Region until 2020 (Greek Ministry of Transport, 2010): Metropolitan; Transportation planning | - redundancy achieved by an internal and external ring-road and connecting roads between them and the national road network. Planned light rail line, parking places and multimodal transport stations offer poor redundancy<br>- modularity by splitting masterplan into smaller transportation projects that can be constructed and function autonomously<br>- buffering through an extended network of connecting roads with the national road network and a bridge that connects the area with the eastern part of Thessaloniki metropolitan area that bypasses the city<br>- connectivity is a major objective of the masterplan especially regarding the road network | - optimized transportation systems for lower transportation costs, more imports/exports options, and variety of available transportation modes. | - the need to have a consensus on the future transportation planning is underlined, in contrast to the previous practices in the city | - the “Masterplan” is proposed to be open to the public and the institutions of the city and to be adapted accordingly, while it should be implemented by the Public Transport Authority of Thessaloniki which is a representative public legal authority. |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Sustainable Urban Mobility Plan for the Metropolitan Region of Thessaloniki (Thessaloniki's Integrated Transport Authority, 2013): Metropolitan; Transportation planning | - planned light rail line from the central bus station to the rest fixed route system network, offers connectivity, and modularity, but seems to be poor in terms of redundancy and buffering. | no provision in this area | - examination of previous and existing experience and every further step taken | - SUMPs include by nature a cyclic procedure of stakeholder engagement in co-design for sustainable urban mobility |
| New regulatory plan of the Prefecture of Thessaloniki - under development- (Greek Ministry of Environment and Energy, 2011): Prefectural; Regional planning | - coordination with national, regional and local policies<br>- interregional connectivity<br>- improvement of polycentric structure of space, diversification of local production<br>- land use control and protection of natural ecosystems and agricultural areas<br>- compact urban development<br>- organization of industrial activities in predesignated areas<br>- specialized protection programmes and interventions where needed.<br>- integrated management of maritime zone | - plan should be updated every 5 years to reflect recent changes<br>- no other specific mention to adaptation and restructuring capability enhancement measures | -the area's natural, historical and cultural heritage should be preserved, accessible to the whole of society and leveraged for international promotion and local tourism development.<br>- other than the above, no experiential knowledge accounted for | - improvement of information and documentation of institutional stakeholders about protection and security threats and policies<br>- collaboration of institutional stakeholders in the development of civil protection plans<br>- web facilitated access of citizens to information about the mitigation of resilience threats<br>- data collection and development of environmental and biodiversity monitoring system |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Regional Framework for Spatial Planning and Sustainable Development of Central Macedonia (Greek Ministry of Environment and Energy, 2004a; 2013): Regional; Regional planning | - modularity through urban unities<br>- strict land use restrictions in designated areas<br>- designation of Special Protection Areas<br>- supra-local connectivity through major transport infrastructure<br>- no measures for redundancy | no provision in this area | no experiential knowledge accounted for | no specific provision for civic engagement and broad scale collaboration apart from minimum law requirements for public consultation |
| Regional Operational Program of Central Macedonia (Greek Ministry of Economy and Development, 2014a): Regional; Regional planning | - connectivity and polytropic sustainable mobility<br>- protection of natural environment, integrated management of maritime areas, adaptation to climate change and crisis management<br>- cultural heritage resources as touristic assets | no provision in this area | no experiential knowledge accounted for | - actions and works to promote social inclusion, but not connected to innovation or technology<br>- different stream of actions related to accessibility and uptake of information technology applications |
| Regional Innovation Strategy for Smart Specialisation of Central Macedonia (Greek ministry of Economy and Development, 2014b): Regional; Regional planning | - spatial planning should be re-oriented toward sustainable development<br>- no other provision in this area | no provision in this area | no experiential knowledge accounted for | - innovation is in the heart of the strategy<br>- developed in consultation with institutional and business stakeholders (without civil sector)<br>- digital growth envisioned as major intervention axis. Citizens seen as consumers, rather than co-creators |

| Study/Regulation: Planning level; Sector | Resilience oriented spatial planning | Adaptive spatial management mix | Reflectiveness, ability to learn from past experience | Civic engagement and collaborative planning |
|---|---|---|---|---|
| Seismic Risks Map for Greece (Greek Ministry of Environment and Energy, 2004b): National; Planning for resilience | no provision in this area | no provision in this area | no experiential knowledge accounted for | no provision in this area |
| Natura 2000 network of protected areas (European Commission, 2006): European; Environmental management | - strict land use restrictions in designated areas<br>- modularity through designation of physical features<br>- buffering zones | no provision in this area | no experiential knowledge accounted for | there is no specific provision for civic engagement and broad scale collaboration |
| EU Floods Directive (2007/60/EC) (European Commission, 2007): European ; Environmental management | - thinly populated or unpopulated areas or areas with limited economic assets or ecological value are considered as not significant for flood risk, hazard maps and flood risk maps<br>-appropriate settling of all industries in predefined zones with modern antifouling equipment | no provision in this area | - Member States should not take measures which increase the risk of flooding in other Member States<br>- a preliminary flood risk assessment shall be undertaken to provide an assessment of potential risks | - Member States shall encourage active involvement of interested parties in the production, review and updating of flood risk management plans |
| Ramsar Convention (Ramsar Convention Secretariat, 1971) : Global; Environmental management | - strict land use restrictions in designated areas<br>- modularity through designation of physical features | no provision in this area | factors affecting the site's ecological character, including changes in land use and development projects | there is no specific provision for civic engagement and broad scale collaboration |

Source: authors' elaboration of data included in the mentioned studies and regulations

# BIKE SHARING SYSTEMS AS A TOOL TO INCREASE SUSTAINABLE COASTAL AND MARITIME TOURISM. THE CASE OF PIRAEUS

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**Abstract**

Piraeus is the fourth largest municipality in Greece and a port city. Piraeus port is one of the biggest in the Mediterranean, serving thousands of passengers, who use the city as a transport corridor to reach Athens. On the other hand, the harbor gives a sense of liveliness in the city, further reinforced by the advantageous geographical position, important archaeological sites and a beautiful shoreline. New perspectives are also opening up for the city due to the development of a new cruise terminal. Among the crucial challenges faced by Piraeus city is the strong car-dependency. In order to cope with this issue and related impacts, but also to reinforce traditional economic activities related to the maritime economy, the municipality has decided to re-orient its planning efforts, visioning Piraeus as a sustainable coastal and maritime tourism destination. As part of this planning goal, the promotion of cycling has been decided, by launching a Bike Sharing System (BSS), being perceived as an excellent tourist attraction along with other advantages this can bring. The paper deals with BSS planning as a smart policy that will directly benefit the local economy. It elaborates on those factors that show how and why changes occur in a city due to a BSS, how and why it is successful or not and what are its benefits but also main challenges. It also gathers knowledge from European BSS in order to embed it in Piraeus' BSS planning effort for improving citizens and visitors' sustainable mobility pattern in Piraeus.

**Keywords:** Port city, Bike Sharing Systems, sustainable mobility, sharing economy, Piraeus

**JEL classification:** R42

## 1. Introduction

Considering the serious threats that affect the city environment such as climate change, accidents, traffic saturation, pollution, noise and the extended takeover of public spaces by cars, the municipality of Piraeus visions to promote sustainable mobility policy choices and solutions, following successful experiences gained by many cities in Europe that have shift towards cycling and walking.

In 2004, OECD, in its report on National Policies to Promote Cycling, stated that "Cycling is increasingly recognized as a clean, sustainable mode of transport and an essential part of an inter-modal plan for sustainable urban travel." Today, almost 15 years later, it is widely recognized that bicycle is the solution to urban problems, such as traffic congestion, high cost of living, land use consumption and also environmental and health issues. Elliot Fishman (2013) indicates that a common response to the contemporary urban policy, seeking to overcome challenges presented by car dependence, is to replace car journeys with bicycles' ones.

Bicycle Sharing Systems (BSS), as part of wider urban mobility management strategies, are critical components of current policies and practices to address these challenges. The key objective of BSS systems is to provide free or low-cost access to bicycles for short distance trips in urban areas as an alternative option to private car use, therefore reducing air pollution, noise levels and traffic congestion. Bike sharing is also linked to motorised public transport either as an alternative transport mode or as a short distance ('last mile') solution, connecting commuters to public transport hubs. In this context, a 'bicycle sharing system', 'bike sharing system' or 'bike sharing scheme', can be defined as any fully automated, self-service network of bicycles that is available to individuals on a short-term basis as a means to short distance transportation in urban areas. Bike Sharing Systems can be classified according to financing models followed (public, private, or public-private partnership), ownership, operator and operational model, scale and range.

Urban transport advisor Midgley (2011) has noted that "bike sharing has experienced the fastest growth of any transport mode in the history of planet." The introduction of a BSS has profound impacts on "creating a larger cycling population, increasing transit use, decreasing greenhouse gases, and improving public health", as reported by DeMaio (2009). Bike sharing gains popularity as it offers both an alternative transportation option and a mean to increase bicycle use by integrating cycling into the transportation system. The main principle of bike sharing is to offer a short-term access to bicycles on an as-needed basis, removing the burden of costs and responsibilities relating to bike ownership. Shaheen et al. (2010) described the benefits of bike sharing, such as flexible mobility, reductions of gas emission, health of population related to physical activity, reduced congestion and fuel use, financial savings at the individual level and support for multimodal transport connections.

Piraeus is a typical Greek city. The main urban characteristics of Piraeus are high density housing and narrow roads, which are disproportionate to the heights of buildings in terms of building height to street width ratio. Building stock counts several decades now, which implies that no underground parking spaces are available, leading to excessive on road parking. Due to this fact, cars can move in a narrower corridor. In fact, car speeds are low, however this does not mean that streets are welcoming and movement of pedestrian and cyclist is safe. In fact, exactly the opposite is the case in the city. Sidewalks are too narrow and full of obstacles, forcing pedestrians to walk on the street. There is absolutely no provision for cyclists. The above-mentioned characteristics and the absence of green elements turn streets into traps for pollution and noise, the well defined in the literature "street canyon effect". The structure and environment of the city as a whole is hardly attractive to walk or even stand on the street. Walking and cycling are not a viable option; hence residents are strongly depended on their car or motorcycle. The effects of this dependency are well known in terms of quality of life and urban operations.

The Municipality of Piraeus participated in the CycleCities project in order to integrate cycling in urban mobility policies. Bike sharing schemes or systems lie at the core of urban mobility management strategies; and the integration of such system in the Piraeus' cycling plan was considered necessary. This research focuses on studying existing BSS case studies in the European context; and using these experiences for planning a new BSS system for the city of Piraeus along the lines of the CycleCities project.

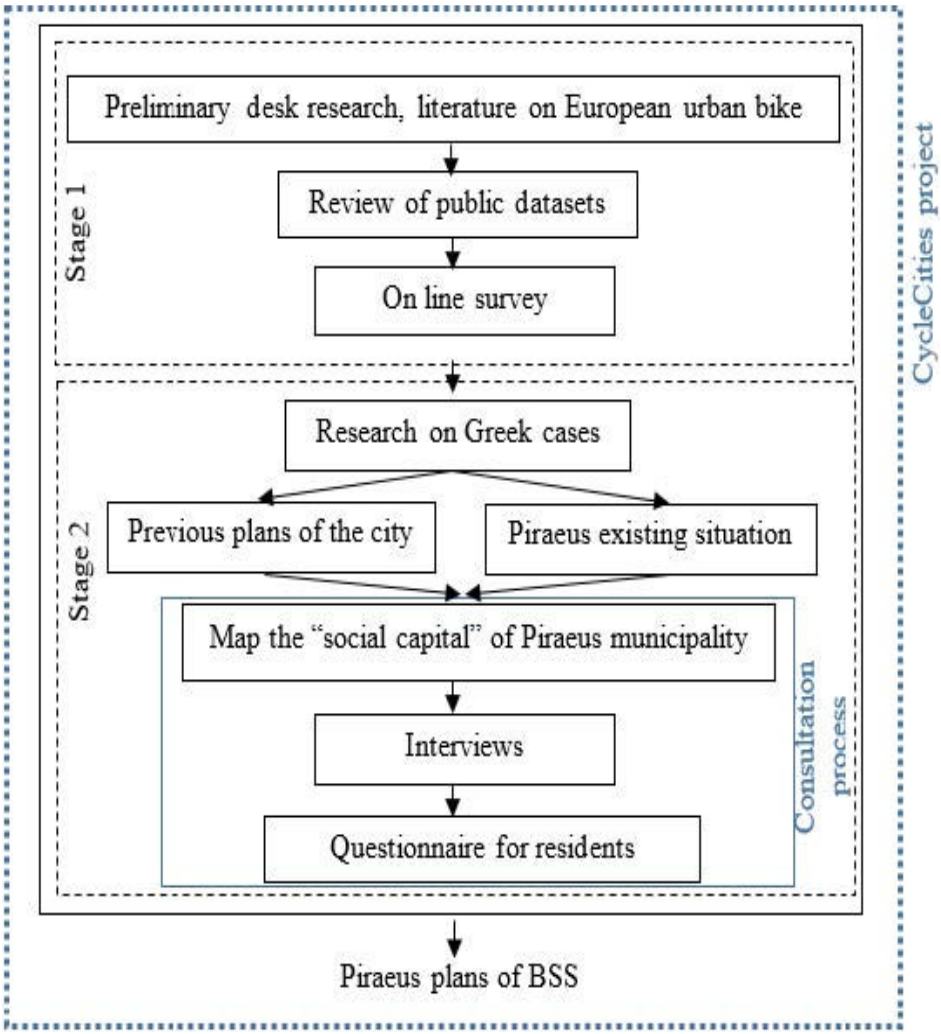
## 2. Methodology

This research was accomplished in two distinct stages (Fig. 1). Both stages were carried out under the umbrella of CycleCities Project, an INTERREG IVC funded project. The first stage intended to gather evidence on BSS effectiveness and impact on urban mobility management. The second stage concerned the state of Greek Bike Sharing Systems (BSS) with a special focus on the case of Piraeus municipality.

Stage 1 included 3 steps. The first step was to make a preliminary desk research, literature review and brief analysis of the state of the art of the European urban bike sharing systems. Then a review of several public datasets (e.g. OBIS project, EPOMM database) currently available on bike sharing systems in Europe (types of systems installed, numbers of bicycles and registered users, costs and financing) took place. Based on the previous steps, the BSS cases to be surveyed were identified and comparatively analysed. An online survey questionnaire was developed so as to gather views, opinions and experiences on effectiveness

and user satisfaction in relation to Bike Sharing Systems, using as a basis on the BSS cases identified through review of available data. Finally, the pilot testing and fine-tuning of the questionnaire took place, while accompanying survey material was structured (e.g. guidelines, invitation texts). The survey lasted for 6 weeks. The questionnaire led to the collection of additional, up-to-date evidence and provided more in-depth insights into the effectiveness, value-for-money and overall impact of current bike sharing schemes and systems in European cities, as voiced by those directly involved in planning, deploying and operating BSSs. After the consolidation of related answers, a comparative analysis of the survey data was carried out.

**Figure 1: Methodological Framework**




Source: own elaboration

The sample was analyzed using the SPSS two-step clustering method and the hierarchical cluster analysis in order to identify groups of similar BSS, with high distinction to other groups.

While steps 1 and 2 of the research aimed at establishing an overview of the current situation and the facts and figures of European BSSs, the questionnaire-based survey (step 3) focused on exploring specific aspects of bike sharing schemes, related to their effectiveness, associated costs and value-for-money as well as their overall impact.

*Stage 2* elaborated on bike sharing systems in the context. At first, Greek cities were researched according to CycleCities questionnaire in order results obtained from them to be integrated in the overall European results. Afterwards, a detailed research on Piraeus municipality took place. All previous studies (transport studies, urban planning studies, architectural reform studies, etc.) were gathered in order to understand the previous/existing visions and goals for the city.

A consultation process followed the above step, aimed at gathering the local authorities', stakeholders' and residents' points of view, in order these to be taken into account in the planning procedure. Public involvement in the planning policies for sustainable mobility is a highly demanding task. Surveys have shown that the reaction of citizens in attempts to enhance participation in the planning procedure is quite similar in most countries. It requires honest intention from the planning organization, acting as the initiator; and effective incorporation views gathered in the final planning outcome, in order for the procedure to be meaningful (Stratigea, 2015). To motivate local population and achieve wide participation for consultation purposes implies the provision of certain incentives. Moreover, a comfortable and friendly environment has to be established, within which citizens should feel that they take part in a planning process that aims at improving the quality of their lives.

The preparation of the *consultation process* includes the following actions:

- Recording of the "social stakeholders" of Piraeus. Interviews / meetings with the "social stakeholders" of Piraeus were recorded.
- Making interviews / meetings with the local authority, the Department of Planning and Development of the municipality and citizens. The type of semi-structured interview was selected, which is a flexible, open, minimum standardized approach and allows for in depth conversation. The conversation focused on the issues of mobility in the city of Piraeus. An interview guide was written that included the three following main issues to be addressed: (a) the way residents travel and the means they use both within Piraeus and in their inter-municipal travels; (b) their participation in urban planning decisions or any suggestions on how citizen participation could be enhanced in such decisions; and (c) the problems of the city, how they perceive the development of the city in general and in relation to their trips in particular.
- Exploring views and wishes of the residents of Piraeus via a questionnaire in relation to travelling in the city and the prospect of sustainable mobility policies.

## 3. . Findings

### 3.1. First stage of research

Starting point of the research was an overview of the current situation of BSS by reviewing the literature and previous surveys/ projects like the OBIS project (2011). A lot of researchers have focused on different aspects of bike sharing systems and their work should be noted as highly important. Matrai et al. (2016) and Fishman et al (2013) make a holistic literature review on this subject. Shaheen et al. (2010) highlight the systems' generation and evolution over time. Ricci (2015) dealt with the identification and critical interpretation of the available data on BSS. Fishman et al. (2014 and 2012) focused on the facilitators or the barriers of bike systems. Midgley (2011) and Shaheen et al. (2012) developed datasets about different system characteristics. DeMaio (2009) focused on analysing the business model of public bike sharing systems.

In the next stage of the research, a survey questionnaire was conducted, leading to the collection of additional, up-to-date evidence and providing more in-depth insights into the effectiveness, value-for-money and overall impact of current bike sharing schemes and systems in European cities, as voiced by those directly involved in planning, deploying and operating BSSs. Data were collected through the collaboration networks of the CycleCities project partners. It was focused on specific aspects of BSS, relating to their effectiveness, associated costs, value-for-money and their overall impact.

#### 3.1.1. Responses' overview

The majority of cities (40%), which participated in the survey, were medium-sized cities. Regarding the respondent's involvement in BSS's deployment, this revealed that most participants were involved in the process ofplanning/designing a BSS, followed by those who worked in systems' daily operation, performance and maintenance.

The analysis regarding the BSSs' user groups revealed that the primary group of BSS users is commuters to work/school, followed by tourists and people on their leisure time.

Concerning the costs and economic results of the BSS, it was revealed that the main source of revenue are primarily the user's fare and advertisements, followed by the income earned from contracts with the local authorities as well as any grants/donations that may occur. Also, the repair/ replacement costs due to damages, vandalism and theft were not as important as some might believe. Compared to the overall operating cost, it was less than 10% for the great majority of the European BSSs. In case of negative economic results, the city administrator or the private operator covers the deficits, depending on who has deployed the system and the type of signed contract in case of private operators.

In the majority of cases, the most important benefits that followed the deployment of BSS systems were the increased bike use ("cycling uptake occurred") and the improvements in citizens' health. The most frequent territorial and other policy measures implemented, in combination with the deployment of the BSS, were cycle routes, awareness raising campaigns and partnerships of BSS with public transport sector.

### 3.1.2. Correlation analysis

The correlation analysis indicated the relationship between variables. It was used to understand whether the relationship is positive or negative, but also identify the strength of this relationship.

There was no relation identified between the proportion of municipality area covered by the BSS and other factors. This lack of correlation appears as it might be beneficial to have a large system that covers the whole municipality, but it is contradictory to the basic design principle, which requires a high density of stations, a fact that is not feasible if the network of stations is expanded in the outskirts of a city.

The average duration of each trip is highly correlated to the relation of revenues and expenses. In all systems with average trip duration up to 30 minutes, expenses exceed revenues. The BSSs that have profits are allocated within the 60-120 min class on trip duration. This is due to the fact that pricing schemes, with a limit of 30 minutes free of charge, are encouraging for short-time use of the public bikes. But this correlation also reveals that users accept to pay if they need a public bike for more than the free time provided.

Highly correlated were found to be the primary user group and the level of public consultation through polls and voting. Adequate public consultation of this kind is only found for the commuter-oriented BSS. High correlation is found for different kinds of public consultation as: public meetings, polls and voting and public information centers. If involvement in public consultation is planned, these three participation modes are sufficient when used together. In other cases, all three are considered somewhat insufficient.

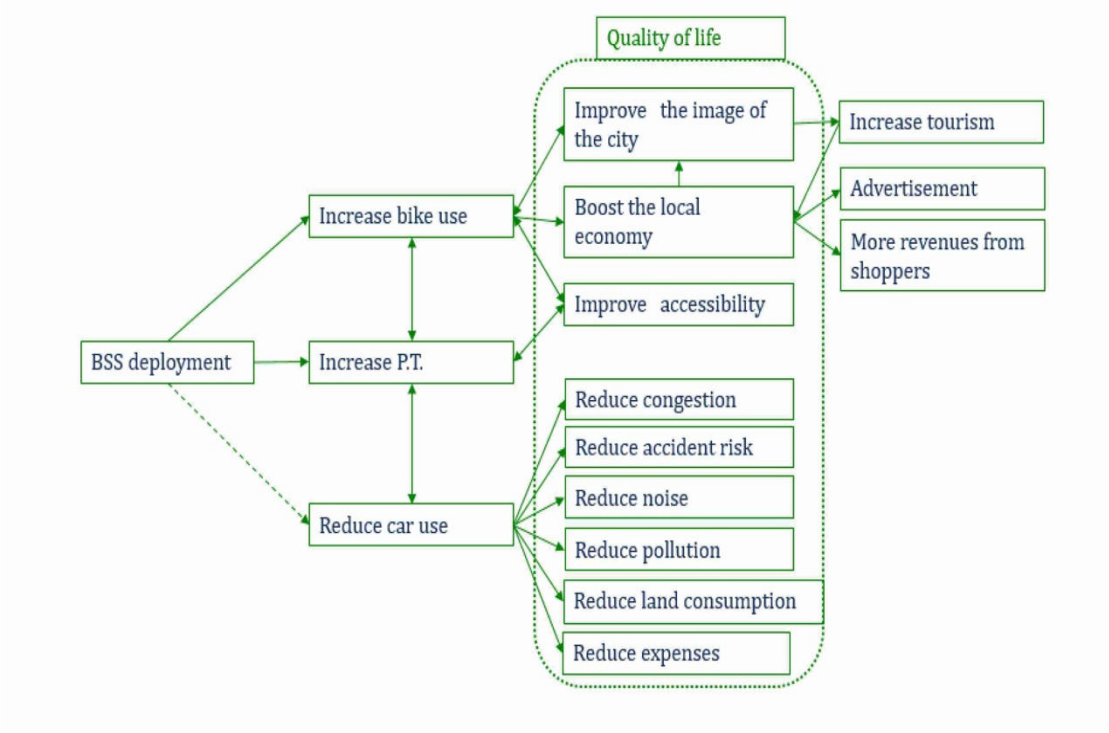
An important correlation occurs between the source of the total revenue and the public opinion. Systems registered as totally financed by advertisement are rated with highest score for the public opinion. This might be due to the fact that advertising companies present a professional image of the BSS.

Furthermore, the effect of increasing tourism as major benefit is strongly correlated with the average economic result of the BSS. For systems with a positive revenue-expense ratio, the effect on tourism is assessed very high and vice versa. The major benefits of the increase in bike use are directly correlated to the benefits of reducing traffic congestion, improving citizens' health and reducing $CO_2$ emissions / improving the urban environment.

High investment costs as a major challenge of the BSS, is significantly correlated to the need for additional funding to improve the system. The importance of additional funding is also correlated to the assessment of public consultation, especially through information centers. Systems that emerge after adequate or sufficient public consultation feature a high importance of additional funding. Lower prices for users, as a critical measure to increase the system's value for the city, is highly correlated to the positive assessment of the impact of BSS on local development as well as to the need for setting up initiatives for engaging local communities in decision-making and combined actions, involving other transport modes.

The overall impact of the systems, based on the results of the survey, is summarized in Figure 2.

**Figure 2: Diagram of the impact of BSS**




Source: Vassi & Vlastos (2014)

### 3.2. Case study: Piraeus

#### 3.2.1. Current situation and existing plans and studies

Piraeus is an historical industrial city. It has very high residential densities and activities and a severe problem of illegal parking that creates traffic jams all day long in various spatial entities. The Piraeus area is characterized by great diversity in its geographical characteristics. It includes areas with steep slopes, but almost flat areas where the bike could move comfortably and serve both residents and visitors from other regions.

Piraeus advantages are the liveliness of the harbor with thousands passages every day as well as the diversity of the shoreline and the landscape in general. It has important archaeological sites and an advantageous geographical position in the center of historic sites, as the islands of the Saronic Gulf, Sounio, ancient Corinth, Epidaurus, Mycenae, etc.

The lack of adequate transport infrastructure and the limited surface resulted in a dramatic increase in density. The classical buildings with one or two stores were sacrificed in order to have block of flats. The existing density is not consistent with the presence of the large number of cars. Piraeus is a lively city and at the same time tends to be paralyzed by congestion on the road network.

The Municipality of Piraeus has become an autonomous commercial and business center. A large part of the population works within the borders of the municipality. There is also an important proportion of the population that works outside the municipality, mainly within the Athens Metropolitan Area (public and private employees, freelancers and entrepreneurs) but also in other areas (industry, etc.). Within the center, but also in the overall municipal territory, there are many supra-regional businesses and services, which increase the traffic congestion, with all the relevant consequences this can cause. The city has a number of important supralocal roads. Thousands of vehicles pass daily throughout the city and determine its functioning and dynamics.

The municipality has implemented traffic regulations (turned two-way roads to one way) due to the expected deployment of the tram and metro. On certain roads were reclamations, aiming at improving conditions for pedestrians or at separating circulation of buses (which move contra flow) from car traffic. While in general, the implementation of one-way roads used to be considered as a good practice in traffic planning for "fine tuning" car flows, a number of problems have arisen in the city of Piraeus.

A severe problem is the increased car speed that now exists on roads without traffic lights, such as the coastal road, which prevent and discourage residents and visitors from crossing it, and therefore degrades the value of the sea front. Also, the illegal parking on central streets constitutes a problem, reducing their capacity and therefore their functionality. Finally, an important problem is the total lack of law enforcement and therefore political support, which could have regulated and prevented situations as the above described.

The lack of parking policies, the emergence of private parking areas that attract more and more cars, combined with the inadequate public transport (at a distance from current needs of the city) create an intolerable situation due to heavy car traffic and on-street parking density that degrades the quality of the urban landscape and quality of life.

Consequence of all the above is the deterioration of the city's image as a coherent urban and social landscape (A4). Additionally, the social inequality is one of the biggest obstacles that Piraeus should overcome in the 21st century.

Previous studies and plans for Piraeus were studied. The aim was to search for those elements that could be used, either in the phase of the analysis or in the phase of the planning process for setting up a strategy for sustainable mobility. The metropolitan plans for the wider area were taken into account, as Piraeus could not remain unaffected by them. Most of the studies and plans were based on the use of car. For example, in 2002, a traffic study was drafted in order to solve traffic problems in the municipality. Proposals emerging from this study aimed at optimizing the flow of cars along the main roads, by increasing the traffic lanes and the green phase of traffic lights in the junctions.

In 2008, the newly elected municipal authority set new objectives for the city, a vision that was targeting to: improve the quality of life, decrease spatial inequalities, improve sustainable accessibility, enhance sustainable mobility, showcase the history-culture and promote the city as a tourist destination. In the light of these objecitves, decided crucial aspect was to cope with mobility inefficiencies aand make a turn towards more sustainable mobility patterns in the city. The first attempts made were rather inadequate. In 2008, the Municipality of Piraeus, in cooperation with Attiko Metro, has launched 6 projects for the rehabilitation, restructuring and development of urban transport of the greater Piraeus area (extensions of lines, underground lines, parking facilities), in order links to be established to the rest of the Attica Region. In 2012, the project of converting an inactive railway section to bicycle and pedestrian routes was considered highly insufficient by some and totally useless by others. The reconstruction, planting and aesthetic upgrading of the route are of no value, since the pedestrian-bike path will be cut off from the urban environment and disconnected from public spaces and public transport.

In 2011, the municipality joined the CycleCities consortium, inspired by the sustainable mobility targets set: increase the percentage of cycling in the city, improve accessibility in particular land uses, plan for cycling network, attract private investments on cycling, decrease accidents, engage stakeholders in the planning process, raise the citizens' awareness. The opportunity seen via CycleCities was to integrate cycling in urban mobility policies, using the European experience. One of the policy directions serving sustainable mobility concerns in Piraeus municipality, already identified from the beginning of the project, was the deployment of a BSS, as this was proven to be extremely efficient in terms of adopting bicycle as means of transport in cities without any urban cycling culture (case of London and Paris). The results of the first stage of research were absolutely encouraging towards the adoption of such a system within the framework of "Piraeus' Cycling Implementation Plan", which was the main expected outcome of the project. As BSSs directly increase bike use and public transport use, it was proven (by the first stage of the research) that it improves the image of the city, boosts the local economy and improves accessibility. It also indirectly reduces car use, resulting in reduced congestion, noise, pollution, accident risk, land consumption and expenses.

These results were almost identical to the targets set by the municipal authority for the city. In this way, BSS has emerged as the ideal "tool" for achieving these goals.

#### 3.2.2. Consultation process

As mentioned above, in the context of the interviews / meetings, the social stakeholders' groups of Piraeus were identified. More specifically the groups that were identified to take part in the meetings or share their views through interview-based one-to-one discussions,

included: municipal social services such as parents' associations in schools, local associations and partnerships which act in Piraeus, other unions or partnerships that engage citizens (churches, orphanages), local media (news websites, newspapers, radio, bloggers) and local political parties.

Based on the type of stakeholders identified, interviews were performed. The involvement of citizens offered valuable information and highlighted critical issues, which were taken into account in the planning process and further explored in the second phase of public participation.

Among others, the main conclusions drawn from the interviews were: a) there was strong support for the creation of cycle routes mainly on one way roads, along the beach and along the harbor: and b) citizens were reluctant to use the bike for safety reasons, practicality or health (due to traffic conditions, inadequate cycling skills, difficulty to find safe parking near the house, knee problem, rise of the crime during night time). There was a preference towards bike, mainly for local traveling and leisure in the coastal roads but not at the metropolitan level. The transportation from / to and within the city center, emanating from the neighborhoods, are done by foot or by car. Piraeus is a dense area, with relatively small distances and the center can be reached by foot from the surrounding neighborhoods. Consequently, there was strong support for measures in favor of the pedestrian; and it was generally desirable to restrict the use of cars in the center. Moreover, the bus service in Piraeus was not adequate due to the lack of reliability and speed of service.

There was strong interest in quality of life issues (security, cleaning, pedestrian traffic, use of open spaces, highlighting of archaeological sites-monuments). Moreover, rise of crime and lack of security in certain areas, made walking and public transport a less attractive option in the evening.

Regarding the planning procedure and public participation, there was contact between the municipality and the citizens, but promises were not realized. Some people believed that the involvement of citizens eventually will make planning worse. It was feared that the involvement of citizens is affected by personal interests and that people were trying to "promote" themselves or their interests through participation and not to improve planning. There was a feeling that the environment of the city was shaped by personal choices of powerful groups and not only by the municipality.

Finally, there is a strong sense that Piraeus must regain its identity, a core element of which is the port. The port should be reorganized in order the cruise industry and tourist services to be developed.

The findings of the interviews were reinforced by a larger sample, using a standardized questionnaire. The views of residents on critical issues related to the desires and intentions as well as their experience of the city were explored. The questionnaire focused on specific interventions and traffic scenarios in the city, which respondents were asked to evaluate, stating their agreement or disagreement with them. Evaluation of the scenarios were used for the design of various interventions in the city. The scenarios included in the questionnaire reflect real dilemmas of planners.

The findings regarding bike attractiveness were very optimistic, but regarding bike sharing systems, the feelings of the residents were mixed. This is justified by the fact that there is no experience of a successful system in the wider metropolitan area of Athens, but also in Greece.

## 4. Planning for Bike Sharing System

The creation of a network of BSS stations was divided into four phases. In order to select the location of the stations, the following data were used: population density, strong poles of attractions, Piraeus' public transportation network, the proposed bicycle network, a BSS study made by the municipality of Athens for installing public bicycle system, the European average prices for bicycle numbers/ no., residents & visitors, cover / housing density, distance between stations, bike prices, costs, etc, origin and destination study made by OASA in 2006. According to this study, 24.72% of commuters live in the Municipality, while 20.6% use cars and 29.8% use public transport. This means that some short trips in the Municipality can potentially be replaced by bikes and public transport. It should be noted that for the choice of

location of stations, easily accessible -on foot or by means of transport- public spaces were preferred, provided that they do not disturb the coverage area.

The first phase is a pilot design for a network of bike sharing stations. Residents and visitors of Piraeus prefer the construction of cycling infrastructure on the beach (which meets the highest percentage of the municipality recreational uses). For this reason, the first bike rental stations will be placed along the coastal road. Additionally, an important issue for both residents and visitors of the municipality is to establish links of this the infrastructure with the existing public transport. So, they are placed in Metro and Tram stations. Twelve stations with twenty bikes on each station were proposed, following the European average ratio 'bicycles / residents and visitors' as well as the findings from a similar study in Athens. The proposed stations will be installed in the locations shown in Figure 3a and Figure 3b.

**Figure 3a: Position of the first 12 stations (Phase 1)**


Source: own elaboration

The distance between the stations is small, so a user of the system can easily and quickly go from one station to another, but even if he/she wants to approach them on foot, this is feasible. All stations were chosen to be in proximity with major poles of attraction and in direct contact with the proposed bicycle network of Piraeus.

The *second phase* will complement the first one. Links will be established to and from rail and tram network. There will be placed additional stations to serve the tourists' demand, arriving at the two ports of Piraeus (piers cruise and passenger ships). An attempt is made to exploit the existing infrastructure of Piraeus; and the one to be launched in the near future. In this way, additional areas will be served. Finally, the service of the central region and the coastal cycling network is enhanced. Ten more stations with 20 bikes per station were proposed. The proposed stations will be installed in the locations depicted in Figure 4a and Figure 4b.

**Figure 3b: Bike sharing stations – 1st phase, proposed cycling network, public transport and major poles of attraction in Piraeus Municipality**


Source: own elaboration

The distance between stations (in the first and second phase) is small, and the users can easily switch from one station to another. All new stations were chosen to be nearby and have direct contact with the proposed bicycle network.

**Figure 4a: Bike sharing stations – 1st and 2nd phase, proposed cycling network, public transport (and the new lines) and major poles of attraction in the Municipality.**

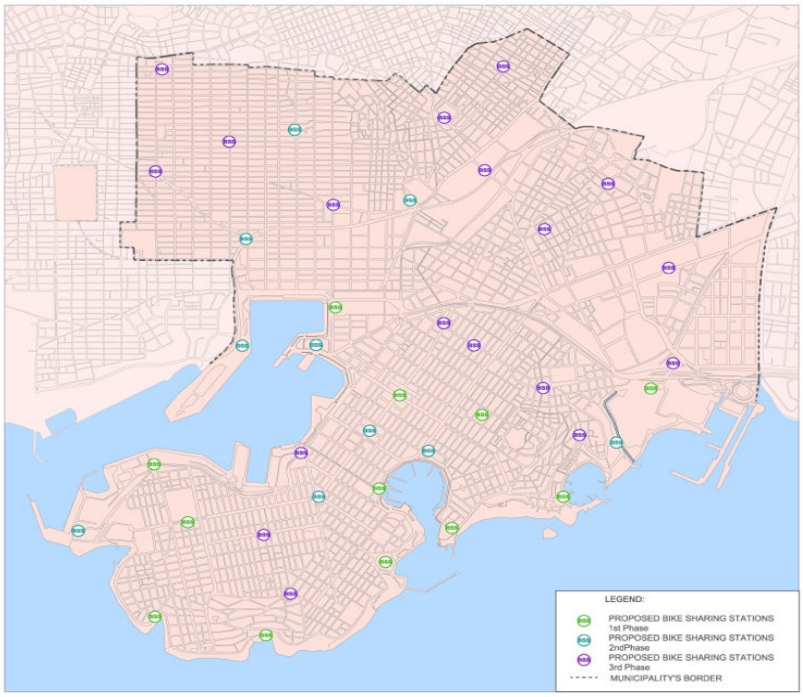

Source: own elaboration

**Figure 4b: Position of the first 22 stations (Phase 1 + Phase 2)**


Source: own elaboration

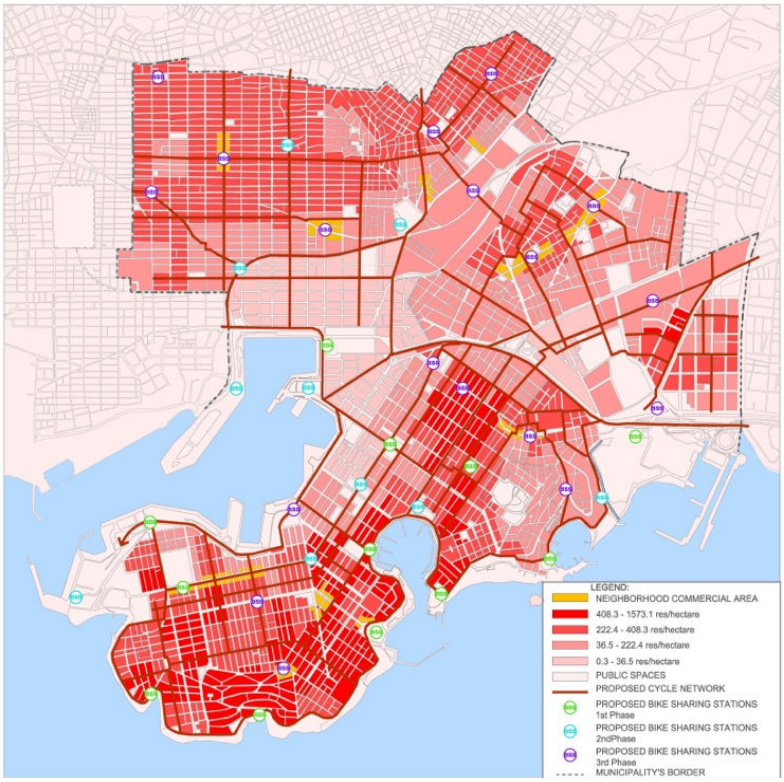
The *third phase* attempts to cover areas, which designate high population density, in order for the inhabitants to gain better access to rail and neighborhoods centers. Furthermore, in order to enhance the trips at the neighborhood scale, areas with commercial activities of a smaller scale than the one in the center of Piraeus were selected to be served. Finally, additional stations were selected, to be established in the central regions and close to powerful poles, as demand is expected to be high. Eighteen stations with 20 bikes in each were proposed. The proposed stations will be installed in the locations shown in Figure 5a and Figure 5b.

**Figure 5a: position of the first 40 stations (Phase 1 + Phase 2 + Phase 3)**



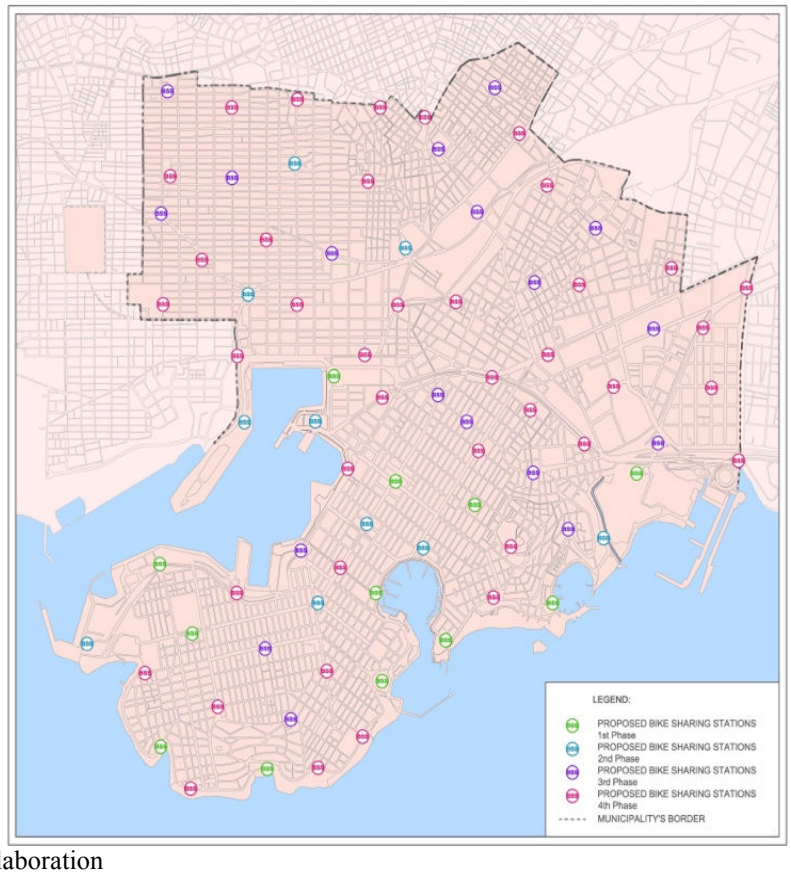

Source: own elaboration

**Figure 5b: Bike sharing stations – 1st, 2nd and 3rd phase, proposed cycling network and population density in the Municipality**




Source: own elaboration

Figure 6a: Locations of the stations – area of the municipality covered



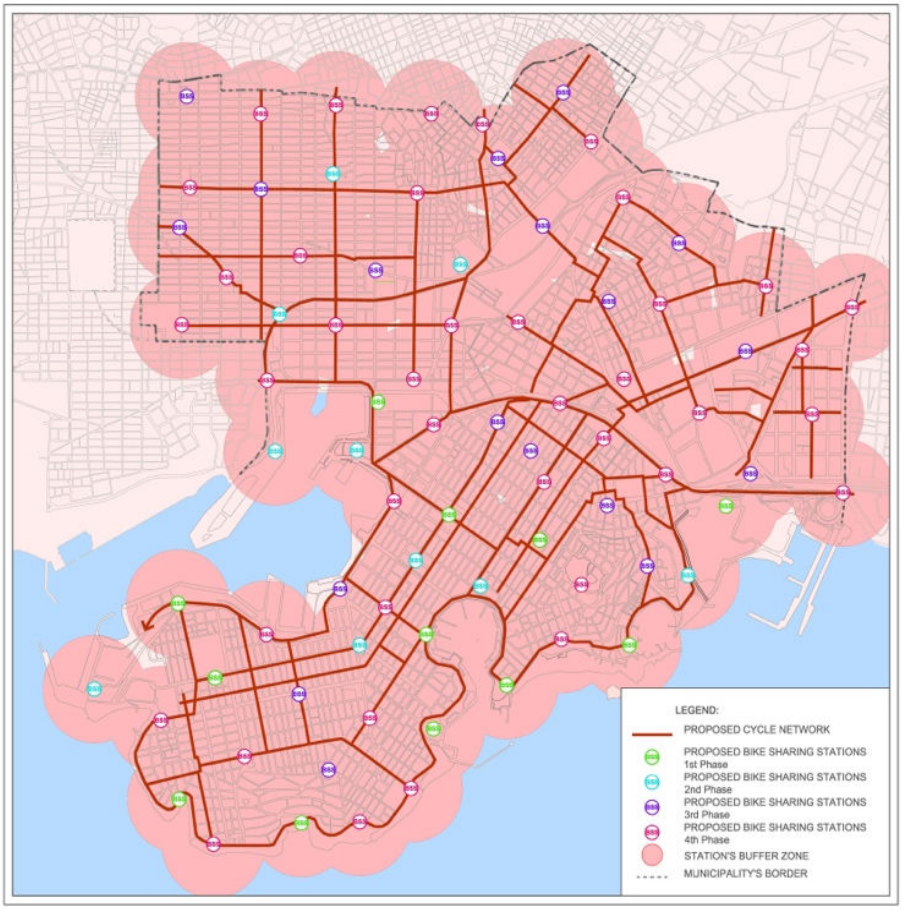

Source: own elaboration

The distances between stations are reduced, so bicycle use can be facilitated by people who are not familiar with it. All stations are located near the proposed bicycle network, and they are selected to be placed in public places (eg squares, parks).

In the *fourth phase*, the stations were selected in a way that the maximum distance between two stations to be 250m (the buffer zone of 250m from each station was selected as it is easy to travel the distance by bike). Therefore, buffer zones, influence zones of 250m around the stations of the previous phases, were created. Those areas not covered by these zones are the locations of 40 new stations of the fourth stage.

The criteria for the establishment of the new stations were: a) the location of the new stations, which have to be near proposed bicycle network; b) the selected locations for the stations should be in proximity to land uses, such as schools, sports facilities and shops; and nearby roads served by public transport (buses) (among the whole network of stations, only three stations are not in direct contact with the proposed bicycle network, but in a range of 250m.); and c) the central area of Piraeus (shopping center, and trade and recreation center) will be enriched with extra stations for shared bicycles, as in this area the demand is expected to be more intense. Forty more stations were proposed (Figure 6a and 6b).

**Figure 6b: Bike sharing stations in the Municipality of Piraeus (1st, 2nd, 3rd, and 4th Phases)**




Source: own elaboration

The final outcome is shown in the map of Figure 6b. The Municipality will have constructed 80 bike sharing rental stations, with 1600 shared bicycles. This image is a proposal for the distant future, in another society, where the bike is fully incorporated into the daily life of residents and visitors of the area.

## 5. Conclusions

Following experiences gained in other European cities, Piraeus BSS is expected to act as a complement to public transport, especially in the light of the new metro and tram lines. It will replace short journeys that are currently made by car. This is expected to improve travel conditions (both for pedestrians and motorized transport) in the central areas but also near the public transport stations. Furthermore, the problem of parking in the center of Piraeus, which today is one of the most important problems throughout the Municipality, will be dealt with.

Although it requires a great deal of funding, the implementation of a bicycle sharing system, will bring immediate benefits not only to the company that will operate it, but also to the Municipality, provided that its implementation is properly done. The city will be more attractive and easy to visit. Thus the visitors, who are now crossing Piraeus and heading to Athens, will remain to the city.

The implementation of the BSS will take place gradually in order to initially attract the visitors of the city and then the residents of Piraeus, so as to use it for their daily journeys. Initially the system is expected to serve city visitors in order to reach the major poles of attractions in this city. In this phase, residents are expected to understand the operation and usefulness of the system. Over time, they will integrate it into their everyday lives, replacing motorized vehicles.

A very important component for the success of the public bicycle system is the maintenance of the infrastructure in order for the system to be reliable. The municipality should pay attention in order to prevent vandalism and also to repair immediately possible damages. In addition to the bicycle infrastructure, bicycle applications should be developed to inform the public for the location of the stations, the number of bicycles available and the cost of using them. Moreover, applications and / or maps can be developed to present the city, attractions and possible "activities to do" so that the visitor can easily explore the city. Different routes within the city can be proposed (routes of archaeological interest or recreation). The difficulties or interest of each route should be stated, as well as alternatives to tackle those difficulties should be mentioned. Concerning the success of the system, there must be continued political support in order to persuade residents to use it. The deployment of such systems should be accompanied by citizen awareness campaigns and motivation for the use of bicycles.

It should be highlighted that in many cities, in Greece and abroad, Municipal Authorities decided to deploy BSSs without implementing other measures or infrastructures for the bike. The deployment of such systems contributes to the modern image of a city. It also helps municipalities to establish links with the younger generation, which is familiar with the use of the internet. Through the internet, availability of bikes in every station can be searched; and potential users can communicate with each other and get informed about interesting sites and preferred routes.

This system is a challenge and a dilemma for Piraeus, since no other measures regarding bicycles are implemented. Piraeus aspires to follow the example of the 1,286 cities worldwide, which have already installed more than 3,420,000 public bicycles. This attempt is undertaken in order for the municipality to strengthen its economy related to cycling tourism, so as to compete with the other southern European cities (Spanish, Italian and French), where the largest number of BSS is deployed (132 cities in Spain, 104 in Italy etc.). The deployment of a bike sharing system can bring direct kind of profits in the city of Piraeus, as it can improve its image, strengthen economic activities, raise the number of visitors', as well as reduce pollution, noise and energy consumption levels. The benefits to the city's social environment are also not negligible: health, safety, socialization, liveliness of public spaces.

All these show that Piraeus' public electronic bicycles are not a luxury but a high-performance investment, which is even more efficient when accompanied by cycle paths, low traffic streets and enhanced public transport.

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# HUMAN PRESSURES AND CARBON ASSESSMENT OF POSIDONIA OCEANICA MEADOWS IN THE AEGEAN SEA: LIMITATIONS AND CHALLENGES FOR ECOSYSTEM-BASED MANAGEMENT

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**Abstract**

In the last decades the interaction between marine users is becoming more complex as there are growing needs of different sectors competing for the limited sea space. EU has adopted new institutional structures such as the Marine Strategy Framework Directive (MSFD) and the Maritime Spatial Planning (MSP) Directive promoting the sustainable management of marine and coastal areas. A key aim of these structures in line with "Blue Growth" objectives is the sustainable use of maritime space following an ecosystem-based approach. This study explores interactions among existing human activities in the Aegean Sea (Greece) so as to identify areas which would be mostly benefited by spatial planning. Conflicts between existing uses are discussed along with the cumulative impacts of these uses on a key priority habitat, the seagrass Posidonia oceanica that provides important services to human well-being. Then the study links impacts with the value of a key service provided by seagrasses, carbon sequestration. Finally, it discusses the potential of such a joint analysis to support prioritization of areas or stressors of concern. In this context, limitations and challenges arising due to the inherent complexity of the involved factors and parameters are acknowledged.

**Keywords:** cumulative impact assessment, ecosystem services, Posidonia oceanica, carbon stock provision, maritime spatial planning

**JEL classification:**

## 1. Introduction

The demand for sea space is rising rapidly because of different and mostly competitive human uses (aquaculture, fishing, transportation, oil and gas exploration, wind parks etc.); it is more prominent in multi-use coastal areas, where various social and economic factors interplay adding to the complexity of adopting a sharing understanding of existing conflicts and finding resolutions. The major environmental and social management challenges that we face today are the result of cumulative impacts from a large number of activities that although individually may be insignificant, synergistically they may have regional or even global repercussions (IFC, 2013). Understanding how coastal/marine space is used, and how human pressures interact with natural drivers of change ultimately affecting marine ecosystems is a priority for effective management (Guarnieri et al., 2016).

Indeed, escalating impacts of human activities on the marine environment imperil the delivery of important ecosystem services (ES) (Salomidi et al., 2012) and hence of goods and benefits contributing to human welfare. These range from the provision of fish and aggregates, to regulation of the planet's climate and protection of our coastlines, offering a setting for recreation, cultural and spiritual experiences (Mace et al., 2011; Liquete et al., 2013; Hattam et al., 2015). Marine ecosystems today contribute with services that can be

valued at more than 2,5 trillion USD annually to the global economy (Global Opportunity Explorer, 2017, accessible at: http://www.globalopportunityexplorer.org/markets/regenerative-ocean-economy-accessed 06/12/2017), whilst the livelihoods of over 3 billion people worldwide depend upon services from marine and coastal biodiversity. Hence, the collection of information regarding the distribution and intensity of stressors on marine ecosystems, and particularly conservation priority ones, is a prerequisite to ensure the adoption of suitable measures for collective pressures to be kept within levels compatible with the preservation or restoration of Good Environmental Status (GES) sensu the Marine Strategy Framework Directive (MSFD) (EC, 2008). The latter implies that human pressures should not exceed the capacity of the marine ecosystem to withstand human-induced changes, whilst enabling the sustainable use of the marine environment now and in the future (MSFD Article 1(3)) (Crise et al., 2015).

A key ecosystem component for the Mediterranean is the endemic seagrass, Posidonia oceanica, extending from the coastline down to 40–45 m depth, being a priority habitat for conservation under the Habitats Directive (Council Dir 92/43/CEE) (Díaz-Almela and Duarte, 2008). It is used to develop biotic indices for the purposes of the EU Water Framework Directive (WFD) (EC, 2000) monitoring, and has been suggested as a useful tool for the MSFD monitoring (Panayotidis et al., 2015). Posidonia meadows provide, among other services, an essential habitat contributing to food provision and opportunities for recreational fishing (Jackson et al., 2015), leaves are used as material, it contributes to wastewater treatment (Lamb et al., 2017), protection from coastal erosion, carbon sequestration (Duarte, 2000). Indeed, the outstanding role of P. oceanica as a carbon sink in the Balearic Islands, with an accumulation five times higher than the average recorded for the whole region, has been also confirmed recently (Serrano et al., 2014). In addition, Posidonia meadows contribute indirectly through fish production to local traditional fisheries communities by sustaining livelihoods (Vlachopoulou et al., 2013) through the creation of revenue, employment, food security, especially where alternative employment and income resources are limited. On a global scale, seagrasses undoubtedly provide many ecosystem services that benefit human needs directly or indirectly (Nordlund et al., 2016); they are usually assigned an annual economic value between €12.000 and €16.000 per hectare, while estimates may reach €25.000 per hectare in seagrass beds in Florida, taking into account profits from fishing only (OCEANA, 2010).

However, intensive coastal anthropogenic pressures, contribute to the ecological degradation of this major benefit provider. A recent study in Greek waters has shown that the main human activities/uses affecting seagrass meadows status were small and medium scale fisheries, land-based activities (agriculture, industry, urbanization), aquaculture and coastal defence infrastructures (Brodersen et al., 2017). Furthermore, declining of the meadows at alarming rates (34% in the last 50 years) has been documented and was mainly ascribed to cumulative effects of multiple local stressors (Telesca et al., 2015).

Although there are gaps and challenges for treating uncertainty in cumulative impact assessments, with most efforts lacking standardization of processes when conducting assessments (Stelzenmüller et al., 2011), they remain one of the few comprehensive quantitative tools to measure how humans are affecting natural systems. Hence, they have helped identify which areas and ecosystem types are relatively pristine or heavily impacted, where hotspots of biodiversity and impacts overlap, and which stressors dominate human impact. In this way, biodiversity conservation, threat mitigation and spatial planning decision processes can be informed (Halpern et al., 2013) and improved (Fernandez et al., 2017), especially in the light of the European Directive on maritime spatial planning (MSP) (EC, 2014).

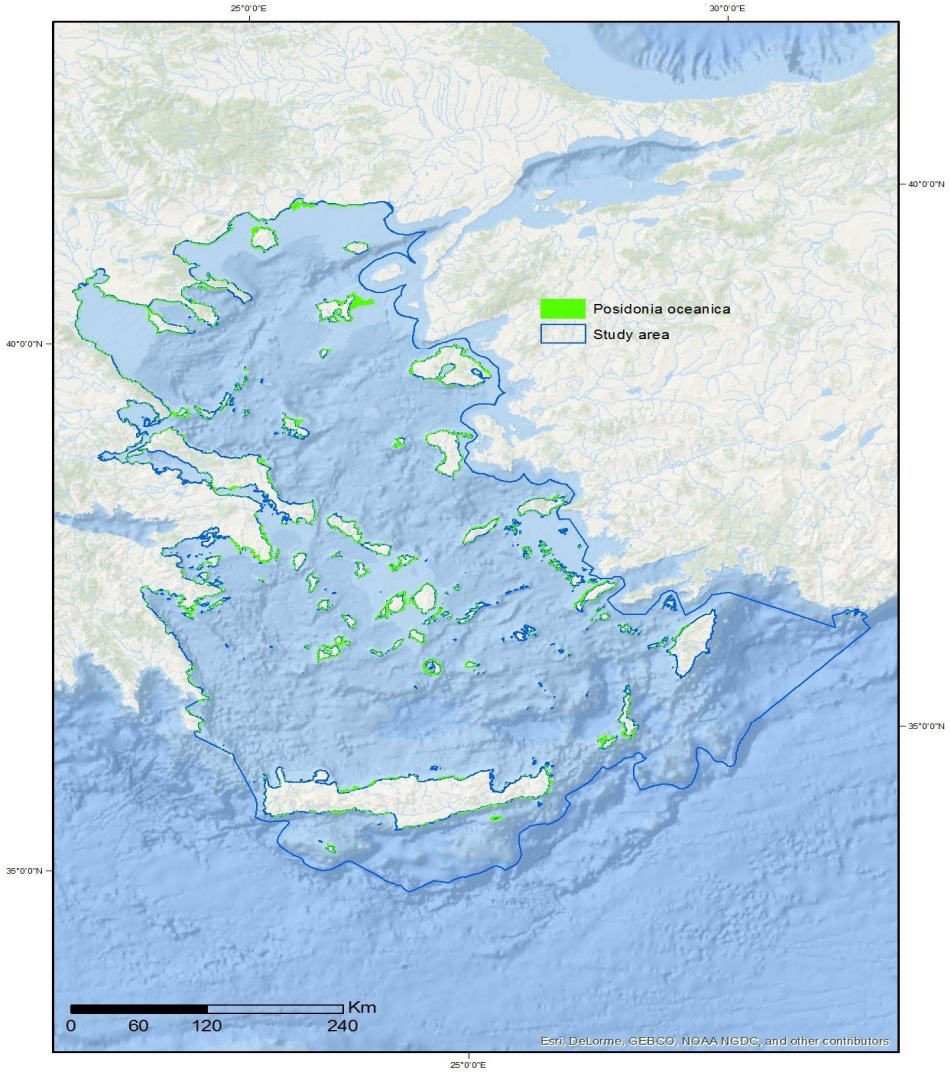
In the present study, cumulative impact assessment was used to explore the impact of human activities on Posidonia oceanica meadows in the Aegean Sea (Greece) and relate it to a key ecosystem service that of carbon stock provision. The ultimate aim was to investigate the potential of such a joint analysis to derive a more informed spatial management plan that would thus more effectively sustain delivery of ecosystem services (Arkema et al., 2015).

## 2. Material and methods

### 2.1. Study area

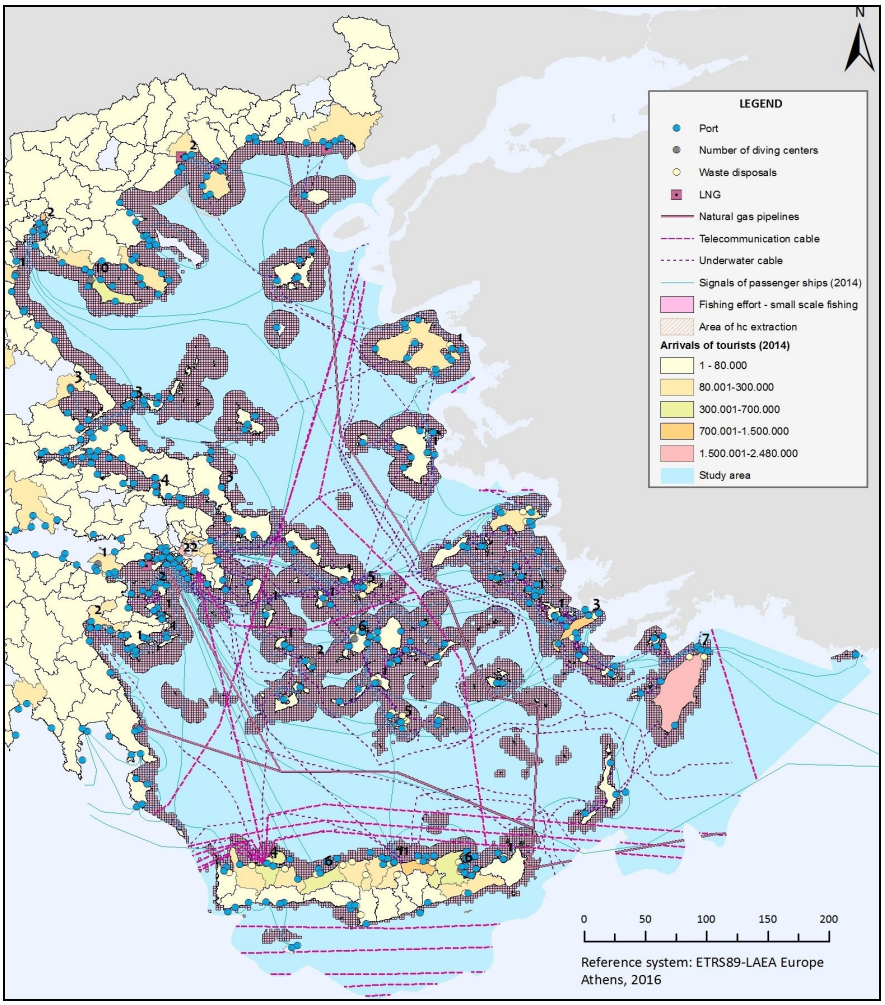
Aegean Sea is located in East Mediterranean Sea, it covers 213.168 km$^2$ (Figure 1) where a number of conservation priority habitats such as *Posidonia oceanica* meadows, coralligenous formations, as well as essential fish habitats such as nursery grounds for target commercial species exist. In Figure 1 the distribution of *Posidonia oceanica* is presented. At the same time, the Aegean Sea is an area with various human uses such as tourism, transportation, fishing, aquaculture (Figure 2).

**Figure 1: Study area and *Posidonia oceanica* meadows**




Source: Topouzelis *et al*. (2018)

**Figure 2: A subset of the activities that are present in Aegean Sea**




Source: Katsanevakis *et al*. (2017)

## 2.2. Assessment of human impacts on *Posidonia oceanica*

The first steps for the cumulative impact analysis are to define: (a) the goal of the study (which ecosystem components are to be examined), (b) the cause of the changes that add pressure on the ecosystem, and (c) the relation between ecosystem components and the cause of the changes that is translated to sensitivity or vulnerability to these factors of change. The outputs of a cumulative impact assessment, are the following:

- areas where the density of human uses and impacts is equally high
- areas where the density of human uses is low but the density of impacts is high (in this case the ecosystem components can be really sensitive to a human use)
- areas with high density of human uses and low impacts (in this case human uses have not great impacts in ecosystem components)

Cumulative impacts assessment is based on a methodology suggested by Halpern *et al*. (2007) applied to a global scale (oceans) and then used widely in many studies such as the analysis of the Mediterranean Sea (Micheli *et al*., 2013) and Baltic Sea (Andersen *et al*., 2013 & Korpinen *et al*., 2012).

According to this methodology, pressures from human activities are converted to impacts and represented as total scores of cumulative impacts allowing the identification of vulnerable areas. The modelling of cumulative impacts is based on the consideration that human activities act separately and therefore the sensitivity of each ecosystem component to these can be estimated as a cumulative score. The normalization and homogenization of the available spatial data based on a grid using a cell size that can be determined by the maximum analysis of the available spatial data (Stelzenmüller *et al*., 2011).

Halpern *et al*. (2008) estimate a unitless human impact score **I** for each cell (x,y) of a regular grid as

$$I_{\text{sum}}(x,y)=\sum_{i=1}^{n}\sum_{j=1}^{m}D_i(x,y)e_j(x,y)\mu_{i,j}$$

where:

- $D_i$ is the log(X+1)-transformed and rescaled (to maximum 1) intensity of stressor i
- $e_j$ is the presence (1) or absence (0) of ecosystem component j
- $\mu_{i,j}$ is a weight representing the sensitivity of ecosystem component j to stressor i.

The main output of this model is a regular grid where each cell contains an impact score representing the per-pixel average of each ecosystem vulnerability-weighted stressor intensities was calculated and mapped for selected ecosystems.

According to the model, the total impact is zero when no human activity or ecosystem component is present while the more ecosystem components and human activities are present in an area the more is the total impact score I.

For the purposes of our analysis, the study area was divided into a regular square grid of 1 $km^2$. In order to apply the methodology, we used human uses as separate activities (e.g., small-scale fishing) and not as general categories (e.g. fishing) because of the study area's particularity (large extent, small island areas) and the available data. The cell size set as calculation unit was 1km * 1km which was considered as suitable - after various experiments with different cell sizes (2 km * 2km, 100m *100m etc.) – for the selected study area and the data resolution. We collected data for the following datasets:

- Fishing effort for small scale fishing, purse seiners and for trawlers (Kavadas and Maina, 2012; Kavadas *et al*, 2015).
- Areas of aquaculture Passenger and commercial ports, marinas, anchorages and fishing ports
- Route of Passenger and commercial ships
- Areas of research and exploitation of hydrocarbon
- Gas pipelines as well as main underwater telecommunication cables
- High developed touristic areas Population of coastal areas
- Public wastewater treatment plants areas Main industrial units
- Agricultural runoffs

The ecosystem component that was examined was *Posidonia oceanica* meadows (1,618.7 $Km^2$). The vulnerability assessment of the ecosystem components to human pressures was calculated by experts' judgement based on Halpern *et al*. (2007) criteria. To calculate the total impact scores, we used the model given by Halpern. Each $D_i$ * $E_j$ was multiplied by the corresponding weighting factor and then summed up for the ecosystem component resulting to the cumulative impact score (I) for each cell of the study area. The cumulative impact scores were mapped using the same thresholds used in Halpern *et al*. (2008) to define meaningful categories of the cumulative impact scores: high (12–15,52); medium high (8,47–12); medium (4,95–8,47); low (1,4–4,95); and very low impact (1,4).

### 2.3. Assessment of carbon storage

Estimates on the economic value of carbon sequestration and storage in coastal and marine vegetated ecosystems are limited and vary widely. *Posidonia* acts as the best marine carbon sink of the Mediterranean (Luisetti *et al*., 2013), linked to a vast long-term carbon stock accumulated over millennia, creating a reservoir representing 11 to 42% of the $CO_2$ emissions produced by Mediterranean countries since the beginning of the Industrial Revolution (Pergent *et al*., 2012). Available estimates demonstrate that this seagrass species has an estimated carbon burial rate of 1,82 t C ha/year (Gacia *et al*., 2002). Barron *et al*. (2006) estimate that this specific meadow can fix 400 g C /$m^2$/year while, Pergent *et al*. (2012) report that the carbon storage capacity varies between 8-487 g C /$m^2$/year for the short term (1-6 years) and 6-175 g /$m^2$/year for the long term (> 100 years).

Considering the price per ton of $CO_2$, estimates of this service have been produced. Campagne *et al*. (2015) use the above long-term sequestration of carbon estimate achieved by

*P. oceanica*, a price of 35 €/t (€2014) and elicit a value between 7,7 and 230 €/ha/year (€ 2014) (770 to 23.000 €/km$^2$/year), that is between 688.000 and 20.550.500 €/year (€ 2014) (in France). At a regional scale, Diaz-Almela (2014) estimated that the *P. oceanica* meadows in Andalusia sequester 31.531 $CO_2$ tons (8.592 C tons) per year, equivalent to a total value of 83.854.149 € (€ 2011) (4,80 €/ t$CO_2$) if traded in the voluntary carbon market, and 315.850.629 € (€ 2011) (18,08 €/ t$CO_2$) if traded in the Kyoto carbon market. Mangos *et al*. (2010) assess benefits relating to climate regulation based on the marine environment's capacity to absorb anthropogenic $CO_2$, valued at the price per tonne of $CO_2$ in force under the European Emission Trading Scheme in 2005 (i.e., 20,5€/t$CO_2$). In order to quantify this ecosystem service, the estimate provided by Huertas (2009) was used (an annual average rate of anthropogenic $CO_2$ sequestration amounting to 11,8 t/km²/year), which gave a total sequestered volume of 108 million tonnes of $CO_2$ per year for the Mediterranean as a whole. Regarding Greece the authors estimate a value of 98 M/year (€ 2005).

Furthermore, Luisetti *et al*. (2013) estimate the accounting value of the stock of carbon storage service in currently existing seagrass beds (*P. oceanica* and *Z. marina*) in Europe at US$168.749.727 (in 2012), using mean EU allowances price of traded carbon and Gacia *et al*. (2002) storage estimate of carbon for *P. oceanica*. They also estimate the present value (US$) of the C storage service loss economic value in European seagrass beds in three scenarios, the optimistic, pessimistic and ultra-pessimistic scenario, over 50 years (2010–2060), discounted at 3,5% discount rate, at 'social cost of carbon' prices (US$ 5, 50, 312) and 'British Department of Energy and Climate Change' prices (all relevant year values).

In our study, in order to estimate the accounting value of the stock of carbon storage service in currently existing *Posidonia* in Aegean Sea, the following assumptions are made. We use the long-term sequestration of carbon estimate of Pergent *et al*. (2012), that is the 6-175 g C/m$^2$/year estimate (plant and matte), that corresponds to 22-642 t $CO_2$ /km$^2$/year, assuming 1 C t = 3,67 t $CO_2$ (Trumper *et al*., 2009). Furthermore, the current extent of *Posidonia oc*. of 1.618,7 km$^2$ (Topouzelis *et al*., 2018) is considered, while regarding price we use the mean price of traded carbon from EU Emissions Trading System in 2015 (8 €/t$CO_2$). It is noted that prices seem very volatile as from 30 €/t$CO_2$ in 2008 plunged to as low as 5 €/t$CO_2$ in 2014 (Carbon Market Watch, 2014), while in 2015 had an annual average value of about 8 €/t$CO_2$ (Investing.com, 2017 accessible at: http://www.investing.com/commodities/carbon-emissions-historical-data,accessed 06/12/17).

In addition, we value economic losses due to a potential degradation from cumulative impacts in the area for a 10-year period and we estimate the present value of the flows of carbon storage benefits foregone over this time horizon using a 3,5% constant discount rate (HM Treasury, 2013). Finally, the impact of price changes on foregone benefits estimation is assessed. It is reminded that future benefit losses are based on the risk identified from the assessment of human impacts (previous section) considering a scenario of lack of protection for this ecosystem in that area.

Overall, it is acknowledged that the analysis here is for illustrative purposes and that it is a snapshot i.e. it describes the loss in benefits from losing a specific area of *Posidonia oc*. in the near future. In reality this loss might be reached over time however, this is hard to assess. Nevertheless, the analysis helps to provide a rough indication of the magnitude of benefits forgone from potential degradation on the particular habitat as a result of marine activities.

## 3. Results

### 3.1. Cumulative impacts in the Aegean Sea

Results are presented in Table 1 and Figure 3. According to the assessment, areas of high anthropogenic impacts are mainly located in Chalkidiki (Area 1), Attica (Area 2), Cyclades (Area 3) and Crete (Area 4) areas (Figure 4). The activities that mainly contribute to these pressures (Table 2) are small scale fishing (89,5% of the total area), population density (88,3%), agriculture (71,3%) and tourism (60,2%). However, total pressure from all activities is low-very low at the 89,1% of the total area under study.

**Table 1. Cumulative impacts on Posidonia oceanica**

| Total impact | Score | Number of cells | % of the total area |
|---|---|---|---|
| Very low | 0-1,4 | 465 | 9,3% |
| Low | 1,4-4,95 | 3977 | 79,8% |
| Medium | 4,95-8,47 | 471 | 9,4% |
| Medium to high | 8,47-12 | 69 | 1,4% |
| High | 12-14,01 | 5 | 0,1% |
| Sum | | 4987 | 100% |

**Figure 3: Cumulative impacts on *Posidonia oceanica* in Aegean Sea**

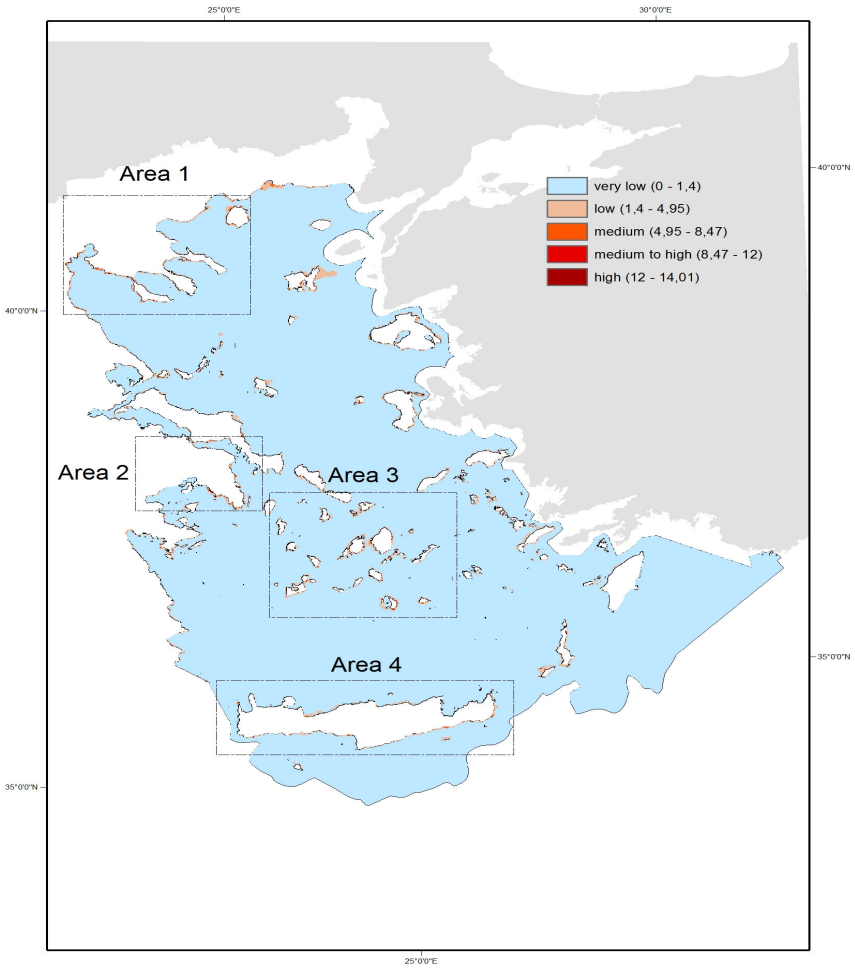


**Figure 4: Cumulative impacts on *Posidonia oceanica* (a) Area 1: Chalkidiki, (b) Area 2: Attica, (c) Area 3: Cyclades, and (d) Area 4: Crete**

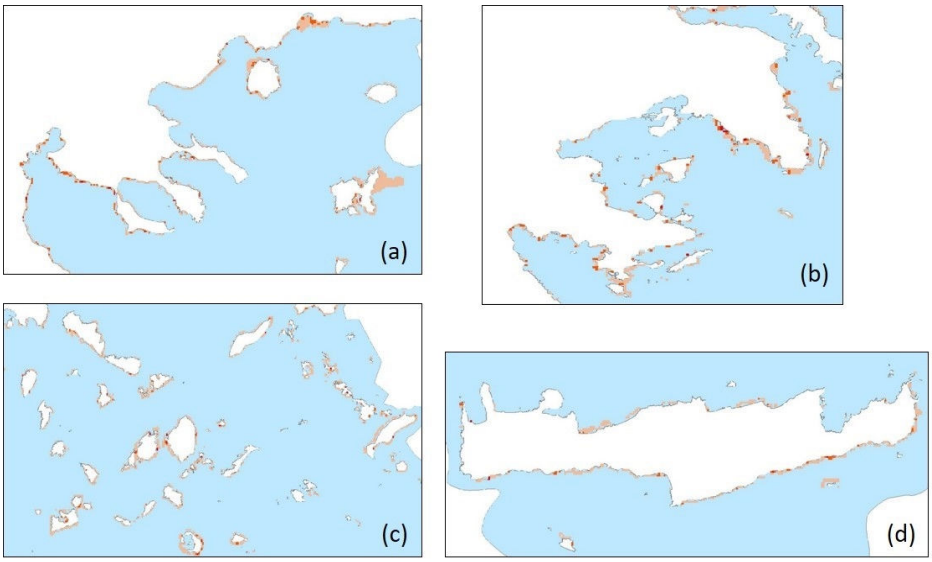



**Table 2. Impacts on Posidonia oceanica per activity**

| Human activity | % of the total area | Number of cells with impacts |
|---|---|---|
| Population of coastal areas | 88,3 | 5850 |
| Agricultural run offs | 71,3 | 4818 |
| Tourism | 60,2 | 4789 |
| Fishing ports | 19 | 1809 |
| Ports | 12,4 | 1155 |
| Marinas | 0,5 | 38 |
| Anchorages | 0,9 | 70 |
| Aquaculture | 8,6 | 792 |
| Public wastewater treatment plants areas | 3,3 | 290 |
| Industrial units | 0,4 | 52 |
| Fishing effort for purse seiners | 43,6 | 3292 |
| Fishing effort for small scale fishing | 89,5 | 7884 |

### 3.2. Assessment of the value of the stock of carbon storage service

Regarding the assessment of the value of the stock of carbon storage service in currently existing *Posidonia oc.* in our case study area, it could range between 285.000 to 8 M € /year or 176 to 5.000 € /km$^2$/year (€ 2015). For this estimation we consider the distribution of the habitat (i.e., about 1.618 km$^2$), a range of 35.600 – 1.038.700 t$CO_2$ /year (potential long-term sequestration) and the 2015 mean price of traded carbon. Then, this information is combined with cumulative impacts analysis to explore the potential risk of degradation. In particular, it is assumed that those areas where cumulative impacts are 'medium' (i.e., about 10%), that is about 162 km$^2$, will likely lose the capacity to offer this service. This degradation could be translated to 28.500 to 810.000 €. Hence, the present value of loss in flows of carbon storage benefits over for example a 10-year period using a 3,5% discount rate may range from about €245.000 to 7M. As highlighted before, this simplistic analysis is only presented for illustrative purposes as uncertainty is involved in initial estimation of carbon sequestration as well as present value estimations. Regarding the latter, we can see here for example how sensitive results are to price change. Hence, considering a scenario of average yearly price increase of about 16% for the next years (e.g., till 2024) (Carbon Market Watch, 2014), the present value of loss in benefits over 10 years using a 3,5% discount rate may range from €557.000 to 16M. Finally, with regards to the analysis here it should be also noted that the beneficiaries of this service are not strictly national since benefits are transboundary.

## 4. Discussion and conclusions

Seagrasses provide essential ES at different scales, for example from supporting key commercial fisheries and local livelihoods to regulating the climate through carbon sequestration at national and international level. In this study, we attempt to explore the importance of carbon provision in relation to *Posidonia* meadows by using a joint analysis and new available data, i.e., seagrass distribution using satellite images (Topouzelis *et al*., 2018). Although, it is noted that a considerable number of ES research efforts in Greece focus on marine and coastal ecosystem services (Dimopoulos *et al*., 2017), we are not aware of any studies with a focus on the valuation of this particular service in the scale of our case study area. With regards to the particular habitat, Halkos and Galani (2016) value *Posidonia oceanica* in Greece by employing non-market methods. In this choice experiment study related to MSFD, the habitat is an attribute defined as the '% of *Posidonia* that is not impacted by anchors. Analysis showed that respondents of three Aegean regions were willing to pay €4,46 per household (in 2012 prices), through increased water bill for eight years, to maintain the good environmental status of *Posidonia oceanica* in the country compared to the business as usual. However, the authors in their analysis note the low total adaptation of the model.

The results of our combined analysis highlight that although cumulative impacts may be low at the scale of Aegean Sea region, when proceeding to fine scale assessments results are not negligible, emphasizing the issue of scale in relation to the availability of geospatial data. The human uses potentially contributing to final scores include small scale fishing, urbanization and tourism. Furthermore, results demonstrate the economic importance of the carbon storage service of *Posidonia oceanica* meadows which might be impacted by cumulative activities in the case study area. For the purposes of this study, this can increase awareness, across local authorities, users of the marine and coastal space and the general public, about the contribution of the marine environment to human wellbeing, especially considering that *P. oceanica* re-growth requires several centuries. Overall, the estimation of the value of organic carbon (C) stocks in *P. oceanica*, provide a baseline against which future change scenarios can be compared (e.g. with or without management measures that might be required to achieve MSFD goals). Hence, the availability of a baseline can enable an informative marine management by investigating areas that maximize ES and minimize the cost of degradation. Of course, in such an assessment consideration should be also given to social sustainability (who benefits and who losses). It is also noted that cumulative impact assessments and/or combination of these with other scenario development tools can be employed in generating options while operationalizing MSP (Stithou 2017). In addition, there is a clear role for ecosystem service valuation not only to be combined with cumulative impact assessment for generating options, but also at many stages of the marine planning process as presented in Börger *et al*. (2014).

Nevertheless, the methodology used is quite sensitive to specific factors. Regarding cumulative impacts assessment, geospatial data is one of the key factors: despite existing maps illustrating human impacts on marine ecosystems, information remains either large scale but rough and insufficient for stakeholders (1 km² grid, lack of data along the coast) or fine scale but fragmentary and heterogeneous in methodology (Holon *et al*., 2015). Acquiring data at a finer scale is either difficult or of high cost and it is usually used in order to respond to specific and local objectives (the study of protected areas, a specific habitat or particular features). As a result, they mostly remain local and thus these studies are heterogeneous in their methodology. Another factor of crucial importance is scale. As Korpinen *et al*. (2013) point out, with too large scales, a severe local human impact would be diluted among weaker impacts, whereas too detailed scale is laborious to work on and is useful only for assessments on smaller scales. Moreover, large-scale predictions and their limitations may be particularly hard to use for regional managers and local policy makers focusing on specific interests (i.e. < 1km² grid cells) (Holon *et al*., 2015).

A third element to be considered is the weighting factors assigned by the experts. The assessment of habitat vulnerability based on expert opinion can be a practical solution in large-scale evaluations of potential effect of human pressure but is probably unrepresentative of the actual vulnerability at local scale (Guarnieri *et al*., 2016, p.12). The use of expert

judgment instead of direct empirical assessments to calculate impact weights greatly increases uncertainty of impact scores. Empirical quantification of the ecological impacts of drivers is currently unavailable and filling this gap is acritical need within the Mediterranean and other regions (Micheli *et al*., 2013). Regarding carbon storage assessment, variations in both price and storage in coastal and marine vegetated ecosystems are large. This is due to uncertainties about the amount of carbon stored and/or released, and by the lack of common value assigned to a unit of carbon (Russi *et al*., 2016). Hence, the monetary assessments may change greatly over time because of fluctuations in price and quantity. The estimated physical quantity at local level involves uncertainty as it depends on biological processes, which in turn depend on ecosystem quality and environmental conditions. As a result, the estimated amount of carbon storage may vary significantly in time and spatially (Duarte *et al*., 2011). Values of the sites that can be effective for blue carbon and conservation, are the sites where seagrass have significant matte and thickness, reflecting a long period of good environmental conditions for plant growth. However, this information is not available yet in the study area and our analysis is based on seagrass distribution using satellite images (Topouzelis *et al*., 2018), which is related to specific limitations. Furthermore, variations in the degree of emissions triggered by different levels of destruction (conversion) (Luisetti *et al*., 2013) are also to be expected and hence further investigated. Finally, it is also acknowledged that the assessment of a potential degradation over time is simplified here as the analysis describes the loss in benefits from losing a specific area of *P. oceanica* tomorrow.

Overall, it is emphasized here that as also demonstrated in other cases (e.g., restoration investments) a joint spatial analysis of stressors and ecosystem services can provide a critical foundation for maximizing social and ecological benefits (Allan *et al*., 2013). However, challenges and limitations exist and should be prioritized and targeted to get overcome. Through our experience broad recommendations in order to increase the robustness of results include further research with regards to better knowledge linking the impact of marine activities on the specific ecosystem and the provision of not only the particular service but also other prioritized services, if our aim is to use these tools for marine management and planning. Availability of habitat mapping enriched with information about local conditions and habitats status (e.g., its density, quality), apart from distribution would add towards this attempt. Importantly, while planning can be based on the best information available at the time while keeping in mind the "precautionary" and "proportionality" principles, the adoption of an adaptive management is expected to reduce uncertainty over time.

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# TOWARDS AN INTEGRATED PARTICIPATORY MARINE/COASTAL AND TERRITORIAL SPATIAL PLANNING APPROACH AT THE LOCAL LEVEL – PLANNING TOOLS AND ISSUES RAISED

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**Abstract**

Future development of coastal and island communities is nowadays marked by two evolving trends, namely the rapid urbanization and the increasing interest in sea-related activities. Coping with these trends as well as other challenges faced in these areas (climate change, coastal erosion etc.) lies at the heart of policy concern, while has also opened up new fields of research work and concern as to the methodological aspects that can support an integrated planning view of terrestrial and marine environments and their interactions. By drawing on knowledge acquired from relative studies at a macro-regional level, this paper attempts to shift to the local level; and structure an integrated methodological approach enabling the concurrent confrontation of territorial and maritime planning issues and policy making. The paper places emphasis on testing well-established planning tools (MICMAC and MACTOR models) that are capable of perceiving, in a structured way, the integration of land and marine environments into one system as well as integration of views, interests, stakes etc. of land and maritime stakeholders. Implementation of this framework in an island region – Zakynthos Greece– designates the value of these planning tools in: feeding the planning process with valuable knowledge, emerging from the study of interaction of land and maritime subsystems as well as of respective stakeholders; and effectively supporting implementation of subsequent planning stages for building up more informed policy decisions.

**Keywords:** Blue growth, Integrated marine and land spatial planning, Policy, MICMAC and MACTOR models, Island regions.

**JEL classification:** R00, R11, R14, R50, R58.

## 1. Introduction

*"How inappropriate to call this planet earth when it is quite clearly ocean"*
*Arthur Clarke*

The rapid *urbanization* of coastal areas, resulting in high concentration of population and a rising competition for land, is a remarkable trend of recent decades in the European Union (EU), especially in the Mediterranean Region (Stratigea et al., 2017). This trend is nowadays further intensified by the increasing *interest in sea-related activities*, e.g. fisheries or shipping, offshore renewable energy, maritime tourism (recreational boating and cruise ships), mariculture etc., which were set up by the Blue Growth Strategy of EU; and have resulted in a more intensive use of the marine environment. At the same time, coastal areas are confronted with a range of contemporary challenges e.g. *climate change* resulting in sea level rise, acidification, coastal erosion, increasing water temperatures, and frequency of extreme weather events, etc. (Giannakopoulos et al. 2005; Lionello et al. 2008; Stratigea et

al., 2017), rendering them *areas at risk*, severely threatening both land and maritime activities.

The above *trends*, but also *risks*, have generated the necessity for setting up marine and coastal management strategies and policies in order to: assure the sustainable exploitation of coastal and marine resources; cope with conflicting interests in land and maritime environments; and avoid their environmental decline (Cohen, 1995).

Taking into consideration the growing interest in the sustainable management of marine resources, as this was highlighted by the Blue Growth (BG) Strategy of the EU, but also other policies targeting innovation and new job creation, new research and methodological issues in the field of *spatial planning* arise. More specifically, effective implementation of the BG Strategy requires *Marine Spatial Planning (MSP)* as a tool for the sustainable management of marine resources, implying the spatial delineation of maritime uses in such a way that emerging *conflicts* can be properly handled; while *synergies* among various stakes in the marine environment can be promoted.

In conducting MSP studies, it should be taken for granted that a marine management area can be substantially affected by human activities that are: *upstream* emanating from the drainage area of the adjacent coastal region (e.g. agriculture); and *downstream* emerging from the open ocean. Indeed, as Dahl (2009:62) argues, *"pressures on the resources of the marine management area may be greater from activities outside the marine area than from activities inside it."* This fact illustrates the importance of drawing the spatial boundaries of analysis broader than the boundaries of the marine management area.

Most of MSP case studies conducted so far refer to a *macro-regional level*. However, when shifting to a more *local level*, e.g. an island region or a small-scale coastal community, successful MSP needs to take into account potential territorial developments and related policies as well as future visions and respective planning objectives in the terrestrial part along with their impact on the marine part and vice versa. Towards this end, there is a need for assessing the influence of territorial policy decisions and development choices or paths on marine resources and ecosystems, as well as the impact of various maritime policies (e.g. aquaculture development) on the terrestrial in general and the coastal in particular, part of a region. This, in turn, calls for building up an *integrated spatial planning approach*, i.e. an *inter-sectoral and land-sea cross-cutting approach* [COM(2008)395] that can effectively manage terrestrial, coastal and maritime activities and their interactions in a sustainable way; and achieve greater *coherence* between different sector- and space-related policy areas, since actions in one policy area may have positive or negative, intended or unintended, effects on other policy areas of concern [COM(2008)395]. Such an *integrated approach*: touches upon different sectors in land, coastal and maritime environments, different levels of governance, a variety of land- and marine-based stakeholders, etc.; and establishes the ground for identification of *synergies* and exploration / management of *conflicts* both within land or marine environments in isolation, as well as in between them.

The present paper elaborates on such an approach, taking as a case study example an island region, *Zakynthos – Greece*. In this specific case study, valuable marine ecosystems and terrestrial compartments are under severe pressure due to the high concentration of mass coastal tourism activity. The *goal* of this paper is to streamline an *integrated methodological framework* and *test well established planning tools* falling into certain steps of this framework, which have so far been successfully used for territorial but also sectoral planning purposes. These can pave the way towards *better informed and integrated policy directions for future sustainable territorial and maritime development*, taking into account specificities of land and marine environment as well as their interactions.

The *structure* of the paper has as follows: first it sheds light on MSP in EU, in order more insight to be gained on the evolving interest and value attached to European Seas and coastal areas as 'laboratories' of growth and development; this is followed by a short discussion on the experience gained by the exploration of a number of MSP studies at a macro-region level, illuminating, among others, methodological aspects as well as aspects of stakeholders' engagement, as a critical issue in MSP; shifting to the local level, an integrated methodological approach is presented, which aims at testing land-based planning tools for conducting a structural and a stakeholders' analysis in the specific case study (island of

Zakynthos – Greece); finally, some conclusion are drawn based on the experience gained from this work.

## 2. Maritime Spatial Planning in the European Context

The effort of *coastal and maritime resource management and protection* in the EU can be first traced in 1975, when 16 Mediterranean countries and the European Community adopted the Mediterranean Action Plan (MAP, 1975), the first-ever Regional Seas Programme under UNEP's umbrella. In 1995, the Action Plan for the Protection of the Marine Environment and the Sustainable Development of Coastal Areas in the Mediterranean (Action Plan, 1995 - MAP Phase II) (UNEP(OCA)/MED IG.6/7) was adopted by the Contracting Parties in order to replace the 1975 MAP with some amendments. The Contracting Parties are now 22 (Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, the European Community, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia, Turkey). The amended Convention, recorded as "Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean" has entered into force on 9 July 2004.

Following this effort, the European Commission has so far conducted several attempts in order to communicate that the integrated management of coastal zones requires a *strategic, coordinated and concerted action at the local and regional level*, guided and supported by the appropriate national framework. Towards this end, the European Parliament in *2002* (Fig. 1) recommends a *strategic approach* with regards to the implementation of *Integrated Coastal Zone Management in Europe* (2002/413/EC), partitioned by:

- *An ecosystem approach* aiming at the preservation of the integrity and functioning of the natural resources of both marine and terrestrial components of the coastal zone;
- A *climate change oriented approach*, recognizing threats emerging from this challenge;
- An approach serving, among others, the *protection* of coastal settlements and their cultural heritage as well as the smooth functioning of the socio-cultural system in local communities;
- An approach that can effectively serve the creation of *sustainable economic opportunities* and broaden *employment options*;
- An approach ensuring unobstructed *accessibility* of land by the public and maintenance or promotion of remote coastal communities;
- An approach that is rested upon the *conflation of actions* undertaken by all authorities in order the *sea-land interaction* to be properly managed.

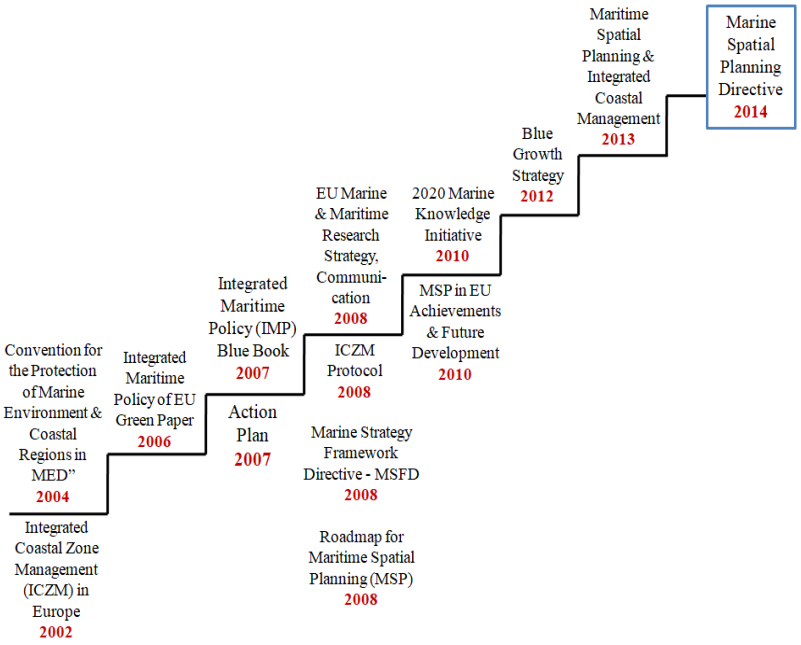
In *2005*, the Commission puts forward the Communication "Towards a Future Maritime Policy for the Union: A European Vision for the Oceans and Seas" [COM(2006)275 final of 7.6.2006, Vol. I], aiming at setting out planned objectives for the future of the EU maritime policy. This was followed by the Green Paper "Towards a Future Maritime Policy for the Union: A European Vision for the Oceans and Seas" in *2006* [COM(2006)275 final of 7.6.2006, Vol. II - Annex].

In *2007*, the Commission announces a proposal on the *Integrated Maritime Policy (IMP)* of EU, known as the *Blue Paper on "An Integrated Maritime Policy for the European Union"* [COM(2007)575 final of 10.10.2007]; and a corresponding *Action Plan* [SEC(2007)1278 of 10.10.2007]. The first one emphasizes the need for creating optimal conditions for the sustainable growth of maritime sectors and coastal regions; while ensuring that the environmental objectives of EU will be met. The second declares the development of a *Marine and Maritime Research Strategy*, which will adopt a new cross-thematic approach, supporting infrastructure, education and capacity building.

At the same time, under the Barcelona Convention (1976) and the EC Recommendation 2002/413/EC, European Commission sets up the Report to the European Parliament and the Council on the *"Evaluation of Integrated Coastal Zone Management in Europe"* [COM(2007)308 final]. The last one highlights the need for establishing a more concrete *coastal management process*, as the effort carried out so far follows a more sectoral approach.

In this respect, European Commission provides directions towards a more *integrated coastal planning*.

**Figure 3: Paving the way towards the Marine Spatial Planning (MSP) Directive in EU**




Source: own elaboration

In *2008*, a Commission Communication on *"European Marine and Maritime Research Strategy"* [COM(2008)534] was launched, proposing concrete measures and mechanisms to improve marine and maritime research in order the challenges and opportunities presented by the oceans and seas to be properly addressed. Meanwhile, the *Integrated Coastal Zone Management (ICZM) Protocol was signed* (Conference of the Plenipotentiaries, 2008), and urged the Member States to facilitate a thorough rational planning of activities for the sustainable development of coastal zones, preserving the integrity of coastal ecosystems, landscapes and geomorphology. ICZM aims to coordinate the application of policy processes that affect the coastal zone. In order to promote synergies' creation between the Energy Policy and the Integrated Maritime Policy at the EU level, the European Commission set up, in *2008*, the Communication on *"Offshore Wind Energy"* [COM(2008)768]. This Communication identifies the challenges of offshore wind energy exploitation in Europe. Both policies target the economic development and environmental protection through a more thorough exploration of the geopolitical value of Europe's Oceans and Seas for serving energy *security, competitiveness and sustainability objectives*.

Furthermore, in *2008*, the *Marine Strategy Framework Directive (MSFD)* (Directive 2008/56/EC) established a framework for community action in the field of marine environmental policy. The MSFD aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020; and protect the marine resources that are linked to marine-related socio-economic activities. It is derived from three previous policy achievements: the Commission Communication about the Thematic Strategy on the Protection and Conservation of the Marine Environment [COM(2005)504 final]; the Proposal for a Directive establishing a Framework for Community Action in the field of Marine Environmental Policy (Marine Strategy Directive) [COM(2005)505 final]; and the Commission's Staff Working Paper on the Impact Assessment [SEC(2005)1290], accompanying the Community Thematic Strategy on the Protection and Conservation of the Marine Environment. The key elements for the establishment of this Strategy were the integration of: a *dual EU/regional approach*, a *knowledge-based approach*, an *ecosystem-based approach* and a *co-operative approach* into the existing EU policy. The MSFD is the main environmental pillar of the IMP that provides a clarity platform for the successful development of all maritime activities, by paying due attention to their cumulative impacts.

The optimization of the use of marine space and the need for a better coordination among marine sectors as well as the properly planned distribution in the marine environment has

motivated, in 2008, the design of a *"Roadmap for Maritime Spatial Planning (MSP): Achieving Common Principles in the EU"* [COM(2008)791 final].

The *Communication on MSP* [COM (2010)771 final], in 2010, further notices that this must be applied in alignment with the international law, making explicit reference to UNCLOS. At the same year, the Council adopted the Decision to ratify the Protocol on Integrated Coastal Zone Management to the Barcelona Convention [Council Decision 2010/631/EU]. This EU Decision follows the signature of the Protocol adopted by the Council on 2008 [Commission Directive 2009/89/EC].

IMP has set the ground for the development, in *2012*, of the Blue Growth Strategy [COM(2012)494], focusing on the sustainable exploitation of marine resources as a driving force and a new source of economic prosperity for EU. Significant initiatives of Blue Growth Strategy lay in the five priority areas: sustainable exploitation of the diversity of marine life; new offshore challenges; exploitation of deep sea resources – deep sea mining; ocean observation technologies/systems; socio-economic aspects.

In *2013*, the European Commission launched a legislative procedure for the adoption of a Directive establishing a framework for MSP and ICZM [COM (2013)133 final]. The last one was further amended at the same year with a new Communication paper [COM (2013)133 – C7- 0065/2013 – 2013/0074(COD)], where the European Parliament has added a number of national sectoral objectives that had not been included in the first step; and had set the minimum requirements for MSP, by adding the activities related to exploration and extraction of raw materials (other than gas and oil); while incorporating potential fishing and military training areas, marine and coastal tourism and cultural heritage protection sites.

In *2014*, the European Commission applied the Directive 2014/89/EU, establishing a framework for Maritime Spatial Planning (MSP) in order the sustainable growth of maritime economies and the rationale use of marine resources to be achieved. MSP objective is to balance sectoral interests and achieve sustainable use of marine resources in line with the EU Sustainable Development Strategy. MSP is considered as a *key instrument* for the implementation of the EU Integrated Maritime Policy. It supports coordination of actions of public authorities and stakeholders; and targets optimization of marine space use to the benefit of economic development and environmental protection of maritime environment. This Communication sets out *key principles for MSP* and aims to encourage the establishment of a common approach among EU Member States. Furthermore, it stresses the importance of *proper planning* as the bedrock of all marine-based activities for value creation, by establishing *synergies* between different maritime sectors.

The *Marine Strategy Directive, the Water Directive, the Habitats Directive and the NATURA 2000 network* constitute the environmental pillars of MSP. The new *Fisheries Regulation* (Regulation 1380/2013) along with existing instruments addressing regional specificities, have laid the foundations for the incorporation of fisheries activities in MSP.

Along with MSP, other important horizontal policy tools of IMP constitute the Marine Knowledge and the Marine Surveillance. In *2010*, a Commission Communication on *Marine Knowledge 2020* [COM(2010)461], intended to improve the use of scientific knowledge on Europe's seas and oceans through a coordinated approach to data collection and assembly. In *2013*, the EU Regulation 1052/2013 established the *European Border Surveillance System* (EUROSUR), in order to detect, prevent and fight cross-border crimes and ensure the protection of migrants' lives. Finally in *2014*, a Commission's Communication on the *Common Information Sharing Environment* [COM(2014)451], intended to improve the efficiency and cost-effectiveness of maritime surveillance by enabling appropriate, secure and efficient data sharing across sectors and borders throughout the EU.

## 3. Methodological Aspects of MSP in Europe

The scope of this section is twofold, namely to: gather experiences on the *methodological aspects* and the way these are treated in a range of MSP studies, implemented at a *macro-region level* in the European territory; and elaborate on the issue of *stakeholders' engagement* that are raised in such studies. Both will constitute valuable input in the subsequent part of the paper, taking an integrated view of territorial and marine spatial planning, addressing the *local level*.

### 3.1. Gathering experiences on methodological aspects from existing MSP studies

A range of MSP studies have so far been conducted in European Seas (Adriatic, Baltic, Mediterranean), in the context of transnational cooperation among a number of states. At the core of these studies lies the use of MSP as a *development tool* for the sustainable exploitation of marine resources. Methodological approaches, adopted by these MSP studies, depict certain similarities but also differences. These are shortly presented in the following, being the outcome of elaboration of the four studies below:

a. Marine Spatial Planning – A Step-by-step approach towards ecosystem-based management (Dahl, 2009 – UNESCO study);
b. BaltSeaPlan Project – Planning the future of the Baltic Sea – providing general directions for MSP in Baltic countries (Zaucha and Matczak, 2011);
c. PlanCoast regarding a number of participating European / Balkan countries (Schultz-Zenden et al., 2008); and
d. ADRIPLAN Project – MSP in the Adriatic – Ionian Region (ADRIPLAN, 2015)

A cross-cutting issue of all the above studies is the adoption of the European policy framework on MSP and ICZM and its implementation through a typical planning process, relevant to the one of territorial planning. These studies, as happens with the majority of MSP exercises, although they carry out an exhaustive research of the marine environment and respective biophysical processes, they lack the *human dimension of MSP* as argued by Dahl (2009), in the sense of enriching the pure listing and mapping of activities they accomplish by knowledge on *"processes (e.g., community and territory), connections (e.g. within and across communities, economies), space (e.g., territories, cultural perceptions), and scales (e.g. local, regional, national scales of society)"* (Dahl, 2009: 56) (ADRIPLAN, 2015).

Common to certain studies [see (a) and (d) above] is the implementation of a *pre-planning stage*, elaborating on a range of issues. However, different aspects are falling into this pre-planning stage in the different MSP studies. For example in the study (a), this stage is concerned with the: establishment of a skilled MSP team; development of a work plan defining key work products and resources leading to timely delivered outputs; setting up of the boundaries and time frame for analysis and management as well as of the principles guiding the development of the marine spatial management plan; and identification of goals and objectives to be served (Dahl, 2009). As opposed to that, pre-planning stage of study (d) sketches the planning regulatory framework; analyses strategic documents; identifies management area's boundaries and relevant stakeholders; defines operative tools (data portal, website); etc. (ADRIPLAN, 2015).

Since MSP is a *future oriented activity*, of crucial importance is also the way that different studies define and analyze future states – *where we want to go* – i.e. define alternative spatial sea use *scenarios* as the means for identifying potential future demand and spatial organization of maritime uses. The scope of these scenarios is to envision desirable future states and enable proactive decision-making in order these to be reached (Stratigea and Giaoutzi, 2012a and 2012b). Most of the studies identify such conditions by means of a certain projection of current state to the future, taking into consideration different streams, e.g. policy directions [study (b) above]; interests and future plans of stakeholders [study (c) above]; vision already in place [study (d) above]. Study (a) provides a more comprehensive approach. This elaborates on a range of future scenarios, reflecting different spatial delineations of projected trends and predicted new needs, in order these to be assessed and the most prevailing one to be selected, providing thus more options for decision-making.

The above discussed studies differ also as to the level of *stakeholders' engagement* they adopt. This level ranges from involvement only at the stage of identifying and managing conflicts to a more substantial one, taking place throughout the various stages of the planning process. Generally speaking, study (a) provides a more structured and well established process for stakeholders' identification and engagement than the rest of those explored, properly elaborating on *who* to engage, at *which* stage of the planning process and *how*. This implies that different stakeholder groups, with varying levels of interest and entitlement, can take part in different steps of the MSP process.

Last, but not least, it should be stressed here the lack of *citizens' engagement* in the above mentioned studies, although civic engagement constitutes nowadays an issue that is rated high in the political agenda and it is met in a considerable number of MSP (Jarvis et al., 2015; Strickland-Munro et al., 2016) and ICZM (Kearney et al., 2007; EC, 2010) case studies. The marine uses are mainly addressing needs of economic actors and related activities, within an environment that is completely different from the terrestrial one in the sense that is lacking the: concept of a definitely bound territorial entity; attributes of the built environment; private property characteristics; well-established forms of jurisdiction and planning authority; etc. These shortages as well as the spatial scale of the above mentioned studies – macro-regions – does not make so evident the role of the civic society in the studies explored. It should be mentioned though that shifting to the *local level* gives substance to this role, since marine space is **inextricably** linked to the terrestrial one, offering prosperity, recreation and other options to local population and, as a consequence, the right to engage and have a 'saying' on the way this will be developed.

### 3.2. Elaborating on stakeholders' engagement

The issue of stakeholders' engagement in planning is rising in importance. General guidelines can be given in such a context, addressing territorial and marine planning endeavours. These guidelines, however, need to be properly adjusted in order to reflect local peculiarities and conflicts, participation culture, gap identified between current and end state that needs to be filled, policy priorities, readiness in terms of technical and technological aspects, etc. (Stratigea 2015).

But what exactly is meant by stakeholders and what is the difference when talking about stakeholders' engagement in terrestrial or marine planning exercises?

The concept of stakeholder does not have a clear cut definition yet. On the contrary, a range of definitions can be found in the literature, originating from the business but also other scientific fields. As such can be indicatively referred the following:

- Stakeholders are those groups that can affect or be affected by the actions, objectives and policies of an organization. Some examples of key stakeholders are creditors, directors, employees, government (and its agencies), owners (shareholders), suppliers, unions, and the community from which the business draws its resources (Business dictionary, www.businessdictionary.com).
- Stakeholders are "*people or small groups with the power to respond to, negotiate with, and change the strategic future of the organization*" (Eden and Ackermann 1998:117).
- Stakeholders are *"... all those who are affected by a change"* (Bryson 2004:22). This wider definition is more compatible with notions of democracy and social justice, implying a redistribution of power to the benefit of less powerful groups of society.
- *"Any group or individual who can affect or is affected by the achievement of the organization's objectives"* (Freeman1984:46).

Delineation of stakeholders in a certain planning study is of decisive importance for its outcomes, as it largely defines who counts and what for (Mitchell et al., 1997). This becomes more crucial when *spatial planning studies* are concerned; as such studies deal with managing conflicts and creating synergies in space by means of *land use plans*, accommodating all societal groups' perspectives. This implies the need for adopting more inclusive stakeholders' approaches (Lewis, 1991).

Shifting to the Maritime Spatial Planning (MSP) context, of interest is the stakeholders' definition provided by Ehler & Douvere (2007)and Pentz et al. (2012), stating that stakeholders can be individuals, groups and/or organizations who:

- are affected or will be affected by MSP decisions;
- are tightly linked to the marine resources managed by MSP;
- can have or raise legal claims over MSP areas and inherent resources;

- can have a seasonal or geographic interest in the area concerned; and finally
- can have a special interest in the management of the area of concern.

Stated in a compact way this is formulated as "*individuals, or groups, or organizations, that are (or will be) affected, involved or interested (positively or negatively) by MSP measures or actions in various ways" (*Pentz et al., 2012: 4).

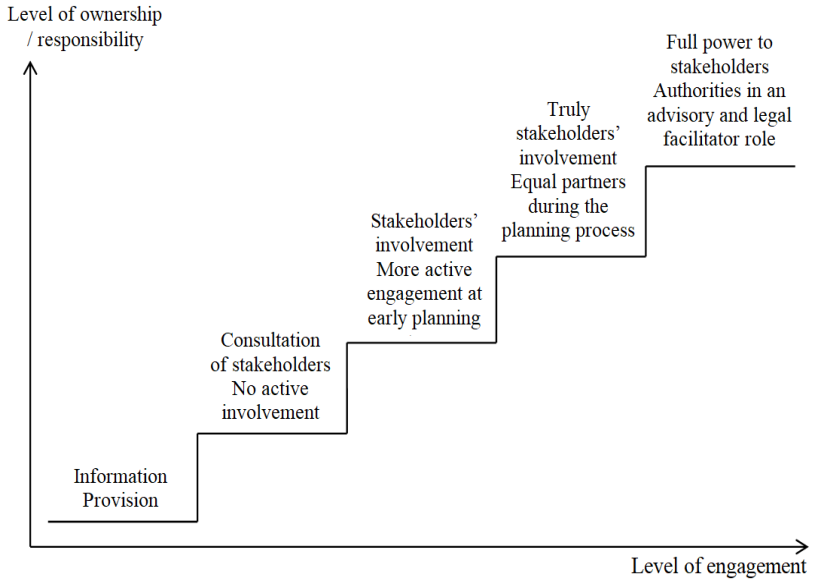
The value of stakeholders' engagement in MSP is largely recognized and can follow several streams. This has been well presented by Dahl (2009), stating that stakeholders' engagement: supports a better *understanding of complexity* of the marine environment concerned in terms of space and time; encourages *ownership and voluntary compliance* to the spatial plan produced, promoting trust between stakeholders and decision makers; deepens *mutual understanding* of problems and challenges inherent in the specific marine area; disentangles own *sectoral interests*, perceptions etc., thus better orienting coordination of policies; establishes the ground for *synergies' creation* and the perception of *new options and solutions* not previously evident; enriches *knowledge and information* of planning team, thus improving *capacity* to reach local expectations through planning outcomes.

This value has also been stressed by the OECD study (2004), which elaborates on the way stakeholders' engagement can affect MSP, stating that this influence can take the form of:

- *a substantial effect* i.e. affecting the substance of MSP and leading to better and more acceptable, and therefore easier to implement, planning outcomes;
- *a procedural effect* i.e. affecting the planning process per se by means of taking advantage of the MSP process for maturing stakeholders' knowledge as well as enhancing mutual understanding of different perspectives and views and thus influencing conflicts' resolution; and
- *a contextual effect* i.e. affecting the context of MSP itself by enriching information exchange among those engaged in the process, improving strategic capacity of decision makers, steering democratic processes and affecting mutual trust and respect.

The engagement of stakeholder in a planning process, both terrestrial or marine, can scale up from information provision to full power of stakeholders in the final decision (Fig. 2) (Stratigea, 2015). Different tools for interaction / communication among stakeholders can be used at the different levels of stakeholders' engagement, ranging from simple face-to-face workshops, structured by use of classical participation tools, to more ICT-enabled interaction through e.g. PPGIS tools (Panagiotopoulou and Stratigea, 2017).

**Figure 4: Level of stakeholders' engagement**




Source: Own elaboration from Stratigea (2015)

Speaking of stakeholders' analysis, certain differences appear concerning the groups involved in the *terrestrial* and the *marine* part in relative planning studies (onshore vs offshore stakeholders), depicted in Table 1.

## 4. Shifting to the Local Level – Integrated Methodological Approach and Case Study Results

Based on the European but also the global experience gained through the study of relevant transnational MSP endeavours, the focus of this section is on the use of this knowledge in order a methodological framework for *integrating territorial and marine spatial planning at the local level* to be sketched. The need for ensuring *coherence between terrestrial and marine strategies and plans*, as well as their consistent implementation is stressed in COM(2010)771, stating the need for placing attention to the spatial development of the transitional space from land to sea, as part of the Integrated Coastal Zone Management (ICZM) process. The proposed framework argues that, when working at the local level, this should be further expanded to incorporate the terrestrial part of case study concerned and related policies; and assure *coherence and coordination* between land and maritime planning objectives and policies.

**Table 1. Differences between terrestrial and maritime stakeholders**

| Maritime stakeholders | Terrestrial stakeholders |
|---|---|
| *Nature / number of stakeholders* | |
| Mostly limited to associations, NGOs and public agencies / lower number of stakeholders | More wide context of participation / larger number of potential stakeholders |
| *Complexity* | |
| Higher | Lower |
| *Ownership status of area of spatial planning concern* | |
| Mostly in the public domain | Public and private domain |
| *Dependence on legal acts* | |
| Dependence on international legal acts, which are usually less specific as to whom and how to engage | Dependence on national legal acts, which are more clearly defining relative stakeholders and type of engagement |
| *Quality and quantity of information* | |
| Poor spatial information – marine data often scattered across different organizations, institutions and administrative levels | Richer spatial information |
| *Political influence* | |
| Usually top-down, from governments and ministries | Both top-down and bottom-up |

Source: Pentz et al., (2012)

In the proposed *integrated methodological approach*, emphasis is placed on two specific steps of the planning process, namely the one elaborating on the *current state* of the study area in order to identify land and marine uses and features, and explore key drivers of change of this specific spatial system; and the one related to *stakeholders' analysis* in order interests of both the *communities* and the *economic sectors* of the study area to be accommodated in this approach. This in turn, incorporates an effort to study the area of concern as an *integrated spatial system*, composed of both terrestrial and coastal/marine interacting parts; while taking into consideration all different stakes and related stakeholders, i.e. territory- and marine-related stakeholders. The paper attempts to apply the rationale of this approach and supportive planning tools in an island region, Zakynthos Island – Greece.

### 4.1. The study region

Zakynthos belongs to the Ionian Sea island complex. The region constitutes a powerful node of tourist development at a regional (Region of Ionian Islands), but also national and

international level, with tourism being the prevailing sector of the local economy. Of importance is also the agricultural sector, with highly extroverted local qualitative production. *Key mid-term objectives* (2015-19) of the region are the sustainable exploitation of local resources, using as pillars the agricultural and tourism sectors; the upgrading of the local production system in alignment with the Regional Innovation Strategy for Smart Specialization (RIS3); and the environmental upgrading of the area through the development of related infrastructure (e.g. waste management, renewable energy infrastructure).

Zakynthos area disposes unique natural habitats, nurturing protected or rare flora and fauna species (e.g. *Carreta carreta* sea turtle) (Fig. 3a), as well as valuable natural beauties and cultural resources (Fig. 3d and 3e respectively). Based on these resources, mass (coastal and seasonal) as well as alternative forms of tourism activities are flourishing in the area. Population distribution designates a certain pattern (Fig. 3b) with highly dense populated compartments lying in coastal and marine protected areas. The same holds for tourist developed areas and related accommodation infrastructure, with almost half of this infrastructure (50% of hotel and 47% of rooms for rent) deploying in the Gulf of Laganas (Fig. 3c), where the National Marine Park of Zakynthos is located. Such a pattern is definitely placing a certain burden on the fragile ecosystems of the southern east part of the island (Fig. 3a – NATURA 2000 sites), with the western north part being less populated and tourist developed, mainly due to its rocky and steep morphology.

Figure 5**:** Special attractions - attributes and population / tourist accommodation distribution in Zakynthos Island


a. Zakynthos protected areas (Source: http://www.oikoskopio.gr/map/)

b. Density of population (2011)


c. Distribution of tourist accommodation in Zakynthos island
Source: own elaboration

d.Natural configurations – beauties of Zakynthos Island
Source: www.web-greece.gr

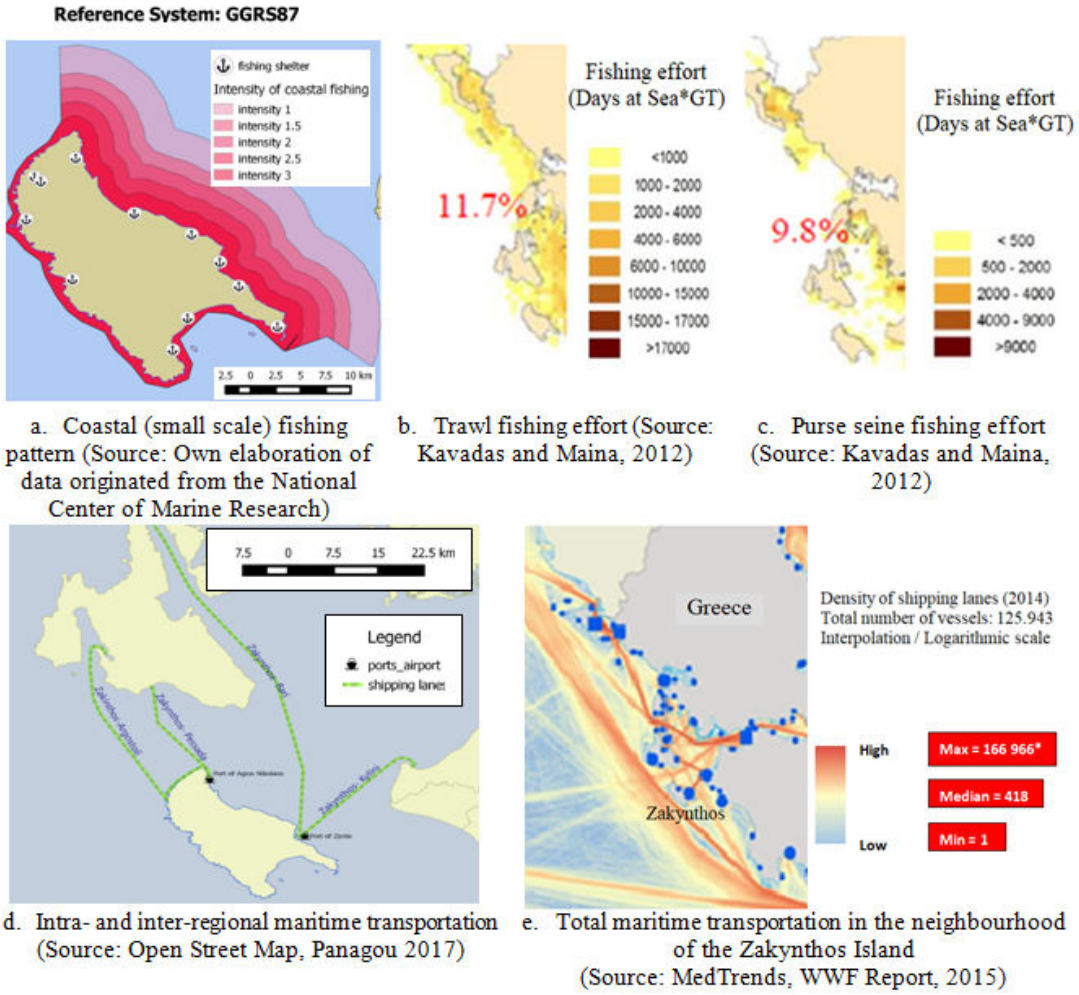
e. Museum of Byzantine and MetaByzantine Art

With regards to *maritime activities* (Fig. 4), the following can be noticed:

- *Fishing*: *coastal fishing* expands up to the 6 miles from the coast, depicting a descending activity as distance from the coast grows (Fig. 4a); Purse seine and trawl fisheries are mainly taking place along the eastern part of the island (Fig. 4b) (Fig. 4c). From these figures it is evident that fishery sector is mainly activated at the northern and southern east part of the island, where also the largest part of mass tourism activity is located.

- *Maritime transportation*: the island of Zakynthos (Port of Zakynthos) is regularly connected with Peloponnese (Port of Kylini), while maritime connections also exist between the Port of Zakynthos and Bari-Italy (from – to). Moreover, Zakynthos is seasonally connected to Kefallinia through the port of Agios Nikolaos in the northern part of the island (Fig. 4d). Apart from these connections, the island of Zakynthos lies in the middle of a rather crowded area in terms of maritime transportation, taking place in the Ionian – Adriatic Sea (Fig. 4e).

**Figure 6: Maritime activities (fishing and transportation) in Zakynthos Island**




a. Coastal (small scale) fishing pattern (Source: Own elaboration of data originated from the National Center of Marine Research)

b. Trawl fishing effort (Source: Kavadas and Maina, 2012)

c. Purse seine fishing effort (Source: Kavadas and Maina, 2012)

d. Intra- and inter-regional maritime transportation (Source: Open Street Map, Panagou 2017)

e. Total maritime transportation in the neighbourhood of the Zakynthos Island (Source: MedTrends, WWF Report, 2015)

## 4.2. The proposed methodological approach

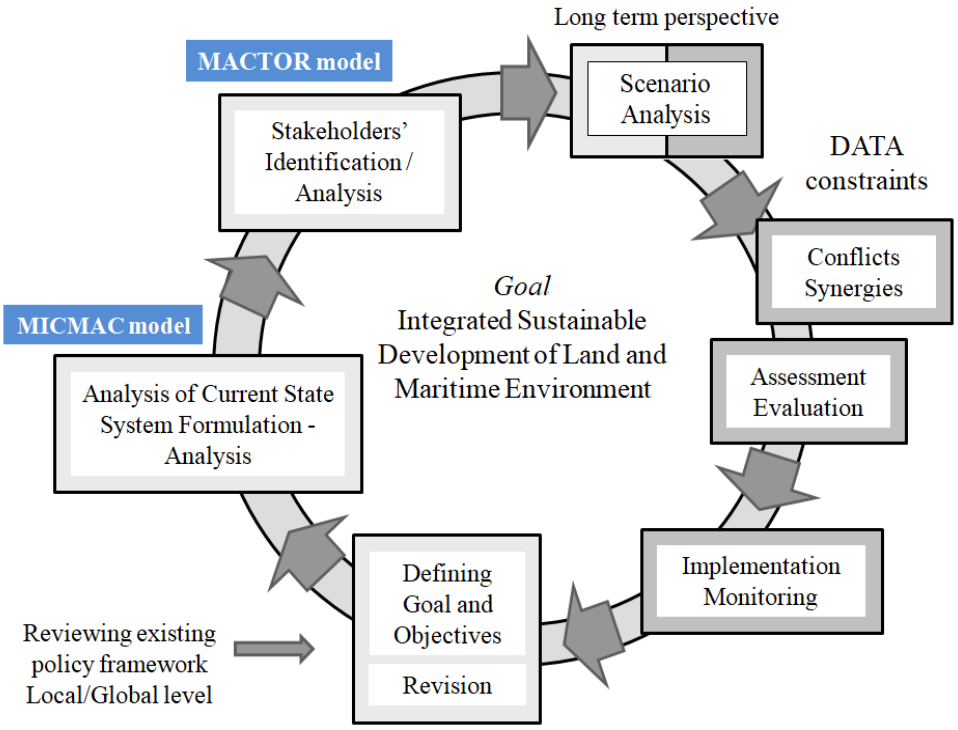
The focus of this section is on the elaboration of a *strategic integrated participatory territorial & marine spatial planning approach* for dealing with terrestrial and maritime development at the local level; and guiding *informed, well structured and coherent policy directions*.

The *steps* of the proposed framework are delineated in Fig. 5. More specifically these have as follows:

- *Review of the existing policy framework at higher hierarchical levels*: this first step designates policy directions that are already in force for the region at hand. For the Zakynthos case study example, indicative plans at national and regional level that need to be consulted are the Special Framework of Spatial Planning and Sustainable Development for Tourism, the Regional Spatial Plan of the Ionian Region, etc., used for decoding main strategic policy directions set up for the study region. Additionally, trends of the

external environment of the study area need to be explored in order key challenges of this environment to be grasped, e.g. climate change, migration, environmental stability, patterns of tourist demand. These designate potential future developments of this environment, within which decision-making for the region at hand will take place.

**Figure 7: The proposed methodological approach and the stages elaborated in this work (in blue)**




Source: own elaboration

- *Defining goals and objectives*: based on the outcome of the first step and a thorough analysis of past and current state of the study region (both terrestrial and coastal/maritime) are sketched the *goal* and *objectives* to be reached in the context of the integrated spatial plan.
- *System formulation and analysis*: at this step a thorough analysis of the study area (terrestrial and coastal/marine area) is carried out, resulting in information that is used to present the area as a *spatial system*, depicted by means of several *subsystems*, each of which is composed by a number of *variables*. Subsystems and related variables are used for defining a *structural matrix*; while also the interaction between each subsystem and related variables with all the rest of subsystems/variables of the matrix is articulated. Elaboration of these data – *structural analysis* – provides information on the *key drivers* of the study system, i.e. the most *influential variables* or those that are crucial for the future development of the system, being the outcome of this step. Implementation of this step is carried out by use of the *MICMAC module* of the LIPSOR[1] participatory planning tool.
- *Stakeholders' analysis*: consists of an important step in the context of territorial and coastal/maritime planning, providing insight in the interrelationships, current and (potential) future interests and expectations of certain stakeholders, potential conflicts or synergies' creation, etc. The analysis is based on the *MACTOR module* of the LIPSOR participatory

[1] LIPSOR scenario planning model - Laboratory for Investigation in Prospective and Strategy, developed by M. Godet in 1994.

planning tool, using two types of input data. The *first type of data* relates to the *interaction* among stakeholders' groups engaged in the planning process. Use of an integrated approach, considering interrelationships between both terrestrial and maritime stakeholders, sets the ground for addressing the interests of both the local community and the *land and maritime economic actors* in a certain study area. The *second type of data* depicts the position of stakeholders' engaged with regards to the objectives set. This is an important outcome for planning purposes as it can reveal, among others, oppositions to the planning objectives that can hamper implementation of the final policy decisions. In this sense, it can contribute to either the change of the proposed planning decisions or the identification of those policy decisions that will weaken resistance and assure smooth implementation of planning outcomes.

- *Scenario analysis*: taking into consideration that planning is a future oriented activity, at this step it is crucial to identify the dynamics of the system at hand and the desired end state (vision), in order proper policies, driving the system to this vision, to be defined (Stratigea and Giaoutzi, 2012a and 2012b). At the same time, it is important to grasp developments of the external environment, i.e. the decision environment, within which implementation of planning outcomes will take place. In such a context, scenario analysis is a useful strategic tool for identifying alternative future end states that can serve objectives set.
- *Exploring conflicts and synergies*: at this stage, *conflicts and synergies* that are due to sectoral developments and respective *terrestrial and maritime uses* in each single alternative scenario are explored.
- *Assessment / evaluation of alternative scenarios*: alternative scenarios and related spatial organization i.e. land and maritime uses, serving integrated future development paths of the region at hand within different decision environments, are assessed. This assessment is based on their performance with respect to the set of objectives. Outcome of this process is decision-making regarding the most prevailing scenario for further implementation (Stratigea and Giaoutzi, 2012a).
- *Implementation of selected scenario – Monitoring*: this concerns the stage where the selected scenario is implemented. Crucial in this respect is the steady monitoring of the selected scenario in terms of environmental, economic and social performance. Towards this end properly selected indicators are used. Identification of potential deviations from expected outcomes are crucial for setting up relevant remediation actions. This can fuel revision of any of the previous presented stages and related outcomes, e.g. from goal and objectives, structure of the system and variables concerned, stakeholders' groups taken into consideration, alternative scenarios, etc., marking *feedbacks* within the proposed planning framework.

Additionally, it should be noted that given the *complexity* and *uncertainty* of both the internal (case study) and external environment of any planning exercise (Stratigea, 2015), the proposed framework is not considered to represent a linear process. On the contrary, it is perceived as a process, where feedback is necessary among the various stages as a mean of *deepening understanding* of the study system at hand; and increasing *performance and value* of planning outcomes.

Finally, it is also noted that in each of the above stages are embedded knowledge and principles, tools, expertise, data, etc. that relate to each subsystem (terrestrial and coastal/marine), revealing thus the multidisciplinary and interdisciplinary nature of such a *shared planning study*.

### 4.3. Primary results - Discussion

In the following, primary results obtained by the application of two steps of the above described methodological approach are presented, referring to a specific study region, the

Island of Zakynthos. More specifically, the empirical application attempts to shed light at the stages of the analysis of the study system and the stakeholders' analysis by use of respective planning tools that enable an integrated consideration of terrestrial and coastal/marine environments as well as of land and maritime stakeholders. This is accomplished by elaborating on the interaction / interrelationships between:

subcomponents of the study system, i.e. key elements of both the terrestrial and coastal/maritime environment; and

terrestrial and coastal/maritime stakeholders' groups, addressing thus in the planning context the specific needs and visions of both local community and economic sectors.

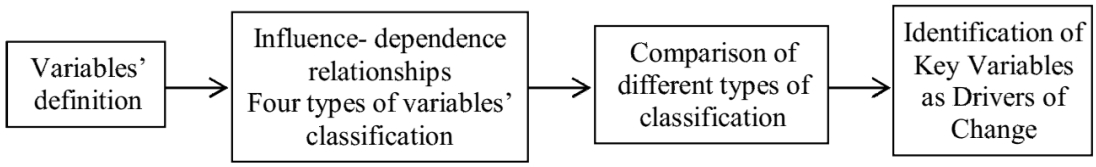
The above two steps are shortly discussed in the following, by presenting the basic principles of related planning tools (i.e. MICMAC and MACTOR module of the LIPSOR participatory planning model) as well as indicative outcomes produced in the case study of Zakynthos.

It should be noted here that although the above two steps (as well as the rest of the steps presented in Fig. 5) of the proposed methodological framework imply the engagement of community and other stakeholders in order to feed these stages with the necessary data input, this did not take place in the present study. Based on time and budget constraints, but also following the rationale of this paper, which is to test the usefulness of these tools to the integrated, terrestrial and maritime, planning approach and outcomes produced, data feeding the two modules reflect researchers' insight from the study area as well as certain experts' consulting, gathering specific reflections on the land and coastal/maritime as well as stakeholders' interactions.

#### 4.3.1. Structural analysis – MICMAC module

The MICMAC module explores the key variables of the study system and formulates the basic questions relating to its future states (Godet 1994 and 1999; Stratigea, 2013). This is based on a structural analysis, exploring the "influence-dependence" relationships among the selected key variables, which correspond to the attributes of the internal and external environment of the study system, capable of driving its future states (Fig. 6). Selection of variables is conducted on the basis of their role as drivers of change (Stratigea and Giaoutzi 2012a; Stratigea, 2013).

**Figure 8: Steps of the MICMAC model**




Source: own elaboration

Application of MICMAC aims at identifying the key variables that can drive future development of the Zakynthos study area. For serving this purpose, a structural matrix was created, based on 39 variables, namely: i) internal environment variables, such as coastal built environment, morphology of shoreline, National Marine Park of Zakynthos, land and marine valuable ecosystems, hydrocarbon fields in neighbouring areas, settlements' development, sectors of the local economic structure (aquaculture, mass and alternative forms of tourism, agriculture, maritime transportation, conventional and alternative forms of energy production, telecommunication infrastructure, etc.), educational level of population, cultural heritage, income, employment, and waste management; and ii) external environment variables: climate change, economic recession, technology, blue growth strategy, EU policy for tourism and culture.

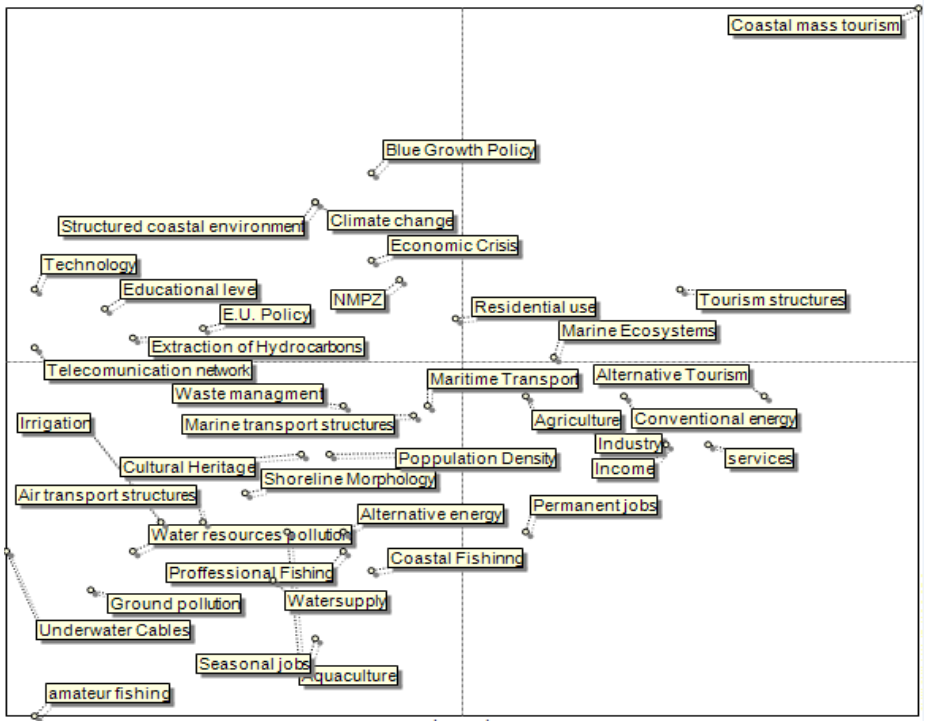
*Variables' selection* as to the *internal environment* is based on the deep insight on past behaviour and current state of the study system, gained through exploration of contemporary and historical data (Stratigea, 2013). This implies collection and analysis of statistical but also qualitative information in order major evolutionary trends, past discontinuities, etc. to be identified.

With regards to the external environment, variables' selection is grounded on the exploration of major challenges faced nowadays by regions and particularly by insular communities (Stratigea and Katsoni 2015).

Based on this matrix, a structural analysis is conducted, focusing on the 'influence-dependence' relationships among the variables of both the internal and the external environment.

More specifically, four types of '*influence-dependence'* relationships between each specific set of variables are explored by MICMAC, namely, '*direct*', '*indirect*', '*potential direct*', and '*potential indirect*'. Variables that are steadily rating high in all these types of *'influence-dependence'* relationships are considered as having an *influential role* in its evolution, perceived as key drivers, steering future developments of the study system (Godet 1994 and 1999, Godet et al. 2004). Results of the direct and indirect influence – dependence relationships among the 39 variables are depicted in Fig. 7 and 8 respectively.

**Figure 9: Direct influence-dependence relationships among the 39 variables of the study system – MICMAC results**




Source: Panagou, 2017

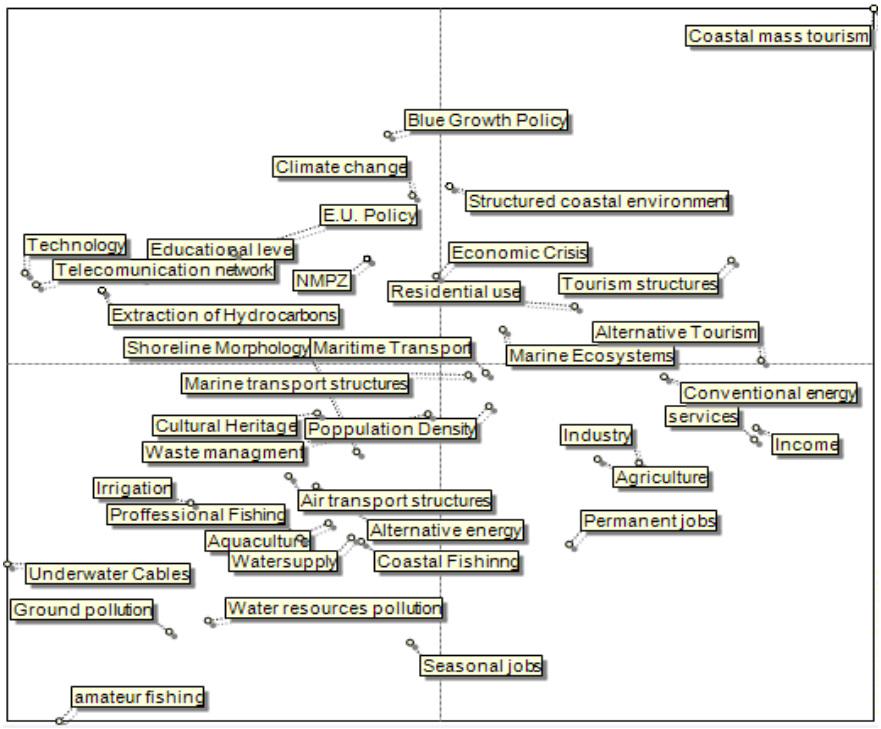
The study of all four types of relationships of key variables and their interpretation along the MICMAC rationale (Godet, 1994 and 1999, Godet et al. 2004, Stratigea and Giaoutzi 2012a; Stratigea, 2013), can lead to their classification as (Table 2): *influential* (those that are largely affecting development of other variables); *dependent* (those that are highly influenced); *lay variables* (those that are both affecting but also influenced from the other variables); and *independent* (variables that are following a trajectory that is mostly not relying on variables of the system concerned).

*Interpretation* of these results is summarized as follows:

- *Influential variables* i.e. key drivers for change of Zakynthos study system. Most of these variables are related to the external environment (climate change, economic recession, technology, EU policy for culture and tourism as well as blue growth). High dependence of the future of the study system by variables of the external environment was somehow expected, taking into consideration the extraversion of this system due to the tourism activity. The prevalence of this sector in the local economy and its future trajectory are indeed largely affected by climate change, changing the geography of tourist destinations at a global scale (Stratigea and Katsoni, 2015); the EU policies for culture and tourism, marking a certain shift from the mass (prevailing

tourism model in Zakynthos island) to alternative, more qualitative and experience-based, tourism forms; the Blue Growth strategy affecting both the tourism sector but also other, competing to tourism, economic sectors that can potentially be located to the marine environment (Stratigea and Katsoni, 2015). With regards to the internal environment, of decisive importance are the: educational level of local population, conditioning directions of future development and competitiveness of relative sectors; coastal built environment, both as a factor exerting high pressure on land coastal parts of the area and as a potential threat for marine environment's health, taking also into consideration the fragility of these parts of the island (marine park); and hydrocarbon extraction in adjacent to Zakynthos fields, an issue that can potentially highly affect the image and the local economic structure, placing at stake tourist development of the region.

**Figure 10: Indirect influence-dependence relationships among the 39 variables of the study system – MICMAC results**




Source: Panagou, 2017

- *Lay variables interpretation*: protection of marine ecosystems as well as developments of the tourism sector – coastal mass tourism and development of tourism infrastructure – are largely affected by the influential variables (mainly EU policies); while they play a crucial role for the development of dependent variables (income, job creation, services etc.). Same holds for settlements' development and residential use largely driven by economic recession, EU policy on culture and tourism that sets up certain directions for inland developments regarding alternative tourism forms, based on available land resources, etc.
- *Dependent variables*: the evolution of influential and relay variables will largely affect development of the local labour market, jobs' creation, and energy demand. Additionally, it will particularly affect the pattern of tourism development, giving birth to alternative forms of tourism as well as agricultural activities (both for goods' production and as the ground for alternative tourism development).

**Table 2. Classification of variables of Zakynthos study system – MICMAC results**

| Influential variables Key drivers of change | Lay variables | Dependent variables |
|---|---|---|
| v8- ydrocarbon extraction | v6 - Marine ecosystems | v17 - Income |
| v 35 - Climate change | v21- Coastal mass tourism | v18 - Permanent jobs |
| v36 - Economic recession | v30-Tourism infrastructure | v20 - Services |
| v37 - Technology | v9-Settlements' development | v26- Conventional energy production |
| v39 - EU policy for culture and tourism | v7 - Residential use | v11 - Agriculture |
| v15 - Educational level | | v22 - Alternative tourism |
| v38 - Blue growth strategy | | |
| v1 - Coastal built environment | | |

Source: Panagou, 2017

#### 4.3.2. Stakeholders' analysis – MACTOR module

The *MACTOR module* identifies the role of principal stakeholders in the study system. Various attributes of these stakeholders are studied, such as their economic interests, potential strategic moves, projects in progress, motives, attitudes, personal profiles, strategic alliances, strengths and weaknesses, etc.; while relationships among stakeholders are also taken into account, revealing the underlying *power structure of stakeholders* within the study system. *Key hypothesis* of the MACTOR model is that the future state of a study system is largely based on own decisions of stakeholders (sectoral representatives, local population and policy making bodies) (Godet 1994). In depth analysis of past behaviour and current state of the study region as well as results obtained from the application of the MICMAC model (influential and relay variables) are decisive factors for identifying the *stakeholders' groups* that need to be considered at this stage. Based on this information, stakeholders identified for the case study of Zakynthos are shown in Table 3.

Additionally, a very important attribute of MACTOR lies on its capacity to reveal the *attitudes* (position or level of resistance) of the various actors/stakeholders against the *planning objectives* (convergence with or divergence), providing planners with valuable information for decision-making purposes **(**Stratigea and Giaoutzi 2012a; Stratigea, 2013).

The steps undertaken and the rationale of MACTOR model is designated in Fig. 9.

The *goal* of Zakynthos case study is the Development of a Spatial Plan Integrating Terrestrial and Coastal/Marine Environment. The *objectives* set for serving this goal have as follows (Panagou, 2017):

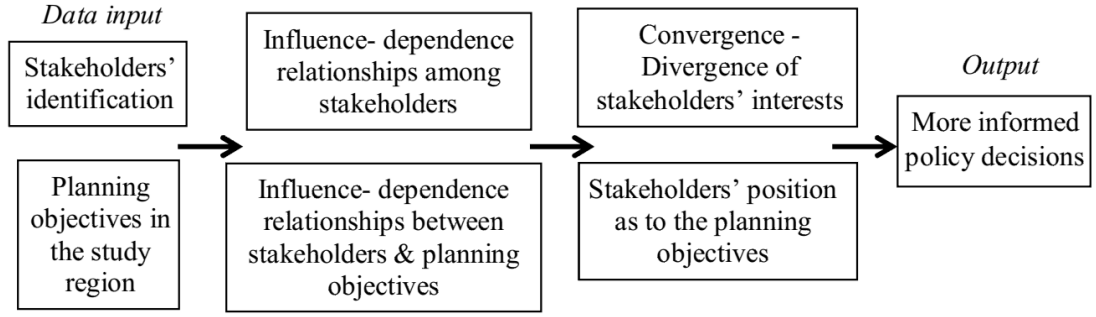
- **S1:** development of alternative forms of tourism in the terrestrial and coastal part.
- **S2:** development of alternative forms of tourism in the marine part.
- **S3:** decentralization of tourism sector across the coastal part.
- **S4:** protection of high valued coastal and marine ecosystems.
- **S5:** synergies' creation applying between uses in the terrestrial and marine environment in isolation as well as in between them.
- **S6:** conflicts' management applying between uses in the terrestrial and marine environment in isolation as well as in between them.
- **S7:** Human resource upgrading – Promotion of green and blue entrepreneurship.

**Table 3. Stakeholders considered in Zakynthos case study**

| Stakeholder | Description |
|---|---|
| A1 | Cultural associations |
| A2 | Social associations |
| A3 | Local authorities |
| A4 | Environmental associations |
| A5 | Experts |
| A6 | Trade Associations |
| A7 | Tourist associations |
| A8 | Maritime transport companies |
| A9 | Agricultural associations |
| A10 | National Marine Park of Zakynthos |
| A11 | Policy making authorities at a higher hierarchical level (regional/national) |

Source: Panagou, 2017

**Figure 11: Steps of the MACTOR model**




Source: own elaboration

Basic data input in the MACTOR model consist of:

- A *cross-impact matrix* designating influence – dependence relationships among stakeholders concerned. Analysis of these data classifies stakeholders into dominant-driving, relay or link, dominated and independent.
- An *mxn stakeholders x objectives matrix*, sketching the position of stakeholders concerned as to the set of planning objectives.

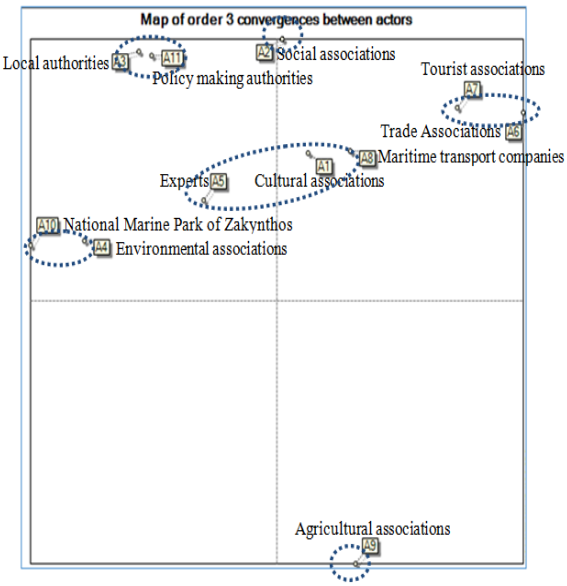
A variety of results are produced by MACTOR model that can support a more in depth elaboration of stakeholders' role, taking into consideration their attitude with regards to the planning objectives and their position in the local power relations system (Godet, 1994 and 1999; Stratigea, 2013). Based on these aspects, their potential to affect implementation of planning outcomes is sketched. Some indicative results, obtained from MACTOR analysis and their interpretation, are presented in the following.

More specifically, Fig. 10 illustrates *stakeholders' convergence* (Fig. 10a) as well as *alliances and divergence* among allied groups formed (Fig. 10b). From this figure, it is evident the coalition between environmental associations and the National Marine Park of Zakynthos, sharing the same environmental concerns; and their divergence from the allied group of tourism and trade associations, representing a more market-oriented approach of the exploitation of local resources.

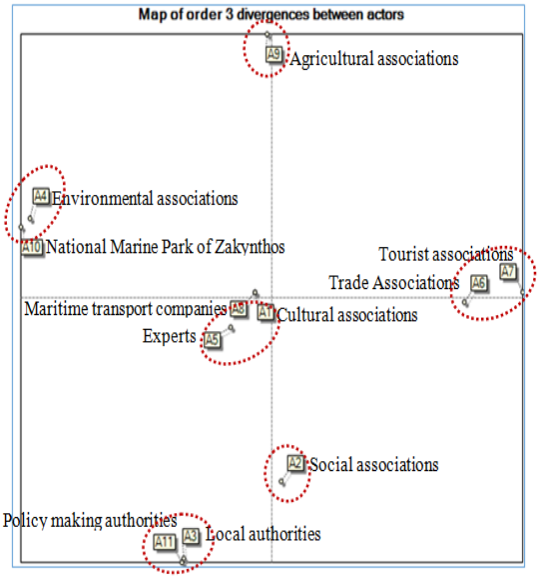
Also it is evident the coalition of decision and policy making bodies (local administration authority as well as relevant authorities at the regional and national level), sharing similar concerns about the sustainable development of local/regional resources, lying also at a distance from tourism and trade associations approach. Worth mentioning is the position of agricultural and social associations, reflecting a high divergence from other allied groups depicted in Fig. 10b.

**Figure 12: Convergence among stakeholders, alliances and divergence of interests of allied groups**

a. Stakeholders' convergence




b. Stakeholders' alliances - divergence



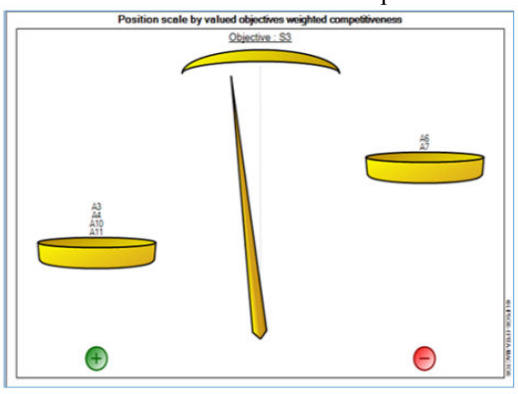

Source: Panagou, 2017

With regards to the *position of stakeholders* as to the *planning objectives*, the following can be noticed:

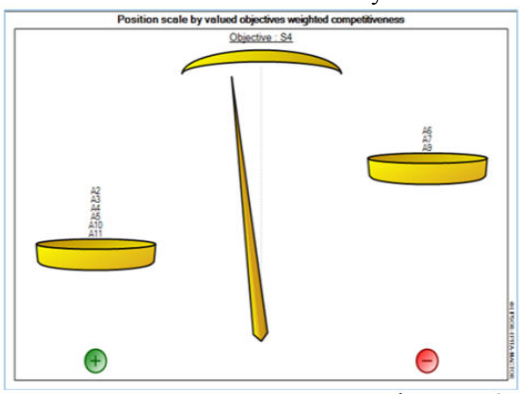
- Full convergence of stakeholders is reached in cases of *Objective S1* (development of alternative forms of tourism in the land and coastal part) and *Objective S2* (development of alternative forms of tourism in the marine part);
- *Objective S3* (decentralization of tourism sector across the coastal part) seems to be accepted by the majority of stakeholders, apart from A6 (Trade Associations) and A7 (Tourist associations), who seem to resist to this objective as this opposes already well established tourism patterns and location of sector-related businesses in the coastal part of the study region (Fig. 11a).
- With regards to Objective S4 (protection of high valued coastal and marine ecosystems), the majority of stakeholders is positive, apart from A6 (Trade Associations), A7 (Tourist associations) and A9 (Agricultural associations), as this objective will inevitably imply the enforcement of certain constraints to respective sectoral-related activities (Fig. 11b).
- Concerning *Objective S5* (synergies' creation between uses in the terrestrial and marine environment in isolation as well as in between them) (Fig. 11c) and *Objective S6* (conflicts' management between uses in the terrestrial and marine environment in isolation as well as in between them), opposing are A4 (Environmental associations), A9 (Agricultural associations) and A10 (National Marine Park of Zakynthos), each for own reasons. Such an opposition can potentially be related to the reluctance to accept a land use change or unwillingness of the above groups to share rights on, already exploited by them, land parcels.
- Finally in *Objective S7* (Human resource upgrading – Promotion of green and blue entrepreneurship) full convergence of stakeholders is reached.

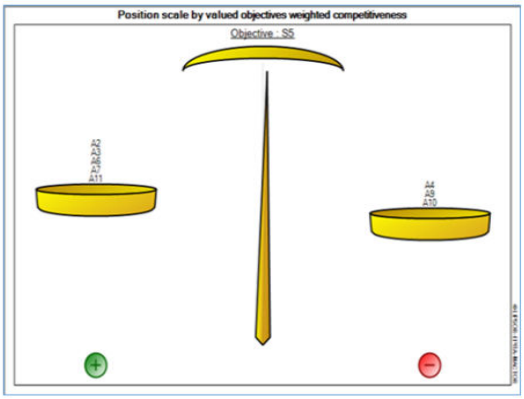
**Figure 13: Position of stakeholders as to the objectives**

a.Position as to S3 - decentralization of tourism sector across the coastal part




b. Position as to S4 - protection of high valued coastal and marine ecosystems




c. Position as to S5 - synergies' creation between uses in the land, the marine as well as the land – marine environment

Source: Panagou, 2017

## 5. Conclusions

Coastal environments are nowadays at the epicentre of planners' interests as 'laboratories' of growth and development, but also as land parcels that are extremely vulnerable to human activities' impacts. This interest is due to their dual nature as *enablers* of land and marine activities, with an increasing importance for job and wealth creation in the context of the Blue Growth Strategy; and as *public spaces* that provide ecological and recreation goods and services to local populations. This in turn designates the value of these places for both the *local level*, i.e. local communities, but also the *supralocal level*, since these areas constitute appealing environments for investments with impact at the regional or even the national economy. Based on this challenging dual role, they constitute attractive places for population and activities, a fact that exerts considerable pressure on these terrestrial compartments, rendering them a field of *conflicting and competing economic and social interests* that strongly affect their trajectory and impact both the territorial and the marine/coastal environment and spatial organization.

As *interfaces* of marine and terrestrial activities, e.g. fishing, agriculture, tourism and recreation, transportation and maritime trade (Echevarría et al., 2013), coastal areas are subject to both *marine/coastal (MSP and ICZM) and terrestrial planning endeavours*. The need for an integrated spatial planning approach in marine and coastal zones is pretty well understood and endorsed in various EU policy documents [COM(2013)133 final]. On the contrary, the role of *terrestrial plans* on the coastal/marine environment and the need relative planning endeavours and policies emerging out of them to be in harmony with marine/coastal planning considerations and objectives and vice versa, especially when planning at a *local scale,* has not been yet fully realized.

The latter lies at the heart of this paper, arguing that, at the local level, *marine/coastal (MSP and ICZM) and terrestrial planning* should be rather perceived as a *shared planning exercise*, embedding in it principles and peculiarities of terrestrial, coastal and marine environments and their interactions, as well as interactions among stakeholders having a stake in all three types of environments. Based on such a shared view of related spaces (terrestrial,

coastal and marine), the paper aims at contributing in a twofold manner, namely by: i) providing a more *integrated, system-based, planning approach*, mostly relevant to *local planning exercises*, which implies the perception of terrestrial and coastal/marine environments as subsystems of one system; and ii) shedding light on proper *planning tools* that are capable of handling terrestrial and coastal/marine space as well as relevant stakeholders and community actors' *interaction*. Such an approach can ensure an *integrated and coherent view* of terrestrial and coastal/marine resource management, *broadening thus the scope* of respective planning efforts and emerging policies for the sustainable exploitation of terrestrial and marine resources by accommodating local development visions, relating to terrestrial space, into the perspective of MSP and ICZM and vice versa. The proposed framework and planning tools can, additionally, set up a *platform for interaction* among a wide variety of stakeholders and communities' representatives, in order understanding of various interests to be facilitated and building up of consensus on mutually benefiting perspectives to be reached.

The integrated view embedded in the methodological approach is largely emerging from territorial planning discipline and principles, properly expanded to introduce coastal/marine space interests as well. As parts of the proposed approach, the rationale and outcomes obtained by use of suitable *planning tools* – MICMAC and MACTOR models – in a specific case study, Zakynthos Island, are depicted. These facilitate the handling of terrestrial and coastal/marine space as well as stakeholders and communities' *interaction* at the local level. The participatory context of these tools is stressed; although time and budget constraints did not allow its real implementation in the case study region (data used for feeding these models reflects mainly researchers' insight and experts' views, occasionally advising researchers in their effort).

The usefulness of planning tools tested in this paper (MICMAC and MACTOR models) lies mainly on their capacity to provide, in a more systematic and structured way, useful *knowledge* on key drivers of the study system for: predicting *future demand for space* in both the terrestrial and coastal/marine environment; and using this knowledge for building *more informed and robust scenarios* with respect to alternative future developments of the territorial / marine system as a whole. Additionally, they provide the chance for early identification of *powerful stakeholders* in the study system, an issue of critical importance for its future development (Carrero et al., 2013). Both inputs can affect validity and robustness of subsequent steps of the process e.g. identification of conflicts and synergies, assessment of scenarios.

Experience gained from the application of these tools in the specific case study area can be shortly summarized in a range of key *barriers or difficulties* that need to be handled in such a *shared planning endeavour*.

A key aspect that relates to the effective implementation of the proposed methodological framework lies on the *capacity* of establishing substantial communication and interaction among the multidisciplinary and interdisciplinary group required for accomplishing such a planning exercise. Indeed, a variety of different *perspectives* and relative *scientific backgrounds* are incorporated in this framework (legal, cultural, environmental, social, economic, spatial, technological, etc. knowledge). These, as research has also revealed (ADRIPLAN, 2015), cannot always find pathways for establishing full mutual understanding and constructive interaction in order the different perspectives and technical knowledge to be fully integrated in each specific case study context. Things are getting worse in this respect, due to time and resource constraints.

*Stakeholders and local communities' engagement* is another important issue. As earlier discussed, coastal/marine stakeholders and community actors do not share the same values and do not dispose similar perceptions with regards to local terrestrial or marine resources. In certain cases the two groups can represent rather conflicting stakes. Bridging these differences and establishing a fruitful and creative interaction among completely different, in terms of knowledge and objectives but also power to influence policy decisions, groups, seems to be a real planning challenge and a considerable barrier to overcome. If this can be properly handled, networking through stakeholders and community's engagement can have multiplying effects towards conflicts' alleviation and synergies' creation at the local level.

The role of *governance structures* is also stressed in such an effort. Such structures, apart from their role as facilitators of the full engagement of relevant coastal and maritime stakeholders (Stojanovic and Barker, 2008; ADRIPLAN, 2015; Jay et al., 2016), can act also as *enablers* of the proposed integrated approach, since this engages different hierarchical decision levels and related bodies. Indeed, while terrestrial spatial organization and respective decision-making is a responsibility of the local level, coping with marine environment falls into the state's jurisdiction. Implementation of the integrated methodological approach of the present paper, in this respect, implies both *horizontal* (decision-making bodies at the local level, having a role in spatial and developmental planning issues) and *vertical* (decision-making and policy making bodies at different hierarchical levels, e.g. local, regional, national) spatial territorial governance. Such a vertical and horizontal cooperation and coordination can assure that all kinds of legal, institutional etc. barriers can be overcome; and the final planning outcome can be in alignment with the strategic objectives and respect constraints of higher hierarchically policy making levels.

Finally, *availability of reliable spatial data* in both the terrestrial and the marine environment is of crucial importance in handling issues raised in such a shared planning approach. This holds true especially for marine data that appear to be more scarce and scattered to various institutions and researchers, while terrestrial data seem to be an issue easier to handle. Data shortage has been stressed by most of the macro-region studies explored in this work. Both aspects, i.e. availability and quality of data, but also data accessibility, can largely affect the smooth handling of the planning process and the validity of the results obtained.

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# CHANGES IN THE NUMBER OF VISITORS' OVERNIGHT STAYS IN HOTEL ACCOMMODATIONS AND CAMPSITES IN THE THIRTEEN ADMINISTRATIVE REGIONS OF GREECE : A SHIFT SHARE ANALYSIS APPROACH

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**Abstract**
The shift-share method is applied in order to divide a regional value's change into separate components. The present paper aims to divide the percentage change of the number of overnight stays that took place in hotel and campsite accommodations in the thirteen Greek administrative regions between the years 2003 and 2015 into separate components, by applying the above mentioned method. Arrivals and overnight stays' data for domestic and international visitors were used for the division of the percentage change of the total number of overnight stays.

**Keywords:** Shift-share analysis, Arrivals, overnight stays, hotel accommodations
**JEL classification:** Z30, R58

## 1. Introduction

The shift-share analysis (Dunn, 1960), in its diverse variations (Kalbacher,1979, Loveridge et all, 1998), is an extremely popular method for the two following reasons: it's simple and undemanding in data . The core of the method lies in the comparison of a regional value's change in relation to the change of the same value in a reference area, usually the whole country (Loveridge,1995). Of course, the method has received some criticism (Lamarche 2003, Kochanowski 1989, Holden et all 1989, Arcelus 1984, Esteban Marquillas 1972). Despite the criticism, the possibility of a first rough approach to the hidden causes that affect the regional variables and, consequently, to a region's economy that this method offers, renders it, if not a typical analysis method, at least one that cannot be ignored when it comes to a first description of a regional economy. In the tourism sector, the method's classical approach, static or dynamic, or in its revised form, has been applied in order to analyse an area's tourism sector or the competitiveness inside the area's tourism (shi Chunyun et all 2007, Fuchs et all 2000). In the present paper, the new shift-share analysis approach will be applied in the tourism sector (Artige et all 2014). The new approach has dealt with the points of criticism of the classical method (Dunn 1960), as well as those of the modified method (Esteban 1972). In the present paper, the new method will be applied using data involving all the years between 2003 and 2015, introducing a dynamic character to the analysis (Barff 1988 et al). We will attempt to address the question of whether it is possible to divide the percentage change of the number of overnight stays that took place in hotel accommodations and campsites in the thirteen Greek administrative regions, between the years 2003 and 2015, into separate components. We deem that the use of this method will contribute to its wider introduction in analyzing more variables in the tourism industry (Chun-Yun et al 2008, Shi et all 2007).

## 2. The model.

If $A_{i,t} = \sum_j^k A_{ij,t}$ and $N_{i,t} = \sum_j^k N_{ij,t}$ express the total number of arrivals (A) and overnight stays (N) in hotel accommodations in region i coming from visitor categories j=1,2,3,...k at time t and $r_{ij,t+1} = \frac{A_{ij,t+1} - A_{ij,t}}{A_{ij,t}}$, $g_{ij,t+1} = \frac{N_{ij,t+1} - N_{ij,t}}{N_{ij,t}}$ express the change rates of arrivals and overnight

stays by category, then the rate of arrivals and overnight stays in the categories' total are $r_{i,t+1} = \sum_j^k \frac{A_{ij,t}}{A_{i,t}} r_{ij,t+1}$ and $g_{i,t+1} = \sum_j^k \frac{N_{ij,t}}{N_{i,t}} g_{ij,t+1}$, respectively. If every visitor category is 1/k of the arrivals' total and makes up for 1/k of the overnight stays' total, then we have the average change rate of arrivals $\bar{r}_{i,t+1} = \sum_j^k (\frac{1}{k}) r_{ij,t+1}$ and overnight stays $\bar{g}_{i,t+1} = \sum_j^k (\frac{1}{k}) g_{ij,t+1}$, respectively. The rates $r_{i,t+1}$, $g_{i,t+1}$ of the arrivals and overnight stays may be also expressed, respectively, as (Artige et all 2014):

$$r_{i,t+1} = \sum_j^k (\frac{1}{k}) r_{ij,t+1} + \sum_j^k (\frac{A_{ij,t}}{A_{i,t}} - \frac{1}{k}) r_{ij,t+1} \quad [1]$$

$$g_{i,t+1} = \sum_j^k (\frac{1}{k}) g_{ij,t+1} + \sum_j^k (\frac{N_{ij,t}}{N_{i,t}} - \frac{1}{k}) g_{ij,t+1} \quad [2]$$

Taking into consideration that the ratio of the number of overnight stays to the number of arrivals reflects the average number of overnight stays per visitor, number [**2**] is expressed as:

$$g_{i,t+1} = \bar{r}_{i,t+1} + (\bar{g}_{i,t+1} - \bar{r}_{i,t+1}) + (r_{i,t+1} - \bar{r}_{i,t+1}) + [(g_{i,t+1} - \bar{g}_{i,t+1}) - (r_{i,t+1} - \bar{r}_{i,t+1})] [3]$$

If $\bar{r}_{t+1}, r_{t+1}, \bar{g}_{t+1}, g_{t+1}$ are, respectively, the arrival and overnight stays' rates of the reference area, which is usually the whole country, the expression corresponding to number **[2]** for the whole country is **[4]**

$$g_{t+1} = \bar{r}_{t+1} + (\bar{g}_{t+1} - \bar{r}_{t+1}) + (r_{t+1} - \bar{r}_{t+1}) + [(g_{t+1} - \bar{g}_{t+1}) - (r_{t+1} - \bar{r}_{t+1})] [4]$$

The result of the difference $DG_{i,t+1} = (g_{i,t+1} - g_{t+1})$ provides the differential growth of area i in comparison to the reference area. Having available the number of arrivals and overnight stays per category for the points in time t=0,1,2,..,T, the percentage change $pc_i = \frac{N_{i,T} - N_{i,0}}{N_{i,0}}$ in the number of overnight stays of area i, between the time points 0 and T, is divided into corresponding percentage change epci and deviation units $DG_i$ that result from $DG_i = DA_i + MA_i + DO_i + MO_i$. The percentage change pci is expressed as:

$$pc_i = epc_i + DG_i \quad [5]$$

The **corresponding percentage** change component $epc_i = \frac{(N_{i,0} + \sum_{t=0}^T N_{i,t} g_{t+1})}{N_{i,0}} - 1$ refers to the change that the area would have if the deviation $DG_i$ expressed as $DG_i = \sum_{t=0}^T N_{i,t} (g_{i,t+1} - g_{t+1})$ was zero. If the deviation is not equal to zero, the deviation units $DA_i$, $DO_i$, $MA_i$, $MO_i$ reinforce or weaken the corresponding percentage change, depending on their sign.

The component: **Dynamics of arrivals** $DA_i = \frac{\sum_{t=0}^T N_{i,t} (\bar{r}_{i,t+1} - \bar{r}_{t+1})}{N_{i,0}}$ refers to the deviation units that are cumulatively attributed to the average change rate of the arrivals. If the component's value is positive, the average change rate of arrivals cumulatively renders a higher average number of overnight stays in the area, in comparison to the number that would be rendered by the corresponding average rate of the reference area.

The component: **Structure of arrivals** $MA_i = \frac{\sum_0^T N_{i,t} [(r_{i,t+1} - \bar{r}_{i,t+1}) - (r_{t+1} - \bar{r}_{t+1})]}{N_{i,0}}$ refers to the deviation units that are cumulatively attributed to the structure of arrivals in the area. If the value of the component is positive, the existing structure of arrivals in the area results in a higher number of overnight stays in comparison to the number of overnight stays that the structure of arrivals in the reference area would have rendered. The sum Ei of the deviation units $DA_i$,$MA_i$ refers to the deviation that may cumulatively be attributed to the competitiveness of the area in terms of arrivals. If $E_i > 0$, the effect of the components "dynamics of arrivals" and "structure of arrivals" cumulatively renders a higher number of overnight stays in the area, in comparison to what the corresponding rate and structure of arrivals would have rendered in the reference area.

The component: **Dynamic duration** $DO_i = \frac{\sum_{t=0}^T N_{i,t} [(\bar{g}_{i,t+1} - \bar{r}_{i,t+1}) - (\bar{g}_{t+1} - \bar{r}_{t+1})]}{N_{i,0}}$ refers to the deviation units that are cumulatively attributed to the difference of the average change rate of

arrivals and the average change of the overnight stays' rate. If the value of the component is positive, the difference of the average rates cumulatively renders a higher average number of overnight stays in the area per visitor, in comparison to the number that would be rendered by the corresponding difference of rates in the reference area.

The component: **Structural duration**

$MO_j = \frac{\sum_{t=0}^{T} N_{i,t}([(g_{i,t+1}-\bar{g}_{i,t+1})-(r_{i,t+1}-\bar{r}_{i,t+1})]-[(g_{t+1}-\bar{g}_{t+1})-(r_{t+1}-\bar{r}_{t+1})])}{N_{i,0}}$ refers to the diversion units that are cumulatively attributed to the existing difference between the structure of arrivals and the structure of overnight stays. If the value of the component is positive, the difference between the structures renders a higher number of overnight stays per visitor in the area, in comparison to what would be rendered by the corresponding difference of the reference area. The sum Ii of the deviation units $DO_i$,$MO_i$, provides the component of average stay duration and refers to that section of the deviation that can be attributed to the components of dynamic duration and structural duration. The sum Ii is an indication of the area's ability to convert the arrivals into overnight stays per visitor, in comparison to the reference area. If $I_i>0$, the difference between rates and structures renders a higher number of overnight stays per visitor in the area, in comparison to the number of overnight stays per visitor that would be rendered by the corresponding rates of the values in the reference area. All of the above are reflected in the table_1 below

**Table_1 The components and their signs (+) or (-)**

| Competitiveness in terms of Arrivals $E_i$ | Structure of Arrivals Component, $MA_i > 0$ | Structure of Arrivals Component, $MA_i < 0$ |
|---|---|---|
| Dynamics of arrivals component, $DA_i > 0$ | 1. The deviation of the area is reinforced by the structure of arrivals, as well as the dynamics of the arrivals.<br>2. The area's rate of arrivals cumulatively renders a higher number of overnight stays in comparison to what would be rendered by the corresponding rate of the reference area. | 1. The deviation of the area is reinforced by the dynamics of the arrivals.<br>2. The area's rate of arrivals cumulatively renders a higher number of overnight stays in comparison to what would be rendered by the corresponding rate of the reference area<br>if : $DA_i - MA_i > 0$ |
| Dynamics of arrivals component, $DA_i < 0$ | 1. The area deviation is reinforced by the structure of arrivals.<br>2. The area's arrival rate cumulatively renders a higher number of overnight stays in comparison to what would be rendered by the corresponding rate of the reference area<br>If : $MA_i - DA_i > 0$ | 1. The area's deviation is weakened by the structure of arrivals, as well as the dynamics of arrivals.<br>2. The area's arrival rate cumulatively renders a lower number of overnight stays in comparison to what would be rendered by the corresponding rate of the reference area. |
| Comparative Ability of converting arrivals into overnight stays $I_i$ | Structural Duration Component, $MO_i > 0$ | Structural Duration Component $MO_i < 0$ |
| Dynamic Duration Component, $DO_i > 0$ | 1. The deviation of the area is reinforced by the structural duration of the stay, as well as the dynamic duration of the stay.<br>2. The difference between the change rate of arrivals in the area and the change rate of the overnight stays renders a higher visitors' stay duration in the area, in comparison to what would be rendered by the corresponding difference of the reference area. | 1. The deviation of the area is reinforced by the dynamic duration of the stay.<br>2. The difference between the change rate of arrivals in the area and the change rate of the overnight stays renders a higher visitors' stay duration in the area, in comparison to what would be rendered by the corresponding difference of the reference area<br>if: $DO_i - MO_i > 0$ |
| Dynamic Duration Component, $DO_i < 0$ | 1. The area's deviation is reinforced by the structural duration of the stay.<br>2. The difference between the change rate of arrivals in the area and the change rate of overnight stays renders a higher visitors' stay duration in the area, in comparison to what would be rendered by the corresponding difference in the reference area<br>If : $MO_i - DO_i > 0$ | 1. The area's deviation is weakened by the structural duration of the stay, as well as the dynamic duration of the stay.<br>2. The difference between the change rate of arrivals in the area and the change rate of overnight stays renders a lower visitors' stay duration in the area, in comparison to what would be rendered by the corresponding difference in the reference area |

## 3. Application

The [5] was applied in the thirteen administrative regions of Greece in order to divide the accomplished percentage change of overnight stays that took place between the years 2003 and 2015 in each of them, into separate components. The arrivals and the overnight stays have been divided in domestic and international arrivals and overnight stays. The relevant values are presented in the following table_2[1]

[1] $pc_i=epc_i+DG_i$ , $DG_i=E_i+I_i$ , $E_i=DA_i+MA_i$, $I_i=DO_i+MO_i$

**Table_2: Change rate of overnight stays, realized (pc) , corresponding (epc) and deviation units**

| Administrative Regions | $pc_i$ | $epc_i$ | $DG_i$ | $DA_i$ | $MA_i$ | $DO_i$ | $MO_i$ |
|---|---|---|---|---|---|---|---|
| Kentriki Makedonia | 131,0 | 68,9 | 62,1 | 68,0 | -24,9 | 9,9 | 9,2 |
| Kriti | 76,0 | 50,8 | 25,2 | 21,9 | 19,2 | -5,0 | -10,9 |
| Attiki | 38,2 | 43,0 | -4,8 | 1,5 | -1,0 | -0,2 | -5,1 |
| Ionia Nisia | 33,5 | 42,4 | -8,9 | -14,7 | 21,3 | -11,3 | -4,1 |
| Anatoliki Makedonia, Thraki | 27,8 | 41,9 | -14,1 | 12,9 | -35,7 | -7,3 | 16,0 |
| Notio Aigaio | 26,6 | 37,0 | -10,5 | -9,7 | 20,4 | -10,6 | -10,7 |
| Dytiki Ellada | 21,7 | 38,8 | -17,1 | -25,1 | -14,8 | 29,2 | -6,3 |
| Peloponnisos | 18,9 | 39,3 | -20,4 | -16,4 | -15,4 | 15,6 | -4,2 |
| Thessalia | 17,6 | 40,8 | -23,2 | -8,6 | -22,5 | 7,0 | 1,0 |
| Epirus | 5,5 | 34,6 | -29,0 | -24,9 | -15,8 | 17,3 | -5,7 |
| Voreio Aigaio | -1,9 | 32,2 | -34,1 | -28,7 | 0,9 | -5,8 | -0,5 |
| Sterea Ellada | -2,1 | 36,3 | -38,4 | -29,3 | -12,1 | 9,3 | -6,3 |
| Dytiki Makedonia | -25,2 | 34,0 | -59,2 | -67,3 | -12,7 | 15,3 | 5,5 |

## 4. Conclusion

According to table_1 and the numerical results of table_2 concerning the thirteen administrative regions of Greece and the realized percentage change of overnight stays, we conclude the following:

**A:** Only two regions have realized a percentage change in the number of overnight stays between 2003 and 2015 higher than the corresponding, the deviation (DG) reinforcing the corresponding, according to table_1. Those regions are: Kentriki Makedonia and Kriti. In the rest of the regions, the realized change in the number of overnight stays is lower than the corresponding. In addition, in three regions in this category, the percentage change of overnight stays, between 2003 and 2015, is negative. These regions are: Sterea Ellada, Dytiki Makedonia, and Voreio Aigaio.

**B:** The region with competitive arrivals' advantage and comparative ability to convert arrivals into overnight stays is: Kentriki Makedonia which is attributed to the dynamics of arrivals and to the structural duration of the stay, as well as the dynamic duration of the stay.

**C:** The regions with competitive advantage in arrivals but without comparative ability to convert arrivals into overnight stays are: 1.Kriti which is attributed to the structure of arrivals, as well as the dynamics of arrivals and to the structural duration of the stay, as well as the dynamic duration of the stay ,2.Ionia Nisia, Notio Aigaio which is attributed to the structure of arrivals and to the structural duration of the stay, as well as the dynamic duration of the stay. 3.Attiki which is attributed to the dynamics of arrivals and to the structural duration of the stay, as well as the dynamic duration of the stay

**D:**The regions without competitive advantage in arrivals but comparative ability to convert arrivals into overnight stays are: 1.Thessalia, Dytiki Makedonia which is attributed to the structure of arrivals, as well as the dynamics of arrivals and to the structural duration of the stay, as well as the dynamic duration of the stay.2.Dytiki Ellada, Peloponnisos, Epirus ,Sterea Ellada which is attributed to the structure of arrivals, as well as the dynamics of arrivals, and to the dynamic duration of the stay.3.Anatoliki Makedonia Thraki which is attributed to the structure of arrivals and to the structural duration of the stay.

**E:** Only the region of Voreio Aigaio holds no competitive advantage in arrivals and no comparative ability to convert arrivals into overnight stays.

To conclude, we must point out that the division of the overnight stays' percentage change into separate components may help lead us towards analyzing the explanatory variables of the components.

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# A NOTE ON SCHUMPETERIAN COMPETITION IN THE CREATIVE CLASS AND INNOVATION POLICY

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**Abstract**

We study innovation policy in a region in which the members of the creative class engage in Schumpeterian competition and thereby extend aspects of the recent analysis in Batabyal and Yoo (2017). Using the language of these researchers, the creative class is broadly composed of existing and candidate entrepreneurs. In contrast to these researchers, we suppose that R&D by candidate entrepreneurs does not generate any negative externalities. In this setting, we analyze the impact that taxes and subsidies on R&D by existing and candidate entrepreneurs have on R&D expenditures and regional economic growth.

**Keywords:** Creative Class, Creative Destruction, Economic Growth, Innovation Policy, R&D

**JEL classification:** R11, O31, O38

## 1. Introduction

We begin with the definitions of two concepts---the creative class and creative capital---that are now very familiar to and much studied by both regional scientists and urban economists. Richard Florida (2002, p. 68) helpfully explains that the creative class "consists of people who add economic value through their creativity." This class is made up of professionals such as doctors, lawyers, scientists, engineers, university professors, and, notably, bohemians such as artists, musicians, and sculptors. From the standpoint of regional economic growth and development, these people are significant because they possess creative capital which is the "intrinsically human ability to create new ideas, new technologies, new business models, new cultural forms, and whole new industries that really [matter]" (Florida, 2005, p. 32).

Several researchers have now documented the salience of the creative class in promoting regional economic growth and development. In a recent paper, Batabyal and Yoo (2017) (hereafter B&Y) summarize the literature on the creative class and make three salient points. First, B&Y note that in regions where the creative class is a dominant part of the overall workforce, there is a clear link between innovations, the creative class, and regional economic growth and development. Second, B&Y contend that innovative activities and processes are essentially competitive in nature and that this competitive aspect is related to the insight of Joseph Schumpeter who argued that growth processes are marked by creative destruction in which "economic growth is driven, at least in part, by new firms replacing incumbents and new machines and products replacing old ones" (Acemoglu, 2009, p. 458). Finally, B&Y point out that the preceding two points notwithstanding, there are no theoretical studies that examine how Schumpeterian competition between the members of a region's creative class affects both innovation policy and economic growth in this region.

Given this state of affairs, B&Y provide what they claim is the first theoretical analysis of the ways in which Schumpeterian competition in the creative class affects innovation policy and economic growth in a region that is creative in the sense of Richard Florida. B&Y broadly divide the creative class they study into existing and candidate entrepreneurs. A key assumption made by B&Y in their analysis is that negative externalities accompany the R&D

undertaken by the candidate entrepreneurs. The justification for this assumption is the idea that when many candidate entrepreneurs are competitively attempting to come up with quality improvements in the inputs called machines that are used to produce a final consumption good such as a camera, diminishing returns are likely to exist. This notwithstanding, we contend that R&D by the candidate entrepreneurs may but does not have to be accompanied by the presence of negative externalities.

As such, our central objective in this note is to first suppose that R&D by the candidate entrepreneurs does not generate any negative externalities and to then study the impact that taxes and subsidies on R&D by the existing and the candidate entrepreneurs have on R&D expenditures and economic growth in a creative region. In the course of our analysis, we shall make use of the basic point that a subsidy can be thought of as a negative tax and that a tax can be thought of as a negative subsidy. The remainder of this note is arranged as follows. Section 2 describes the model employed by B&Y. Section 3 highlights the ways in which the balanced growth path (BGP) equilibrium with taxes and subsidies studied by B&Y changes when the R&D conducted by the candidate entrepreneurs generates no negative externalities. Section 4 studies how the comparative statics results about the effects of taxes and subsidies on R&D and economic growth obtained by B&Y change when, once again, no negative externalities arise from the R&D conducted by the candidate entrepreneurs. Section 5 concludes and then offers two suggestions for extending the research delineated in this note.

## 2. The Model

### 2.1. Preliminaries

Consider an infinite horizon, continuous-time, stylized region that is creative in the sense of Richard Florida. The representative creative class household in this region displays constant relative risk aversion (CRRA) and its CRRA utility function is denoted by $\int_0^{\infty} \exp(-\rho t)\,[\{C(t)^{1-\theta}\text{-}1\}/(1\text{-}\theta)]dt, \theta \neq 1$, where $C(t)$ is consumption at time $t$, $\rho > 0$ is the constant time discount rate, and $\theta \geq 0$ is the constant coefficient of relative risk aversion. At any time $t$, members of the creative class possess creative capital and we denote each member and her creative capital by $R(t)$. The population of the creative class is constant and therefore we have $R(t) = R, \forall t$. The existing creative capital is supplied inelastically.

The aggregate resource constraint at time $t$ is given by

$$C(t) + X(t) + I(t) \leq O(t), \tag{1}$$

where $C(t)$ is consumption, $X(t)$ is total spending on machines, $I(t)$ is total spending on R&D, and $O(t)$ is the output and the value of the single final consumption good such as a camera. The machines we have just referred to are essential inputs in the production of the final good.

There is a continuum of machines that is used to produce the final good $O(t)$. Each machine line or variety is described by $v$ where $v \in [0,1]$. The source of economic growth in our creative region is *process innovations* that improve the *quality* of existing machines. To this end, let $q(v,t)$ denote the quality of the machine of line or variety $v$ at time $t$.

The single final good or $O(t)$ is produced in accordance with the function

$$O(t) = \frac{1}{1-\beta}\left[\int_0^1 q(v,t)^{\beta} x(v,t;q)^{1-\beta}\, dv\right] R^{\beta}, \tag{2}$$

where $R$ is creative capital, $q(v,t)$ is the quality of the machine of line $v$ at time $t$, $x(v,t;q)$ is the total amount of the machine of variety $v$ and quality $q$ that is used at time $t$, and $\beta \in (0,1)$ is a parameter. Let $w > 0$ denote the wage rate or the return to the creative capital input $R$ and let $r > 0$ denote the interest rate.

The *quality* improvements in the machines that arise from the process innovations mentioned above are the outcome of two types of innovations. The first type of innovation is performed by members of the creative class known as *existing entrepreneurs*. These are the

individuals who have already invented and produced machines that are presently being used to produce the final consumption good. The second type of innovation is performed by the members of the creative class known as *candidate entrepreneurs*. These are the individuals who are seeking to invent and produce higher qualities of machine lines than the ones that are presently being used to produce the final good. The basic feature of the model employed by B&Y is the *Schumpeterian competition* between the existing and the candidate entrepreneurs. This competition is Schumpeterian because for any machine line $\nu$, when a candidate entrepreneur develops a machine of higher quality than the quality that is presently in use to produce the final good, the candidate entrepreneur's higher quality machine *creatively destroys* an existing entrepreneur's now lower quality machine. Next, let us comprehend the R&D process that gives rise to the invention and production of higher quality machines.

### 2.2. The ontogenesis of quality machines

Let $q(\nu, t)$ denote the quality of machine line $\nu$ at time $t$. The "quality ladder" for each machine variety is of the form

$$q(\nu, t) = \delta^n q(\nu, s), \forall \nu \text{ and } t, \tag{3}$$

where $\delta > 1$ is the "ladder" with rungs and $n$ denotes the number of *marginal* innovations on this machine line---or the number of rungs climbed up the ladder---in the time period between $s \leq t$ and $t$. Here, $s$ is the time at which this particular type of machine technology was first invented and $q(\nu, s)$ is its quality at that point in time. An existing entrepreneur has a fully enforced patent on the machines that she has developed. Even so, this patent leaves open the possibility that a candidate entrepreneur will engage in R&D and "jump over" an existing entrepreneur's machine quality. At time $t = 0$, each machine line begins with some quality $q(\nu, 0) > 0$ and this line is owned by an existing entrepreneur. Marginal innovations can only be brought about by an existing entrepreneur. If an *existing* entrepreneur engages in R&D and spends an amount $i^E(\nu, t)q(\nu, t)$ of the final consumption good for a marginal innovation on a machine of quality $q(\nu, t)$ then this existing entrepreneur gives rise to the flow rate of innovation $\phi(i^E)i^E(\nu, t)$ where $\phi'(i^E) > 0$, $\phi''(i^E) < 0$ and this flow rate function $\phi(\cdot)$ satisfies the conditions $lim_{i^E \to 0}\phi'(i^E) = \infty$ and $lim_{i^E \to \infty}\phi'(i^E) = 0$. The result of this R&D and expenditure by an existing entrepreneur is a new machine of quality $\delta q(\nu, t)$.

Candidate entrepreneurs can also conduct R&D with the aim of producing quality machines that will improve upon the presently used machines of line $\nu$ at time $t$. Assume that the current quality of a machine of line $\nu$ is $q(\nu, t)$. Then, by spending one unit of the final consumption good, a *candidate* entrepreneur can innovate at the flow rate $\eta\{i^C(\nu, t)\}/q(\nu, t)$ where $\eta'\{\cdot\} < 0$ and $i^C(\nu, t)$ is the R&D expenditure incurred by the candidate entrepreneur on machine line $\nu$ at time $t$. For machine line $\nu$, a quality innovation by a candidate entrepreneur that jumps over an existing quality is a *drastic* innovation and a drastic quality innovation creatively destroys the existing quality machine of line $\nu$. Whereas candidate entrepreneurs give rise to drastic innovations only, existing entrepreneurs can give rise to marginal and to drastic innovations. However, even though existing entrepreneurs can give rise to both kinds of innovation, in practice, they only generate marginal innovations.[1]

The key point to note is the B&Y assumption that the $\eta\{\cdot\}$ function is *strictly decreasing*. This assumption captures the idea that the competitively undertaken R&D by the candidate entrepreneurs is subject to diminishing returns and hence leads to negative externalities. This is the assumption that we dispense with in section 4 by supposing that $\eta\{i^C\} = \tilde{\eta}$, where $\tilde{\eta}$ is

[1] This is because of a phenomenon known as Arrow's (1962) replacement effect. See Acemoglu (2009, pp. 420-422) and Batabyal and Yoo (2017) for additional details.

a positive constant. Also, note that the candidate entrepreneurs treat the $\eta\{\cdot\}$ function as exogenous to their decision-making. The $\eta\{\cdot\}$ function for the candidate entrepreneurs satisfies the conditions $lim_{i^C \to \infty} \eta\{i^C\} = 0$ and $lim_{i^C \to 0} \eta\{i^C\} = \infty$. Finally, a quality innovation by a candidate entrepreneur leads to a new machine of quality $\chi q(v,t)$ where $\chi > \delta$. Put differently, quality innovations by candidate entrepreneurs are *more* drastic than those undertaken by the existing entrepreneurs.

Once a specific machine of quality $q(v,t)$ has been inented, any amount of this machine can be produced at the marginal cost $\psi$ in terms of the final good and, in the remainder of this note, we shall use the normalization $\psi = 1 - \beta$. Observe that the total spending on R&D or $I(t)$ in (1) can also be expressed as

$$I(t) = \int_0^1 \{i^E(v,t) + i^C(v,t)\} q(v,t) dv, \tag{4}$$

where $q(v,t)$ refers to the *highest* quality of machine variety $v$ at time $t$.

In our creative region, a so called *allocation* has four parts. First, there are the time paths of consumption, total spending on machines, and total spending on R&D given by $\{C(t), X(t), I(t)\}_{t=0}^{\infty}$. Second, we have the time paths of the R&D expenditures by the existing and the candidate entrepreneurs denoted by $\{i^E(v,t), i^C(v,t)\}_{v \in [0,1], t=0}^{\infty}$. Third, there are the prices and the quantities of the highest quality machines and the net present discounted value of profits from these same machines given by $\{p^x(v,t;q), x(v,t;q), V(v,t;q)\}_{v \in [0,1], t=0}^{\infty}$. Finally, there are the time paths of the interest and the wage rates denoted by $\{r(t), w(t)\}_{t=0}^{\infty}$.

An *equilibrium* allocation is one in which four properties are satisfied concurrently. First, the candidate entrepreneurs make R&D decisions to maximize their present discounted value. Second, the existing entrepreneurs choose machine prices and quantities and make R&D decisions to maximize their present discounted value. Third, the representative creative class household chooses consumption to maximize utility. Finally, all markets clear. It is understood that a balanced growth path (BGP) is an equilibrium time path on which both consumption and the output of the final good grow at a constant rate.

Now, with this description of the model in place, our next task is to delineate the ways in which taxes and subsidies on R&D by the existing and the candidate entrepreneurs influence R&D expenditures and regional economic growth with the assumption that the R&D conducted by the candidate entrepreneurs does *not* generate negative externalities. While performing this exercise, we follow B&Y and adapt some of the results in Peters and Simsek (2009, pp. 275-284) to our analysis of Schumpeterian competition in the creative class that broadly consists of existing and candidate entrepreneurs.

## 3. The BGP Equilibrium with no Negative Externalities

Suppose that an apposite regional authority (RA) levies taxes on the R&D expenditures undertaken by the existing and the candidate entrepreneurs. Denote these two taxes by $\tau^E$ and $\tau^C$ respectively. B&Y show that in the presence of these two taxes, a unique BGP equilibrium exists in our creative region and that this equilibrium satisfies three properties. First, the output of the final good $(O)$, consumption by the representative creative class household $(C)$, total R&D expenditures $(I)$, and the average total quality of machines $(Q)$, all grow at a constant rate. Second, the value function is explicitly a function of machine quality $q$ and it has the linear form $V(q) = \omega q$. Finally, R&D expenditures by the existing and the candidate entrepreneurs $(i^{E*}, i^C)$ are positive. We now demonstrate how the BGP equilibrium studied by B&Y changes when R&D conducted by the candidate entrepreneurs does *not* generate negative externalities or when $\eta\{i^C\} = \bar{\eta}$, a constant.

Modifying equations (34), (35), and (37) in B&Y, we get

$$(\delta - 1)\phi'(i^{E*})\omega(t) = 1 + \tau^E, \tag{5}$$

$$\chi\tilde{\eta}\omega(t) = 1 + \tau^C, \tag{6}$$

and

$$\omega(t) = \omega = \frac{\beta R - i^{E*}(1+\tau^E)}{r_{BGP} - (\delta-1)\phi(i^{E*}) + i^C\tilde{\eta}}, \tag{7}$$

where $r_{BGP}$ denotes the interest rate in the BGP equilibrium. The BGP equilibrium growth rate of the economy of our creative region is now given by modifying equation (27) in B&Y. This gives us

$$g_{BGP} = (\delta - 1)\phi(i^{E*}) + (\chi - 1)i^C\tilde{\eta}. \tag{8}$$

We now want to ascertain the equilibrium R&D expenditures by the existing and the candidate entrepreneurs or $(i^{E*}, i^C)$. To this end, let us use (6) to eliminate one equation from the system of equations given by (5), (6), and (7). We get

$$(\delta - 1)\phi'(i^{E*})\left(\frac{1+\tau^C}{\chi\tilde{\eta}}\right) = 1 + \tau^E, \tag{9}$$

and

$$\omega = \left(\frac{1+\tau^C}{\chi\tilde{\eta}}\right) = \frac{\beta R - i^{E*}(1+\tau^E)}{[\theta(\chi-1)+1]i^C\tilde{\eta} + (\theta-1)(\delta-1)\phi(i^{E*}) + \rho}, \tag{10}$$

where we have substituted for $g_{BGP}$ from (8) in the representative creative class household's so called Euler equation---see equation (24) in B&Y---to obtain the denominator in the right-hand-side (RHS) of equation (10).

Equations (9) and (10) give us a system of two equations that can be solved to obtain the two unknowns $i^{E*}$ and $i^C$. In this regard, note that we can solve equation (9) directly for $i^{E*}$or the equilibrium spending on R&D by the existing entrepreneurs. This is because inspection of (9) reveals that this equation gives us $i^{E*}$ as a function of exogenous parameters only. Once we have obtained the equilibrium value of $i^{E*}$, we can substitute this value in equation (10) to give us the equilibrium value of $i^C$ or the optimal value of the spending on R&D by the candidate entrepreneurs.

We conclude this section with two observations. First, the main impact of the $\eta\{i^C\} = \tilde{\eta}$ assumption is to simplify some of the mathematical analysis conducted by B&Y. Second, when the R&D of the candidate entrepreneurs generates no negative externalities, the BGP equilibrium values of $i^{E*}$ and $i^C$ are both *different* from the values obtained by B&Y and easier to solve for. We now proceed to study how the comparative statics results about the effects of taxes and subsidies on R&D spending and economic growth obtained by B&Y change when there are no negative externalities from the R&D conducted by the candidate entrepreneurs.

## 4. Comparative Statics with Taxes and Subsidies

Recall that the taxes on R&D spending by the existing and the candidate entrepreneurs are denoted by $\tau^E$ and $\tau^C$ respectively. Now, let us first consider the impact of these two taxes on the R&D spending of the existing entrepreneurs. B&Y show that a tax on R&D by the existing (candidate) entrepreneurs lowers (raises) the amount of R&D they conduct. To see what happens when $\eta\{i^C\} = \tilde{\eta}$, we work with equation (9). Totally differentiating this equation and then simplifying the resulting expression, we get

$$\frac{di^{E*}}{d\tau^E} = \left\{\frac{\chi\tilde{\eta}}{1+\tau^C}\right\}\left\{\frac{1}{(\delta-1)\phi''(i^{E*})}\right\} < 0 \tag{11}$$

and

$$\frac{di^{E*}}{d\tau^C} = -\left\{\frac{1}{1+\tau^C}\right\}\left\{\frac{\phi'(i^{E*})}{\phi''(i^{E*})}\right\} > 0. \tag{12}$$

Comparing (11) and (12) with the previously stated result obtained by B&Y, we see that the absence of negative externalities does *not* change the impact that these two taxes have on the R&D spending of the existing entrepreneurs. Specifically, in both the B&Y paper and in the present note, R&D spending by the existing entrepreneurs goes *down* when the R&D tax

is imposed on them and it goes *up* when the R&D tax is imposed on the candidate entrepreneurs.

Let us now analyze the impact of the two taxes on the R&D spending undertaken by the candidate entrepreneurs. To this end, suppose $\tau^C$ increases by a small amount. Then (10) tells us that $i^{E*}$ goes up. However, when $i^{E*}$ goes up, (10) tells us that for a given value of $i^C$, the left-hand-side (LHS) of this equation rises and the RHS falls. This means that in order to satisfy (10), $i^C$ must go down. Therefore, we get

$$\frac{di^C}{d\tau^C} < 0. \tag{13}$$

To determine the impact that the tax $\tau^E$ has on R&D spending $i^C$, observe that equation (10) can be simplified to give us

$$\omega[\{\theta(\chi-1)+1\}\tilde{\eta}di^C + (\delta-1)(\theta-1)\phi'(i^{E*})di^{E*}] = -(1+\tau^E)di^{E*} - i^{E*}d\tau^E, \tag{14}$$

We now substitute equations (9), (11), and (12) in the above equation. After several steps of algebra, we get

$$\omega\{\theta(\chi-1)+1\}\tilde{\eta}di^C = -\left\{i^{E*} + \frac{\theta\phi'(i^{E*})}{\phi''(i^{E*})}\right\}d\tau^E. \tag{15}$$

It is not possible to sign the expression in the curly brackets on the RHS of (15) without making further assumptions about the flow rate of innovation function $\phi(\cdot)$. Therefore, as in B&Y, once again, the impact of the tax $\tau^E$ on R&D spending by the candidate entrepreneurs is ambiguous. In symbols, we have

$$\frac{di^C}{d\tau^E} \gtrless 0. \tag{16}$$

Comparing (13) and (16) with equations (43) and (47) in B&Y, we see that the B&Y results are *unchanged*. In other words, whether or not the R&D undertaken by the candidate entrepreneurs generates negative externalities, R&D spending by the candidate entrepreneurs goes *down* when the R&D tax is imposed on them and there is an ambiguous impact on this same R&D spending when the tax is imposed on the existing entrepreneurs.

Now note that if $\tau^E$ or $\tau^C$ is the tax imposed on the R&D spending of either the existing or the candidate entrepreneurs then we can interpret $-\tau^E$ or $-\tau^C$ as the corresponding subsidy given either to the existing or to the candidate entrepreneurs. This means that a small increase in the tax $\tau^E$ or $\tau^C$ is equivalent to a small decrease in the subsidy $-\tau^E$ or $-\tau^C$. So, looked at from the standpoint of a subsidy, the comparative statics results in (11) and (12) tell us that an increase in the subsidy $-\tau^E$ $(-\tau^C)$ on R&D spending undertaken by the existing entrepreneurs raises (lowers) their R&D. Next, consider the R&D undertaken by the candidate entrepreneurs. Now, the results in (13) and (16) are of interest. Once again, looking at the comparative statics impacts from the perspective of a subsidy, (13) tells us that an increase in the subsidy $-\tau^C$ raises the R&D undertaken by the candidate entrepreneurs and an increase in the subsidy $-\tau^E$ has an ambiguous impact on the R&D undertaken by the same candidate entrepreneurs. In sum, whether or not the R&D conducted by the candidate entrepreneurs generates negative externalities, the comparative statics results involving the two taxes and the subsidies obtained by B&Y do *not* change.

Since the comparative statics results with the two taxes and the subsidies are the same as those obtained by B&Y, intuitively speaking, it follows that the impact of the two taxes on the growth rate of the economy of our creative region in the BGP equilibrium $(g_{BGP})$ is also unchanged. Specifically, using the methodology of B&Y, it can be shown that a tax on the R&D performed by the candidate entrepreneurs has an *ambiguous* impact on $g_{BGP}$ but a tax on the R&D of existing entrepreneurs *lowers* $g_{BGP}$. This concludes our analysis of Schumpeterian competition in the creative class and innovation policy.

## 5. Conclusions

In this note, we studied innovation policy in a region in which the members of the creative class engaged in Schumpeterian competition and thereby extended aspects of the recent analysis in Batabyal and Yoo (2017). Using the language of these researchers, the creative class was broadly composed of existing and candidate entrepreneurs. In contrast to these researchers, we supposed that the R&D conducted by the candidate entrepreneurs did not generate any negative externalities. In this setting, we analyzed the impact that taxes and subsidies on R&D by the existing and the candidate entrepreneurs had on R&D expenditures and regional economic growth.

The analysis in this note can be extended in a number of different directions. Here are two suggestions for extending the research described here. First, one could analyze a social planner's problem in which the planner maximizes the utility of the representative creative class household. The objective here would be to shed light on the temporal behavior of this household's optimal consumption. Second, it would also be useful to analyze whether there are circumstances in which a social planner selects a higher growth rate than the rate that arises in a BGP equilibrium. Studies that integrate these aspects of the problem into the analysis will increase our understanding of the connections between Schumpeterian competition in a region's creative class and economic growth in this same region.

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# A MEASUREMENT ISSUE REGARDING THE LINK BETWEEN A REGION'S CREATIVE INFRASTRUCTURE AND ITS INCOME

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**Abstract**

The creative capital possessed by the members of the creative class in region $j$ is either acquired through education or present innately in these members. Therefore, the creative infrastructure $(CI_j)$ in the $jth$ region is the sum of a part $(CI_j^E)$ representing creative capital obtained through *education* and a second part $(CI_j^I)$ denoting creative capital present *innately* in the creative class members. A researcher wishes to estimate the true relationship between the $jth$ region's log income per creative class member $(y_j)$ and its creative infrastructure $(CI_j)$. He has data on $CI_j^E$ but not on $CI_j^I$. We study whether an ordinary least squares (OLS) regression of $y_j$ on a constant and $CI_j^E$ will produce an unbiased estimate of the impact of $CI_j$ on $y_j$ in two cases. In the first case, $CI_j^E$ and $CI_j^I$ are uncorrelated. In the second case, $CI_j^E$ and $CI_j^I$ are positively correlated.

**Keywords:** Creative Capital, Creative Infrastructure, Ordinary Least Squares Estimation
**JEL classification:** L80, C13

## 1. Introduction

### 1.1. Preliminaries and a definition

The concept of *creativity* in the context of cities was first discussed by Yencken (1988). Even so, there is no gainsaying the fact that the concept of creativity in general and the twin concepts of the *creative class* and *creative capital* that regional scientists, economists, and geographers are now so familiar with were first discussed and popularized by the urbanist Richard Florida.[1] In this regard, Florida (2002, p. 68) helpfully explains that the creative class "consists of people who add economic value through their creativity." This class is made up of professionals such as doctors, lawyers, scientists, engineers, university professors, and, notably, bohemians such as artists, musicians, and sculptors. From the standpoint of regional economic growth and development, these people are significant because they possess creative capital which is the "intrinsically human ability to create new ideas, new technologies, new business models, new cultural forms, and whole new industries that really [matter]" (Florida, 2005a, p. 32).

Closely related to the above concepts of the creative class and creative capital is the notion of a region's *creative infrastructure*. This notion has been used in different ways by different writers.[2] Even so, since our paper is fundamentally about a region's creative infrastructure,

[1] See Florida (2002, 2005a, 2005b) and Florida *et al.* (2008).

[2] Florida himself has used this notion on several occasions without---to the best of our knowledge---ever defining it concisely. For one such usage, see Florida (2005a, pp. 249-251).

we need to define what we mean by this notion. However, in order to understand this definition in the context of the Richard Florida inspired literature on the creative class, it is necessary to first comprehend the sense in which the concept of creative capital is *different* from the more traditional concept of human capital.

In empirical work in regional science and economics, the concept of human capital is typically measured with education or with education based indicators. This notwithstanding, Marlet and Van Woerkens (2007) have rightly pointed out that the accumulation of creative capital does *not* have to be dependent on the acquisition of a formal education. What this means is that even though the creative capital accumulated by some members of Florida's creative class (doctors, engineers, university professors) does depend on the completion of many years of formal education, the same is not necessarily true of other members of this creative class (artists, painters, poets). People in this latter group may be innately creative and thus possess raw creative capital despite having very little or no formal education.

Given this situation, Marlet and Van Woerkens (2007) are surely right when they say that there is little or no difference between the concepts of human and creative capital when the accumulation of this creative capital is a function of the completion of many years of conventional education. In contrast, there can be a lot of difference between the concepts of human and creative capital when the accumulation of this creative capital does not have to be a function of the completion of a conventional education. Because creative capital is of two types, it is a *more* general concept than the concept of human capital.

The discussion in the preceding two paragraphs tells us that the creative capital possessed by the members of the creative class in a region, say region $j$, is either acquired through education or present innately in these members. Therefore, let us define the aggregate creative infrastructure in this $jth$ region $(CI_j)$ to be the sum of two components. The first component $(CI_j^E)$ represents the creative capital obtained through *education* and the structures that make the accumulation of this education possible. The second component $(CI_j^I)$ denotes the creative capital present *innately* in the creative class members along with the structures that enable this innate creative capital to develop and flourish. The reader may want to think of the first or $CI_j^E$ component as this $jth$ region's *physical and scientific* infrastructure and the second or $CI_j^I$ component as this same region's *artistic and cultural* infrastructure. In symbols, we have $CI_j = CI_j^E + CI_j^I$.

With this definition in place, let us point out that the creativity that a region's creative infrastructure engenders is concerned primarily with invention and innovation concerning either a good or service for consumption or a process whose use leads to the production of a good or service, once again, for consumption. Now, in their own ways, several researchers have pointed to a connection between a region's creative infrastructure and its welfare. Therefore, let us briefly review this literature and then proceed to the specific objective of our paper.

### 1.2. Literature review and specific objective

Batten (1995) has studied what he calls network cities and contended that the dynamism of such cities is very much a function of the extant creative infrastructure. Ho (2009) concentrates on Singapore and points out that policies are in place to grow creative industries by building infrastructure for a range of activities. Chapain and Comunian (2010) contend that in order to enhance the creative economy in two different regions in England, it will be necessary to account for the salience of regional infrastructure and the knowledge pool necessary to develop creative and cultural industries.

Comunian (2011) argues that instead of investing in regeneration projects or flagship developments, policymaking designed to promote creative cities ought to focus on the nature of the infrastructure, networks, and agents engaging in the city's cultural development. Similarly, Lee and Hwang (2012) concentrate on Seoul, South Korea and point out that the

city government's promotion of the notion of a creative city relies, in part, on the development of what they call physical cultural infrastructure.[3] Finally, concentrating on the United States, Florida (2004, p. 132) has said that "[t]he United States must invest generously in its creative infrastructure."

The papers discussed in the previous two paragraphs have certainly advanced our understanding of the connection between a region's creative infrastructure and its welfare. However, the extant literature about a region's creative infrastructure has *not* studied a basic measurement issue that arises when linking a region's creative infrastructure to its welfare. Consistent with the discussion in section 1.1, this measurement issue arises from the fact that a region's aggregate creative infrastructure can be thought of as the sum of *two* distinct components. Given this lacuna in the literature, our objective in this paper is to shed light on this measurement issue. In this regard, note that because we are focusing on a region's creative class that possesses creative capital, we shall use the logarithm of this region's income per creative capital unit or creative class member as a proxy for its welfare.[4]

The remainder of this paper is organized as follows. Section 2.1 delineates the problem faced by a researcher who wishes to estimate the true relationship between the $jth$ region's log income per creative capital unit $(y_j)$ and its aggregate creative infrastructure $(CI_j)$. Since it is generally harder to obtain data on a region's artistic and cultural infrastructure $(CI_j^I)$, we suppose that this researcher has data only on this region's physical and scientific infrastructure or $CI_j^E$ and *not* on $CI_j^I$. Specifically, our researcher would like to know whether an ordinary least squares (OLS) regression of $y_j$ on a constant term and $CI_j^E$ will produce an *unbiased* estimate of the true impact of aggregate $CI_j$ on $y_j$. To this end, section 2.2 derives an expression of the form $y_j = a + bCI_j^E + other\ terms.$ Section 2.3 studies the unbiasedness of an OLS regression of the above sort in the case where $CI_j^E$ and $CI_j^I$ are uncorrelated. Section 2.4 does the same for the case in which $CI_j^E$ and $CI_j^I$ are positively correlated. Section 3 concludes and then offers two suggestions for extending the research delineated in this paper.

## 2. The link between a region's creative infrastructure and its income

### 2.1. Ordinary least squares estimation

Consider a stylized region $j$ that is creative in the sense of Richard Florida and that is part of an aggregate economy of $j = 1, 2, \ldots, N$ regions. This $jth$ region possesses creative infrastructure $CI_j$ of the sort described in detail in section 1.1. Suppose that the true statistical relationship between the aggregate creative infrastructure $CI_j$ and the logarithm of this $jth$ region's income per creative capital unit $y_j$ is given by

$$y_j = a + bCI_j + e_j, \tag{1}$$

where $a$ and $b$ are positive constants and $e_j$ is an error term that has the standard statistical properties.

As noted in section 1.1, we have $CI_j = CI_j^E + CI_j^I$ and our researcher has data only on $CI_j^E$ and not on $CI_j^I$. We assume that the two creative infrastructure components $CI_j^E$ and $CI_j^I$

[3] In a related context, Suarez-Villa (1993) has contended that the ability of a region to become a center of invention depends critically on what he calls the "human capital infrastructure" of this region.

[4] Some members of the creative class possess more creative capital than others but every member of the creative class possesses some creative capital. Therefore, given the sense in which we are using the concepts of the creative class and creative capital in this paper, the creative class necessarily possesses creative capital.

in the $jth$ region are uncorrelated with the error term $e_j$. Given this setup, our next task is to derive a linear relationship of the form $y_j = a + bCI_j^E + other\ terms.$

### 2.2. The linear relationship

Substituting the aggregate creative infrastructure expression $CI_j = CI_j^E + CI_j^I$ in equation (1), we get

$$y_j = a + bCI_j^E + bCI_j^I + e_j. \quad (2)$$

Equation (2) gives us the expression we seek. Three comments about equation (2) are now in order. First, observe that the weights on $CI_j^E$ and $CI_j^I$ in the equation $CI_j = CI_j^E + CI_j^I$ are implicitly equal to one. This means that the marginal contributions of these two distinct creative infrastructure components to the aggregate creative infrastructure in region $j$ are identical. Since there is no existing empirical research on the *form* of the mathematical relationship between a region's aggregate creative infrastructure and its two constituent components, we believe that the intuitively most straightforward way to describe this relationship is to suppose that it is linear with weights of one attached to $CI_j^E$ and to $CI_j^I$.

Second, given the discussion in the preceding paragraph, it is clear that when we substitute the expression $CI_j = CI_j^E + CI_j^I$ into equation (1) to get equation (2), we get a linear relationship in which the impacts of $CI_j^E$ and $CI_j^I$ on $y_j$ are identical. This may appear to some readers to be a strong assumption but note that it logically follows from the additive specification $CI_j = CI_j^E + CI_j^I$ for which we have already made a case.

Finally, the discussion in the previous two paragraphs notwithstanding, if we had reason to believe that the effects of $CI_j^E$ and $CI_j^I$ on $y_j$ are not identical then we could account for this feature explicitly by attaching *dissimilar* weights $w_j^E > 0$ and $w_j^I > 0$ to $CI_j^E$ and to $CI_j^I$ with the understanding that these two weights may or may not sum to one. This would be one approach a researcher could follow if he wanted to study the case where $CI_j^E$ and $CI_j^I$ have disparate effects on $y_j$. However, such an inquiry is beyond the scope of this paper and hence we do not pursue this matter any further.

Now, ideally, our researcher would like to run an OLS regression on equation (1) but he cannot do so because he does not observe and hence has no data on $CI_j^I$. Therefore, this researcher runs an OLS regression on

$$y_j = \alpha + \beta CI_j^E + e_j, \quad (3)$$

where $\alpha$ and $\beta$ are positive constants. We know from standard econometrics---see Kelejian and Oates (1981, p. 56-57)---that the coefficient $\beta$ in equation (3) can be expressed as

$$\beta = \frac{Cov(CI_j^E, y_j)}{Var(CI_j^E)}, \quad (4)$$

where $Cov(\cdot,\cdot)$ is the covariance function, $Var(\cdot)$ is the variance function, and $y_j$ denotes the true log income per creative capital unit in region $j$ and is given in equation (2).

Now, substituting the true log income per creative capital unit from equation (2) into equation (4), and then simplifying, we get

$$\beta = \frac{Cov(CI_j^E,\ a+bCI_j^E+bCI_j^I+e_j)}{Var(CI_j^E)} = b + \frac{bCov(CI_j^E, CI_j^I)}{Var(CI_j^E)} = b\left\{1 + \frac{Cov(CI_j^E, CI_j^I)}{Var(CI_j^E)}\right\}. \quad (5)$$

In writing equation (5), we have used the fact that because $CI_j^E$ is uncorrelated with the error term $e_j$, we get $Cov(CI_j^E, e_j) = 0$. We are now in a position to ascertain whether an

OLS regression of $y_j$ on a constant and $CI_j^E$ will produce an unbiased estimate of the effect of the $jth$ region's aggregate creative infrastructure on its log income per creative capital unit.

### 2.3. The uncorrelated case

In the first case that we study, the two creative capital components $CI_j^E$ and $CI_j^I$ in the $jth$ region are uncorrelated. This means that $Cov(CI_j^E, CI_j^I) = 0$. Using this last result in equation (5), we get $\beta = b$. This tells us that an OLS regression of equation (3) will *not* produce a bias. In other words, performing an OLS regression of equation (3) will allow our researcher to ascertain the *true* impact of the $jth$ region's aggregate creative infrastructure on its log income per creative capital unit.[5]

From a policy perspective, the result in the preceding paragraph has two implications. First, consider a policymaker in region $j$ who is interested in determining the true impact that this $jth$ region's creative infrastructure $(CI_j)$ has on the same region's income per creative capital unit $(y_j)$, for the purpose of resource allocation. Our analysis in this section shows that from a determinative standpoint, this policymaker loses essentially nothing by having data only on what we have called this region's physical and scientific infrastructure and no data on this same region's artistic and cultural infrastructure. Second, the same policymaker can ascertain the true incremental impact of a change in the $jth$ region's creative infrastructure on the income per creative capital unit or $b$ by simply knowing the corresponding incremental impact $\beta$ arising exclusively from the region's physical and scientific infrastructure. We now proceed to study the second and last case where the two components of region $j's$ creative infrastructure are positively correlated.

### 2.4. The positively correlated case

It is clear that when $CI_j^E$ and $CI_j^I$ are positively correlated, we have $Cov(CI_j^E, CI_j^I) > 0$. Using this last result in equation (5), we get $\beta > b$. This means than an OLS regression of equation (3) will produce an *upward* bias in the estimation. Put differently, with an OLS regression of equation (3), our researcher will be overestimating (underestimating) the impact of what we have called region $j's$ physical and scientific (artistic and cultural) infrastructure in predicting this region's log income per creative capital unit.

From an intuitive standpoint, because the creative infrastructure component for which our researcher has no data varies positively with the infrastructure component for which he does, an OLS regression would result in our researcher incorrectly assigning some of the impact of the artistic and cultural infrastructure to the physical and scientific infrastructure. In sum, the salience of "the arts and culture" in determining region $j's$ log income per creative capital unit would be understated. Having said this, the reader should note that by a simple relabeling of the variables, we can tell that if the situation had been reversed and our researcher had data on this $jth$ region's artistic and cultural infrastructure and not on its physical and scientific infrastructure then this researcher would be exaggerating the salience of "the arts and culture" in explaining the $jth$ region's log income per creative capital unit. This concludes our study of a measurement issue concerning the link between region $j's$ creative infrastructure and its income.

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[5] As noted clearly in both the abstract and in section 1.2, our primary objective in this paper is to study whether an ordinary least squares regression of $y_j$ on a constant and $CI_j^E$ will produce an *unbiased* estimate of the impact of $CI_j$ on $y_j$ in two cases. In this regard, two points are worth emphasizing. First, in the uncorrelated case that we have been studying in this section, we have shown that the OLS estimator $\beta$ of $b$ is unbiased. Second, even though this unbiasedness result holds, we are not claiming that this estimator is the best linear unbiased estimator (BLUE).

## 3. Conclusions

In this paper, we analyzed a setting in which the creative capital possessed by the members of the creative class in region $j$ was either acquired through education or present innately in these members. Therefore, the aggregate creative infrastructure $(CI_j)$ in the $jth$ region was the sum of a component $(CI_j^E)$ representing creative capital obtained through *education* and a second component $(CI_j^I)$ denoting creative capital present *innately* in the members of the creative class. A researcher wished to estimate the true relationship between the $jth$ region's log income per creative capital input $(y_j)$ and its creative infrastructure $(CI_j)$. He had data on $CI_j^E$ but not on $CI_j^I$. We studied whether an ordinary least squares regression of $y_j$ on a constant and $CI_j^E$ would produce an unbiased estimate of the impact of $CI_j$ on $y_j$ in two cases. In the first case, $CI_j^E$ and $CI_j^I$ were uncorrelated. In the second case, $CI_j^E$ and $CI_j^I$ were positively correlated.

The analysis in this paper can be extended in a number of different directions. Here are two suggestions for extending the research described here. First, following the lead of Hall and Jones (1999), it would be useful to analyze the link between a region's log income per creative capital unit and its social infrastructure where the term social infrastructure refers to the "institutions and policies that align private and social returns to activities" (Romer, 2012, p. 162). Second, it would also be instructive to study the income and creative infrastructure link studied in this paper in a more general setting in which there are multiple regions and potential interdependencies between the creative infrastructures present in the different regions being analyzed. Studies that incorporate these aspects of the problem into the analysis will increase our understanding of the nexuses between a region's creative and social infrastructure on the one hand and its log income per creative capital unit on the other.

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# OPPORTUNITIES AND LIMITATIONS OF REGIONAL AUTHORITIES' USE OF PUBLIC ADMINISTRATION TOOLS FOR ECONOMIC DEVELOPMENT

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**Abstract**

The article outlines the authors' understanding of the formulation of the regional economic policy. Within the framework of the research, the authors examine regional authorities' willingness to successfully implement the strategic goals of economic development. The methodological basis of the systematic, logical, and comparative analysis allows examining the opportunities and limitations of regional authorities' influence on the development of the regional economy. The article highlights the need for improving the existing instruments of public administration (state regulation) that can contribute to the development of the economy. In this regard, the authors emphasize the problem of defining sectoral and consolidated registers of public authorities' regulatory competencies involved in the constituent entities of the Russian Federation, and the formation of the state regulatory policy. The practical significance of the article is related to the possibility of using the research results to enhance regional authorities' capabilities to influence the development of the economy.

**Keywords:** public administration instruments; regional economic development; public administration effectiveness

**JEL classification:** R58, R1, R5, R11, O1, O2, H83, H70

## 1. Introduction

The key objective of modern Russia is the growth of the economy and the diversification of its sources (Medvedev, 2016). The problem of ensuring economic growth has acquired particular relevance in the context of the formation of the strategic planning system in the Russian Federation (Decree of the President of the Russian Federation of 07.05.2012 No. 596 "On Long-Term State Economic Policy". Federal Law No. 172-FZ of June 28, 2014 "On Strategic Planning in the Russian Federation").

As an integral part of the national economy, regional development is ensured by the implementation of the principle of strategic planning unity and integrity. The strategic plans of regions are built into the system of federal documents about strategic planning. The strategic management is coordinated with the budgetary policy. The balanced and interrelated documents about the strategic development of the Russian Federation, its regions and municipalities will allow forming a favourable environment for implementing investment projects and business programs (Order of the Russian Federation Government of 17.11.2008 № 1662-p "On the Concept of Long-Term Social and Economic Development of the Russian Federation for the Period to 2020").

In the law on strategic planning, the federal legislator declared the principle of the potency and effectiveness of strategic planning: the choice of techniques and methods for achieving the goals of socio-economic development should be based on the need to achieve specified development results with the least resource costs.

To implement the principles of effective public administration of economic development, it is necessary to understand public administration tools. The authors adhere to institutionalists' scientific views and seek to find a way to complement the market mechanism

with a mechanism for the formation and implementation of collective economic decisions. The aim of the article is to substantiate the opportunitiesand limitations of stateauthorities' use of publicadministrationtools for achieving the objectives of regional economicdevelopment.

The hypothesis implies that the administrative tools available to regional authorities have a number of disadvantages that limit the application of these tools for achieving the objectives of the state's new industrialization.

## 2. Literature Review

The review of scientific research and publications on the theme of this article demonstrate authors' close attention to the problem of increasing the efficiency of the state economic policy and the search for effective tools for the public administration of economic development, and the improvement of the state regulation practice.

For quality assurance and regulatory outcomes, the leading principles of the Organization For Economic Cooperation and Development (OECD) determine that regulation is a key instrument for achieving the goals of governments' social, economic and environmental policies. Governments have a wide range of regulatory mechanisms at their disposal. These mechanisms reflect the complex and diverse needs of their citizens, communities and the economy (OECD, 2005).

Z.A. Saidov (2016) conducted an analysis of regulatory practices. The author developed a few proposals on the development of the economy's state regulatory forms and methods, as well as on the creation of legal and organizational guarantees of legality in the economy of the Russian Federation.

According to North Douglas (1991), institutions perform the role of the so-called 'game rules' in the society. By reducing uncertainty and structuring everyday life, institutions affect the functioning of economic systems. Institutional changes determine the way societies evolve over time.

On the example of developing countries, Gani Aldashev (2017) examines how authorities, and institutions that restrict or supplement them affect the development process. The author monitors the degree of this influence, depending on the overall level of the country's development.

Nick Williams and Tim Vorley (2017) also differentiate the experience of promoting entrepreneurship in states that are at various development levels. They consider the restructuring of formal and informal institutions as support means for entrepreneurship.

Exploring the elements of the regional self-development theory, O. S. Sukharev (2017) interprets 'self-regulation of the regional economy' in the following way. "Regional authorities, with all their powers and resource capabilities, serve as a regulator. The range for regulation is defined in relation to the regions of Russia by federal legislation, and the policy pursued by the federal executive power bodies."

When examining the problems of the public administration of the economy in modern Russia, researchers point to the following problems that remain unsolved:

- The need to develop a concept of the economy's development and public administration on the basis of constitutionally established values and principles that constitute the basis of the constitutional system of Russia (Sharifov, 2017).
- The large number of formal administrative requirements for business entities with lower administrative costs due to non-fulfilment or formal fulfilment of a number of requirements in economic life (Saidov, 2016).
- The need for integrated legislative and administrative improvements for Russia (Sukharev, 2017).
- The need to organize coordinated actions of federal and regional authorities, as well as local governments for creating the most favourableconditions for the economic development of the constituent entities of the Russian Federation (Kuzminova, 2016).

The scientific activity in the field under investigation is associated with the search for solutions to the problems of increasing the efficiency of public administrationtools in the context of economic development.

As new supportive rules for enterprises, V.A. Mau and A.B. Ulyukayev (2015) propose "Developing state support instruments for large and medium-sized investment projects that

have a significant multiplier effect onthe economy and contribute to the solution of infrastructure and social problems, and improving the quality of the preparation of projects and the mechanisms for their selection in the context of using the resources of the National Welfare Fund and the project financing mechanism."

The problem of assessing the effectiveness of public administration (regulation) in the context of the regional economic development is particularly relevant in the presence of legal uncertainty. The federal legislator's declaration of the principle of the strategic planning effectiveness does not regulate the notion of effectiveness, as well the criteria and powers in determining the effectiveness of state administration (regulation). S.A. Starostin (2016) notes that "…Currently, there are methodological recommendations for evaluating the effectiveness of investment projects, methodological recommendations for calculating the indicators for assessing the effectiveness of public property management and the formation of statistical supervision; however, these acts do not give an answer to the question about what form of state administration it is more effective to apply in the implementation of investments in infrastructure…"

According to the OECD "... achieving better regulatory performance requires not just good governance. It is vitally important to have a set of necessary and mutually supportive regulatory mechanisms and structures ... ".

Lawrence J. (2015) investigates the influence on the relationship between the management and effectiveness of the so-called context (By 'context', the author means "situational opportunities and constraints that affect the emergence and relevance of organizational behaviour, as well as functional relations between variables (including sectoral or economic characteristics, as well as other regulatory and institutional structures and regimes") and substantiates the need to develop a context theory and the way the context affects the relationship between management and effectiveness. The importance of the external context for improving management is clearly expressed in the studies of Junjan and Torenvleid (Junjan, Torenvleid, 2016; Junjan, 2016).

Mirela Xheneti (2016) promotes the authors' understanding of policy formation by examining the institutional dynamics between the transnational and national levels of policy development.

Tessa Conroy states how various public policies explain the observed movement of producers between countries(Conroy, Deller, Tsvetkova, 2017). Kronenberg (2013) investigates the regional factors of interstate business transfers. According to Kronenberg, agglomeration economies, human capital, average wages, and industrial diversity are some of the important determinants of crossings.

Criticism is expressed towards the existing institutions and public administration tools in the context of economic development.

Examining the applicability of the existing set of administrative mechanisms related to the major administrative paradigms for overcoming the modern global challenges, A.G. Barabashev (2016) comes to negative conclusions.

Scientific research and publications include authors' criticism towards the existing tools of public administration in the sphere of economic development.

Researchers point to the shortcomings of legislation on the formation of prioritydevelopment areas(Mironov, 2016) and special economic zones (Chernyshev, 2016). The results of the control measures of the Accounts Chamber of the Russian Federation reflect the shortcomings of the mechanism for special economic zones: "...the special economic zones in the Khabarovsk and Primorye krais and the Murmansk Oblast actually do not function. Long-term plans for the development of these special economic zones, which werestipulated in the agreements on their formation, have not been developed or approved." The Accounts Chamber of the Russian Federation notes the need to prevent the misuse or insufficient use of funds allocated for the development of special economic zones. In addition, the Chamber notes that the activity of priority development areas require some adjustments to the legislation for the effective performance and cooperation with state authorities and local governments these territories are formed in (Report on the audit results of the Accounts Chamber of the Russian Federation, "Audit of the Effectiveness Using Public Funds Aimed at the Formation and Development of Special Economic Zones" (http://www.ach.gov.ru)).

The Ministry of Economic Development of Russia initiates the legislative consolidation of general rules for levying non-tax payments (http://economy.gov.ru).

The publications reviewed by the authors of the article testify to the scientific search for ways to improve the policies of regional economic development. Further research in this area may be related to the search for possible specific structural changes affecting the mechanisms for managing the existing regulators. According to OECD guidelines, the latter can be most effective if implemented in conjunction with a broader review of the policy with reference to regulatory schemes, or with an analysis of opportunities to improve operational performance.

## 3. Materials and Methods

The authors used the deduction method as the main method for the research. The research is not based on calculations. It is based on reasonable arguments and substantiation of the authors' position. The authors analyzed the existing public administration toolsused in the Russian practice for solving the problems of regional economic development, as well as identifying the limitations (problems) of their use in the context of the need to comply with the principle of public administration effectiveness.

In the course of the research, the authors proceeded from the fact that the public administration tools for solving the problems of regional economic development should be separated from the mechanisms for legally regulating economic relations. Both of the above-mentioned mechanisms are regulatory tools and serve as carriers of administrative and legal permits, prohibitions, and orders. However, these mechanisms differ in their emphasis. One is a mechanism of legal regulation that is uniform for all law branches, while the other is a management tool used by specific executive bodies to achieve the goals of economic development. Apublic administration tool for solving the problems of regional economic development is a method, a medium, a technique that will allow the executive authority of a constituent entity of the Russian Federation to implement its competencies (set of powers) for solving specific problems of regional economic development.

As an information base for the research, the authors used the Constitution of the Russian Federation and the federal laws of the Russian Federation, which regulate the relations between the entities of the economy and state authorities' powers in this sphere. The selection of legal acts was done by the method of expert assessment. The proposed list is not exhaustive and can be expanded.

Taking into account the results of the research, the authors propose to define the concept of the 'public administration tools of the authorities of the Russian Federation constituent entities for achieving the strategic objectives of regional economic development' as a list of regulatory competencies of the authorities in regional economic development. This regards the competencies that would allow state authorities to provide tax and non-tax preferences, budgetary funds, and state guarantees to specific entities of the regional economy (categories of regional economy entities).

The authors of the research took interest in studying the evolution of legal regulation in the context of regional economic development, as well as assessing the condition of regulatory competencies of state authorities of the Russian Federation.

This research is a continuation of previous studies carried out by authors. Within the framework of these studies, the authors propose a method for assessing the effectiveness of the activity of the state authorities in the field of economic development as a management tool for achieving the strategic goals regional economic development (Belyakov, Vorobyeva, 2016).

## 4. Results and Discussions

The theoretical significance (in clarifying the conceptual apparatus, in the field of tools and methodology) of the research results is related to the identification of the opportunities and limitations of regional authorities' use of public administration tools in the sphere of economic development, as well as the authors' proposals for improving the effectiveness of the regional management of economic development. Federal and regional governments can use the authors' proposals in preparing plans for implementing socio-economic development

strategies, as well as for institutional reforms. The research results complement the theory and practice of regional management with new knowledge.

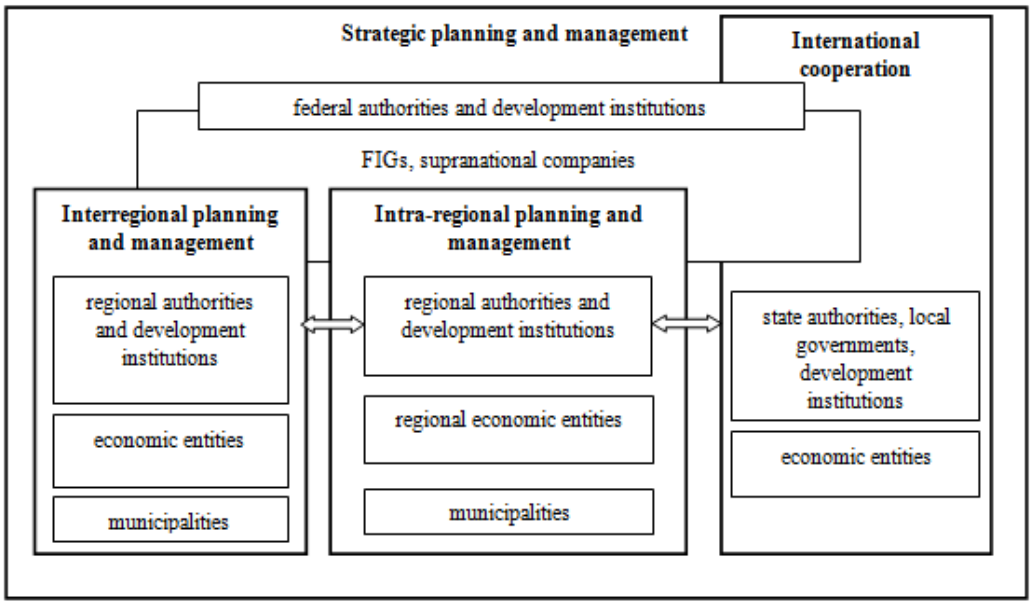
The authors present the research results in the form of answers to the questions touched upon throughout the research.

The authors of the research took interest in the state of the institutional environment. In the Russian Federation, there are both formal and informal institutions for economic development, among them the Industrial Development Fund, the Small and Medium-Sized Enterprise Support Corporation, the Russian Export Center, as well as the Investment Fund, the Regional Development Fund, and the Russian Development Bank were established. In addition, there are regional development corporations, whose main objective is to ensure a high rate of social and economic development, effective cooperation between authorities and investors in theprocess of developing and implementing projects for social and economic development, the development of public-private partnership principles, and the attraction of investments and technologies into the economy.

The modernization processes in the system of economic relations in Russia are characterized by the growing role of regions and interregional competition. The diagram shows regional authorities' increasing role as the organizer, coordinator and regulator of regional economic development.

Figure 1 presents the diagram of the cooperation between state authorities, development institutions, local governments, investors and other economic entities in the process of exercising powers in the sphere of economic regulation.

**Figure 1: The Diagram of the Cooperation between the Authorities of the Russian Federation in the Sphere of Regional Economic Development**




The above-mentioned cooperation is carried out at the following levels:

- At the federal level, where the basis for regulating economic relations in the Russian Federation is established. The Russian Federation is responsible forthe establishment of the foundations of the federal policy and federal programs in the sphere of the economic development of the Russian Federation, the establishment of legal basis for a single market, financial, currency and customs regulation, money emission, the basis of the pricing policy, and federal economic services, including federal banks (Article 71 of the Constitution of the Russian Federation). The cooperation is carried out in the framework of the strategic planning system.
- At the regional level, where the basis for regulating economic relations in the Russian Federation is established. It is at the regional level that the cooperation between the bodies of the regional economy, financial and industrial groups, supra-national companies and municipal entities is carried out. At present, the role of business in the society and the need for state support for the implementation of various business ideas have been substantiated.

The applied methods of program-targeted management (state programs) provide for the participation of business associations. The cooperation between business communities and the state is carried out in various forms, including public-private partnerships, coordination councils, arbitration bodies, etc. (Burkov, 2017).

- At the interregional level, where it is possible to establish the basis for regulating economic relations in two or more constituent entities of the Russian Federation, which corresponds to the established international practice (Ilina, Leonard, Pliseckij 2015). It is necessary to point out that the set of powers to implement interregional cooperation is not regulated. This is a serious problem in the context of interregional cooperation.
- At the international level, where the foundations of regulating the cooperating parties' relations in the context of economic development can be established.

In their studies, Leonard, Nazarov, Vakulenko (2016), Kuntal, and Quirk (2016) note the importance of subnational institutions for the development of post-Soviet Russia.

State influence on the economy is realized through the impact on the function of the private economic sector with the help of a variety of economic instruments.

It is important to discuss the evolution of the current state of legal regulation in regional economic development. The legal basis for the economic development in the Russian Federation are determined by a large array of the existing laws and constantly evolve around the foundations of the Russian Constitution. The solidarity of economic space, free movement of goods, services and financial resources, support of competition, and freedom of economic activity (Article 8 of the Constitution of the Russian Federation) are constitutionally guaranteed in the Russian Federation.The economic activity aimed at monopolization and unfair competition is not allowed (Article 34 of the Constitution of the Russian Federation).

In the historical retrospect, it is possible to observe activation of the state policy towards supporting economic growth in the Russian Federation. This point of view is supported by O.S. Sukharev (2017) and S.A. Starostin (2016). Civil law relations, taxation issues, labor relations, environmental management, formation of free economic zones and priority development areas, protection of competition, creation of conditions for the administration of small and medium-sized businesses, restrictions on state control, the contract system in the sphere of public procurement, the principles of public-private partnership and industrial policy have been consistently settled. A system of strategic planning has been formed.

The authors studied the provisions of 29 federal laws that regulate the relations between entities that carry out activities in various spheres of the economy (Figure 2), and the powers of state authorities in these spheres.

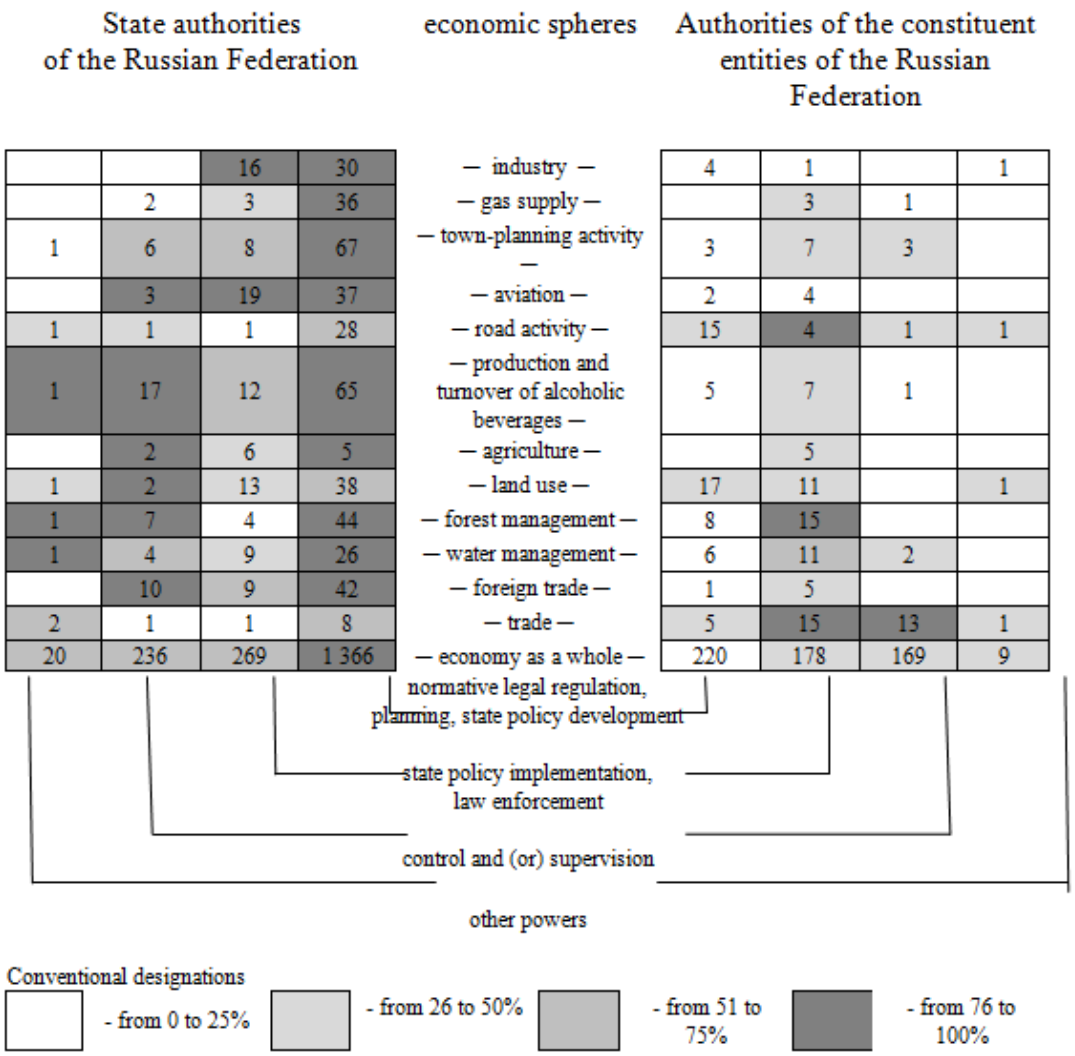
**Figure 2: Chronology of Russian state Authorities' Legislative Allocation with Powers, Whose Implementation Has an Impact on the State of the Economy**

| economic sphere | | year of adopting the existing federal laws | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1993 | 1994 | 1995 | 1997 | 1998 | 1999 | 2001 | 2002 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2011 | 2013 | 2014 | 2015 | 2016 |
| economy (public and legal formations) | | | | | | | | | | | | | | | | | | | | |
| industry | | | | | | | | | | | | | | | | | | | | |
| economy | public-private partnership | | | | | | | | | | | | | | | | | | | |
| | strategic planning | | | | | | | | | | | | | | | | | | | |
| | priority development areas | | | | | | | | | | | | | | | | | | | |
| | state procurements | | | | | | | | | | | | | | | | | | | |
| | purchases by individual legal entities | | | | | | | | | | | | | | | | | | | |
| trade | | | | | | | | | | | | | | | | | | | | |
| economy | state control | | | | | | | | | | | | | | | | | | | |
| | small and middle-sized businesses | | | | | | | | | | | | | | | | | | | |
| road activity | | | | | | | | | | | | | | | | | | | | |
| agriculture | | | | | | | | | | | | | | | | | | | | |
| forest management | | | | | | | | | | | | | | | | | | | | |
| water management | | | | | | | | | | | | | | | | | | | | |
| economy | protection of competition | | | | | | | | | | | | | | | | | | | |
| | free economic zones | | | | | | | | | | | | | | | | | | | |
| town-planning activity | | | | | | | | | | | | | | | | | | | | |
| economy (environmental protection) | | | | | | | | | | | | | | | | | | | | |
| land use | | | | | | | | | | | | | | | | | | | | |
| economy (labour relations) | | | | | | | | | | | | | | | | | | | | |
| gas supply | | | | | | | | | | | | | | | | | | | | |
| international trade | | | | | | | | | | | | | | | | | | | | |
| investment activities | | | | | | | | | | | | | | | | | | | | |
| economy | regional government | | | | | | | | | | | | | | | | | | | |
| | taxes and budget | | | | | | | | | | | | | | | | | | | |
| aviation | | | | | | | | | | | | | | | | | | | | |
| production and turnover of alcoholic beverages | | | | | | | | | | | | | | | | | | | | |
| economy | civil-legal relations | | | | | | | | | | | | | | | | | | | |
| | constitutional framework | | | | | | | | | | | | | | | | | | | |

The authors of the article attempted to answer the question about whether the regional authorities have sufficient powers to stimulate regional economic development. The analysis of the legislatively established powers indicates to their overall prevalence (more than 3 times) among the federal authorities both in the economy as a whole and in certain spheres of the economy, which is reflected in Figure 3.

The specified statistics are based on the analysis of the norms of the legislative acts selected by the authors. The adoption of subordinate laws multiplies the number of established powers. As an illustration, the authors point to a number of normative legal acts (about 9 thousand units) included in the thematic section "Industry" of the Consultant Plus.

**Figure 3: Distribution of State Authorities' Powers in the Sphere of Economy Regulation (units and %)**




The formation of authorities' powers is still in progress. As anti-crisis measurements, the Deputies of the State Duma of the Russian Federation proposed:

- Introducing a state planning system for the social and economic development of the Russian Federation; forming a unified management system for the development of the national economy, including state planning bodies, i.e. anti-crisis management systems.
- State support measures for growth points of the national economy through the provision of budget investments and other forms of state support, and the implementation of public-private partnership projects.
- Intensification of the state industrial policy of the Russian Federation aimed at ensuring sustainable growth of the industry, primarily in process industries, and at carrying out import substitution.
- A temporary change in the legal status of the Central Bank of the Russian Federation within the framework of its participation in activities aimed at implementing the priorities of the social and economic development of the Russian Federation, as well as state support measures for the national economy.
- Measures to protect the financial market of the Russian Federation and to restrict the capital export from the Russian Federation.
- state regulation of prices (tariffs) for certain types of goods (labour, services), activation of the state anti-monopoly policy.

The parliamentarians propose introducing a state planning system for the social and economic development of the Russian Federation based on a regular monitoring of the national welfare (Draft Federal Law No. 882161-6 "On Priority Measures to Stabilize the

Social and Economic Situation and on the Transition to the State Planning of the Social and Economic Development of the Russian Federation"), tightening parliamentary control over the formation and implementation of plans for the social and economic development (Draft Federal Law No. 240438-6 "On Amendments to the Federal Law 'On the Parliamentary Investigation of the Federal Assembly of the Russian Federation' and the Criminal Code of the Russian Federation").

In accordance with the list of instructions of the President of Russia, the Government of the Russian Federation prepared a draft federal law "On scientific and technological valleys". The law was aimed at regulating the provisions of conditions for the establishment and functioning of scientific and technological valleys as territorially isolated complexesformed on the basis of higher educational institutions and scientific organizations and aimed at creating favorable conditions for the implementation of priority development areas of science, engineering and technologies, as well as at ensuring an increase in attracting investmentsin research and development, as well as in the commercialization of scientific and technical results, and forming knowledge-intensive industries

(http://economy.gov.ru/minec/about/structure/depcorp/2017110503).

Thus, the authorities of the constituent entities of the Russian Federation have significant opportunities for using government regulation tools to solve the problems of regional economic development. Restrictions on the use of these tools are related to the lack of registers of the authorities' regulatory competencies.

The identification of 'public administration tools of state authorities of constituent entities of the Russian Federation for achieving the strategic goals of regional economic development' can be done on the basis of the lists of state authorities' regulatorycompetencies.In the framework of specific investment projects of permits, tax and non-tax preferences,these competencies would allow state authorities to provide specific entities of the regional economy (categories of regional economic entities) with the following conditions: granting of subsidies and state guarantees, research and development co-financing, measures to stimulate demand (including through the public procurement system and tariff regulation measures), application of special investment contract regimes, a mechanism for granting investment tax credits, provision of state property (land and infrastructure), a 'single window' for the investor, accelerated and facilitated administrative procedures, and so on.

It is also possible to assess the state of regulatory competencies of the authorities of the constituent entities of the Russian Federation after giving a solution to the problem of forming the register of state authorities' regulatory competencies by analogy with the registers of public services (Article 11 of the Federal Law of July 27, 2010, No. 210-FZ "About the Organization of Provision of State and MunicipalServices") and with registers of budgetary obligations(Article 87 of the Budget Code of the Russian Federation).

The problem of the sufficiency of regional authorities' regulatory competencies for realizing the objectives of the country's new industrialization can be solved by involving all the available tools in the management practice. V.A. Mau and A.V. Ulyukaev (2015) proposed "Inventory of legal regulation and management of business practices...".

The authors of the research touched upon the question of how to select the most effective management tools from the vast array of established powers to be used by specific executive bodies (in the context of this article, regional authorities) to achieve specific goals of economic development aimed at implementing the principle of public administration efficiency.

Any regulatory power is subject to an assessment of its regulatory impact. According to the OECD Guidelines for Quality Assurance and Regulatory Results (OECD 2005), the most suitable regulatory mechanisms are the ones that rely on all aspects of the regulatory framework. This approach should yield the greatest benefits.

In Russia, the mechanism of regulatory impact assessment has been applied recently and is established by Article 26.3-3 of Federal Law No. 184-FZ of 06.10.1999 "On General Principles of the Organization of Legislative (Representative) and Executive Bodies of Constitutional Entities of the Russian Federation". Up to half of all normative legal acts undergo regulatory impact assessment.

The experts of the World Bank highly appreciated the regulatory reforms and the development level of the RIA (Regulatory Impact Assessment) systems in Russia (http://economy.gov.ru/minec/about/structure/depregulatinginfluence/2017050506).

The authors find it important to continue the scientific discussion of the assessment methodology problems (Romanova, Strovsky, 2016). Examples of such assessments are found in foreign practice as well (Fabrice Defever, 2017; Friedrich Heinemann, Marc-Daniel Moessinger, Mustafa Yeter, 2017).

Restrictions on regional authorities' use of state regulatory tools for solving the problems of regional economic development are related to the lack of a certain methodology for assessing and selecting the most effective tools for solving specific problems of economic development.

The above-mentioned restrictions are also related to the availability of federal authorities' various approaches for the implementation of regulatory powers by regional authorities. For example, the order of the Ministry of Finance of the Russian Federation of December 3, 2010, No. 552 views the granting of regional tax privileges as a negative factor of assessment, while the methodology established by the order of the Government of the Russian Federation from 11.04.2016 No. 642-p is viewed as positive.

The possibility of having multidirectional assessments is predetermined by the absence of a federal regulatory policy. The concept of the state regulation of regional development, as well as the specifics of the participation of federal authorities, state authorities of the constituent entities of the Russian Federation, local governments and economic interaction associations of the constituent entities of the Russian Federation (Draft Federal Law No. 18259-3 "On the fundamentals of state regulation of regional development in the Russian Federation") in the above-mentioned process has been formed but not approved.

According to the authors, it is advisable to form a regulatory policy that determines – among other things – the following areas:

- establishment of a unified methodology for assessing the effectiveness of regulatory competencies,
- maintaining a single register of government bodies' regulatory competencies,
- exclusion of federal authorities' various approaches to the implementation of regulatory powers by regional authorities,
- forming subdivisions engaged in implementing regulatory competencies in the system of executive bodies.

In order to prevent conflict between the regulatory policy and the competition protection policy, it is obviously required to update Chapter 5 of Federal Law No. 135-FZ of July 26, 2006 "On Protection of Competition", in particular, the regulation of the provision of state preferences.

## 5. Conclusion

The implementation of ambitious long-term plans to modernize the basic sectors of the regional economy and the formation of new promising niches requires the availability of reliable management tools of the state authorities of the constituent entities of the Russian Federation.

The legal basis for ensuring the activities of executive bodies of the constituent entities of the Russian Federation in the field of economic development is formed by a significant number of federal regulatory legal acts.

Powers are evolving towards strengthening the state support for economic growth. A regulatory impact assessment mechanism has been introduced and is being applied. The study confirmed the need to audit and eliminate public authorities' unnecessary overlapping powers in the field of regulatory legal relations in the sphere of the economy. It is necessary to theforeground and segregatestate authorities' regulatory competencies viewing regulatory competencies as a code of powers that are used by regional authorities to develop the economy and(or) its individual spheres. In this sense, the authors of the research recommend formulating the missing registers of regulatory competencies that are viewed as a set of tools regulating influence on the economy or its individual spheres. It could be used in choosing the most effective way of achieving the goals of economic development. The transparency and accessibility of the register of regional authorities' regulatory competencies will allow

businesses to take into consideration various regulatory scenarios when forming business development strategies. The understandability of regulatory procedures and the ability to 'evaluate' them based on the effectiveness of their influence on the achievement of the goals of economic development will increase regional authorities' capabilities in the process of achieving the goals of the strategic development of the economy.

According to the authors of the research, it is required to form a state regulatory policy that will determine the priorities and foundations of regulatory activities, which will allow developing federal authorities' similar attitude to the facts of implementing measures of state support for economic development by the authorities of the constituent entities of the Russian Federation.

The field under investigation is marked by a limited understanding of the most effective institutional basis for the regulatory policy and the lack of a clear understanding of effective tools for public administration in the field of economic development.

The methodology for assessing the effectiveness of regional authorities' tools for influencing the regional economic development (due to its lack) can be subject to further scientific research.

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# INVESTMENT IN INNOVATION AND EDUCATION: AN EFFICIENCY BENCHMARKING ANALYSIS IN EUROPE

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**Abstract**

As technical efficiency enhancement becomes an increasingly important issue within Europe and worldwide, policy planning should draw attention towards a wide range of production ideas, component technologies and complementary socio-economic capabilities. Within this framework, it is rather difficult for any single economy to incorporate and take advantage of the relevant technological advances in economy, as well as the underlying conditions in innovation and education investments. This means that the actions of policy planning involve the targeted development of specialized knowledge assets, which are integrated from a wider range of investment areas. This paper analyses, through a benchmarking approach, investment in innovation and education in Europe, creating a spectrum of policy implications.

**Keywords:** Productive Efficiency, Innovation, Education, Investments
**JEL classification:** F13, F47, F15, R15

## 1. Efficiency in Innovation and Education Investments

Sustainable development is a key concept within the Innovation and Education Investment policy of the European Union. The key elements for the sustainable development policy concern the efficient use of resources encouraging the development of new productive technologies, extending the use of productivity and efficiency enhancement schemes and encouraging both innovative and productive activities. Within this context, the main role of Innovation and Education Investment policy in the European Union is to provide the appropriate framework conditions and to make the European Union an attractive place for Innovation and Education Investment development (Korres and Kokkinou, 2011, Kokkinou, 2010).

One of the core targets of Innovation and Education Investment policy is to influence the volume and composition of the European Union output, primarily the Innovation and Education Investment output, aiming to increase the volume of production and/or employment (Baldwin and Martin, 2006). More specifically, Innovation and Education Investment policy refers to structural policies designed to strengthen the efficiency, scale and international competitiveness of industrial sectors within a country, bringing about economic growth and development (Soete, 2007).

In Europe, public research, technology and innovation policies are no longer exclusively in the hands of national authorities: increasingly, national initiatives are supplemented by, or even competing with, regional innovation policies or transnational programmes, in particular the activities of the European Union. At the same time, industrial innovation increasingly occurs within international networks (Kuhlmann and Edler, 2003).

On the other hand, education investment policy is essential for European Union productive efficiency and an important driver in enabling European Union to enhance competitiveness, increased efficiency and growth and consequently to compete on a global scale. However, policy-makers also underlined the need for interaction between innovation policy and other policy areas to improve the environment for innovative enterprises.

## 2. Innovation and Education Investment in European Union

After the Second World War, and increasingly since the 1970s, with the acceleration of high technologies, the industrialised countries developed a broad spectrum of technology policy intervention measures. However, neither industrial policy nor innovation policy was among the areas covered in the 1957 Treaty of Rome. By the early 1980s, however, both had found a place among the European Commission's directorates. The first research and technology development (RTD) programmes were designed and implemented in the early 1980s. This included broad programmes such as the European Strategic Programme for Research and Development on Information Technologies (ESPRIT) whose main goals were: i) to promote intra-European industrial cooperation through pre-competitive R&D; ii) to thereby furnish European industry with the basic technologies that it needed to bolster its competitiveness through the 1990s; and iii) to develop European standards and the Basic Research in Industrial Technologies (BRITE) programme designed to help the European manufacturing industry to become more competitive (Mytelka and Smith, 2001). Since the 1980s the Community was trying to foster the creation of strategic industries, in line with the individual member states' efforts to promote national champions. In fact, the objective was to foster cooperation, innovation and commercialization processes, where the role of Community institutions was mainly to enable and coordinate policies rather than dictate their contents (Belyakova et al., 2017).

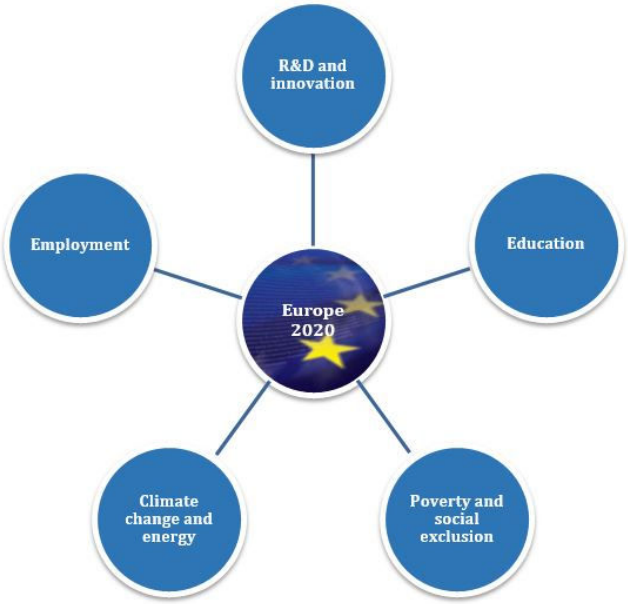
Until the middle of the 1980s the Community had a research and technology policy of its own that more or less complemented national policymaking with a transnational dimension, in order to create a European Research Area. The rationale behind this approach is that European economic integration, in combination with the opportunities associated with the enlargement of the European Union and the challenges of economic and technological globalisation, functionally leads to an integrated innovation policy approach in European Union. On top of the national and regional efforts and in parallel with Europe's economic and political integration, the emergence of a European innovation policy-making system can be traced (Almeada et al., 2017). The system of innovation approach lays emphasis on the interactive process in which enterprises in interaction with each other and supported by institutions and organisations – such as industry associations, R&D, innovation and productivity centres, standard setting bodies, university and vocational training centres, information gathering and analysis services and banking and other financing mechanisms – play a key role in bringing new products, new processes and new forms of organisation into economic use.

Into the 1990s, Community innovation RTD programmes sought to promote technology transfer across industries and regions in Europe, aiming at achieving competitiveness and productive efficiency. A few years later enhancing innovation became a cornerstone of the strategy to meet the target agreed by the European Council in Lisbon in March 2000 of the Union becoming the most competitive and dynamic knowledge-based economy in the world by the end of the decade, drawing attention to the interfaces between industries and financial markets, R&D and training institutions, advisory services and technological markets (Nilsson, 2004). The Lisbon European Council (2000) was an important milestone for the Community's approach to innovation policy. The so-called Lisbon strategy required the Union to become, by 2010, "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

In 2002, the Barcelona European Council set a twofold objective requiring the Union to reach, by 2010, a level of R&D expenditure equal to 3% of European GDP (compared with 1.9% recorded in 2000), within which the level of private funding should increase up to two thirds of community R&D investments.

The Europe 2020 strategy (European Commission, 2010) was adopted as the successor of the Lisbon strategy. It emphasizes smart, sustainable and inclusive growth as a way of strengthening the EU economy and preparing its structure for the challenges of the next decade.

**Figure 1: Europe 2020 strategy thematic areas**




Source: (YERUN Office, 2018)

The Europe 2020 strategy puts forward three mutually reinforcing priorities to make Europe a smarter, more sustainable and more inclusive place to live:

- Smart growth, through the development of an economy based on knowledge, research and innovation.
- Sustainable growth, through the promotion of resource efficient, green and competitive markets.
- Inclusive growth, through policies aimed at fostering job creation and poverty reduction.

In a rapidly changing world, these priorities are deemed essential for making the European economy fit for the future and for delivering higher employment, productivity and social cohesion (European Commission, 2010). Under the three key priorities, the EU adopted eight targets:

- Smart growth: covered by the target on R&D and two targets on education
- Sustainable growth: covered by three targets on climate change and energy
- Inclusive growth: covered by the targets on employment and on poverty and social exclusion.

**Figure 2. The Europe 2020 strategy's key priorities, targets and flagship initiatives**

| | Targets | Flagship initiatives |
|---|---|---|
| Smart growth | — Increasing combined public and private investment in R&D to 3 % of GDP<br>— Reducing school drop-out rates to less than 10 %<br>— Increasing the share of the population aged 30–34 having completed tertiary education to at least 40 % | — Innovation Union<br>— Youth on the move (ended in December 2014)<br>— A digital agenda for Europe |
| Sustainable growth | — Reducing greenhouse gas emissions by at least 20 % compared to 1990 levels<br>— Increasing the share of renewable energy in final energy consumption to 20 %<br>— Moving towards a 20% increase in energy efficiency | — Resource efficient Europe<br>— An industrial policy for the globalisation era |
| Inclusive growth | — Increasing the employment rate of the population aged 20–64 to at least 75 %<br>— Lifting at least 20 million people out of the risk of poverty and social exclusion | — An agenda for new skills and jobs<br>— European platform against poverty and social exclusion |

Source: (YERUN Office, 2018)

The targets are monitored using a set of nine headline indicators and additional sub-indicators related to various dimensions of the data (such as the multidimensional concept of poverty and social exclusion).

The eight targets belong to five thematic areas: employment, education, poverty and social exclusion, climate change and energy, and R&D and innovation. These five areas are strongly interlinked. For example, higher educational levels are associated with improved employability and increasing the employment rate helps to reduce poverty. A greater capacity for R&D and innovation across all sectors of the economy, combined with increased resource efficiency, would improve competitiveness and foster job creation. Investing in cleaner, low-carbon technologies would help the environment, contribute to the fight against climate change and create new business and employment opportunities (European Commission, 2010).

The EU targets have been translated into national targets. These reflect each Member State's situation and the level of ambition they are able to reach as part of the EU-wide effort for implementing the Europe 2020 strategy. However, not in all cases are the national targets sufficiently ambitious to cumulatively reach the EU-level targets. For instance, the fulfilment of all national targets in the area of employment would bring the overall EU-28 employment rate up to 74 %, which would still be one percentage point below the Europe 2020 target of 75 %. Similarly, even if all Member States met their national targets on R&D expenditure, the EU would still fall short of its target of 3 % R&D intensity, reaching only 2.6 % by 2020 (European Commission, 2014).

Currently. a doubling of the budget of the 9th EU Framework Programme (FP9) for Research & Innovation to 160 billion euro, also requested by the Lamy Group, would create an estimated 650.000 jobs by 2040 and add around 0.46% to GDP over the same period. As the European Commission has stated in its Communication on the next MFF, this doubling would enable the EU to emerge as a global leader in areas like future-energy batteries, smart and clean buildings and vehicles, infectious diseases, and the circular economy. At the same time it would stimulate more inclusive and resilient societies, increase sustainable growth and reduce inequality in Europe (YERUN Office, 2018).

Although Horizon 2020 is the largest framework programme for research and innovation to date, it is, with less than 80 billion euro for 7 years, underfunded. In some parts of Horizon 2020, the current budget supports less than 1 out of 5 high quality proposals. Equally, even though the success of Erasmus + is outstanding in fostering mobility and employability, at 5% European student mobility is far below the 20% Bologna Process target.

However, doubling the FP budget cannot be a substitute for strong support for, and investment in, research, innovation and education at national level. Sufficient national investment in research (to the level of 3% of GDP as agreed by the Member States) and education, together with EU funding, is crucial for Europe's competitiveness and for a sustainable European society (in line with the UN Sustainable Development Goals). We also urge the European institutions to encourage Member States more forcefully to meet their commitments in the framework of the European Research Area (ERA) and the European Higher Education Area (EHEA) (YERUN Office, 2018) .

Investment in research and education not only brings the highest European added value, it is also the most effective long-term, future-oriented commitment that the EU can make towards its citizens (Tarrach, 2018).

This kind of spending on research, innovation and education means, first and foremost, investing in people - in particular, Europe's youth. It is the sine qua non condition to fulfil the ambition of turning the European Union into a world leader in innovation-driven growth and competitiveness.

What we do, ultimately, when investing together, is empower our societies to tackle common challenges and reach shared objectives regarding competitive innovation, societal growth, job creation, environmental protection and social inclusion.

It is also about efficiency. Research and innovation are a European public good. Investing in them creates synergies, economies of scale and a very high return. We know that every euro invested in research and innovation generates on average €13 in value added for business (Tarrach, 2018).

Furthermore, investing in research and education reinforces European awareness and identity through transnational collaboration and mobility. The EU's Horizon 2020 and Erasmus+ are unique in this respect and even more funding should go to the next generation of programmes.

Plus, investing in education, research and innovation is Europe's best foreign policy instrument. Beyond academic exchanges, what we have developed, and must further strengthen, is a reliable space for dialogue with partners around the world. Not only do we tackle global challenges, we create concrete ties enabling scientists, students and innovators to work across borders, embedded in the quest for excellence and personal development.

For all these reasons, it is time for the member states to significantly step up their commitment to European research and education. As the multiannual financial framework is being designed, the university sector suggests doubling investment to boost Europe's competitiveness and sustainability. Europe's leaders need to consider this and remember that universities have the potential to become a treasure chest of European added value (Tarrach, 2018).

The majority of public initiatives is still mainly developed in national policies, offered by national institutions. While for the last years member states increasingly tended to compete with each other in the field of innovation policy, strong industrial or financial capital actors have been appearing more frequently on the scene - multinational enterprises, international strategic alliances of national enterprises- who act globally and across the national innovation systems. In the member states of EU this policy initially took the form of initiatives for stimulating research, improving innovation financing and promoting technology absorption and innovation management.

Additional priorities like intensifying the cooperation between research, universities and universities, promoting 'clustering' and other forms of cooperation among enterprises and other organisations involved in the innovation process and encouraging the start-up of technology- based companies were added to the national innovation policy (Nilsson, 2004).

At the national level, governments could set up agencies funded by public bonds with the mission to provide venture capital, investment credits and R&D support to new activities in the above fields. Productive efficiency and competitiveness would be strengthened by:

- Pooling scarce resources to help to achieve critical mass in bringing innovation to the market; and by increasing cooperation in innovation to create large scale demonstration projects and pilot test facilities
- Reducing the fragmentation of innovation support systems, facilitating bringing innovative solutions to the market, and increasing the market focus of research projects.
- Developing support for innovative services based on measureable outcomes
- Facilitating the growth of manufacturing industries by ensuring that regulations do not pose obstacles to expansion; by favouring access to appropriate finance; and by providing support services for accessing new markets, and publicising these.

## 3. Conclusions and Policy Implications

Innovation policy seeks to help firms or industries to improve their capacity to innovate. This includes the provision of scientific infrastructure in research and education and direct and indirect support for research and technological development. It also includes a wide range of policies which aim to build networks, to make markets more conducive to innovation, to facilitate the transfer of technology, to help firms to acquire relevant capabilities, and to provide a supporting infrastructure in areas such as standards and intellectual property. Public innovation policy aims to strengthen the competitiveness of an economy or of selected industries, in order to increase societal welfare through economic success (Kuhlmann, 2001). Hence European Union has made innovation a top priority through several strategies, funding opportunities and assessments. The pressures of globalisation have brought innovation to the fore as a key element in increasing productivity along with technical efficiency and

underpinning industrial competitiveness, taking into consideration the under-investment in business R&D and other innovative activities, strongly linked to the fragmented condition of European markets.

A new generation of policies have to overcome the limitations and failures of past experiences, such as collusive practices between political and economic power, heavy bureaucracy, lack of accountability and entrepreneurship. They have to be creative and selective, with decision-making mechanisms that are more democratic and inclusive of different social interests. These new approaches to industrial and innovation policies could play a key role in pulling Europe out of the current crisis. The politics behind such a new departure has to be based on a wide social consensus over the distribution of the productivity and efficiency gains deriving from new technologies and economic activities.

Investment in education and innovation policy programmes and projects claim to contribute to technical efficiency. This implies that policies should concentrate on areas in which there is expansion and therefore good prospects for growth, community businesses are supposed to become more competitive, and scientific and technological progress is expected to offer a medium- or long-term potential for dissemination and exploitation. An open, efficient and competitive business environment is a crucial catalyst for growth in a global context. Rising to these challenges can improve the competitiveness of European manufacturing industries, and the Commission aims to help the member states to use their limited resources efficiently in order to increase the global competitiveness of their industries. Addressing these challenges will improve the growth prospects of industries. A competitive industry can lower costs and prices, create new products and improve quality, contributing thus decisively to wealth creation and productivity growth throughout the economy.

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# ILLEGAL CONSTRUCTIONS IN THE POST-MEMORANDUM GREECE
## Changes and constants in a chronic phenomenon

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**Abstract**
The ¨stirring¨ of the problem of illegal constructions in Greece, during the last decade, that followed the issue of five consecutive laws regarding their integration in the country´s official urban planning in the period 2009-2017, has led to a short-lived race of declaring and legitimizing illegal, constructions on behalf of the hundreds of thousands of popular owners. This institutional reform becomes, increasingly, significant in combination with the contemporary fiscal reform and the relevant tax burdening of realty owners. The timeless popular investment shelter of building ownership, for the first time after WWII, loses its immunity and becomes an unbearable tax weight, transforming popular illegal constructions into the national tool for transforming the country´s real-estate map. Our ability to translate the outcome of this ¨crisis¨, through our route through all the past time, will define the quality of life in our new urban environment, but most important, our own standard of living and our future.

**Keywords:** Illegal constructions, urban planning, economic crisis
**JEL classification:** R0, R5

## 1. Introduction

The debate on illegal constructions and urban planning is not recent in Greek society. It starts from the beginning of the Modern Greek state, while the formalities of the 19th century often differed from those of the 20th century, only in the linguistic styled. This fact highlights the deep historical depth of the processes that are related to both planning and its cancellation, and therefore their complexity and the difficulty of identifying their causes[1].

The evolution of this phenomenon, from its first appearance to our days, is impressively steady. Already, since the establishment of the New Hellenic State, few things have essentially changed in the political-social hierarchy of institutions. The Kotzambasides of the Ottoman feudal empire, the class of tax collectors on behalf of the Turks, became the delegates of the western partners, the new protectors-lenders of our newly established state. The political and, at the same time, economic dependence of the country was universal[2], but it became more organized and systematic only after the Second World War. Since January 1946, with the assistance of British and American consultants, the United Nations Relief and Rehabilitation Administration have covered vital needs of the population and industry, on behalf of the United Nations, mainly with US funding. With the implementation of the Truman Doctrine in the spring of 1947 and the Marshall Plan shortly after, the Americans were activated with a wide margin of intervention.

The "Report on the Economic Problem of Greece[3]," which was submitted in 1952 by Mr. Varvaressos to the Plastiras government, as financial adviser and executive of the International Bank, is a decisive indication of the direction of the options for the reconstruction of the damaged post-war Greece. This report reflects openions of international organizations and defines agriculture as the main development axis instead of industry and, at

1 M. Mandouvalou / M. Balla (2003), The (non) planning of the urban space-social determinations and political dimensions, Law and Nature, on the website https://nomosphysis.org.gr/7044/o-mi-sxediasmos-tou-astikou-xorou-koinonikoi-prosdiorismoi-kai-politikes-diastaseis-septembrios-2003/?st=o%20(μη)%20σχεδιασμός (last access to 03/06/2018)

2 Φ.Ε.Κ 2Α-05.01.1836 (on the establishment of the National Bank of Greece) and Φ.Ε.Κ 298Α-07.12.1927 (establishing a Bank of Greece)

3 Varvareos K. (1952), Report on the Economic Problem of Greece, Athens

the same time, stresses the need to implement a significant and long-term housing project, thus driving any future policy to tolerating any building activity, practically, including illegal constructions. Thus, from 1952 and untill the law 410/1968 the formal or informal tolerance of the state was a given. The inherent choice of our mediterranean people, instead of the formal application of the laws of a state, which provided for dwelling only on a theoretical level, ignoring the devastated society, was self-righteous urbanization, which seemed like the only pragmatic way of survival, not legitimizing, ethically, the contradiction against illegal building constructions.

Until 1968, the state had shown institutionally that the legislator's intention was to stop the unconventional building and to organize our cities in a modern, European context. However, the lack of material support, with long-lasting and permanent solutions to the intense national housing problem, condemned any legislation in practical failure. With this law, the state legitimized all illegal constructions built until that day by paying a fine, thus inaugurating[4] the time of legitimate dealings between state and citizen on illegal construction issues and, at the same time, starting the national dialogue to solve the chronic problem. The fall of the Junta and the institutional restoration of the democracy, the 1975 Constitution, and later the ideological optimism of PASOK's "Change" made the first public views inspired by innocence and, at the same time, a feudal dynamism. However, the ill-fated establishment of thirty years of disorganized constructions was irreversible with easy moves. The established situation was very different from the beginning of the post-war phenomenon.

The illegal houses, as they were created from 1950 onwards, belonged to History. It is true that the acute post-war social housing problem, no longer existed, either quantitatively, or qualitatively. The basic need for housing the majority of the tortured people was met on a first level and proof of this is the inauguration of the phenomenon of illegal holiday residence. As the phenomenon changes, since the late 1970s, the illegal houses lose their "immunity" and receive the first negative outlook. In 1979 T.E.E. [5] (Technical Chamber of Greece) makes one of the first straight remarks against illegal buildings on a purely materialistic criterion, namely the loss of income for the insurance system, which highlights the economic consequences of the uncontrolled problem. A five year period of change had already passed and the western governmental direction was, frankly, declared in the Greek Parliament by mouth of the prime minister[6]. The gradual implantation of Western mentality of computational rationality had begun to emerge, characteristic of the raising of the standard of living and the upcoming Europeanisation of the country.

The world where the formation of society is based on emotion, interpersonal relations and fluid privacy has begun to diffuse slowly and dangerously in that of interest, impersonal relations, and the leveling power of collective individuality of the loneliness of contemporary Western man, where everything is measured by profit. In such a world, the hidden causes of the origin and evolution of illegal building are not significant, unless they are linked to economic impacts. The debate over illegal constructions, after the initial pragmatic attempts to, scientifically, explain the phenomenon, has gradually moved its interest to more technocratic and, above all, superficial aspects that have to do with how and how much will be needed to institutionalize the legitimacy of the existing situation.

Since 1983, most of the debate has been dealing with fines and their enforcement and collection procedures. The unspoken acceptance of the situation and the explicit absence of a formal scientific exploration of deeper ways towards a sustainable management of the modern Greek urban landscape, embedded the debate in a context of informal negotiation between the citizen and politician, with the only obvious stake, the way of legitimizing illegal constructions.

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[4] We exclude previous regulations of the past century on the legalization of arbitrary charges (Law "On payment of the price of land of occupied land" of 1855, a few years after the adoption of the first framework for city plans in 1835

[5] One of the conclusions of the extensive recording of the arbitrary constructions of the public and industrial buildings of the Thessaloniki district of the Central Macedonia Department was that "TEE's contributions were lost. (0.25% of the budget) and TEMP (1,5% of the budget) borne by the owner "

[6] Rissis Karamanlis K. "We live in the West", speech to the Hellenic Parliament, 12 April 1976

In a few words, the amount of the imposed fines was more important than the country's urban planning. The age of innocence had passed and the age of consolidation of the illegal constructions was already here, paving the way for the era of greed, the epoch of hubris. Since the end of the 1980s, we experienced the saturation[7] of the dialogue and the lack of new legislative initiatives that followed the adoption of the law 1377/1983, which, in conjunction with the new General Building Regulation, law 1512/1985, balanced the situation, satisfying for a long time market and popular will, bringing the dialogue to a second level. However, this was not the sole cause of weakening the theoretical interest in illegal constructions. The entry in the pre-Olympic Athens period and the silent preparation of the country's entry in the European Union did not favor the shake-up.

In the first case, the timely construction of Olympic projects in a country without complete national land register, forest maps and national spatial planning would be impossible in an environment where illegal constructions are not *tolerable*... In the second case, E.U. and the forthcoming establishment of a supranational economic power in Greece, corresponds to the practical beginning of the entry into the age of globalization and of "global government[8]", recently announced by politicians. They will show their interest in urban planning later on, as part of the modernization of development structures, including real estate and illegal buildings' management. The more than twenty years of political inertia and the economic prosperity of the pre- and post-Olympic Greece of the euro zone have determined the passage from the age of greed to the age of hubris.

The property is now the absolute popular investment and its transfer is accompanied by its "integral" profit-making illegal sequences, in a surreal process of equalizing and accepting illegality in the official transactions of the owner with the state services. Inside this sweet journey in an atmosphere of drunkenness and overconsumption, no one wishes the end of the journey, but the contrary. Thus, a dialogue that attempts to awaken from the dream can only be unwillingly disingenuous. The inflation of material goods in the buoyant rise of the standard of living and the illusion of national fulfillment with the entrance of the Euro Zone, almost, equated in the popular subconscious, monetary integration with the spiritual one. We have entered, the time when Economy overcomes Politics, and sets the framework for discussion on every subject. Everything has an economic impact[9]. Otherwise they have no reason to exist. Following the global financial crisis of 2008, Europe's national spatial planning systems are rearranged to respond to the needs of internationalized economic and financial activity by promoting new types of investments in the property market (Adams & Tiesdell, 2010, Allmendinger & Haughton, 2012 ). Thus, together with the environment, a new ally in the fight against illegal buildings, is the economy. Thus, the economy becomes, in a new spirit, more compatible with the requirements of globalization and international capital than with the scientific views of the academic world on urban planning.

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[7] Typical the conclusion of the TEE Working Group of 1991, which he unanimously reached and confirms "the oldest findings as absolutely topical"!

[8] Announcement of 08 February 2005 by Anna Psarouda-Benaki to Karolos Papoulias at the Maximos Mansion and a speech by George Papandreou of the United Nations on 20 September 2010 in the New York

[9]The theme of the conference, "Arbitrary and National Economy", is indicative of this, as well as the degree of Europeanisation and alienation of the way of thinking of the people of a country which, when it entered EOK, respecting its cultural role in Europe was the one who devised and pioneered the founding of the European Capital of Culture, upgrading the character of a union of states to a union of peoples and cultures and which, thirty years later, alienated and alienated from its history and customs, is a slogan policies, which monopolize its productive potential in achieving exclusively economic objectives. There is only one Eurogroup, the finance ministers of the UNO. There is no Eurogroup of ministers of education, culture, communication and communications, only financial! υπουργών οικονομικών της O.N.E .. There is no Eurogroup of ministers of education, culture, communication and transport, only financial!

Times are changing. There is no longer a mass popular movement for the illegal construction of basic family-houses, because it has, long ago, been saturated. There is not even a popular movement to construct second-rate, holiday houses. Approaching the end of the 2000s, the (traditional) popular movement of illegal constructions is that of maximizing all, practically, possible building surfaces in the first, second, or any dwelling, at work, in the farm, in the warehouse, anywhere ... Not by following a basic need for housing, but by taking the existential imperatives of our modern, globalized society. Globalization, whose presence and growth in Greece is growing more and more, has forced a change in our material needs, mainly through excess and through a world image that has been built to the standards of the West, in which, monolithically, we "belong".

It is a narrative that contrasts with the corresponding Eastern Christian philosophy of life and art[10], which is more spiritual and based on the perpetual, intangible entity of things. We, as the people who has defined this geography[11] between East and West, instead of maintaining the balance that our physical and historical position dictates, we have been occupied by an incomprehensible inferiority complex to the "valid" wisdom of the Western World and the cultural enforcement of its aesthetic values (Wallerstein, 1980), which, is, probably, not the appropriate answer for the Mediterranean city. Just like when, before the crisis began in 2010, we bought a two and a half thousand cc car for our daily shift to work, just like we were buying a mobile phone with the ability to run nuclear physics applications in order to arrange our meetings, just like we were eating much more than we needed, in the same way we bought and built our properties. Within this alienated society, the debate on illegal buildings could only follow and not lead.

At the end of the 2000s, the debate about illegal constructions is a saturated from the abundance of interventions at all levels, worn out by time and stagnation, lost affair. No one seriously believes that anything is going to follow the direction of a sincere effort to, permanently, cure the popular epidemic of building greed, excess, and misuse. Paradoxically, the transition to the age of crisis coincides with the emphatic re-activation of the state into the forgotten problem of illegal constructions. The feverish adoption of a sequence of five relevant laws in the period 2009-2017 will also rekindle the national dialogue. State interest in the problem is, historically, unprecedented and it is the first time that the implementation of the laws is universal, as it extends, eventually, to all[12] real-estate properties.

However, the intensity and quality of the measures, which are, ultimately, obligatory, lead to the opposite direction of that which the "spoiled" modern Greek people have been used to until now. For the first time, the measures adopted do not lead to horizontal legalization or permanent exemption from demolition of the illegal constructions. This is because the recent laws, combined with the imposed taxing policy and the immense change in the tax treatment of real estate, seem to allow, in the long run, only to a limited economic elite, to maintain the profits from past realty property investments. The land-property and building system since the 1950s, after 23.04.2010[13], is changing for the first time, conveying space and society. The co-operation, official or non, of the state with popular desire was a fact that no one dared to touch.

This violent institutional breakthrough has consequences that are already visible in contemporary Greece: building is being limited[14] and removed from the hands of the small

[10] Coomaraswamy K. Ananda (1994), "Christian Eastern Philosophy of Art", Athens: Quintessa Publications

[11] The terms West and East, both geographically and culturally, world-wide, have always been defined in relation to their native Greece

[12] Article 52, N.4495/2017 about Electronic Identify Of Building

[13] Announcement of Prime Minister G. Papandreou entering the country under economic surveillance, island of Megisti

[14] Elements of the Hellenic Statistical Authority (ELSTAT) in May 2016: the size of the total building activity (Public-Private) in the whole country, measured on the basis of issued building permits, amounted to 849 building permits, corresponding to 140,2 thousand m2 of surface area and

and middle class. The status of a vast sea of micro-properties, which made possible the formation of the modern Greek city, is dying. A historic record of 86% growth over the five-year period 2013-2016, but also as an absolute figure in the past year, reaching 130,000 heritage disclaimers, because of ENFIA[15] and other real-estate-related taxes, show a change in property treatment as an asset, that reverses the past course. However, while the latest legislative arrangements show a pleasant shift from the traditional mismatch between laws and actions, other changes[16] are, practically, abolished.

On one hand, universal control is, finally, applied on the new constructions, just like mandatory registration and, also, settlement of the existing illegal constructions. These are changes that constitute the commencement of the "tiding up" of the anarchic and, literally, unknown landscape of the built environment in modern Greece. But, on the other hand, the de-capitalization of the Green Fund hinders the tool of the law with the most positive prospects. The Green Fund is, in theory, a remarkable innovation that shows a new logic, the management of building rights in the context of the environmental balance philosophy and through the management of land stock, through the 'land bank' tradability of building rights, regulates the link between private and public interests. However, the Fund's incomes have been redirected to an unknown and, definitely, irrelevant direction at a percentage of 97.5%, and the coveted expropriations and the creation of open and green spaces on the grounds of environmental reward have, literally, been deactivated. As a result, the tangible, practical results of the last five laws, concerning illegal constructions, show that they are automatically cancelled, both economically and urbanistically.

Politics today is, urgently, required to decide action and direction on entirely pragmatic issues such as the way in which the relative fines are calculated, but, also, on much more complex ones, such as the way of incorporating the existing illegal structures into the urban fabric, with tool the new legislation. The present political conjuncture entrusts law 4495/2017 with the historical ability and responsibility to dictate the way in which ubiquitous illegalities participate in the production of space in future Greece, in the formation of a unique, local urban plan. Little is being discussed about this and the general indignation and frustration, certainly, contribute to the tolerance of the situation, thus enhancing voices more theoretical and less relevant to urban sciences, to lead the debate in a more economical direction, relative to the investments of large capital. Just recently, was stated from the official lips of the president of the Highest Court of Greece, the tragic admission of the "dominance of Economy over the Institutions, which had a decisive influence on almost all state actions and marked the subsequent retreat of the rule of law", an admission which marked his resignation, a sad admission for the country that gave birth to democracy and the bases for every humanistic science.

The assumption of the retreat of the rule of law[17] is crucial in the debate on illegal buildings. The twofold character of the discussion, since its launch, has two opposite diametric, but also, parallel poles. On one side, we have the official directions for urban policy, represented by the state. This has undertaken the rational and legitimate organization of our cities, unfortunately, at a theoretical level, detached from social practice. The initial humanitarian atonement of the phenomenon has given it a post-war national dimension, bringing it into a folk ethos and a common practice, which, because of the forces of the

634.3 thousand m3 of volume, a 31.5% decrease in the number of building permits, 38.5% in surface area and 38.9% in volume compared to the corresponding month of 2015

[15]Enikonomia (05.09.2017), More than 150,000 heritage disclaimers in 2017 due to ENPHY, on the site

http://www.enikonomia.gr/my-money/164949,pano-apo-150000-apopoiiseis-klironomias-to-2017-logo-enfia.html, (last access 03.06.2018)

[16] N.4178/2013, Article 39 (1) and N.4495 / 2017 Articles 75 (1) & 76 (1) on the Green Fund

[17]Statement by Sakellariou N., President of the CoE, dated 16.05.2018 on the site https://www.pentapostagma.gr/2018/05/εκτακτο-παραιτήθηκε-ο-πρόεδρος-του-στ.html (last access 03.06.2018)

formed market in the land system and the efficiency of investment in real estate, covered all social groups. The official pole on the matter, which, only after the Constitution of 1975, is systematically involving urban planning and environmental protection, is expressed, hypocritically and inefficiently, by the government.

The only participant in the official pole, honestly blocking the ongoing legislative "flexibility", remains that of the Highest Court of Greece, which is the practical obstacle to the complete circumvention of urban planning.

Procrastination to all these rising pressures of maturing and evolving planning mechanisms is the dominant state response, with the known negative effects in our modern cities and our society, ignoring the real market forces and turning the dialogue about illegal constructions into two parallel monologues. Thus, social dynamics were left free to shape the production of space. Primary cause of the creation, survival and enlargement of the nature of the space produced, is another state policy, the economic one, which, since 1952[18], steadily and unceasingly, supported the production of the built space as a basic sector of the economy, which in turn, supported the created model of social and economic development. This policy has, until recently, been expressed, also, through the taxation system, which has consistently favored the maintenance of a positive climate for the construction industry and the possession of real estate.

Until 2010 and the crisis, the two poles, the "official one" of state planning and that of totalitarian "social practice" do not seem to have a meeting point. This practice concealed many problems and was, tragically perceived in the current economic circumstance. Modern Greek urban planning, without its self-assessment, lost its ability to evolve and adapt to the locus, ignoring its particular mediterranean environment and even stronger local social-historical dynamics. Insisting on inapplicable planning theory tactics has, tragically, cancelled planning, every time new rules were put in the real field of action of the vibrant society and the market. The inappropriate rigidity of the regulations rendered them ineffective, as unrelated to the social and economic dynamics, but also to the dominant model of development. The incomplete result of this hypocritical bilingualism would be the systematic detour of urban planning and the deficient model of our current built environment, devaluing the real estate market and contributing to the mortgaging of our future. The timeless degradation of our architectural heritage and its overburdening with problematic illegal constructions, has taken away from us a significant outlet in today's crisis. This is, perhaps, the most important negative consequence, today, of this peculiar dualism of state policy. After so many decades of the phenomenon, it is, today, obvious that the established grid of, ineffective and inelastic, strict regulations, ultimately results in the exclusion of creative forces and the support of general systemic inertia, which conceals the profitability (Pagonis, 2014).

Approaching towards the end of the decade of 2010 and after eight years of crisis, the abovementioned bipolar, responsible for the formation of the dialogue on illegal constructions and space production, for the first time in post-war Greece, shows strong signs of imbalance. The pole of official state policy, following the 2004[19] astronomical fines, gradually implements a more pragmatic policy through the latest laws on the settlement of illegal constructions, adjusting fines in the current times with many installments, as well as imposing itself with more rigor and honesty. It is a law which, for the first time, is, ultimately, mandatory, rendering building control universal, and covering, for the first, time all new buildings.

The other pole of state politics, the economic policy, which for decades has made real-estate property the absolute investment heaven, since the surplus value it offered was unrivaled and, more importantly, it has never betrayed the Greeks until now, it is, now radically, following an opaque policy, adapting abruptly to the international dictates of globalized capital. Real-estate property is transformed into a tax burden for the small and middle class, and its associated illegalities increase its "weight", which, at a time of the crisis,

[18] Varvaresos K. (1952), Report on the financial problem of Greece

[19] Joint Ministerial Decision 9732/2004 - Government Gazette 468 / B / 5-3-2004

is multiplying. The launching of electronic auctions[20] for houses, that is beginning this year, in addition to this process, will make built property a "mobile" commodity, further reducing its traditional investment attractiveness.

As a result, the social dynamics, which was the main protagonist of the other pole in the debate, suddenly freezes! The natural force of the momentum, which is trying to keep things in orbit, is the only driving force of pushing any popular investments into real estate, almost exclusively, main homes. Within the western economic system, in which the country entered after accession in the European Economic Community and, most importantly, after entering the Euro Zone, we see the timeless, illegal constructions of micro-owners for self-exploitation, or comercial use, being gradually replaced by speculative macro-illegalities that appear organized after the 1990s, increasing their aggression until the Olympics[21]. It is only after 2010, however, that the qualitative shift towards the relentless profit is taking place. Real-estate profits are no longer diffused into all social layers, thus, making the broad consensus on the status quo disappear. Real estate prices, as most of the produced property was directed to self-ownership rather than profit, fell. Building was despised. The direction of social mobility has changed! We are at an extremely critical turning point of our recent urban history, after the 1950s, where we must decide what direction to follow in the new, globalized world, and our adaptability will determine, to a large extent, the level of living in our cities, but also our own standard of living. The social dynamics in these stormy changes is staying numb, being a sole viewer of unexpected developments and as it is trying to absorb the changes, it interrupts its participation in the pole of real estate investment, fleeing to save what it has, literally, built, during the past decades.

The dialogue on illegal constructions has changed. The debate is no longer about how to legalize and increase building investments. And if that is not absolute, it is solely due to the remnants of money-saving over the recent years of “fat cows“ and to the survival of the moral principles and solidarity of the Greek family, as the basic feeder of daily economy. The recent reform is not a substantial hit against the current course of things so far, but an attempt to solve specific issues related to strategic investments within the existing system (Economou, 2015), for which we have been indifferent for decades. This indifference has led the most prolific player of the land system in post-war Greece, to, willingly, put himself out of the game. The investment gap of the small and middle class, as the legislative framework is adapting accordingly, now comes to be covered by international capital, on a different scale.

The void in the dialogue about contemporary urban planning and illegal buildings in Greece, is the only one, perhaps, in which the, yet, unexpressed social dynamics can contribute. Now that the particular alliance of legislative and social practice seems to be dying, it is the historic moment to rethink, on a new basis, the philosophy of regulating illegal constructions, but also urban planning in whole, evaluating the results so far and taking into account the modern political conditions. Only by introducing into the discussion all those local, valuable elements, necessary for the adaptation of general, modern data, we can bring out a result more integral. The topical, flaming, special issue of illegal constructions’ policy concerns our policy of city planning in general, which today is redefined and ceases to support building as a main lever of the economy. Investments, which are mainly foreign, will be those that will drive the economy and only as part of this logic, constructions will be part of the system, mainly controlled by the foreign capital; not by the specialized scientific community. Defending construction activity as a promoted economic policy is no longer a central pillar of the system. Faced with these sweeping changes, correct interpretation of the crisis will be the one to push us towards an effective defense and will allow the planning to intervene. The state's "formal dialogue" today must stop dealing with, exclusively, technocratic issues of the legalization process.

The study and knowledge of everything that has been done in our modern state from the 1950s onwards, negative and positive, by decoding the events with polymorphic tools all the relevant sciences, plus the awareness of our past actions, will bring the longed-for self-

[20] Technical agreement on the Eurogroup package of 4 December 2017

[21] K. Chatzimichalis (2015), Debt Crisis and Land Survey, Athens: KPS Publications

knowledge of our present modern Greek identity. This self-awareness is necessary for articulating a vigorous argument against the imposed rules on illegal constructions and urban planning. It is true that the debate on urban planning, in the way it is being held today, direct result of the more general historical conditions we are experiencing, is suffering. It lacks in the data that takes into consideration and it lacks in the study tools it uses.

If man managed to survive in conditions, paradoxically, anti-human, primitive, to rally up the ranks of the evolutionary scale, breaking the shell of barbarism and giving his life a higher content, this is undoubtedly due to his logical ability. Man is a logical animal. Thanks to the divine spark of "logos" that shone in him, he accomplished the feat of society. By manifesting his social potential he has created the polis-politismos (city-culture): language, art, religion, etc., which differentiates human cohabitation from the coexistence of animals. The animal is adorned with the gift of adaptation to the environment; instead, man is gifted with the creative passion of transformation, the change of the physical space. He creates his own world within the cosmic "chaos" of universal harmony. It responds, in some way, to the world of "stars in absolute order", which contains and restrains all. Such powerful tools, sciences that study the feat of society, city-culture and anthropology of space are omitted in a debate that targets productivity rather than man, quantity rather than quality. Our culture today is use-targeted.

The existence and life of the city (polis) are based on the beyond, but today they are based on fiscal targets. The divine origin of the city implies the divine origin of the laws[22]. Today, the divine laws, the laws of Nature, are dictated by the "institutions" of supranational organizations of economic surveillance... We are far from this vision which, we Greeks as a people, have born and donated to the world! It is absent from the thinking of the man-consumer of today. A zap on everyday TV shows will convince us immediately. Within this environment we are, unfortunately, today discussing the future of illegal buildings and urban planning. By fact, a debate with incomplete data is doomed to wrong results. At the same time, however, we are obliged to carry it out today, the time of the Economy, of the inanimate digital revolution, of globalization... The complete interpretation of the crisis, of our previous course and of today, will be the one that will dictate successfully, the mix of policy both in illegal constructions and urban planning policy, in general. The creative synthesis of the qualitative elements that derive from the urban-relevant humanitarian sciences, with the modern humble facts of the perishable life of man-consumer will clarify the course of the dialogue and the fate of its outcome; The responsibility of the undertaking is burdening, equally, the scientific world, as every single citizen (politis: member of polis, person with voting rights)...

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# THE MACROECONOMIC IMPACT OF REGIONAL MINIMUM WAGEs: A CROSS-PROVINCE DATA EVIDENCE FROM INDONESIA

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**Abstract**

The main purpose of our study is to determine the causality relationship between economic growth, regional minimum wages (RMWs), unemployment rate and labor force participation rate (LFP). Using cross-section data set of 27 provinces from Indonesia for the period of 2003-2015, data analyzed using panel co-integration test, panel vector error correction model, and Granger causality test. Panel co-integration test indicates that there is a long-run relationship between the variables. In the long-run, LFP positively related to the economic growth, and negatively related to RMWs. The unemployment is positively related to both the economic growth and RMWs. In the short-run, RMWS has a significant and positive effect on economic growth. The unemployment and LFP have a negative and significant effect on RMWs. LFP has a negative and significant effect on unemployment and RMWs has a positive and significant effect on LFP. Furthermore, economic growth has a negative and significant effect on LFP. The result of Granger causality test points out that there is a bidirectional causality relationship between economic growth and RMWs and between RMWs and LFP. In addition, unemployment rate causes RMWs, and LFP causes unemployment.

**Keywords:** Economic growth, regional minimum wages, labor force participation, unemployment and panel vector error correction model

**JEL classification:** J31, O4, R23

## 1. Introduction

The minimum wage policy set by the government can affect macroeconomic variables especially the employment variables. Moreover, the wages can determine the demand and supply of labor in the labor market. The labor force's desire to enter the labor market is motivated by their desires to earn wages. The higher the wage rate, the higher the willingness to work. This means that RMWsof a region affects labor force participation and unemployment rates in the area. In turn, the linkage between wages with these two variables can impact on regional economic growth.

Research on the relationship amongthe LFP, unemployment rate and economic growth has been largely done by previous researchers. The result of their studiesis still varied and paradoxical, so the natureof the relationship of these variables isan open question. The wage has no impact on the unemployment rate (Muravyev&Oshchepkov, 2013; Angeles-Castro et al., 2014). Empirical research conducted by Belman & Paul (2014) concludes that the minimum age has a negative and insignificant impact on unemployment, where a minimum wage increases of 10% causes the unemployment rate to fall between 0.03% and 0.6%. In contrast, Akpansung (2014) reveals empirical evidence that minimum wages are positively correlated with unemployment rates.

Regarding the relationship between minimum wage and economic growth, conventional neoclassical theory predicts a negative relationship between the two variables. However, previous studies provide the empirical evidence that when labor supply increases there is a positive relationship between wages and output. On the contrary, when labor demand increases the relationship between the two variables isunclear (Kim, 2005). Watanabe (2013) proves that minimum wages promote economic growth. In contrast to Watanabe's findings, empirical research conducted by Dube (2013) found a negative relationship between the two variables.

The results of empirical studies on the linkages between the unemployment rate and economic growth also still provide various conclusions. Several researchers found an inverse

relationship between the two variables (Rosoiu & Rosoiu, 2014; Phiri, 2014; & Yelwa et al., 2015). Not inline with researchers, Sadiku, Ibraimi & Sadiku (2015) and Nikoli (2014) found no inverse relationship between unemployment and economic growth. Previously, there were also studies that found a negative relationship between the two variables (Brooks, 2002; Yam et al., 2002, &Totan et al., 2013). In contrast, Chang-Shuai & Zi-Juan (2012) concluded that the relationship between the two variables is positive. A recent study conducted by Abraham & Ozemhoka (2017) for the case of low-income countries in Sub-Saharan Africa provides two different conclusions. Firstly, using cross-nations data sets there is a negative relationship between unemployment and economic growth. Secondly, using individual countries case the unemployment rate positively related to economic growth.

Studies on the nature of the relationship between the unemployment rate, labor force participation and economic growth are still paradoxical. The unemployment rate and economic growth affect the LFP positively and significantly (Tasseven, Altas & Un., 2016). The unemployment rate has a negative and significant impact on LFP (Zaheer & Qaiser, 2016). The LFP is positively related to economic growth (Amir, Khan, & Bilal, 2015 and Forgha & Mbella, 2016). Economic growth increases the LFP, after a reaching a certain point economic growth decreases LFP. So, there is an inverse U-shaped relationship between the two variables (Dogan & Akyuz, 2017).

So far, the study on the relationship between regional minimum wage, unemployment rate, LFP and regional economic growth in Indonesia has not been much empirically expressed yet. Whereas, the determination of the minimum wage by the local government impact on both the employment variables and regional economic growth. In contrast to previous research, our study analyzed the long-term and short-term relationships between the four variables and simultaneously tested the causality relationship between the variables. The use of panel co-integration test, panel vector error correction model (VECM), and Granger causality test can reveal a short-term and long-term relationship as well as causality relationship between the four variables.

The systematic arrangement of the paper is divided into five sections, following this introduction is section two explaining the literature reviews regarding the linkage of RMWs economic growthLFP and unemployment. The data source, measurement of variables and estimation techniques are explained in section three. Both the results and discussion are discussed in section four, while section five concludes the paper.

## 2. THE LITERATURE REVIEW

### 2.1. The links of unemployment and economic growth

Among the many linkages between macroeconomic variables studied by researchers is the relationship between economic growth and the unemployment rate. The relationship between the two variables has long been the focus of economic studies. Beginning with research conducted by Okun (1962) for the case of American economy provided the empirical evidence indicating the inverse relationship between the two variables (Rosoiu & Rosoiu, 2014). The increase in economic growth of 3% would reduce the unemployment rate by 1%. That is, economic growth has a negative impact on the unemployment rate. The higher the economic growth the higher the unemployment rates. The research findings go on to known as Okun's Law.

In the next period, there are a number of studies that provide empirical evidence about the direction of the relationship between these variables. However, the studies present ambiguous results. On the one hand, there is research that supports Okun's findings that there is an inverse relationship between economic growth and unemployment, and on the other hand, there is also research that presented a positive relationship between the two variables. The unemployment is positively associated with economic growth. In addition, there are also researchers who did not find the relationship between the two variables.

Empirical research conducted by Noor, Nor & Judhiana (2007) for Malaysian economy proven an inverse relationship between economic growth and the unemployment rate. Consistent with the findings, Yelwa et al. (2015) also provide the empirical evidence pointing out the inverse linkage between the two variables. Furthermore, research conducted by Rosoiu & Rosoiu (2014) for the economy of United States and Resurreccion (2014) in the Philippines

as wel as Phiri (2014) in South Africa also confirm an inverse relationship between economic growth and the unemployment rate. In contrast to these studies, Sadiku, Ibraimi, & Sadiku (2015) in their study in Macedonian countries did not find an inverse linkage between unemployment rates and economic growth. Similarly, Nikoli's (2014) study with the Albanian economic case failed to prove Okun's Law.

Several other studies have found a negative relationship between unemployment and economic growth. Such as research conducted by Brooks (2002) in the Philippines concluded that the decline in the unemployment rate increased economic growth. The same study conducted by Totan et al. (2013) in Romania also provides empirical evidence regarding the opposite relationship between the two variables, where economic growth lowers the unemployment rate. Similarly, Abdul-Khaliq, Soufan & Shihab's (2014) studies in Arab countries revealed that an increase in economic growth of 1 percent lowered the unemployment rate by 0.16 percent. The higher the economic growth rate, the lower the unemployment rate. On the contrary, the slow economic growth is positively associated with the high unemployment rate (Aqifi & Malaj, 2015). In the short term, unemployment has a negative and significant impact on economic growth (Michael, Emeka & Emmanuel, 2016).

The empirical studies conducted by Ozel, Sezgin & Topkaya (2013) using panel data in G7 Countries also concluded that economic growth has a strong and significant effect on the decline in the unemployment rate before the crisis period, but becomes insignificant and very small after the crisis, whereas the effect of economic growth as a decreasing effect over unemployment continues and its impact level rises.

Other research findings on the linkage between unemployment and economic growth suggest an asymmetric relationship. The unemployment rate responds to economic growth asymmetrically. The response of the unemployment rates to economic growth is greater in times of recession from expansion (Crespo-Cuaresma, 2003). In the pre-crisis period, the unemployment response to economic growth was negative and very strong where an increase in economic growth could significantly reduce the unemployment rate. However, the response was not significant under conditions of economic crisis (Ozel, Sezgin & Topkaya, 2013). Silvapulee et al. (2004) also present similar findings supporting asymmetric unemployment responses to economic growth.

Viren (2001) uses cross-country dataset of 20 developing countries also presents evidence of asymmetric behavior between unemployment and economic growth. In bad times the response to the unemployment rate is near zero, and at a lower unemployment rate, the effect of output growth is greater. The existence of asymmetric information relating to the relationship between unemployment and economic growth is also expressed by research findings Abraham & Ozemhoka (2017) for the case of low-income countries from in Sub-Saharan Africa. Firstly, using cross-nations data sets there is a negative relationship between the unemployment rate and economic growth. Secondly, by using individual countries in case, the unemployment rate is positively related to economic growth.

Related to the direction of causality relationship between unemployment rate and economic growth is also still present inconsistent results. In the long run, there is an equilibrium relationship between the two variables, where economic growth is positively related to the unemployment rate (Chang-Shuai & Zi-Juan, 2012). Thayaparan (2014) and Mosikari (2013) conclude there is no causality between economic growth and the unemployment rate. In contrast, Michael, Emeka & Emmanuel's (2016) researchsin Nigeria found Granger causality results indicated unidirectional causality relationship running from economic growth to the unemployment rate.

### 2.2. The links of labor force participation and economic growth

The labor force participation rate is expected to increase output in the economy. The greater the willingness of the labor force to participate in various fields of work the greater the value of goods and services produced. Research findings conducted by previous researchers provide empirical evidence of the relationship between the two variables. Amir, Khan & Bilal (2015) in their research in Pakistan using ECM concluded that educated labor force has a significant impact on economic growth in the long run. Forgha & Mbella's (2016) studies in

Cameroon concluded that female labor force participation and positively impact on economic growth of the country.

Furthermore, research conducted by Rahmadana & Simatupang (2016) found that in the agricultural sector, there is a two-way relationship between economic growth and employment. While in the mining and quarrying sector, construction sector, transport and communication sector, and services sector only have one-way direction relationship from absorption of labor to economic growth. Empirical research conducted by Tasseven, Altas, &Un (2016) in the OECD Countries concluded that unemployment, and per capita income, affect the labor force participation in a positive and significant way. Zaheer & Qaiser's (2016) studies also found that unemployment rates have a negative and significant effect on labor force participation. Dogan & Akyuz (2017) show that economic growth increases the labor force participation rate. After reaching a certain point, economic growth decreases labor force participation. Thus, there is an inverted U-shaped relationship between the two variables.

### 2.3. The links of regional minimum wage and economic growth

Neoclassical theory predicts a negative relationship between real wages and outputs. However, previous studies provide the empirical evidence that when a supply-side shock exists, there is a positive correlation between real wage and output. In contrast, when there is a demand-side shock, the relationship is not clear (Kim, 2005). Minimum wage is also positively associated with productivity. Similar to Angeles-Castro et al's (2014) studies for the American economy found that average wage growth boosted economic growth. Previously, Watanabe's (2013) studies also proved that minimum wage increases boosted economic growth. The higher the wage rate, the higher the economic growth.

### 2.4. The links of the regional minimum wage, labor force participation and unemployment rate

The result of an empirical study on the relationship between RMWs, LFP and unemployment rate is still an open question. Until now there has been no consensus on the direction of the relationship between these variables. Related to the relationship between wages and employment, for example, empirical research conducted by Imobighe (2007) for the Nigerian economy revealed that there is a positive relationship between minimum wages and employment. In contrast, Dube's (2013) study found a negative relationship between minimum wage and aggregate employment growth. An Increase in the minimum wage may decrease employment. Similar to Dube's findings, Meer and West (2015) found that minimum wages have a negative impact on employment growth.

Related to the relationship between unemployment rates and labor force participation, previous research findings still present different results. Yildirim (2014) found no strong evidence that the unemployment rate is the main driving force behind the low participation of the labor force. Long-term estimates show that for educated women an increase of 1% unemployment causes an increase in labor force participation between 0.64% and 0.74%. Tansel, Ozdemir, & Aksoy (2015) in their study for Turkey economy also provide the same conclusion that there is no long-term relationship between labor force participation and the unemployment rate.

With regard to the relationship between minimum wage and unemployment rates, Muravyev & Oshchepkov's (2013) studies using panel data concludes that minimum wages have no effect on unemployment rates for workers aged 25-72 years old. This is supported by the Angeles-Castro et al. (2014) in America also revealed that average wage growth does not affect the unemployment rate. In contrast to the results of the both studies, Gunsoy &Tekeli (2013) used time series data from 1988-2009 in Turkey, indicating no significant relationship between minimum wage and employment. The results of Muhammad, Sa'idu & Yakubu's (2013) studies in Nigeria conclude that unemployment rates have a positive and significant effect on wage levels. Pantea's (2017) studies in Romania using panel data concludes that the increase in the minimum wage has a significant effect on employment. Previously, Belman & Paul (2014) concluded that the increase in minimum wages had a less significant impact on unemployment, where a minimum wage increases of 10 percent, causing the unemployment rate to fall between 0.03 and 0.6 percent

Some studies also provide empirical evidence of a direct relationship between the minimum wage and the unemployment rate. Fidrmuc & Tena (2013) study in the UK founding out that the minimum wage has a negative effect on the employment of men aged 21 years old. This means that the higher the minimum wage the lower the employment opportunity so that the impact on increasing the unemployment rate. In line with these findings, empirical research by Akpansung (2014) in Nigeria gives the same conclusion that the minimum wage is positively correlated with the unemployment rate with a correlation coefficient of 0.8328. The higher the minimum wage the greater the unemployment rate. Even a minimum wage increases of 1 percent could decrease employment by 6.4 percent. But the findings of his research did not find any causality between the two variables. Bossler & Gerner's (2016) study on the labor impact of minimum wage policy in Germany also provides similar results, where increased wages have an impact on the decline in employment. They concluded that an average wage increases of up to 4.8 percent had a 1.9 percent reduction in employment. This implies that the employment elasticity to wages is -0.3.

## 3. RESEARCH METHODS

The data used in this study are provided by Indonesian central bureau of statistics.The data are panel dataset of 27 provinces in Indonesia for the period of 2003-2015. The province comprises of Aceh province, North Sumatera, West Sumatera, Riau, Jambi, South Sumatera, Bengkulu, Lampung, Bangka Belitung, West Java, Central Java, Yogyakarta, East Java, Banten, Bali, West Nusatenggara, East Nusatenggara, West Kalimantan, Central Kalimantan, South Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, Maluku and Papua province. Economic growth was measured by yearly per capita income based on constant prices in 2000. Regional minimum wage is measured from monthly provincial minimum wages. Labor participation rate measured by unit percent. Furthermore, unemployment proxied from the rates of open unemployment is the ratio of the unemployed to the total labor force.

The first stage in my empirical study is represented by the analysis of stationarity. The Levine–Lin–Chu (LLC) method (Levine, Lin, & Chu, 2002) and then I'm–Pesaran–Shin (IPS) method (Im, Pesaran, & Shin, 2003) are utilized to check the order of integration to see where the time series variable attains stationarity. Both the LLC and IPS methods were deployed on the principles of the conventional Augmented Dickey-Fuller (ADF) test. The LLC method explores the heterogeneity of intercepts across members of the panel, while the IPS method explores the heterogeneity in the intercepts, as well as in the slope coefficients. Both tests were applied by averaging individual ADF t-statistics across cross-section units. The test follows the estimation using the following equation:

$$\Delta Y_t = \mu_i + \gamma_i Y x_{it-1} + \sum_{j=1}^{Pi} \beta_{ij} \Delta Y_{it-j} + \delta_i t + \epsilon_{it}$$

where i =1, 2, … n: t=1, 2, T: $Y_{it}$ is the series for province i in the panel over period t; $p_i$ is the number of lags selected for the ADF regression; $\Delta$ is the first difference filter; $\varepsilon_{it}$ refers to independently and normally distributed random variables for all i and t with zero means and finite heterogenous variance. The others method of unit roots test of the panel data is ADF-Fisher, ADF-Choi, PP-Fisher, and PP-Choi. In this research, we also use the four methods in order to test the data stationarity more perfect.

The second stage in the method of the analysis is cointegration test. The concept of cointegration, introduced by Granger (1969), is relevant to the problem of determining the long-run relationship between the variables. The basic idea that underpins cointegration is simple. If the difference between two non-stationary series is itself stationary, then the two series are cointegrated. If two or more series cointegrated, it is possible to interpret the variables in these series as being in a long-run equilibrium relationship (Engle & Granger, 1987). By contrast, a lack of cointegration suggests that the variables have no long-run relationship-thus, in principle, the postulated variables can arbitrarily move far away from each other.

In the third stage, the causality analysis between the four variables is performed by means of a panel vector auto regression (PVAR) model. The panel data VAR methodology combines the traditional VAR approach, which treats all thevariables in the system as endogenous, with the panel-data approach, which allows for unobservedindividual heterogeneity. The optimal

of lag length is evaluated by means of the Schwarz information criterion. VECM model employed to examine the causality relationship among economic growth, regional minimum wages, labor force participation and open unemployment is formulated as follow:

$$\Delta LRPI_{it} = \propto_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LRPI_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LRMWs_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LLFP_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LUnem_{i,t-j} + \gamma e_{i,t-1} + \mu_{it}$$

$$\Delta LRMWs_{it} = \propto_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LRMWs_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LRPI_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LLFP_{i,t-j} + \sum_{j=1}^{n} \beta_{4j} \Delta LUnem_{i,t-j} + \gamma e_{i,t-1} + \varepsilon_{it}$$

$$\Delta LLFP_{it} = \propto_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LLFP_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LRMWs_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LLFP_{i,t-j} + \sum_{j=1}^{n} \beta_{4j} \Delta LUnem_{i,t-j} + \gamma e_{i,t-1} + \epsilon_{it}$$

$$\Delta LUnem_{it} = \propto_0 + \sum_{j=1}^{n} \beta_{1j} \Delta LUnem_{i,t-j} + \sum_{j=1}^{n} \beta_{2j} \Delta LRMWs_{i,t-j} + \sum_{j=1}^{n} \beta_{3j} \Delta LLFP_{i,t-j} + \sum_{j=1}^{n} \beta_{4j} \Delta LRPI_{i,t-j} + \gamma e_{i,t-1} + v_{it}$$

where ΔLRPI is the first difference of the natural logarithm of regional per capita income, as the measurement of the provincial economic growth, ΔLRMWs is the first difference of the natural logarithm of the regional minimum wages, ΔLFP is the first difference of the natural logarithm of the labor force participation rate, and ΔLUnem is the first difference of the natural logarithm of open unemployment rate.

The model above can avoid the loss of short-term information. Short-term deviations toward long-term balance are adjusted directly to long-run equilibrium. Therefore, the term of error helps to correct the proportion of imbalances in the next period. The term of error correction model (ECM) is represented by the coefficient γ if the variables are cointegrated.

Furthermore, Impulse Response Function (IRF) is used to check the shock response of each dependent variable to the independent variable. Finally, Granger causality is used to test the causality relationship between the variables studied.

## 4. THE RESULT AND DISCUSSION

### 4.1. The result of unit root test

As explained earlier, the unit panel of the root test can use six methods consisting of Levin, Lin & Chu (LLC), ImPesaran& Shin (IPS), ADF-Fisher, ADF-Choi, PP-Fisher, and PP-Choi. The stationarity of the data is based on the probability value. If the p-value <0.05, the data has reached the stationary. Conversely, if the p-value> 0.5 indicates the data is not stationary.

The result of panel unit root test at data level indicates that only labor force participation reaches stationary at level. On the contrary, economic growth, regional minimum wage, and unemployment rate are not stationary at the level. Thus, a unit root test is performed on the

first difference. The results show that all variables reach the stationer at first difference. For more details about the panel result, unit root test can be seen Table 1.

**Table 1. The result of panel unit root test**

| No | Variable | Methods | Individual Intercept | | | | Intercept & Trend | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level | | First Difference | | Level | | First Difference | |
| | | | T-stat | P-value | T-stat | P-value | T-stat | P-value | T-stat | P-value |
| 1 | *L*RPI | Levin, Lin & Chu | 0.993 | 0.839 | -4.098 | 0.000** | -3.707 | 0.000 | -3.172 | 0.000** |
| | | Im, Pesaran& Shin | 7.257 | 1.000 | -2.667 | 0.004** | 0.199 | 0.579 | 0.168 | 0.567 |
| | | ADF - Fisher $X^2$ | 16.039 | 1.000 | 80.361 | 0.012* | 53.973 | 0.476 | 55.474 | 0.419 |
| | | ADF - Choi Z-stat | 7.461 | 1.000 | -3.037 | 0.001** | 0.167 | 0.566 | 0.238 | 0.594 |
| | | PP – Fisher | 18.732 | 1.000 | 114.479 | 0.000** | 38.903 | 0.939 | 103.638 | 0.000** |
| | | PP – Choi | 10.678 | 1.000 | -4.316 | 0.000** | 3.039 | 0.999 | -0.955 | 0.169 |
| 2 | *L*RMWs | Levin, Lin & Chu | 5.927 | 1.000 | -5.206 | 0.000** | -1.082 | 0.139 | -4.426 | 0.000** |
| | | Im, Pesaran& Shin | 8.640 | 1.000 | -2.879 | 0.002** | 2.292 | 0.989 | -0.823 | 0.205 |
| | | ADF - Fisher $X^2$ | 6.069 | 1.000 | 87.145 | 0.003** | 40.507 | 0.913 | 66.726 | 0.115 |
| | | ADF - Choi Z-stat | 9.261 | 1.000 | -3.007 | 0.001** | 2.824 | 0.998 | -1.060 | 0.145 |
| | | PP – Fisher | 8.575 | 1.000 | 149.254 | 0.000** | 58.962 | 0.299 | 191.661 | 0.000** |
| | | PP – Choi | 10.911 | 1.000 | -6.898 | 0.000** | 3.237 | 0.999 | -7.562 | 0.000** |
| 3 | *L*LFP | Levin, Lin & Chu | -5.969 | 0.000** | -12.109 | 0.000** | -5.381 | 0.000 | -11.647 | 0.000** |
| | | Im, Pesaran& Shin | -4.276 | 0.000** | -8.958 | 0.000** | -2.518 | 0.006 | -5.565 | 0.000** |
| | | ADF - Fisher $X^2$ | 105.260 | 0.000** | 177.823 | 0.000** | 83.268 | 0.006 | 125.614 | 0.000** |
| | | ADF - Choi Z-stat | -4.546 | 0.000** | -8.383 | 0.000** | -3.103 | 0.001 | -5.365 | 0.000** |
| | | PP – Fisher | 155.196 | 0.000** | 339.609 | 0.000** | 148.934 | 0.000 | 279.807 | 0.000** |
| | | PP – Choi | -6.967 | 0.000** | -14.422 | 0.000** | -6.284 | 0.000 | -12.198 | 0.000** |
| 4 | *L*Unem | Levin, Lin & Chu | -4.698 | 0.000** | -6.958 | 0.000** | 0.471 | 0.681 | -8.552 | 0.000** |
| | | Im, Pesaran& Shin | 0.289 | 0.614 | -4.866 | 0.000** | 0.861 | 0.806 | -2.352 | 0.009** |
| | | ADF - Fisher $X^2$ | 42.765 | 0.865 | 112.590 | 0.000** | 47.483 | 0.722 | 81.548 | 0.009** |
| | | ADF - Choi Z-stat | 0.392 | 0.652 | -5.183 | 0.000** | 0.919 | 0.821 | -2.805 | 0.003** |
| | | PP – Fisher | 30.323 | 0.996 | 182.515 | 0.000** | 51.016 | 0.590 | 165.620 | 0.000** |
| | | PP - Choi | 1.671 | 0.953 | -8.542 | 0.000** | 0.565 | 0.714 | -6.147 | 0.000** |

Source: Own calculation by E-views software

Note: * indicate the significant at 95% level, and ** indicate the significant at 99% level.

As shown in Table 1 above, the results of the unit root test indicate that the variables achieve stationary after first difference. This pointed out by the p-value of the methods of the unit root test is less than 0.05 for all variables, respectively.

### 4.2. The result of co-integtation test

Since the four variables reach stationary at first difference, we can perform a cointegration test to test for a long-term equilibrium relationship between economic growth, regional minimum wage, labor force participation and unemployment rate. In the research, cointegration test using Pedroni's Residual-Based Cointegration Test, Kao's Residual Panel Cointegration Test and Johansen Fisher Panel Cointegration Test.

Pedroni (1999) suggests seven statistical tests to determine the presence of panel cointegration. The statistical methods divided into two groups. The first group is consists of panel v-statistic, rho-statistic panel, PP-statistic panel and ADF-statistics panel. The all statistical test is termed "within-dimension" (Panel test). The second group of the tests consists of group rho-statistic, group PP-statistic and ADF-statistic group, is termed "between-dimension" (group test). The null hypothesis proposed in the cointegration test is that there is no cointegration between regional economic growth, regional minimum wages, unemployment and labor force participation rate, while the alternative hypothesis is that the four variables are cointegrated. Acceptance of one hypothesis is based on p-value with the provision that if p-value <0.05, the alternative hypothesis is accepted. Conversely, if p-value>0.05 then the null hypothesis is accepted. The result Pedroni'scointegration test can be seen in Table 2.

**Table 2. The Result foPedroni's Residual-Based Cointegration Test**

| Panel Cointegration Statistics (Within-Dimension) | | |
|---|---|---|
| Test Statistics | Statistical Values | |
| | Intercept | Intercept and Trend |
| Panel v-Statistic | 0.259<br>(0.398) | 22.421<br>(0.000)* |
| Panel rho-Statistic | 1.495<br>(0.933) | 3.502<br>(0.999) |
| Panel PP-Statistic | -8.473<br>(0.000)* | -13.848<br>(0.000)* |
| Panel ADF-Statistic | -4.072<br>(0.000)* | -4.124<br>(0.000)* |
| Group Mean Panel Cointegration Statistics (Between-Dimension) | | |
| Test Statistics | Statistical Values | |
| | Intercept | Intercept |
| Group rho-Statistic | 4.179<br>(1.000) | 6.443<br>(1.000) |
| Group PP-Statistic | -8.750<br>(0.000)* | -5.306<br>(0.000)* |
| Group ADF-Statistic | -4.947<br>(0.000)* | 0.764<br>(0.778) |

Note: The values in parentheses give the probabilities values. Ho: no cointegration; * and ** indicate the rejection of null hypothesis at 1% significant level.

Table 2 above shows the results of Pedroni (1999) "s panel cointegration tests that some of the p-values are greater than 0.05, especially for rho-rho and group-rho statistic panels. However, the p-value of the Panel PP, ADF Panel, Group PP and Group ADF-Statistic is smaller than 0.05. Thus, there is strong evidence indicating the existence of long-run cointegration relationships among the four variables.

Furthermore, the acceptance or rejection of the hypothesis with kao's residual panel cointegration testalso based on p-value. If the p-value <0.05 means there are cointegration and vice versa. The result of Kao's residual panel cointegration test in Table 3.

**Table 3. The Result of Kao's Residual Panel Cointegration Test**

| Null Hypothesis | T-Statistic | P-value |
|---|---|---|
| No cointegration | -5.1493*** | 0.0000 |
| Residual Variance | 0.0022 | |
| HAC variance | 0.0023 | |

Note: *** Indicates the rejection of null hypothesis at 1% level of significance.

Table 3 provides the results of Kao (1999) panel cointegration test pointing outthe p-value of 0.000 less than 0.05. Thus, the null hypothesis is rejected. It can be concluded that there is strong evidence pointing out that the variables co-integrated in the long-term. Finally, Johansen Fisher panel cointegration test utilized to determine the number of co-integration equation. The result of the test can be seen as follows:

**Table 4. Johansen Fisher Panel Cointegration Test**

| Null Hypothesis | Alternative Hypothesis | Fisher Stat.* (from trace test) | | Fisher Stat.* (from max-eigen test) | |
|---|---|---|---|---|---|
| | | Trace test | p-value | Max-eigen test | p-value |
| $r = 0$ | $r \neq 0$ | 55.26*** | 0.0000 | 55.26*** | 0.0000 |
| $r \leq 1$ | $r > 1$ | 55.26*** | 0.0000 | 55.26*** | 0.0000 |
| $r \leq 2$ | $r > 2$ | 16.86*** | 0.0098 | 17.51*** | 0.0076 |
| $r \leq 3$ | $r > 3$ | 6.29 | 0.3906 | 6.29 | 0.3906 |

* p-value are computed using asymptotic Chi-square distribution.

*** Indicates the rejection of null hypothesis at 1% significant level.

As explained earlier, for the co-integration test we found the long-run relationship between the four variables. Base on the table above can conclude that at least there is two co-integration equations. Hence, we employee panel vector error correction model (VECM) as means of the data analysis.

### 4.3. The Result of the lag length criteria

The tests used were determined based on informational criteria - the Akaike information criterion (AIC), Hannan-Quinn (HQ), and Schwarz information criterion (SC), taking into consideration that if the number of lags is too small then the model does not capture all the information while if there are too many lags then the degree of freedom is wasted. Different information criteria suggest different optimal lag lengths for the VAR model, as shown in Table 5. The standard information criteria of Hannan-Quinn (HQ) and Akaike information criterionshows an optimal lag length of 2, respectively.

**Table 5. The result of Lag Length Criteria Test**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | 91.93278 | NA | 2.31e-06 | -1.628385 | -1.529047 | -1.588107 |
| 1 | 732.6913 | 1222.188 | 2.18e-11 | -13.19799 | -12.70130 | -12.99660 |
| 2 | 778.6822 | 84.31653 | 1.25e-11 | -13.75337 | -12.85933* | -13.39087 |
| 3 | 807.8600 | 51.33144 | 9.84e-12 | -13.99741 | -12.70601 | -13.47379 |
| 4 | 834.5847 | 45.03598 | 8.12e-12 | -14.19601 | -12.50726 | -13.51129 |
| 5 | 878.1682 | 70.21799 | 4.92e-12 | -14.70682 | -12.62072 | -13.86098* |
| 6 | 895.5221 | 26.67348 | 4.86e-12* | -14.73189* | -12.24844 | -13.72494 |
| 7 | 905.2901 | 14.29026 | 5.57e-12 | -14.61648 | -11.73568 | -13.44842 |
| 8 | 924.8176 | 27.12151* | 5.36e-12 | -14.68181 | -11.40365 | -13.35263 |

* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

Since the variable achieved stationarity after the first difference and Schwarz information criterion shows an optimal lag length of 2, then the lag length in utilizing panel vector error correction model as means of data analysis technique. The result of using econometrics method comprised of two parts covering short-term and long-term effects as described in the following sections.

### 4.4. The Result of panel vector error correlation model (VECM)

The result of VECM provides empirical evidence deal with the long-run relationship between the variables. There are two co-integration equations representing the long run equilibrium relations of the variables. Each of the equation as follows:

$$\Delta lRPI = -41.579 + 1.643\Delta lUnem_{t-1} + 11.216\Delta lLFP_{t-1} \quad (1)$$
$$[3.580]^* \qquad [3.913]^*$$

$$\Delta lRMWs = 27.142 + 0.427\Delta lUnem_{t-1} - 3.596\Delta lLFP_{t-1} \quad (2)$$
$$[1.737] \qquad [-2.343]^*$$

First equation represents the long-run equilibrium relations between economic growth, unemployment rate, and LFP. Unemployment and LFP rate is positively related to economic growth in long term. Second equation represents the co-integration equation between RMWs, unemployment, and LFP. Unemployment is positively related to minimum regional wages whileLFP rate negatively related to RMWs.

In the long-run, the LFP rate positively effects on economic growth. The higher the LFP rate, the higher the economic growth. The existence of the long-run relationship between LFP rate and economic growth indicates that the increase in regional economic output in Indonesia is significantly affected by LFP rate. The improvement of LFP means that the increase in the number of the labor forces at work (and trying to find a job for those who have not worked yet). This condition encourages increased production of goods and services which ultimately positively impacts the economic growth of the region.

In the long-run, the LFP rate also has a negative and significant effect on RMWs. This means the higher the LFP rate, the lower the RMWs. The RMWs is the minimum wage that

employers have to pay for their employees. The decision of the local government to determine the number of wages, due to labor demands for wage increases. In fact, in almost any region of Indonesia, the decision of the local government to raise the provincial minimum wage is preceded by labor demonstrations which in turn may lead to a mass strike. Such conditions lead to a decrease in LFP rate. Therefore, an increase in the RMWs due to the decrease in the LFP rate. When LFP rate is relatively high, labor demands for higher wages are not usually considered by the local government. This is what causes in the long-run, there is an inverse relationship between the LFP level and the RMWs. The LFP rate also has a negative and significant impact on the unemployment rate. The higher the LFP rate, the lower the unemployment rate.

### 4.5. The Short-run effect between the variables

In the short-run, if economic growth lies above long-term equilibrium, then the LFP rate will increase in the next period. Similar to the unemployment rate, the increase in the unemployment rates caused by the effect of population growth and labor force. So, it as though that there is a positive relationship between the economic growth and unemployment rates. In the short-run, if the RMWs lies above the long-run equilibrium, then in the next period unemployment rates is rising, and labor force participation is declining. This is due to the RMWs set by the local government must be obeyed by companies operating in the area. In turn, an unable company to payminimum wages in accordance with established wage standards will reduce the number of employees. The result of PVECM representing the short run equation related to the causality relationship between the variables summarized in table 6.

**Table 6. The Summary of Short-run Equation**

| *Dependent Variable* | *Constant* | *Independent Variable* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | ΔLRPI | | ΔLRMWs | | ΔLUnem | | ΔLLFP | |
| | | Lag 1 | Lag 2 | Lag 1 | Lag 2 | Lag 1 | Lag 2 | Lag 1 | Lag 2 |
| ΔLRPI | 0.020<br>[5.246] | (0.029)<br>[0.547] | (0.323)<br>**[6.933]** | **(0.085)**<br>**[2.925]** | **(0.104)**<br>**[3.603]** | (-0.013)<br>[-1.221] | (-0.015)<br>[-1.393] | (0.063)<br>[0.969] | (-0.038)<br>[-0.634] |
| ΔLRMWs | 0.044<br>[5.173] | (-0.067)<br>[-0.582] | (0.211)<br>**[2.089]** | (-0.025)<br>[-0.399] | (0.005)<br>[0.077] | (0.087)<br>**[3.817]** | (0.007)<br>[0.314] | (-0.487)<br>**[-3.439]** | (-0.093)<br>[-0.714] |
| ΔLUnem | -0.078<br>[-3.363] | (-0.022)<br>[-0.071] | (-0.208)<br>[-0.752] | (-0.186)<br>[-1.081] | (0.008)<br>[0.047] | (-0.121)<br>[-1.946] | (-0.228)<br>**[-3.675]** | (-1.501)<br>**[-3.859]** | (-0.605)<br>[-1.688] |
| ΔLLFP | 0.005<br>[1.364] | (-0.185)<br>**[-3.934]** | (-0.017)<br>[-0.412] | (0.052)<br>**[2.054]** | (0.018)<br>[0.711] | (-0.002)<br>[-0.295] | (0.013)<br>[1.454] | (-0.255)<br>**[-4.417]** | (-0.139)<br>**[-2.623]** |

Note: Number in ( ) is regression coefficient of the variables

Number in [ ] is t statistics.

Based on Table 6 above, it can be seen that regional economic growth in Indonesia is significantly influenced by itself and the RMWs of the region, respectively. The significanteffect of the economic growth on itself occurs at the 2-period horizon. Furthermore, the significant effect of the provincial minimum wage on economic growth takes place on the 1-2 period horizons. In the short term, open unemployment rates and LFP have no significant effect on economic growth. The positive and significant impacts of RMWs on economic growth support Watanabe's (2013) findings concluding that an increase in minimum wages promotes economic growth. Imobighe (2007) and Angeles-Castro et al. (2014) also provides the same conclusion that minimum wages have a positive impact on labor productivity and economic growth.

Based on Table 4 above, it can be seen that the unemployment rate has no significant effect on economic growth. This finding is consistent with the results of the Sa'idu & Muhammad (2015) empirical study in Nigeria concluding that unemployment rates have no significant impact on economic growth. Saget (2000) in the European countries also concluded that there is no relationship between unemployment and the rate of economic growth in the short term. But this study differs from the findings of Michael, Emeka & Emmanuel (2016) research in Nigeria concluding that the unemployment rate has a negative and significant effect on regional economic growth.

In the short run, the RMWs is affected by economic growth, open unemployment rate, and the LFP rate. The effect of economic growth on the RMWs occurs in lag 2 (positive). This means that economic growth over a given year period has a positive impact on increasing RMWs in the next two periods. The unemployment rate positively affects the RMWs in lag 1. The higher the unemployment rates in a certain period, the higher the RMWs in the next period. The local governments' decision to raise minimum wages is usually due to some workers leaving their jobs because the wages they receive are considered unable to meet the needs of decent living. This finding is consistent with the findings of Muravyev & Oshchepkov (2013) in Russian Regions also indicating a direct relationship between the two variables. Previously, Brooks (2002) and Akpansung (2014) also found that the minimum wage was positively related to the unemployment rate.

Furthermore, the LFP rate has a negative and significant impact on the RMWs at lag 1, indicated by the regression coefficient of the variable of -0.487, and the t-test of -4.439. The increases in the LFP rate in a certain year period significantly lead to the decline of the RMWs at the next period. As explained before, even though the RMWs regulated by the local government, the determination of the wage amount is expressed in local government regulations depend on the demands of workers on wage increases. As long as workers have not felt the need for increased wages, the LFP rate is still relatively high so that the demand for wage increases has not occurred yet. In this condition, the government not interested to increase the RMWs. This what causes the LFP rate have an inverse relation with the RMWs.

In the short-run, the open unemployment rate is negatively affected by itself on the 2-period horizon with the coefficient of -0.228 and t statistic of -3.675, and labor force participation on the 1-period horizon with coefficients of -1.501 and the statistical t value of -3.859. This means that an increase in the unemployment rate in a certain period, impacts on the decline in unemployment rates in the 2-next period horizon. Furthermore, an increase in the LFP rate in a period lead to decrease the unemployment rate in the 1-next period. This finding is in contrast to the results of Aqifi & Malaj's (2015) research in the Republic of Macedonia concluding that unemployment in a certain year is positively and significantly affected by the unemployment rate on 1-year before

Furthermore, the RMWs has no effect on the unemployment rate. This finding is consistent with the findings of the Angeles-Castro et al. (2014) and Pantea (2017) which provide empirical evidence that wages have no significant effect on the unemployment rate. However, unlike the findings of Muravyev & Oshchepkov's (2013) studies in Russia pointing out that minimum wages increase unemployment especially in workers aged 15-24 years, and Fidrmuc & Tena's (2013) research findings in the UK proving the existence of a negative relationship between the two variables.

The LFP rate is negatively affected by itself at the 1-2 period horizon and economic growth at the 1-period horizon and is positively influenced by the RMWs at the 1-period horizon. An increase in economic growth in a certain period has a significant impact on the decrease in LFP in the 1- next period. Furthermore, the increase of RMWs in certain period causes the increase of LFP rate in the next period. In contrast, the unemployment rate has no significant effect on the LFP rate either at one or two periods. The negative effect of economic growth on the LFP rate is different from the findings of the Tasseven, Altas, & Un's (2016) studies for the case of OECD Countries concluding that economic growth affects labor force participation positively and significantly.

### 4.6. The result of Granger causality test

In order to test the causality relationship between the four variables, VECM Granger causality test used as a data analysis technique. The result of the test indicates that there is a unidirectional causality running from economic growth to LFP rate, from unemployment rate to RMWs and from LFP rate to unemployment rate. Further, there is a bidirectional causality relationship between economic growth and RMWs, and between LFP and RMWs. For more details about the results of causality test can be seen in table 8.

**Tabel 8. VAR Granger Causality/Block Exogeneity Wald Tests**

| *Dependent Variable* | *Independent Variable* | | | |
|---|---|---|---|---|
| | ΔLRPI | ΔLRMWs | ΔLUnem | ΔLLFP |
| ΔLRPI | - | (21.667)<br>[0.000]*** | (2.877)<br>[0.237] | (1.552)<br>[ 0.460] |
| ΔLRMWs | ( 6.185)<br>[0.045]** | - | (14.763)<br>[0.000]** | (11.879)<br>[0.003]** |
| ΔLUnem | (0.602)<br>[0.740] | (1.169)<br>[0.557] | - | (16.204)<br>[0.000]*** |
| ΔLLFP | (16.365)<br>[0.000]*** | (4.744)<br>[0.093]* | (2.464)<br>[0.292] | - |

Note: Δ is the first difference operator, the values in parentheses ( ) are chi-square, the values in bracket [ ] are p-values. * indicate the significant at 90% level, ** indicate the significant at 95% level, and *** indicate significant at 99% level.

In the short run, the unemployment rate does not cause regional economic growth in Indonesia. This finding is consistent with the result of the empirical studies conducted by Thayaparan (2014) for the case of Sri Lanka, and Mosikari's (2013) studies in South Africa discovering that there is no causal relationship between unemployment rate and economic growth. However, this finding is different from the result of Yelwa et al's (2015) studies for the Nigerian economy confirming the causal linkage between unemployment and economic growth in Nigeria. Others research conducted by Michael, Emeka & Emmanuel (2016) for the Nigerian economy also found that there is unidirectional causality relationship running from economic growth to unemployment. Finally, the findings of this study indicating a two-way causality between the RMWs and LFP are different from Gunsoy & Tekeli's (2013) research results in Turkey indicating that there is no significant relationship between the two variables.

## 5. CONCLUSION

This paper analyzes the economic impact of RMWs. The economic impacts referred to in this study are economic growth, open unemployment and labor force participation (LFP). Using panel dataset of 27 selected provinces from Indonesia for the period of 2003 to 2015 the main finding of the research can be explained as follows: Firstly, there is a long-run co-integration between the variables. In the long-run, the LFP has a positive impact on economic growth but has a negative impact on the unemployment rate. The unemployment rate is also positively related to the regional economic growth. In the short-run, the RMWs have a positive and significant effect on regional economic growth and LFP. Conversely, unemployment and regional economic growth have positive effects on RMWs, and then economic growth has a negative effect on LFP. Secondly, the result of Granger causality test indicates that there is a unidirectional causality running from the economic growth to LFP, from the unemployment rate to the RMWs and running from LFP to the unemployment rate. Further, there is a bidirectional causality relationship between the economic growth and the RMWs, and between the LFP and the RMWs.

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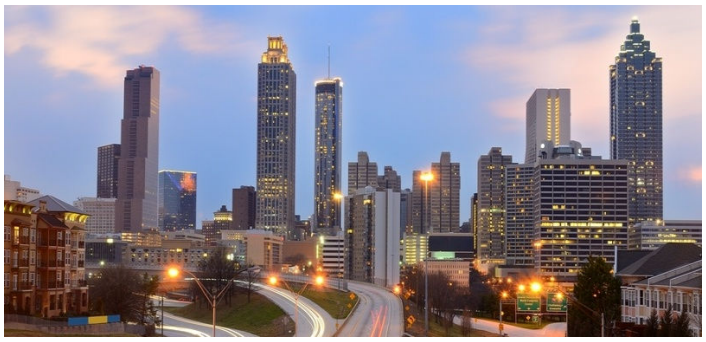
# Announcements, Conferences, News

# ASSA 2019 Annual Meeting
## January 4-6, 2019
## Atlanta, GA - Atlanta Marriott Marquis



## Conference Overview[1]

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The American Economic Association (AEA), in conjunction with 59 associations in related disciplines known as the Allied Social Science Associations (ASSA), holds a three-day meeting each January to present papers on general economics topics.

The ASSA 2019 meeting will be held on January 4 - 6, 2019 in Atlanta, Georgia and the program offers in-depth coverage of economics topics across many disciplines via hundreds of speakers and panels..

Generally, this meeting brings together thousands of job-seekers and recruiting companies in pre-registered interview sessions and it is important to mention that, award presentations, lectures, and many networking opportunities are also part of this meeting.

Furthermore, the American Economic Association publishes a Papers and Proceedings edition in May highlighting selected papers from the meeting, and a limited number of sessions are featured on webcasts.

For more information you could visited the following address: www.aeaweb.org

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1 Conference overview by Christos Genitsaropoulos, Technological Education Institute of Sterea Ellada, Greece

**Pushing Regions beyond their Borders**
**RSA Annual Conference 2019**
5th June, 2019 - 7th June, 2019
University de Santiago de Compostela, Santiago de Compostela, Spain


## Conference Overview[2]

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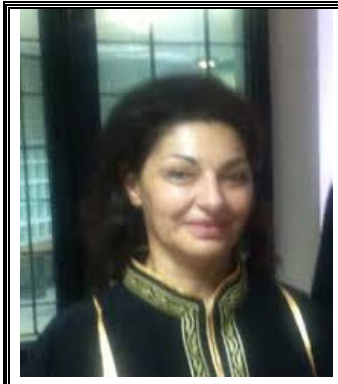
The 2019 Regional Studies Association (RSA) Annual Conference will be held on June 5-7, 2019 in Spain and aims to discuss about how to push regions beyond all kind of borders as a way to plan the future with different lens.

The main conference themes are the following: Regional Development & its Policies, Global Economies, Trade, Commerce, Financial Geographies, Flows & Globalisation, Regional economies & (re)location of activities, Innovation, Knowledge & Regional Development, Technologies, Social Networks & Regional Development, Entrepreneurship, Businesses, Start-ups & Spin-offs, Economies of Agglomeration, Clusters & Externalities, Regions & Identity Economics, Tourism & Regional Development, Developing Rural, Peripheral, Remote & Marginal Regions, Global South, BRICs & Developing Area Studies, Institutions, Governance, Governments & Policies, Borders, Cooperation & Cross Border Regions, Demographics, Mobility, Migration & Labour Markets, Geopolitics Nationalism, Federalism & Regionalism, Spatial Planning, Infrastructures & Practices, Sustainability, Climate Change, Environment & Energy and Regional Methodology & Data

For more information you could visited the following address: www.regionalstudies.org

2 Conference overview by Christos Genitsaropoulos, Technological Education Institute of Sterea Ellada, Greece

# Academic Profiles



**Eleni Papadopoulou** is a graduate of the Agricultural Economics School, with basic studies in Agricultural Economics, postgraduate studies in Agricultural Economics and Management (UK) and PhD research in the Common Agricultural Policy. She has been a visiting researcher at Queen Elizabeth House - Oxford International Decentrment Center and Newcastle University, UK. Since 2008 she is a guest professor at the Department of Planning and Development of the Polytechnic School of Aristotle University of Thessaloniki. Today she serves the Aristotle University of Thessaloniki as President of the Department of Spatial Planning and Development.

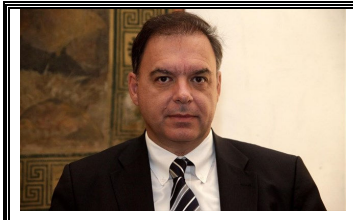
Her research interests in the field of Agricultural Policy and International Trade in Agricultural Products focus on the Common Agricultural Policy and recently on the European Union's Rural Development Policy. She has taught courses for many years at universities and TEIs in the country and she has been a contributor to a large number of special sessions, seminars and invited workshops on her research field.

She has published in Greek and English language, in reputable journals and conferences of the sector in Greece and abroad and has participated in research projects of public, private and European institutions. She is a member of the European Research Network on Rural Development Policy.

Some academic publications –indicative of her research work- include the following:

- Papadopoulou E., Obaidou A., Ladias Ch., Hassanaga N., "Spatial Dimensions of the Characteristics of Farmers and Agricultural Activity. Problems and Prospects ", Regional Science, 3 (1): 75-85.
- Papadopoulou E., Ladias C., Hasanagas N., Zafiri N., Diamantopoulos A., Zacharopoulou A., Stogianni A. (2012). Quarry Disturbance & Restoration Scenarios: The Prosotsani (Greece) Quarry Case, University "1 Decembrie 1918" of Alba Iulia GeoCAD 2012
- Ladias C., Hasanagas N., Papadopoulou E. (2011). Conceptualising 'macroregions': Viewpoints and tools beyond NUTS classification, Studies in Agricultural Economics 113 (2011) 138-144

**Academic Profile by:**
**Antonia Obaidou**
Book Review Editor, Public Relations, RSI Journal



**Panagiotis Liargovas** studied economics at the University of Athens and at the University of Clark, Massachusetts (USA), where he received his Ph.D. in 1991.

He has been a scholar of the Fulbright American Foundation, the Bafala Public Benefit Foundation, the Clark University and the European Commission. For five years he was coordinator at the State Budget Office. He is Director of the National School of Public Administration, Special Advisor to the City of Athens, Special Associate to the Ministry of Finance and External Partner of the European Commission.

He has taught at various Universities in Greece and abroad, such as at Clark, Bologna, Athens, Patras and Thessaly Universities. Currently he is Associate Professor at the University of Peloponnese, President of the Department of Economics and Director of the Postgraduate Program of Studies "Organization and Management of Public Services, Organizations and Enterprises", which is conducted in collaboration with ADEDY and the Ministry of Economy and Finance.

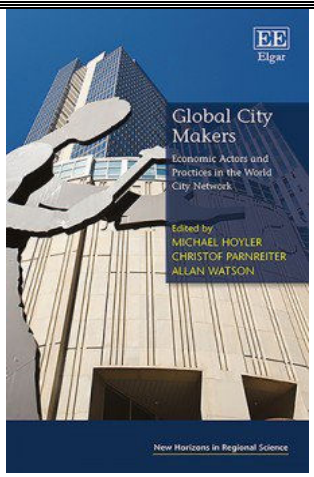
He has authored and published over 10 books and more than 70 articles in scientific journals and publications, most of which are English. He has participated in presentations at more than 70 international conferences in Greece and abroad. He specializes in the field of economic analysis and policy as well as in the European and international economy.

Some of his most recent academic publications include the following:Kalatzis O., Tsiotis D. and Polizos S. (2016). The Contribution of Tourism in National Economies: Evidence of Greece. European Journal of Business and Social Sciences, 5 (5): 41-64.

- "Educating potential entrepreneurs under the perspective of Europe 2020 plan" Business & Entrepreneurship Journal, (with A. Kakouris and Z. Dermatis) 5(1), pp. 7-24, 2015.
- The Effects of EU Structural Funds on Domestic Deposits: Evidence from the Greek Economy: 1986-2013 (with Sp. Repousis). European Structural and Investment Funds Journal, Volume 3, Issue 4, pp.244-253, 2015
- "The Greek Crisis: A Chronology of Events" European Politeia (with Sp. Repousis), Vol.1, pp. 55-76, 2015.
- "A new Europe 2020 strategy adopting an enhanced regional approach" Planning Theory & Practice, (with Nikolaos Apostolopoulos), Volume 15, Issue 4, October 2014, pages 603-605
- "Regional Development and Renewable Energy Enterprises: A Porter's Diamond Analysis" (with Nikolaos Apostolopoulos), Theoretical and Practical Research in Economic Fields , vol. V, Issue 1(9) pp. 5-16, 2014
- "Foreign Direct Investment and Growth Causality in the EU Countries and in the Transition Economies" (with Anastasia Angelopoulou), Vol. 23, No. 3, Journal of Economic Integration September 2014.

**Academic Profile by:**
**Antonia Obaidou**
Book Review Editor, Public Relations, RSI Journal.

# Book Reviews




## Global City Makers
## Economic Actors and Practices in the World City Network

**By Michael Hoyler, Christof Parnreiter, and Allan Watson**
**2018, Edward Elgar Publishing**

This book is well written and provides valuable and significant addition to the literature. More specific, this book

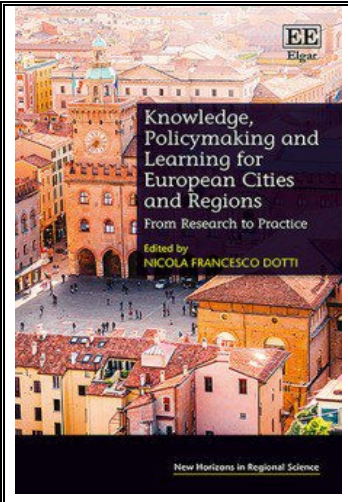
Global City Makers provides an in-depth account of the role of powerful economic actors in making and un-making global cities. Engaging critically and constructively with global urban studies from a relational economic geography perspective, the book outlines a renewed agenda for global cities research.

In more detail, the book contains the following chapters:

1. Agency and practice in the making of global cities: towards a renewed research agenda,
2. Producer service firms as global city makers: the cases of Mexico City and Hamburg,
3. Commodity traders as agents of economic globalization,
4. Real estate and global capital networks: drilling into the City of London,
5. Global cities, local practices: intermediation in the commercial real estate markets of New York City and London,
6. The making of transnational urban space: financial professionals in the global city Tokyo,
7. The making of Mumbai as a global city: investigating the role of the offshore services sector,
8. Focal firms, grand coalitions or global city makers? Globalization vs. new localism in Hamburg's maritime network,
9. Chasing the phantom of a 'global end game': the role of management consultancy in the narratives of pre-failure ABN AMRO.

Overall, this book should be of interest to a wide audience such as academia, business analysts and policy makers.

Book Review by **Christos Genitsaropoulos**, Technological Education Institute of Sterea Ellada, Greece




## Knowledge, Policymaking and Learning for European Cities and Regions. From Research to Practice

### By Nicola Francesco Dotti
### 2018, Edward Elgar Publishing

This book proposes an original and very interesting analysis of the complex interaction between researchers and policymakers. More specific, this book provides theories, experiences, reflections and future directions for social scientists who wish to engage with policy-oriented research in, and for, cities and regions.

The authors review current theories and present novel case studies of policy-orientated research and in more detail, the book contains the following chapters: The research policy nexus: boundaries, bonding and ten golden rules,

Theories on policy learning: Existing approaches and future challenges, Methodological challenges for policy learning, Learning across cities and regions: The limits to transferring "best practice", Spatial knowledge for regional governance: toward an alternative map of Castilla y León, Éupolis Lombardia: Practising Research-Policy Dialogue for a Regional Government, Knowledge Serving the City? Brokerage, Production and Sharing in Brussels, Scotland: a thriving environment for policy entrepreneurship?, Dutch experiences of policy mobility in urban planning,

Knowledge governance in sustainable development: a comparative case study, Policy learning in times of big data analytics: The challenges of skill-based outsourcing, Visual framing for policy learning: Internet as the 'eye of the public'

Knowledge, Urban policy-making and citizen participation: a democratic challenge, Beyond big data, the open data revolution for research, Smart cities, towards smart governance?, Evaluating coordination and learning within governance: open epistemological issues, What role for policy studies in a post-truth politics?, Knowledge Governance: Theoretical and Empirical Reflections on territorial innovation policy, Knowledge for policymaking: an evolutionary perspective to achieve policy resilience and Conclusions on Research-Policy Dialogues.

Book Review by **Christos Genitsaropoulos**, Technological Education Institute of Sterea Ellada, Greece

# GUIDELINES

**for the Writers & a format model for the articles submitted to be reviewed & published in the journal**

# Regional Science Inquiry Journal

(EconLit, Scopus, RSA I) – www.rsijournal.eu

## Guidelines for the Writers & a format model for the articles submitted to be reviewed & published in the journal

### The Title of the paper must be centered, and the font must be Times New Roman, size 12, in Uppercase, in Bold

For the writers' personal information use the Times New Roman font, size 11, in bold, and centered. Use lowercase for the first name and uppercase for the last name. The line below the name includes the professional title and workplace; use the Times New Roman font, size 10, centered. In the third line write only the contact e-mail address in Times New Roman 10, centered.

**Name LAST NAME**
Professional Title, Workplace
E-mail Address

**Name LAST NAME**
Professional Title, Workplace
E-mail Address

**Abstract**

The abstract consists of a single paragraph, no longer than 250 words. The font must be Times New Roman, size 11. The text must be justified. The title "Abstract" must be aligned left, in Times New Roman, size 11, in bold. A space of one line must be left between the title and the text of the abstract. The abstract must contain sufficient information, be factual, and include the basic data of the paper.

**Keywords:** Use 3 to 5 keywords, separated by commas

**JEL classification:** We kindly request that you classify your paper according to the JEL system, which is used to classify articles, dissertations, books, book reviews, and a variety of other applications. The use of the JEL classification is necessary so that your paper be properly indexed in databases such as EconLit. Select the codes that represent your article and separate them by commas. You can find information on the JEL system here: https://www.aeaweb.org/jel/guide/jel.php

## 1. Introduction

All articles must begin with an introduction, a section which demarcates the theoretical background and the goals of the paper.

The present document provides the necessary information and formatting guidelines for you to write your article. We recommend that you copy this file to your computer and insert your own text in it, keeping the format that has already been set. All the different parts of the article (title, main text, headers, titles, etc.) have already been set, as in the present document-model. The main text must be written in regular Times New Roman font, size 11, justified, with a 0.5 cm indent for the first line of each paragraph.

We recommend that you save this document to your computer as a Word document model. Therefore, it will be easy for you to have your article in the correct format and ready to be submitted. **The only form in which the file will be accepted is MS Word 2003**. If you have a later version of Microsoft Office / Word, you can edit it as follows:

- Once you have finished formatting your text, create a pdf file, and then save your file as a Word "97-2003" (.doc) file.

- Compare the two files – the pdf one and the Word "97-2003" (.doc) one.
- If you do not note any significant differences between the two, then – and only then – you can submit your article to us, **sending both the pdf and the Word "97-2003" (.doc) files** to our e-mail address.

If you use a word processor other than Microsoft Word, we recommend that you follow the same procedure as above, creating a pdf file and using the appropriate add-on in order to save your document in MS Word "97-2003" (.doc) form. Once you compare the two files (and find no significant differences), send us both.

## 2. General Guidelines on Paper Formatting

### 2.1. Body

The body of the text consists of different sections which describe the content of the article (for example: Method, Findings, Analysis, Discussion, etc.). You can use up to three levels of sections – sub-sections. For the Body of the text, use the default format style in Word, selecting the Times New Roman font, size 11, justified, with a 0.5 cm indent for the first line of each paragraph (this is further detailed in the section "Paragraphs").

### 2.2. References

The references included in the paper must be cited at the end of the text. All references used in the body of the paper must be listed alphabetically (this is further detailed in the section "References").

### 2.3. Appendices

The section "Appendices" follows the section "References".

## 3. Page formatting

### 3.1. Page size

The page size must be A4 (21 x 29,7 cm), and its orientation must be "portrait". This stands for all the pages of the paper. "Landscape" orientation is inadmissible.

### 3.2. Margins

Top margin: 2,54cm
Bottom margin: 1,5cm
Left and right margins: 3,17cm
Gutter margin: 0cm

### 3.3. Headers and Footers

Go to "Format" → "Page", and select a 1,25cm margin for the header and a 1,25cm margin for the footer. Do not write inside the headers and footers, and do not insert page numbers.

### 3.4. Footnotes

The use of footnotes or endnotes is expressly prohibited. In case further explanation is deemed necessary, you must integrate it in the body of the paper.

### 3.5. Abbreviations and Acronyms

Abbreviations and acronyms must be defined in the abstract, as well as the first time each one is used in the body of the text.

### 3.6. Section headers

We recommend that you use up to three sections – sub-sections. Select a simple numbering for the sections – sub-sections according to the present model.

### 3.7. First level header format

For the headers of the main sections use the Times New Roman font, size 11, in bold and underlined, and leave a size 12 spacing before the paragraph and a size 6 spacing after the paragraph. The header must be aligned left. Use a capital letter only for the first letter of the header.

### 3.8. Second level header format

For second level headers, follow this model. Use the Times New Roman font, size 11, in bold, and leave a size 12 spacing before the paragraph and a size 3 spacing after the paragraph. Select a 0.5 cm indent. The header must be aligned left. Use a capital letter only for the first letter of the header.

#### 3.8.1. Third level header

For third level headers, follow this model. Use the Times New Roman font, size 11, in bold and italics, and leave a size 6 spacing before the paragraph and a size 0 spacing after the paragraph. The header must be aligned left, with a left indent of 1 cm. Use a capital letter only for the first letter of the header.

## 4. Paragraphs

In every paragraph, use the Times New Roman font, size 11, with single line spacing. We recommend you modify the default (normal) format style in Word and use that in your text. For all paragraphs, the spacings before and after the paragraph must be size 0, and the line spacing single. Use a 0,5cm indent only for the first line of each paragraph. Leave no spacings nor lines between paragraphs.

### 4.1. Lists

In case you need to present data in the form of a list, use the following format:

- Bullet indent: 1,14cm
- Text:
    - Following tab at: 1,5 cm
    - Indent at: 1,5cm

Use the same format (the above values) if you use numbering for your list.

1. Example of numbered list 1
2. Example of numbered list 1

## 5. Figures, images, and tables

### 5.1. Figures and images

Insert your figures and images directly after the part where they are mentioned in the body of text. They must be centered, numbered, and have a short descriptive title.

Figures put together “as they are”, using Office tools, are absolutely inadmissible. The figures used must have been exclusively inserted as images in Word, in gif, jpg, or png form (with an analysis of at least 200dpi), and in line with the text. The width of an image must not exceed 14,5cm so that it does not exceed the margins set above.

The images, figures, and tables must be inserted “as they are” in the text, in line with it. **Figures and images which have been inserted in a text box are absolutely inadmissible.**

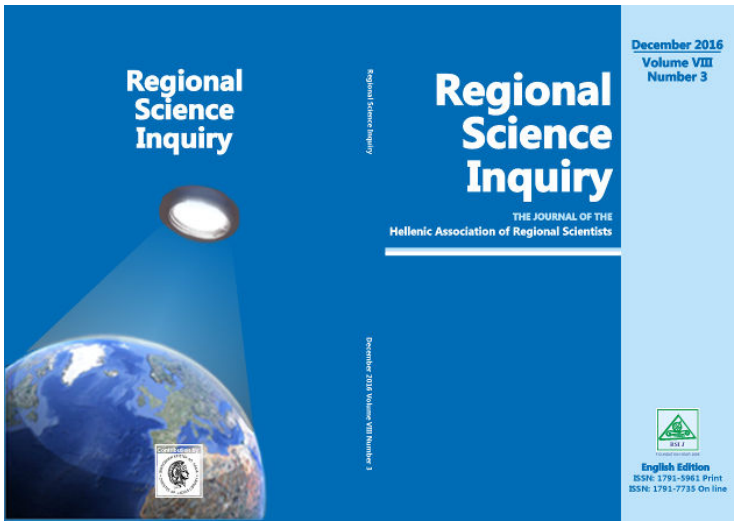
### 5.1.1. Reference inside the text

Avoid phrases such as "the table above" or the "figure below" when citing figures and images. Use instead "in Table 1", "in Figure 2", etc.

### 5.1.2. Examples

A model of how to format figures/images follows. For the title, use the Times New Roman font, size 10, in bold. Write the title above the figure, and set a size 6 spacing before the title and a size 0 spacing after it. The line spacing of the title must be 1.5 line. Both the image and its title must be centered.

**Image 1: Title**




Source: cite the source

Directly below the figure you must cite the source from which you took the image, or any note regarding the figure, written in Times New Roman, size 10. Write it below the figure, leaving a size 0 spacing before and after it, use a line spacing of 1.5 line, and make it centered.

## 5.2. Tables

For the title, use the Times New Roman font, size 10, in bold. Write the title above the table, and set a size 6 spacing before the title and a size 0 spacing after it. The line spacing of the title must be 1.5 line. Both the table and its title must be centered. The width of the table must not exceed 14,5cm so that it does not exceed the page margins set.

**Table 1. Example of how a table must be formatted**

| Age | Frequency | Percentage % |
|---|---|---|
| Under 40 | 44 | 32.1 |
| 40 - 49 | 68 | 49.6 |
| Over 50 | 25 | 18.2 |
| **Total** | **137** | **100.0** |

Source: cite the source

If the table needs to continue on the next page, select in the "Table properties" that the first line be repeated as a header in every page, as in the above example of Table 1. **Tables (or figures or images) which are included in pages with a "Landscape" orientation are absolutely inadmissible.**

Every table must have horizontal lines 1 pt. wide at the top and bottom, as shown in the example. The use of vertical lines and color fill at the background of the cells is strictly prohibited.

Directly below the table you must cite the source or any note regarding the table, written in Times New Roman, size 10. Write it below the table, leaving a size 0 spacing before and a size 6 spacing after it, and make it centered.

## 6. Mathematical formulas

There is a variety of tools in order to insert and process mathematical formulas, such as the "Mathematics", found in the most recent editions of Word, "Math Type", "Fast Math Formula Editor", "MathCast Equation Editor", "Math Editor". Since it is impossible for us to provide you with compatibility with all these tools in all their editions, **we can only admit your paper if it contains mathematical formulas solely in the form of images.**

Keep a continuous numbering for the mathematical formulas and center them in the page, as shown in the following example:

$$y = ax^2 + bx + c \tag{1}$$

The same stands for formulas or particular mathematical symbols you may have integrated in your text. For instance, if you want to use the term $ax^2$ in your text, you must insert it as an imaged, in line with the text. The images containing the mathematical formulas must be legible (at least 300dpi).

**In the exceptional case of a text which may contain a great number of mathematical formulas, the writer may send it to us in TeX form if they so wish.**

## 7. References

We recommend that you use the Chicago Manual of Style Author-Date system, as it is recommended by the AEA (American Economic Association) for the journals included in the EconLit database, and it is the dominant style of bibliography in the field of Economics. For more information you can go to the following links:

- https://www.aeaweb.org/journals/policies/sample-references
- http://www.chicagomanualofstyle.org/tools_citationguide.html
- http://libguides.williams.edu/citing/chicago-author-date#s-lg-box-12037253

### 7.1. Online references (internet citations)

Check your links again before sending your file, to confirm that they are active.

Avoid long internet links. Where possible, also cite the title of the website operator-owner. Return the font color to black, and remove the hyperlink. Links such as the following are impractical and distasteful, therefore should be avoided.

**Example of an inadmissible hyperlink**

https://el.wikipedia.org/wiki/%CE%9F%CE%B9%CE%BA%CE%BF%CE%BD%CE%BF%CE%BC%CE%B9%CE%BA%CE%AC

### 7.2. References Formatting

For your list of references, use the Times New Roman font, size 10, with single line spacing. The paragraph format must include a size 0 spacing before the paragraph and a size 0 spacing after it, aligned left. Use a 0,5 cm indent only for the first line of each paragraph. Leave no spacings or lines between paragraphs.

### 7.3. Example of how References must be formatted

Bureau of Labor Statistics. 2000–2010. "Current Employment Statistics: Colorado, Total Nonfarm, Seasonally adjusted - SMS08000000000000001." United States Department of Labor. http://data.bls.gov/cgi- bin/surveymost?sm+08 (accessed February 9, 2011).

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Romer, Christina D., and David H. Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks: Dataset." American Economic Review. http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.3.763 (accessed August 22, 2012).

Ausubel, Lawrence M. 1997. "An Efficient Ascending-Bid Auction for Multiple Objects." University of Maryland Faculty Working Paper 97–06.

Heidhues, Paul, and Botond Kőszegi. 2005. "The Impact of Consumer Loss Aversion on Pricing." Centre for Economic Policy Research Discussion Paper 4849.
Zitzewitz, Eric. 2006. "How Widespread Was Late Trading in Mutual Funds?" http://facultygsb.stanford.edu/zitzewitz.