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Secoa

SUSTAINABILITY IN THE COASTAL URBAN ENVIRONMENT
Thematic Profiles of Resources and their Users

edited by
Ahmed Z. Khan
Le Xuan Quynh
Eric Corijn
Frank Canters

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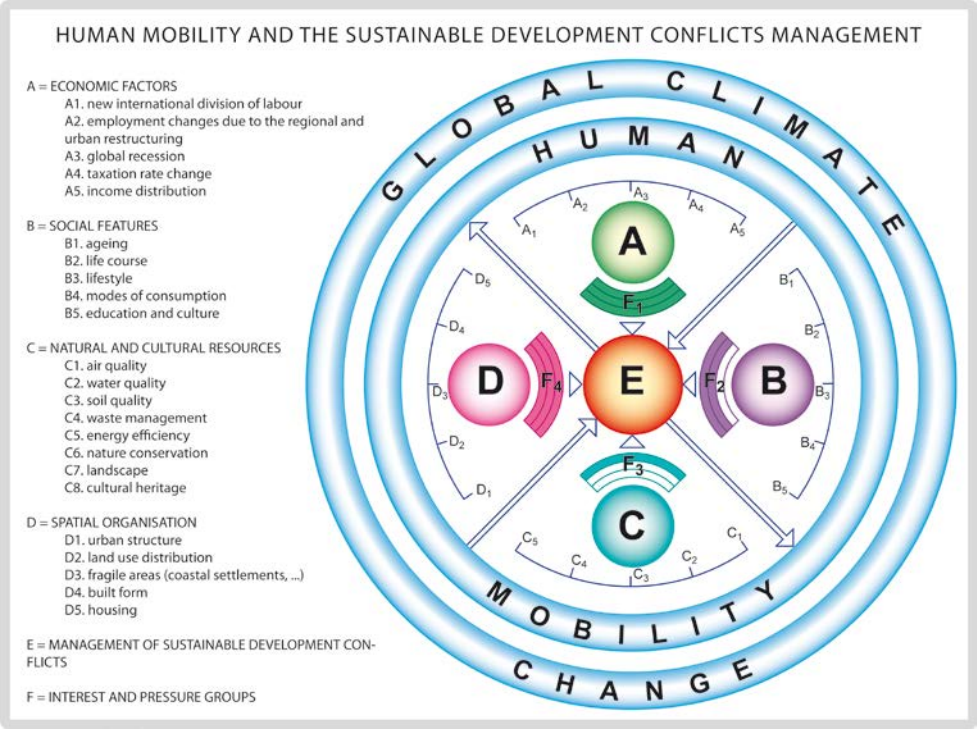
Editor's Preface to the Series

This volume is part of a new series on cross-national comparative research in the fields of global climate change, coastal areas, sustainable urban development and human mobility. These factors, which arise at both the local and global level, are confronted with many conflicts of interest in every possible combination between the local and the global. The volumes being published in this series attempt to provide a contribution to resolving these conflicts. This multi-national and multi-disciplinary network was set up in 2009 on the occasion of the European Commission's call for proposals for a Seventh Framework Programme (FP7) project. The research project Solutions for Environmental Contrasts in Coastal Areas (SECOA), Global Change, Human Mobility and Sustainable Urban Development won the bid and began work in December 2009 (http://www.projectsecoa.eu/), coordinated by Sapienza Innovazione (Riccardo Carelli) with scientific coordination by Sapienza Rome University (Armando Montanari).



Global changes affect both the environment and socio-economic conditions: first the economic crisis of the 1970s and then the financial crisis of the first decade of the new millennium have had a profound impact on environmental and socio-economic conditions. SECOA examines the effects of human mobility on the growth and restructuring of urban

settlements in coastal areas, where: a) the environment is particularly fragile and space is limited, b) every phenomenon is far more concentrated and c) the effects on natural and cultural resources and the environment are more acute. Being aware of these effects can be extremely useful for governments and companies – particularly in the building sector, but also in tourism – in planning their future growth. Awareness of the environmental status of the coast and the local population's usage preferences can help to plan the development of homes, retail and leisure facilities. The problems have multiplied as a result of climate change and its influence on environmental parameters such as the sea level, sparking an increased risk of flooding, the spread of pollution and the displacement of a large number of inhabitants. The control and reduction of undesirable consequences is leading to increased conflict among stakeholders. An integrated approach to the ecosystem incorporating the social, economic and natural sciences is essential to understand the complex and dynamic problems typical of coastal towns, as the figure illustrates. The complexity of the problems and the heterogeneousness of the data required to document very diverse phenomena are being managed using Geographic Information Systems (GIS). SECOA aims to: 1) identify conflicts, 2) analyse their quantitative and qualitative effects on the environment, 3) create models to synthesise the various social, economic and environmental systems and 4) compare the priorities of each type of coastal town using a taxonomic tool. Coastal areas have traditionally been considered difficult to manage because of the problem of the weather, the tides and the seasons and the overlapping of the specificities features of physical geography and hydrography, as well as overlapping jurisdictions and remits of individual government bodies and the competing needs of various civil society stakeholders. Local, regional and national administrations are often responsible for similar aspects of the same physical area and the uses of coastal zones, such as fisheries, environment, agriculture, transport (inland and marine), urban planning, the land registry and the national cartographic and hydrographic services. Many people are able to intuitively recognise a coastline, although they find it harder to determine its precise landward or seaward extent and vertical growth. For this reason, and considering the diversity of the stakeholders, managing authorities and administrative structures, there are inevitable conflicts between users of coastal zones, developers and the rest of society. Similarly, there is a conflict between human society and natural resources. Because of the complexity of the problems involved, the spatial component of data has also been taken into account through the use of GIS, which offer enhanced possibilities of contributing to coastal zone management for a number of reasons: (i) their ability to manage large databanks and integrate data relating to quite heterogeneous

criteria; (ii) their inherent tendency to harmonise data from different sources and thereby contribute to the exchange of information between governing bodies and research institutes; (iii) the possibility they offer of using shared data banks; (IV) their inherent aptitude for modelling and simulation that allows for alternative scenarios to be built before being implemented. The basic function of information that can appropriately inform decision-makers is the ability to produce online geographical maps to illustrate the location of problems, the densification and concentration of shortcomings, the density, the content, what happens in the environs, and changes.

Together with the problems created by climate change, the SECOA project examines the spread of human mobility – an area that principally involves the social science disciplines, each with its own research framework, levels of analysis, dominant theories and hypotheses of application. The social science fields can be considered according to the dependent and independent variables they use. For example, anthropology, demography and sociology consider behaviour a dependent variable; for economics, it is microeconomic flows and impacts; for geography, it is decision-making ability; for history, it is experience; for law, it is treatment and for political science, the dependent variables are management policies and their results. Examples are always hard to agree on, but in this case they are being used to emphasise the differences that exist even between related sectors, and the obvious multiplication of variables when the ones proposed by the social sciences must include geomorphological variables (the way the coast physically changes) and environmental and cultural resources (their availability and the way they are consumed). The SECOA project has attempted to tackle this problem by also measuring types of individual mobility and the attractiveness of the territory. For previously mentioned reasons, these data are not generally registered, so it was decided to use the GIS tool to add space and time values. Space in coastal metropolitan areas is characterised by the differences among the various spatial components, and it is not always easy to identify the coastal stretch used as the element of comparison. Time, on the other hand, is defined in terms of recurring daily, temporary and permanent mobility, with a further variant of mobility that is either production-led (blue-collar, white-collar, managers, regular and irregular workers) or consumption-led (including mobility for reasons of tourism, leisure and retirement). The prediction models, on the other hand, are an instrument to connect the past to the future, and hence to integrate the natural and cultural heritage and contribute to building prediction scenarios.

For this volume, the Series Editor wishes to thank his colleagues at the Vrije Universiteit Brussel (VUB) – first Luc Hens, later replaced by Eric Corijn – who coordinated the Work Package "Analysis of conflicts of uses of coastal resources amongst users and sectors " (WP4), some of the results of which are reported in this book. Special thanks are also due to my Editorial Board colleagues, who took on the responsibility, as referees, of revising the text of the book, suggesting appropriate changes and requesting the necessary additions. Le Xuan Quynh participated from the start in managing WP4 research and producing this book, with the subsequent collaboration of Ahmed Z. Khan and Frank Canters. The VUB team contributed from the beginning to drawing up the WP4 project proposal. The success of any international project is at least partly due to the experience of existing and previously tested collaborations. The SECOA project proposal was organized along an "archipelago" collaboration model where networks of disciplines intersected, based on personal contacts and mutual appreciation. One such network of relationships already existed within the Department of Human Ecology (DHE) in Brussels, which, under Luc Hens's leadership, had been for several years an international reference point for successfully integrating approaches typical of the natural sciences and those of the social sciences. My collaboration with Luc Hens began in the 1980s, when we were both working for environmental associations in our respective countries, with a keen interest in and awareness of European and international co-operation. In 1993 I was elected President of the Brussels-based European Environment Bureau, and the same year Luc Hens proposed my name as guest professor at the VUB, teaching an annual course on the "environmental aspects of recreation and tourism" at the DHE. It was a two-year Master's degree course on creating an integrated relationship between people and the environment, aimed at helping students identify and manage environmental problems in their countries of origin. Teaching at the DHE, initially an occasional activity, became a regular process that I retuned to every year from 1993 to 2000. A singular aspect of this project was the markedly international character of the DHE students, with graduates coming from 50 different countries. During my time at DHE, I encountered Karl Bruckmeier, who would later coordinate the Swedish research group for SECOA, and Tran Dinh Lan, the Vietnamese research group coordinator. When the DHE's work wound up in 2010, the VUB continued to be a part of SECOA through its interdisciplinary research group Cosmopolis, which is part of the Department of Geography.

The WP4 initially produced two books. The volume "Sustainability in the coastal urban environment: Thematic profiles of resources and their users" draws on 17 SECOA project case

studies. It evaluates the main resources and the key users to identify the principal pressures on the environment and the main conflicts in the use of resources.

The volume "Sustainability in the coastal urban environment: Assessing conflicts of uses" provides detailed analysis and evaluation of the specific conflicts and types of resource use that make achieving sustainable development particularly problematic in the 17 coastal urban areas studied by SECOA, where 26 conflict types have been identified. The project analyzed the way these conflicts emerge and develop, classified them by theme and typology, and evaluated their current status and possible future impact.

The expertise of our colleagues at the VUB has undoubtedly contributed to the success of the research and the subsequent gathering of the contributions published in this volume. A multi-disciplinary and multi-national project proposal is based on specialist literature and the past experience of individual researchers. Despite their expertise and skill in everyday research, each project involves fresh difficulties because it always has to go beyond tried and tested means and methods. The ability of a research group cannot be judged by the fact that it finds itself tackling problems that were not anticipated at the programming stage. Research is primarily about innovating, and it is therefore natural for researchers to encounter unforeseen circumstances. What is far more important is evaluating how such unforeseen problems are tackled and resolved. While WP4 did come up against some unexpected situations, they were systematically tackled and resolved thanks to the collaboration and commitment of the VUB research group.

Armando Montanari

Rome, December 2012

CHAPTER 0.
Introduction: Sustainability in Coastal Urban Environment

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1. Introduction

Nature and natural resources are the foundation upon which human settlements are created and the frame within which they function (Doxiadis, 1968; 1976). In the process of the evolution of settlements, the human-nature interaction conditioned by several internal and external forces leads to the development of socio-spatial and cultural resources that are integral for securing the economic base and future of the settlements. Understanding and analyzing the manner in which a multitude of these resources are exploited and used – in quantity and in speed, in patterns of consumtion and production - by a diversity of users and sectors provides a dynamic frame of reference for assessing the sustainability of the settlement system in relation to its natural environment. Therefore, the objective of the first of the three volumes about understanding and assessing 'sustainability' in a specific environment [coastal urban environments] is to build up thematic profiles of resources and their users based on the analysis of 17 SECOA case studies [see table 0.1]. In the course of the volume, this objective is addressed by making an assessement of the main resources and users in each case study in order to identify the most important pressures and conflicts of uses that threaten the sustainability in the respective coastal urban environment.

Studying the conflicts of uses is central to the objectives of the SECOA project of which this volume is a dissemination effort to a wider audience of a specific part of its analytical base developed so far. Assessing, analyzing and understanding environmental conflict cases is crucial for imagining alternative [and more sustainable] futures for the ecologically sensitive coastal urban environments. The intellectual ferment of such a way of looking at conflicts owes to the framing of the SECOA FP-7 research project in the 'environment' theme, which considers the effects of globalisation[1], induced 'human mobility' and 'climate change' on urban settlements' growth and restructuring in fragile coastal areas environments. Such effects are more concentrated and acute in contributing to negative consequences on natural and cultural resources [e.g. increased consumption; pollution; waste; urban carrying capacity demands, etc.]. The need for controlling and reducing such unwanted consequences is contributing to the creation of contrasts [conflicts] among stakeholders belonging to different economic sectors and social spheres in the urban context [residents, commuters, tourists, and enterprises] that compete for resources, spaces and deciding powers. The main challenge for the project is: how to manage contrasts through *sustainable urban planning*, consisting of environmental protection, economic development, and social cohesion? SECOA takes on board an integrated ecosystem approach with the aim to identify contrasts, analyse their quantitative and qualitative effects on

the environment, elaborate an innovative methodology, build alternative scenarios, develop tools for appropriate policies, and create models to combine the complexity of the different social, economic and environmental systems. The project comprises 8 partner universities that investigates 17 coastal urban areas in European and Asian countries (United Kingdom, Belgium, Portugal, Italy, Israel, India and Vietnam). Such a project framing, its scope and the diversity of contexts, captures what we call the SECOAN search for sustainability in the urbanisation and metropolisation of coastal environment.

Table 0.1. The seventeen case study areas of the SECOA project.

Country	Case studies
Italy	Rome Metropolitan Area Chieti-Pescara urban area
Belgium	Oostende (Zee) Brugge
Israel	Tel Aviv Metropolitan Area Haifa Metropolitan Area
Sweden	Gothenburg Metropolitan Area Malmö Metropolitan Area
India	Mumbai Metropolitan Area Chennai Metropolitan Area
Vietnam	Hai Phong Nha Trang
Portugal	Lisbon Metropolitan Area Algarve Region Funchal urban area (Madeira island)
United Kingdom	Thames Gateway Portsmouth City

Framed within the SECOAN search for sustainability, an analysis of conflicts of uses of coastal resources amongst users and sectors in all the 17 case studies was performed, which forms the basis of this volume. At a general level, conflict can be understood as "an expressed difference between at least two interdependent parties who perceive incompatible goals, scarce resources or interference from another party in achieving their goals" (WRDC, 1992). Although there are different approaches to define "conflict", conflicts arising from natural resource management generally consist of two characteristics – resources and entities that want to make

use of them (Bennet *et al*, 2001). The reason lies in the fact that multiple uses of resources are often excludable, which means that one use of a resource will exclude another use (Reed *et al*, 2009). Therefore, managing conflicts of uses typically deals with conflicting interests of various stakeholders since they use the same resources for different purposes. Even though approaches are found to ensure multiple uses, it happens often that one use will generally affect others, either in spatial or temporal terms. Therefore, the formulated objective of this particular part of SECOAN search for sustainability was to deal with the challenge in performing the analysis: identifying which are the resources and the users that are involved in the case study areas that have implications for conflict generation.

In each chapter of this voume, such identification and analysis is performed and presented in a three-fold structure: overview of resources, their users, and comparison across case studies. A broad geographical and historical overview frames the detailed description and analysis of the environmental condition characterised by the biophysical, cultural and social resources in each case study. Coastal morphology, climate and atmospheric conditions, littoral and marine habitats and biodiversity, as well as fresh water, soil, energy and mineral resources, when available, are the main biophysical resources assessed. Several forms of leisure, natural and built heritage and other types of social and cultural resources are also given due consideration. The second part of the review in each chapter consists of a characterization of the main resourse users, sectors and stakeholders in the study areas. They range from local residents / households, tourism establishments, second homeowners, industry and commerce, agriculture, shipping and fishing fleets, to energy production companies and so on. In the last part of each chapter, major resources and dominant users are comparatively analysed and thematically profiled. The approach throughout the analysis has been fundamentally quantitative since the purpose is to identify which users are present on coastal areas and to weigh up the intensity of their presence. By the analysis of magnitude and intensity of users presence in coastal urban areas, potential sources of conflict and stresses on the environment and resources can be forecasted.

In order to facilitate data collection and the unfolding of a comparative perspective over resources and users, a specific approach for the spatial delimitation of case study areas was developed. Based on the analysis of several studies (Bogart, 2006; Van der Haegen *et al.,* 1996; Van Hecke *et al.,* 2007; ESPON and GEMACA II, 2001) and internal discussion among SECOA partners, the following spatial framework was defined for organization and analysis of data collection:

- The *metropolitan core* – that can be seen as the administrative area of the metropolitan area. The major numbers of jobs are also generated in this area. Minimum employment numbers are used to decide whether or not to allocate a sub-area to the core.
- The surrounding *outer metropolitan ring* – that is functionally linked to the core. The boundaries for this ring are defined by journey to work flows in the first part. The ring should be constituted of those areas where at least 15% of the workforce travels from the area to the core. Additional information can come from other functional linkages e.g. transport flows, migration flows.
- Given the nature of this project, a *coastal strip* or *shoreline sub unit* should be defined. This can be statutorily defined, or in terms of a fixed buffer.

In this spatial framewok, the delimitation of study areas is based on the *Functional Urban Area* concept [ESPON] with a denotation that urban area has a soft boundary, which moves dependending on its functions. To define the boundaries for SECOA case study areas, a functional boundary is fixed using the analysis of the home-work flux. Each of the study areas is analysed at two horizontal regions, a core and a ring. The core is defined as the region where most of the administrative and economic activities occurr. There are 5 criteria used to delimit the core, two of which are directly linked to the labour market: it should have at least minimum employment of 50,000 and a positive balance of the home-work flux. The ring is delimited by the cut-off point of 15% working population of an administrative area that works in the core. However, it is important to note that, the delimination of metropolitan areas is adapted to the local circumstances and to the availability of data and therefore each case study should be viewed under their specific conditions. There are also cases where data is not sufficient to define the core and the ring of the study areas based on the labour market method. Examples of such a situation are the delimitation of the case studies in India and Vietnam, where the administrative boundary of the city/metropolitan area is used.

In addition to the spatial framework, a temporal frame of 10-20 years was also defined to analyse the changes in different aspects of each study area. For most of the aspects, two points in time are used: 2001 and 2009. However, due to the heterogeneous nature of each type of data, some other time-points are also employed. The main analysis approach is quantitative, using the data to describe different aspects. Where quantitative data is not available or not accessible, qualitative assessment is used.

Owning to the specificity of location and geography, and difference in the trajectory of development and history, each of the seventeen case study areas in the SECOA project exhibit diverse characteristics and unique features. Most of the European case studies show the traces of a long history – like a palimpsest - that has left marks throughout, especially in their central /core areas. Among them, the most notable are Rome and Brugge, which are two UNESCO world heritage sites. Other case studies also feature countless archeological and historical monuments. For the Asian case studies, the most important historical feature is the marks of colonial Imperialism as most of them were founded in that period. Although different in features, all case studies show an increasing trend of using their historical values and resources for tourism development.

A significant shared trend among all the case studies in the project is the increasing complexity and accompanied difficulties in facing challenges relating to the changing relationships between urban development, human mobility and environmental changes. However, the sites, development histories and environmental settings of the case study areas mean that these are very differently articulated in terms of both resources and stakeholder's interests. Given the ecosystems' importance in these coastal case study areas, an increasing trend of protecting the environmentally sensitive / fragile areas [intertidal areas, mudflats, marshes, mangroves, etc.] can be witnessed through local, national and international conservation designations [including Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI)]. But a combination of [economic and urban] development pressures and climate change constitute major threats to these areas. All involved coastal areas are highly populated, heavily urbanized, and show increasing rates of population growth, urban expansion, economic development and tourism activities and related flows, which implies an increase of human stress on these coastal environments. A general decrease of the agricultural land and open spaces areas, as well as an increase of built-up areas, intense use of coastal areas in the summer season, ports modernisation and expansion activities, pollution problems and waste production are also common trends observed across the cases. Moreover, internal and international migration, second home-owers and a large student population have contributed to renew demographic dynamism in these coastal urban areas.

While unfolding these trends, the aim of the first chapter is to sketch out the diversity of coastal urban environments across the SECOA case study areas. This is based on building up a synoptic view of cases through taking stock of their specific historical and geographical

position, physical characteristics and socio-cultural and economic resources, as well as the identification of main users [Inhabitants / households; Tourism; Industry, Trade & commerce; Agriculture; Fishery; Ports; Environmental / community groups; Second-homes]. The common attributes and distinctive features are summarised in the conclusion that characterises the trends in coastal urban environment across the SECOA cases.

Backing these trends, the following eight chapters in this volume gradually unveal the specificities of each case study, covering various aspects of its resources and users. The aspects covered include description of geographical features and history, inventory of natural resources that are both biotic and abiotic, land use conditions, social and cultural heritages, list of users and their roles, concluded by a comparative perspective on theses resources and users in terms of their potential to generate conflicts.

In the second chapter, two Italian case studies are described and analysed for their territorial resources and users: Rome metropolitan area and Chieti-Pescara urban area. The first one is a large-size area including the capital city; the second one is a mid-sized area. They are located in central Italy, to the West and to the East of the central Apennines, connected by an important road infrastructure. While providing an overview of the main physical, natural, social, economic characteristics of these two areas and of the main players represented in those territories, the chapter highlights the main spatial and socio-economic characteristics of the two areas where several conflicts, linked to the different objectives of economic development and environmental protection, are taking place. Several trends are observed: a loss in the agricultural land and open spaces areas; an increase of industrial, commercial areas and built-up areas; intense use of coastal areas in the summer season, due to a higher number of temporary inhabitants; problems of water availability and waste production; all year long contribution of harbours and airports activities to pollution problems. All these trends risk to compromise the sustainability of coastal development. In conclusions, an attempt is made to assess main contrasts arising by the conflicting interests of different users of the same resources that threaten the sustainability of coastal urban environment.

The third chapter covers the two cases in Belgium, Oostende and Brugge. The two Belgian cases lie next to each other and occupy around half of the total Belgian coastal zone. The Belgian coast is a densely populated and intensely used area due to its well-established infrastructure that makes the coast easily accessible for a broad (European) hinterland. Both the Belgian cases have a larger core and ring area and are famous tourist attractions. While Brugge develops based on its two main pillars of multifunctional cargo port area and its touristic

heritages, Oostende relies on strong beach tourism and a port as a passenger gateway. Both cases have witnessed their strong urbanization process decades ago and their development has become stabilized during the last decade. The economy relies more and more on commercial and service sector rather than traditional industrial activities. Agriculture has been reduced to a marginal role, both in terms of production and employment. The major users include the local inhabitants, visitors, second-home owners, and various community groups. In Brugge, the port of Zeebrugge is one of the major feature as it occupies a large area, which contains also valuable nature sites as well as an important road, rail and waterway links to the hinterlands. In Oostende, competition at the beachfront is one of the main issues. Generally ageing population, loss of agricultural lands, slight increase of mixed-use forest and nature areas, increase in port activities and urban sprawl are some of the trends observed in both cases. The scarcity of coastal space, and its contestation by a diversity of users for competing interests [mainly economic development and environmental protection] plays a crucial role in generating a range of conflicts.

The fourth chapter concerns the two cases in Israel - the Haifa metropolitan area in the north and the Tel Aviv metropolitan area covering the centre and southern coastal areas - with the main objective of highlighting the pressures and resources shaping the coastal stretch and providing a comparative point of view between the two cases. Israeli Mediterranean coast is a relatively small stretch of land representing an unique environment shaped by the interaction of land, sea and coastal interrelations being under immense pressure due to its many users and diminishing available land. Over time pressures on the coastline have intensified with conflicting agendas involving the sustainable an the economic development approaches. Although both areas are along the same coastal stretch they illustrate a very different profile dominated by different economic activities and population, and distinguished environmental aspects. Whilst some development may be avoidable, the increasing population and economic ambitions of both private and public sectors are intensifying the demand for coastal property, resulting in a situation whereupon supply can no longer satisfy the demand and further pressuring on the coastal environment. The unique coastal ecosystems are subject to human and natural processes and pressures, subsequently intensifying the fragility of the coastal front. The pressures for development on the one hand and the struggle for sustainability on the other have intensified the debate on remaining coastal properties under pressure of development. The different pressures along the Israeli coast are evident in the varying characteristics of environmental and land use conflicts identified and analysed in this chapter. The chapter

provides physical and social attributes that exemplify theses pressures together with taking stock of the clashing agendas and processes, which are not unique to the Israeli case studies. However, the relatively small coastal stretch and the diminishing available land intensify the conflicting uses and consequences of social and natural processes.

The fifth chapter provides an overview of natural and social resources, and main user groups relevant for conflicts in the Swedish case studies of the metropolitan areas of Gothenburg and Malmö. In both cases, natural resources and ecosystem services are the main resources leading to problems and potential conflicts. However, most resource use includes combinations of different resource types. Thus, resource related conflicts are characterized by multidimensional, "cross domain"-aspects where, for example, economic use of resources for purposes of production and development is in conflict with protection and maintenance of the natural resource base. Conflicts may also have multi-dimensional reasons where the use of natural resources may not be among the primary drivers. The users described in this chapter are heterogeneous groups of varying size and structure. Important users include urban inhabitants and tourists as well as resource consumers and productive sectors such as agriculture, fishery, industry, and energy producers. The majority of conflicts identified in both case study areas is related to conflicting uses of land, landscape, water and other natural resources for differing social purposes and interests, e.g. conflicts between "urban and traffic development" and "maintenance and protection of natural and cultural heritage and landscapes". Moreover, planning conflicts in Malmö include examples emerging with a changing planning policy from separated to mixed uses. A general dilemma is also whether to defend against climate change or move farther inland consuming valuable agricultural land. Comparing the two cases leads to several recommendations. For instance, the limitation of the standardized categories of resource users and the general classification of resource uses needs to be complemented by a stakeholder analysis in the case study areas to obtain an appropriate picture of users involved in conflicts. Moreover, it is recommended to complement an analysis of statistical and GIS-data with a detailed mapping of the context of conflicts - the use of resource management documents, analysis of strategies implemented by different scales of government, and so on. Thus, for each conflict a context-specific understanding of the diversity of users and sectors and their interaction can be developed.

The two Indian cases are presented in the sixth chapter, namely, Mumbai Metropolitan Region (MMR) and Chennai Metropolitan Region (CMR). In the Indian context, land, water, forests and livestock as well as coastal and marine resources are means of livelihood and

primary sources of income for a good part of the inhabitants. Many natural resources are considered common property and are utilized by multiple users. As the natural resources are limited and not always renewable and because the number of users is increasing at an alarming rate, conflicts (sometimes violent) inevitably occur. This is examined in detail in both the cases of MMR and CMR. The former is the largest metropolitan 'mega-city' and the financial and commercial capital of India while the later ranks fourth among the urban agglomerations in India. The coastal and offshore environments of the two cities support rich biodiversity and have a variety of natural ecosystems. MMR is characterized by rocky and hilly coastal lowland. Sandy coastal and alluvial plains dominate the landscape of CMR. Mumbai has much higher population density, is more ethnically diverse and is economically far more prosperous than Chennai. The proportion of urban poor and slum dwellers, however, is significantly higher in Mumbai. The economic base of the two metros has traditionally been industry, trade, commerce and services. The main users in both cities are similar and include the inhabitants, belonging to different ethnic, religious and economic groups. Cultivators, agricultural labourers, fishermen and tribals are other users that are dependent on land, soil, water, forest and marine resources. Due to rapid urbanization and phenomenal growth of population, the natural resources are under enormous stress. One of the major reasons for the dramatic population increase has been the large-scale influx of skilled and unskilled workers from the rural countryside as well as other parts of the country. With growing demand for land and the consequent prohibitive housing prices, millions of urban poor are forced to occupy environmentally sensitive areas. This has given rise to the (in)famous slums of Indian megacities. Concomitant growth in the business and industrial activities as well as tourism and entertainment activities have induced further stress on the existing resources and consequent degradation of the land, water and forest. Conversion of natural area, occupation of slums in private and government lands, disparity in access to freshwater, sanitation, social exclusion and economic inequity are some of the important reasons for conflicts between different groups in the two metropolitan cities.

In the seventh chapter, natural resources and their users in the coastal areas of Hai Phong and Nha Trang city (Vietnam) are presented. Hai Phong city located in the Northern part and Nha Trang city is located in the Southern part of Vietnam. Hai Phong city is characterised by its harbours and related activities while Nha Trang is famous for its tourism. The comparatively much larger city of Hai Phong – 1.8 million inhabitants and 125 km long coastline - is administered by the central government, while Nha Trang - 393 thousand people and only 7 km long coastline - is a city under provincial administration. The two cities are very

different due to their spefic location as well as the structure of their economy. Even though, they both face similar environmental conflicts in the coastal zone area. The chapter describes their natural resources and their users in order to contribute to the identification of conflicts and ways to manage them. In both cases, the major resources analysed include non-biological and biological features including fresh water, mangrove forest, seagrass, coral reef, soft bottom and rocky tidal ecosystems. The main users include residents/households, the growing number of tourists [over 3.8 million tourists in Hai Phong and 1.4 million in Nha Trang in 2010], divers enterprises, and the booming construction sector. Increasing streams of tourists, modernization and expansion of the port, industrial development, over fishing and rapid growth of built-up area contributes to major impact on local ecosystem and natural resources, which are quite often the root of conflict among environmental groups and economic development interests.

The eighth chapter gives an overview of the three Portuguese case studies: Lisbon Metropolitan Area (LMA), Eastern Algarve (EA) and Funchal Metropolitan Area (FMA). A broad analysis of the physical resources, environmental conditions and cultural heritage resources for each case study is provided, followed by a characterization of the main users in the three study areas. An assessement of the main resources and the magnitude and intensity of users impact is made in an effort to support the identification of potential sources of conflict/stresses with regards to the environment and resources. The main resources and geographical features analysed include fresh water, energy, soil, air, biodiversity, landscape and habitats, cultural heritage and mineral resources. The main user groups identified range from residents / household, tourism establishment, second homeowners, to industry, commerce and agriculture. An increase in sea/river front urban development, and a decrease in agricultural and open space areas, as well as an increase in economic activities [shipping and fishing fleets, energy production companies, industry and commerce] and dwindeling biodiversity, habitat and landscape qualities characterize the trends in the Portugese case studies.

Finally, the ninht chapter focuses on the resources and users in the two case studies in the UK - Portsmouth and Thames Gateway - that are considered against the background of intense, but dynamic, human-nature relationships. The analysis shows that both areas face challenges relating to the changing relationships between urban development, human mobility and environmental changes. However, the sites, development histories and environmental settings of the two urban areas mean that these are articulated very differently in terms of both resources and stakeholder's interests. In Portsmouth, migration and an increasing student

pressure underlie a renewed demographic dynamism, but the land available for new housing and economic development is highly constrained by its site and planning regulations. Thames Gateway is a large diverse region that has been designated as the major focus for urban development in the South East of the UK, and it is accommodating above average population increases through extensive programmes of house building on brown field land. The main users in both areas include different population groups, variety of tourism streams, diverse employers ranging from small service establishments to major manufacturing enterprises, fishery, port, energy companies and so on. The economic structures of both areas are changing rapidly. A range of international and national conservation bodies are represented in the two case studies, as well as a very large number of local conservation groups throughout both regions. The distinctive spatial and temporal distribution of increasing tourism and leisure functions adds to the pressures already existing in both areas. These demographic and construction pressures are generating conflicts over the availability of recreational areas, water, waste disposal and energy. Inevitably, such conflicts are being played out in context of intense social and territorial inequalities that are reflected in the distribution of power and on the way in which issues are formulated.

The context of the case studies in the Secoa-project presented in this volume is one of a multidisiciplinary research in metropolitan coastal areas where social and environmental problems of human mobility and natural resource use by many human users create new, hitherto unknown conflicts. The natural resources includes raw materials such as minerals and biological resources, and not only air, water and soil, but also ecosystems and their services, and flow resources such as wind, tidal and solar energy, as well as space can be seen as natural resources. Their uses are closely tied to the cultural and social resources that are described according to data on mobility, heritage, demography, urban and economic development. On the users side, many connections exist between dominant users. Individuals act in many roles and often simultaneously as members of several groups, organizations and institutions – private households, firms, producers, consumers, etc. Along the chain of resource use (extraction, production and processing, consumption, waste production and disposal) many interactions are created between users. The combinations of natural and other resources in the processes of resource use results in more overlapping user groups. Therefore, a refined user typology is required to take into account the heterogenous forms and combinations of users as individuals/households or formal organisations, sectors of resource use, private and public organisations, large or small groups, productive or consumptive resource users, users with

more or less influence and power. The emergence of conflicts is affected by scarcity of these resources, but also the degree of environmental damage, how the problems are perceived, how different stakeholders and users value a resource, as well as whether they are able to express their concerns. These conflicts need to be addressed for the adaptation to climate change and as part of strategies for sustainable development in coastal urban enviroments.

2. End Notes

The process of globalization has been in the focus for much discussion and debate over its benefits and downsides. Globalisation has helped to raise productivity and employment; lift millions out of poverty; revolutionised communications; boosted international cooperation; fostered competition; boosted global economic growth and interdependencies through trade and FDI flows; and facilitated scientific discoveries (Gurria, 2007). However, at the same time, globalization is also blamed for a growing uncertainty and insecurity in the job market; depressed wages; increasing inequality; overexploitation of irreplaceable natural resources; the transfer of political power to large multinationals operating outside of the democratic processes; and the sacrifice of cultural and other values to the dictates of the marketplace.

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CHAPTER 1.

Coastal Urban Environment: a Synoptic View of Resources and Users Across Cases

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1. Overview of Case Study Areas

The seventeen study areas in the SECOA project have diverse characteristics, many owning to their different location and history. Thirteen study areas are located in Europe and four are in Asia. They have a diversified background that contributes to their development direction and current situation. Most of the European case-studies have long history that has left marks especially throughout central areas. The most notable is Rome and Brugge, which are two UNESCO sites. Other cities also feature countless archeological and historical heritage. For the Asian case-studies, the most important historical feature is the marks of colonisation periods. Although different in features, all cases have shown a great use of its historical values for tourism development. In the following section, a brief overview of the cases shows the specificity and unique features of each case study area.

1.1 Rome Metropolitan Area (Tyrrhenian Sea) (Italy)

Rome, located in the centre of the Italian peninsula, is the capital of the country and the Lazio region. Today, Rome is one of the most important cities in Italy in terms of scientific research. Rome is also a key tourist attraction with more than 20 million visitors in the year 2000. The Rome municipality is at the core of a large metropolitan area. Nowadays the municipality territory of Rome is divided into two areas. On the one side, the central city, within the Aureliano city wall (3rd B.C) and, on the other, the external city or the periphery, made up of townships that resulted from the public and private interventions and spontaneous or illegal developments early in the first stages of the urbanisation process. In order to reach the objectives of our analysis the RMA has been divided into three zones, defined as "central city" (core and rest of the central city), "inner suburban ring", and "outer suburban ring".

1.2 Chieti-Pescara Urban Area (Adriatic Sea) (Italy)

Pescara, the most populated city of the Adriatic coast, is the commercial and administrative centre of Abruzzo region, one of the most dynamic of the last decade thanks to the important historical developments of industrial activities based on the manufacture of metals, furniture, clothes, cement, liquors, pre-cooked-food and dyes, which has allowed the creation of a large number of firms. The territory of the Chieti-Pescara urban area is limited by the sea, at East, and by the National Park of Majella, at West. The central city is constituted by the main cities - Chieti and Pescara - the first one having an ancient origin on the hill, the

second one having a recent origin along the plane and the coast. The Pescara city can be considered as the spontaneous "branch" of the city of Chieti, followed to the technological innovations, which characterised the 20th century. In recent years, a new settlement along the Pescara River was created. It is constituted by houses, business parks, shopping centres, industries, without points of discontinuity.

1.3 Oostende (Belgium)

The first study area in Belgium is Oostende, which comprises five communes of the Oostende Arrondissement (out of the 7 communes in total). The whole of the Oostende SA lies within the designated coastal zone of Belgium. The study area comprises a core of three communes (Bredene, Oostende and Oudenburg) and a ring of two communes (Gistel and Middelkerke). Oostende has a total surface area of 250 km^2 and a coast line of roughly 20 km, or nearly a third of the Belgian coastline.

Historically, Oostende region is an old seaside resort that developed from a small fishing village formed since the 8th century. During the10th till 14th centuries, the area gradually developed with the building of dykes and filling up ditches. The turning point for the area was in the middle of the 15th century, when a harbor was built, which attracted tradesmen and shipments from different parts of Europe, as well as Indies and China. At the same time, Oostende port had a strategic position in the religious wars in the 16th century. In 1830, Oostende became a part of the new independent Belgium. During the reigning of King Leopold I, the first king of Belgium, Oostende was connected to Brussels in 1838. Also a ferry service between Oostende and Dover (in the UK) was set up in 1846. After the Second World War, Oostende began a transformation into a modern coastal city.

1.4 Brugge (Belgium)

The second case study in Belgium is Brugge (Bruge), with a focus on Zeebrugge, a coastal area of the Municipality of Brugge and in itself a seaport. Brugge is the capital and largest city of the Belgian province of West-Flanders. It is located in the northwest of the country. The historic centre of the city is a UNESCO site. The whole city comprises 13,840 ha, approximately 1,075 of which are found at sea. The economic activities of the city are directly linked to its sea harbour, located in Zeebrugge. The Brugge study area comprises the city of Brugge and several of its 8 surrounding communes. This creates a total study area of over 616

km² and a total of over 255,000 inhabitants. The coastline in this study area is roughly 18.5 km long.

The history of Brugge is marked by its connection to the sea. For the development of the city, two sea breaches or transgression were implemented, which created a large creek, several kilometers wide, connecting Brugge to the sea. During the following centuries, the sea retrieved and land began to silt up. Occasional floodings in the first half of the 11th century kept Brugge connected to the sea, but also encouraged the building of dykes. These dykes helped Brugge to become one of the most important Belgian cities in the Middle Ages. By the end of the 12th century, a town, Damme, developed there, acting as an outer harbor for Brugge. The connection was made through a short channel, the Reie. This marked the beginning of the golden ages for Brugge, which held on until the beginning of the 15th century. During the 16th till 18th century, natural and manmade events closed down those connections. In the 19th century, Zeebrugge was created and remains the connection between Brugge and the sea.

1.5 Tel-Aviv and Haifa Metropolitan Areas (Israel)

Israel is situated on the eastern Mediterranean coastline with a coastal front stretching approximately 196 km from the cliffs of Rosh Hanikra in the north to the Gaza strip in the south. With two of Israel's major metropolitan areas on the Mediterranean, Haifa metropolitan area with the Haifa Port at the centre and Tel Aviv the economic core of Israel, pressures on the coast of Israel are immense. Unique attributes of the coast attract diverse uses and users of the coast and demonstrate the immense pressures inflicted upon the coastline, triggering conflicts and competition over the finite coastal supply. Israel's coastal attributes are not dissimilar to other coastlines, however with a shorter coastline and unique attributes due to its geographical attributes, the effects of coastal systems and changes along the coast are greater.

1.6 Gothenburg Metropolitan Area (Sweden)

The delimitation of the Gothenburg case includes the municipalities of Gothenburg and its closest neighbours inland – Partille and Mölndal – making part of the inner and outer ring of the urban centre. The urban centre is surrounded by the coastal municipalities of Öckerö and Kungälv towards the North, and by Kungsbacka to the South forming the outer ring along the coast. The focus of this reporting will be on the municipality of Gothenburg, as it includes both core, inner ring, and outer ring of the urban area. The city of Gothenburg, the second largest city in Sweden, with an area of 3,718.36 km² and ca. 500,000 inhabitants, is located at the

Swedish west coast. The location is favorable at the mouth of the river Göta älv offering excellent harbor situation and inland transportation facilities in the river valley.

Gothenburg counted as Swedish town (by Royal privilege) since 1621. The city at the mouth of the Göta river developed around the fortress which dominated its development until the 19th century. Between 1800 and 1900 the number of inhabitants went up from about 12000 to about 120,000. Until early 20th century sea transport and commerce were the main economic sectors, only then began fast industrialization, which contributed after the First World War to reinforce in-migration and population growth (main industry: metal products). The city area grew throughout 20th century through consolidation (integration of surrounding municipalities, the last big administrative reform in the 1970s). After 1970 until the 1900s the population level decreased, only in the year 2000 (466,990) it went over the level of the year 1970 and is since then slowly growing (2009/10: 507,000). The 2nd half of 20th century brought structural changes in the local economy (reduction of harbour-related economy).

1.7 Malmo Metropolitan Area (Sweden)

The delimitation of the Malmö case study area includes the municipalities of Malmö, Bjurlöv, Lomma, Vellinge at the coast and the inland municipalities of Staffanstorp and Lund. The focus of this reporting will be on the municipality of Malmö and its two coastal neighbours. Malmo is the third largest metropolitan areas in Sweden (after Stockholm and Gothenburg) with an area of 2,535.76 km² and a territorial water area of 2,051.02 km². Population (January 1st, 2010) of the Malmö municipality was 293,909 people.

Malmö has been a Danish town for several hundred years (mainly developing through the rich fishing grounds in the Öresund) before it became Swedish in the year 1658 in the peace contract of Roskilde. After that Malmö lost economic dominance, only at the end of 18th century the port was developed and after that the city grew during the 19th century. At the turn of 19-20th century the city was technically modernized (electricity, etc.). Between the wars and after World War II the city grew until the 1970s when the economy (shipbuilding, textile industry came into crisis) and the number of in habitants went down until 1995, when the building of the new Öresund bridge started (opened in 2000).

1.8 Mumbai Metropolitan Area (India)

Mumbai (formerly, *Bombay*), the largest metropolis in India, is the capital of the Maharashtra State in western India. In terms of population, it is the sixth largest city in the

world after Tokyo, New York, Seoul, Mexico City and Sau Paulo. The boundaries of the MMR were originally defined in 1967. These boundaries were marked by natural features such as Vaitarna Creek and Tansa River in the north, Patalganga River in the south and foothills of the Western Ghat (*Sahyadri*) in the east. On the west, they were defined by the Arabian Sea. The region lies between 18° 33' and 19° 31' N latitude, and between 72° 45'and 73° 28' E longitude. The MMR extends over an area of 4,355 km^2 and comprises: Municipal Corporations of Greater Mumbai, Thane, Kalyan, Navi Mumbai, Ulhasnagar, etc.; 15 municipal towns; 7 non-municipal urban centers; and 995 villages. Its administrative limits cover Mumbai City and Mumbai Suburban Districts, and parts of Thane and Raigad District. There are 40 Planning Authorities that are responsible for the micro-level planning of the different areas.

The city rose from being a small fishing hamlet in the 13th century to the modern mega city after the concession of the Mumbai group of islands to the Portuguese in 1534 and possession of the island by the British in 1661. In the 19th century, economic and educational development in the first half of the 19th century, the beginning of the first-ever Indian railway line in 1853 and the opening of the Suez Canal in 1869, established Mumbai as the international port and commercial capital of India. During the British rule, Bombay (present Mumbai) was the capital of Bombay Presidency, encompassing much of the western and central parts of India. Mumbai became the capital of newly formed Maharashtra State in 1961.

1.9 Chennai Metropolitan Area (India)

The Chennai Metropolitan Area or Region (CMR) extends from 12° 50' to 13° 17′ N latitude and 80° 0′ to 80° 20′ E longitude. The CMR comprises: the Chennai Municipal Corporation (174 km^2); 16 Municipalities (240 km^2); 20 Town Panchayats (156 km^2); and 214 villages in 10 Panchayat Unions (617 km^2). It encompasses the Chennai District (174 km^2), parts of Tiruvallur District (637 km^2) and Kancheepuram District (376 km^2). Chennai (formerly, *Madras*), is ranked as the fourth largest urban agglomeration in India and is the capital of the Tamil Nadu State in southern India.

The city of Madras (present name Chennai) was a small fishing village known as *Chennaipatnam*, before the British East India Company acquired it in 1639. The laying down of a railway line in 1864 and the completion of the harbour in 1896 converted the non-descriptive village of Chennaipatnam into a flourishing trade and commerce center in the late 19th century. The Corporation of Chennai (or Madras) is one of the oldest municipal bodies in India. It was established in 1687. During the British rule, Madras was the capital of Madras Presidency. It

became the capital of Tamil Nadu (earlier Madras) State in 1947. Today Chennai is recognized as the major export hub in South East Asia and a major automobile manufacturing center in India.

1.10 Hai Phong City (Vietnam)

Haiphong is situated on the northeastern coast of Vietnam, about 100 km east of Hanoi Capital. It is the third largest city in Vietnam and possesses the largest seaport in the northern part of the country. It covers an area of 1,519 km^2, including two island districts (Cat Hai and Bach Long Vi). Haiphong has a large coastal and sea area, favorable for marine economic development. Haiphong is the most important commercial and transportation hub in northern Vietnam, connecting the Northern provinces with the world market through its seaport system. Other parts of the country are connected to Haiphong by road, railway, inland waterways, maritime and air links.

The formation and development of Hai Phong associated with the evidence of prehistoric man at Cai Beo archaeology (Cat Ba) belong to the Ha Long culture about 4000 to 6000 years ago; and with the formation of the Red River civilization of the Dong Son culture with the evidence of human at Trang Kenh archaeology (Thuy Nguyen), Nui Voi archaeology (An Lao) about 2000 to more than 3000 years ago; with legend about the Heroine Le Chan – who founded Trang An at early AD – the cradle of Hai Phong city today.

1.11 Nha Trang City (Vietnam)

Nha Trang is a small city of Khanh Hoa province. This is a coastal province in Southern Central Vietnam. The province is bordered by Phu Yen Province to the North; Ninh Thuan Province to the South; Dak Lak Province to the West; and the South China Sea (locally known as East Sea) to the East. Nha Trang City is 1,280 km from Hanoi, 535 km from Danang, and 448km from Ho Chi Minh City. Nha Trang is home to many famous scenic spots and landscapes and is a major tourist center in the country.

Nha Trang City is situated in a valley surrounded by mountains on three sides:North, West, and South. The sea to the East borders the city. Cai river and Cua Be river divide Nha Trang into 3 sections: the North of Cai River, the South of Cua Be River and the inner part of Nha Trang City located between the two rivers. Nha Trang has 19 islands with more than 2,500 households. The largest of these is Tre Island with an area of some 30 km^2, sheltering Nha Trang bay from strong winds and waves.

From the year 1653 to middle of 19th century, Nha Trang was still undiscovered land belonging to Ha Bac, Vinh Xuong district, Dien Khanh palace. Only through the two first decades of the 20th century, Nha Trang had a rapid change. With the decree of the Governor - general of Indochina dated on 30th August 1924, Nha Trang became a town. Nha Trang town formed from the ancient villages: Xuan Huong, Phuong Cau, Van Thanh, Phuong Sai, and Phuoc Hai. Today Nha Trang became the cultural, economic, administrative center of Khanh Hoa province.

1.12 Lisbon Metropolitan Area (Portugal)

The Lisbon Metropolitan Area (LMA) with 299,565.89 ha is the westernmost European capital, encompassing 18 municipalities (Alcochete, Almada, Amadora, Barreiro, Cascais, Lisboa, Loures, Mafra, Moita, Montijo, Odivelas, Oeiras, Palmela, Sesimbra, Setúbal, Seixal, Sintra e Vila Franca de Xira). LMA is divided by the large Tagus river estuary, leading thus to two spatial units such as the Great Lisbon and the Setubal Peninsula, sometimes also named as Southern bank.

The LMA coastal municipalities, which will be subject of analysis in this report, are Lisboa, Oeiras, Cascais, Loures and Vila Franca de Xira (all included in the Great Lisbon spatial unit) and Almada, Barreiro, Seixal, Moita, Montijo and Alcochete (all included in the Setubal's Peninsula). The largest municipality is Montijo with 34,859.26 ha, followed by Vila Franca de Xira with 31,767.24 ha and Loures with 16, 933.72 ha.

1.13 Algarve Region (Portugal)

The Algarve, with 499,474.06 ha, is the southernmost region of Portugal and borders with the Alentejo region (North), the Atlantic Ocean (South and West) and the Guadiana river (East) which borders with Spain. The highest point is situated in the hills of Monchique, with a maximum altitude of 902 m (Peak of the Foia). Internally, the region is subdivided into two zones, one to West (Barlavento) and another to the East (Sotavento).

The Algarve's coastal municipalities, which will be subject of analysis in this report, are Albufeira, Loulé, Faro, Olhão, Tavira, Vila Real de Santo António and Castro Marim. These municipalities were chosen because of their touristic importance and relationship with the protected area of Ria Formosa. The largest municipality is Loulé with 76,416.33 ha, followed by Faro with 20,159.32 ha and Castro Marim with 30,084.67 ha.

1.14 Funchal Urban Area (Portugal)

Madeira Island has an area of 75,852.37 ha, and is divided into 10 municipalities: three facing the North (Porto Moniz, Santana and São Vicente) and seven in the South (Calheta Câmara de Lobos, Funchal, Machico, Ponta do Sol, Ribeira Brava and São Vicente). The Funchal's Metropolitan Area, which will be subject of analysis in this report, encompasses the municipalities of Ribeira Brava, Câmara de Lobos, Funchal, Santa Cruz and Machico.

1.15 Thames Gateway (United Kingdom)

The spatial extent of the Thames Gateway was set out in National Regional Planning Policy Guidance (Department of Transport and the Regions, 2001) as part of the regional spatial strategy for the development of the south east of England. This designated Development Area reflects past governments' policy priorities - namely identifying areas of brown-field land (previously developed land), which could be made available for new housing and infrastructure development. It covers over 100,000 ha and stretches over 64 km along the Thames Estuary from Isle of Dogs and London Docklands, near the centre of London, to Southend in Essex (north) and Sheerness in Kent (south). Thames Gateway includes territory governed by 18 local authorities, 168 wards and 23 UK parliamentary constituencies.

The Thames Gateway occupies a substantial proportion of the Greater Thames Estuary, designated as a Coastal Natural Area. However, it should be noted that the Coastal Natural Area does not extend landward to any significant distance except in low-lying areas – thus the Thames Gateway also encompasses areas that lie beyond it.

1.16 Portsmouth City (United Kingdom)

Portsmouth is located in the county of Hampshire on the southern coast of England, approximately 112 km south west of London. Most of the city lies on Portsea Island, bordering the Portsmouth Harbour in the west and the Langstone Harbour in the east. The City of Portsmouth has an administrative area of 6,019 ha (60.19 km^2), of which 4,028 ha (40.28 km^2) is land and 1,991 ha (19.91 km^2) comprise the Portsmouth (1,431 ha) and Langstone (537 ha) harbours.

Historically, Portsmouth's development has been heavily based on its coastal location. It has been an important naval port for centuries (construction of the first docks started in 1212), and today economic activities in the area include shipbuilding, the commercial port and waterfront regeneration related to retailing, leisure and tourism.

2. Physical Characteristics and Resources Across Cases

The case studies included in this project are very different in shape and size. They include large metropolitan area like Rome or Mumbai, as well as cities like Gothenburg, Lisbon and Thames Gateways. There also are smaller cities and islands such as Algarve or Funchal. Table 1.1 gives an overview of the main features of the case studies.

Table 1.1. Main features of the case studies.

Case-studies	Total area (km^2)	Area of the core (km^2)	Area of the ring (km^2)	Length of the coastline (km)
Rome Metropolitan Area (Italy)	5,792.00	1,498.00	4,294.00	150.0
Chieti-Pescara Urban Area (Italy)	957.00	111.00	846.00	35.0
Oostende (Belgium)	204.09	86.19	117.91	20.0
Brugge (Belgium)	616.06	410.20	205.87	18.5
Tel-Aviv Metropolitan Area (Israel)	1,466	172.00	1,294.00	-
Haifa Metropolitan Area (Israel)	5,339	866.00	4,473.00	-
Gothenburg Metropolitan Area (Sweden)	1,847.45	33.70	1,632.2	-
Malmo Metropolitan Area (Sweden)	2,535.76	13.56	687.00	-
Mumbai Metropolitan Area (India)	4,355.00	466.00	3,889.00	380.0
Chennai Metropolitan Area (India)	1,189.00	174.00	1,015.00	50.0
Hai Phong City (Vietnam)	1,519.00	261.00	1,258.00	125.0
Nha Trang City (Vietnam)	252.60	130.09	122.51	7.0
Lisbon Metropolitan Area (Portugal)	1,449.49	-	-	312.2
Algarve Region (Portugal)	2,206.30	-	-	257.4
Funchal Urban Area (Portugal)	343.53	-	-	330.0
Thames Gateway (United Kingdom)	1,000.00	-	-	64.0
Portsmouth City (United Kingdom)	60.19	-	-	-

All study-areas are very different in term of geographical size and population. For most of the case studies, a core area and at least one ring were defined. The core can be seen as the administrative part of the metropolitan area where most of the jobs are concentrated. The ring plays the role of supplying the core with necessary workforce, often at the rate of 15% or more. However, the functions of the core and ring areas also differ between cases (as said in the methodological section). Definition of core-ring delimination also depends on data availability and realistic functions of the historical zoning process in each case-study area. As seen from

Table 1.1, the ring is often larger than the core in size, except for the cases of Oostende and Brugge (both in Belgium), where the ring is much smaller than the core.

In terms of natural resources, the most notable in all case-studies are the coastal landscapes and ecosystems that are being exploited mainly for tourism purposes. The case studies possess diversified morphological features ranging from beaches wetlands and inland forests. In all European case studies, there's Natural 2000 sites presence. They are vital sites for conservation of important habitats and bird species. However, more often, they locate also very close to urban development areas.

Table 1.2. Presence of the main morphological features of the case-studies.

Main typological features Case-studies	**Coral reef**	**Sea-grass**	**Sandy beaches**	**Dunes/ Hills**	**Tidal flats/ Marshes**	**(Rocky) Cliffs**	**Low (flat) lands**	**Swamp**	**Forest**
Rome Metropolitan Area (IT)				x			x	x	x
Chieti-Pescara Urban Area (IT)			x		x				x
Oostende (BE)			x	x			x		x
Brugge (BE)			x	x	x		x		x
Tel-Aviv Metropolitan Area (IL)			x	x			x		
Haifa Metropolitan Area (IL)			x	x			x		
Gothenburg Metropolitan Area (SE)						x			x
Malmo Metropolitan Area (SE)			x				x		x
Mumbai Metropolitan Area (IN)					x	x		x	x
Chennai Metropolitan Area (IN)		x	x	x				x	
Hai Phong City (VN)		x	x		x		x	x	x
Nha Trang City (VN)	x		x		x	x	x	x	x
Lisbon Metropolitan Area (PT)					x		x		x
Algarve Region (PT)			x		x				
Funchal Urban Area (PT)						x			x
Thames Gateway (UK)					x		x		
Portsmouth City (UK)				x	x				

The 17 study areas boast a variety of ecosystems as expected due to their various characteristics. In all areas, a number of protected areas can be found, either designated by national legislation or under regional protection. In most of the European case studies, protected areas scattered and mingled amongst urban centres. However, European Bird Directive and Habitats Directive also create a large network of protected sites. In Asian cases, a

number of National Parks and Protected Areas are present. They are important features for various reasons, mainly ecosystem functions and touristic attractions. Also, it is notable that most urban centres in Europe have high percentage of green spaces. The combination of urban green space and forest areas in European case-studies is as high as 60%.

Land resource is the next important feature. Land-use is a very important aspect that is defined by the socio-economic development process. The case-studies in SECOA can be categorised into two groups: the developed group where development process has stablised and landuse change occur slowly. The other group is the fast growing group (or developing group) where land-use change occurs much faster.

In the European case-studies, land-use has largely been defined by the development process and many changes are controlled by planning. Agriculture/arable land is the main land-use type in most of the western European countries, with as high as 78% of land area in Chieti-Pescara. Industrial land-use is relatively small in area in most of them.

Table 1.3. Land-uses proportion in the case-studies.

	Year	Total Area (km^2)	Agriculture (%)	Industrial (%)	Mixed Industrial/ Commercial (%)	Natural Habitat (%)	Open Space (%)	Built up area in urban environment with mixed used (%)
Rome (IT)	2006	5,793	60.0	0.50	1.50	20		9
Chieti-Pescara (IT)	2006	974	78.50	0.20	1.80	12	0.45	6
Oostende (BE)	2009	249.4	69.15	3.07	-	2.90	12.31	12.56
Brugge (BE)	2009	616	64.87	2.65	-	6.07	12.72	13.05
Tel Aviv	2009	1,512	27.46		3.52	9.91	68.29	24.71
Haifa	2009	1,045	35.57		2.85	27.86	78.95	16.24
Gothenburg	2005		23.67	-	2.59	49.3	-	11.57
Malmo	2005		71.21	-	1.90	5.68	-	11.67
MMR	2008	4,355	28.0	2.47		34.17	23.10	10.05
CMR	2008	1,189	8.75			1.29	36.83	37.00
Hai Phong	2009	1,519	542.39	360.69		235.21		
Nha Trang	2008	252.60	42.06	34.69				
Lisbon	2006	1,449.5	39.5	3.3	-	23.8	-	19.1
Algavre	2006	2,206.3	49.2	0.3	-	39.6	-	2.6
Funchal	2006	343.5	12.6	0.9	-	66.1	-	-
Thames	2001				2.30	60	6	14
Portmouth	2001				4.20	22.77	11	19.40

Mineral resources are not currently significant at the SECOA case-studies. In some European cases, such as Tel Aviv and Haifa (Israel), Zeebrugge (Belgium), Rome and Chieti-Pescara (Italy), and Lisbon (Portugal), sand exploitation for construction is the main mineral extraction activity. In India and Vietnam, mineral extraction focuses mainly on salt and sand production, with some other minor mining activities. However, it is important to note that mining and mineral extraction have played more important roles in different periods of the urban and industrial development, but not nowadays.

2.1 Socio-cultural resources

All case-studies boast valuable cultural features. In some places (such as Rome, Mumbai, Brugge and Lisbon), there are features of international importance. In other places are values of regional and national importance. The most notable are Rome and Brugge, where several UNESCO World Heritage Sites are located. Rome is one of the richest basins of cultural heritage in the world.

The historic centre of Rome, the properties of the Holy See in Rome, San Paolo fuori le Mura (which is also Vatican extraterritorial property) are listed among the UNESCO world heritage sites, as well as the Etruscan necropolises of Cerveteri and Tarquinia. Ostia antica (the ancient Ostia city) is listed by UNESCO among the most important hundred archaeological sites in the world. The medieval centre of Brugge is another UNESCO site of great importance.

In all sites, regionaly and nationaly important sites can be identified easily. Monuments with archeological or religious values concentrate at high density in most of the cases.

One of the most dominant social phenomena in the SECOA cases studies is the dynamic migration scheme. Migration has always been a visible phenomenon in the metropolitan areas, mainly due to the large employment market. Migrants tend to search low price housing in the suburbs and simultaneously to settle near work places. There is a positive influx rate seen throughout all European case studies. However, positive migratory rate has been slowing down in recent years, with peaks during the 2002-2005 period.

In some cases, such as Rome, Lisbon, and Brugge, migratory rate is higher in the ring than in the core area. Also, the core areas experience some time a negative migratory rate, indicating people are moving out of the core areas. However, the rate of migrants is often high in the core (such as in Thames Gateway and other cases), indicating that while local people are seeking new living space outside the crowded core, migrants are moving in. All coastal areas witness positive migratory rate.

In the four Asian case-studies, rural-urban migration is dominant. In Mumbai, proportion of migrants accounts for a round half of the total population, with more migrants in the ring than in the core area.

2.2 Economy and Employment

Economy is an important feature that is shaped by the utilisation of coastal resources as well as defining the impacts put on them. In coastal areas around the world, economic development pattern run on a rather common path and traditionally relies mainly on fisheries and aquaculture, tourism and port development. In recent development trends, economic growth has shifted to more focus on the tertiary and quarterly sectors, with the fast growing of the services and information sectors.

This common trend is reflected in all of the cases in the SECOA project, with the case studies in developing countries in Asia (India and Vietnam) where traditional development phase with fisheries/aquaculture, tourism and port sectors play the major roles in the development of the regions. Meanwhile, in developed countries in Europe, the economy has shifted to services and information sectors, but tourism and port development still play the major role. However, each case study has different development trends that link them to their location and relative position in the region. The impacts of economic downturns in the last decade also affect each case study differently.

It is also notable that there is a suburbanisation trends in most of the European case studies, where economic activities (industries, commerces and services) grow faster in the ring area and stablised or reduced in the core area. Agricultural activities mostly occur in the ring area, with very fast reduction in the core area, both in term of number of holdings and number of employments. Service sector is the only sector that has grown both in the ring and the core areas in most cases, sometimes at a very high rate. Service sector also provide the most employments across the cases.

In Asian cases of India and Vietnam, agriculture/aquaculture remains a major sector in term of employment as the sector is still relying heavily on manual labours. However, in term of economic contribution, industrial and service sectors are more important. It is notable that in the Asian cases, household industry accounts for a large part of the economy, although this industry is not mostly registered. In the case of Mumbai, this sector employs around 2-3% of the population, mostly women.

Employment and unemployment are important factors in a society. Unemployment, as defined by the International Labour Organization, occurs when people are without jobs and they have actively looked for work within the past four weeks.

Table 1.4. Unemployment rates.

Case-studies	Year	Unemployment rate (%)
Rome Metropolitan Area (Italy)	2008	8.1
Chieti-Pescara Urban Area (Italy)	2009	8.2
Oostende (Belgium)	2008	7.4
Brugge (Belgium)	2008	4.6
Tel-Aviv Metropolitan Area (Israel)	2009	7.6*
Haifa Metropolitan Area (Israel)	2009	7.6*
Gothenburg Metropolitan Area (Sweden)	2005	3.2**
Malmo Metropolitan Area (Sweden)	2005	4.1**
Mumbai Metropolitan Area (India)	2001	17.0***
Chennai Metropolitan Area (India)	2001	21.8***
Hai Phong City (Vietnam)	2009	17.0
Nha Trang City (Vietnam)	2009	6.3
Lisbon Metropolitan Area (Portugal)	2009	9.6*
Algarve Region (Portugal)	2009	9.6*
Funchal Urban Area (Portugal)	2009	9.6*
Thames Gateway (United Kingdom)	2010	4.55
Portsmouth City (United Kingdom)	2010	3.7

In the SECOA case-studies, unemployment rate varies widely. Due to heterogenous data from the case studies, it is not always possible to discuss the unemployment trends. In most case studies, the unemployment rate is higher in the core than in the ring of a study area despite the fact that the core generates much jobs than the ring area.

3. Identification of Users Across Cases

3.1 Inhabitants/Households

The most important user group is undoubtedly the inhabitants of the area. Residents and private households are among the dominant resource user groups, in the roles of

* National unemployment rates reported by EUROSTAT

** Percentage over the total population

*** Adjusted rate: equal to the percentage of "statistically unemployed" minus the percentage of "marginal workers".

"consumptive users". The social differences among the inhabitants in terms of social structure, economic situation and welfare that may influence conflicts between resource users are not sufficiently visible from the statistics for the different parts of the metropolitan area.

The 17 case studies in SECOA are very different in term of their inhabitants. Most areas are crowded with very high population density. As many of them are popular tourist destinations, seasonal surge in density due to tourists is observed. Some have high proportion of migrants while other accommodates mainly locals.

The most heavily populated area is Mumbai Metropolitan Area, with a total population of more than 19 million people. This is also the area with the highest level of migrants, whose account nearly half of the total population. Mumbai Metropolitan Area also has one of the densest areas in term of population density. Both Indian case studies stand out as the densest and most populous, with high level of migrants.

Table 1.5. Demographic indicators (2001).

Case-studies	**Total population (.000)**	**In which (%)**		**Proportion of migrants (%)**
		Men	Women	
Rome Metropolitan Area (IT)	4,259			
Chieti-Pescara Urban Area (IT)	424.00			
Oostende (BE)	123.47	48.71	51.29	3.54
Brugge (BE)	255.84	48.89	51.11	2.52
Tel-Aviv Metropolitan Area (IL)	3,344	49.04	50.96	
Haifa Metropolitan Area (IL)	1,077.00	47.73	52.27	
Gothenburg Metropolitan Area (SE)	797.18	50.27	49.73	14.18
Malmo Metropolitan Area (SE)	403.46	49.00	51	27
Mumbai Metropolitan Area (IN)	19,363.00	54.64	45.36	48.7
Chennai Metropolitan Area (IN)	7,184	51.10	48.90	28.6
Hai Phong City (VN)	1,841.6	49.58	50.42	
Nha Trang City (VN)	393.53	49.50	50.50	
Lisbon Metropolitan Area (PT)	2,662.00			4.82
Algarve Region (PT)				6.07
Funchal Urban Area (PT)	205.50			
Thames Gateway (UK)	1,450.00	48.62	51.38	
Portsmouth City (UL)	187.00	49.20	50.80	

Other case studies in Europe also have high population density in comparison to their national average. They also have high level of migrants (especially international migrants). In Europe, Rome Metropolitan Area is the most populous with a population of nearly 4.3 million. Only 3 out of 13 European case studies have the population of over 1 million people. Portsmouth (UK) is the most densely inhabited area amongst the European case studies with an average of more than 2700 people per km².

Table 1.6. Population density in the study areas (ppl/km²).

Case-studies	Average density	Dendity in the core	Density in the ring	Average household size
Rome Metropolitan Area (IT)	735	1,671	280	
Chieti-Pescara Urban Area (IT)	435	1,580	245	
Oostende (BE)	605	1,087	252	2.07
Brugge (BE)	415	406	435	2.26
Tel-Aviv Metropolitan Area (IL)	2,187	7,073	1,337	2.9
Haifa Metropolitan Area (IL)	399	1,026	277	3.0
Gothenburg Metropolitan Area (SE)	414	4,433	345	2.26
Malmo Metropolitan Area (SE)	147	8,538	397	2.10
Mumbai Metropolitan Area (IN)	4,445	25,705	1,899	4.68
Chennai Metropolitan Area (IN)	6,042	24,963	2,798	4.45
Hai Phong City (VN)	1,212	2,962	850	3.48
Nha Trang City (VN)	1,558	2,008	1,080	3.97
Lisbon Metropolitan Area (PT)	959	1,906		
Algarve Region (PT)	86	-	-	
Funchal Urban Area (PT)	308	-	-	
Thames Gateway (UK)	1,450	-	-	2.42
Portsmouth City (UL)	2,717	-	-	2.28

In most case studies, the core area has much higher population, as high as 10 times more than the ring area. High population concentration is also observed in the coastal area. In some case-studies, such as Thames Gateway, Brugge and Lisbon, population density is uneven in the central core, with some sections of the city with very high population density (over 9000 people/km²). The Indian case-studies have exceptionally high population density.

During the last decade, between 2001 and 2009, all case studies areas saw an increase in population. For most cases, the increase was due to high level of migration (physical growth) rather than due to the natural growth of the population. Average annual population growth rate in European case-studies is below 1%. For Asian case-studies, the average annual growth rate is from 1.1%-3.3%.

European case-studies exhibit a general trend of aging population. Most of the aged population is located in the ring, with most cases have around one fourth of the population of the ring is over 65 (23% in Brugge, 30% in Oostend, 24% in Lisbon). Tel Aviv has the least aging population amongst the European case-studies.

Across the case studies, the household size reduced in the last decade. Household size is much larger in Asian cases, nearly double the figure for European cases. Household size in the ring and the core also differs. In most cases, the ring has smaller household size than the core, except for Swedish cases, where the core has much smaller average household size.

3.2 Tourism

All coastal urban areas in this study boast an important tourism industry, relying on their coastal resources, especially the beaches. For all areas, a combination of different but rich touristic resources draws tourists all year round, but summer is the touristic season in all. The main touristic features include:

Table 1.7. Touristic features of the case studies.

Case-studies	Beaches	Natural reserves/ parks	Special landscapes	Socio-cultural activities	Historical Cultural and Religious heritage	Other (business, shopping, etc.)
Rome Metropolitan Area (IT)	x			x	x	
Chieti-Pescara Urban Area (IT)	x					x
Oostende (BE)	x	x	x			x
(Zee)Brugge (BE)	x	x		x	x	x
Tel-Aviv Metropolitan Area (IL)	x			x		x
Haifa Metropolitan Area (IL)	x					x
Gothenburg Metropolitan Area (SE)	x	x		x	x	x
Malmo Metropolitan Area (SE)	x	x		x	x	x

Mumbai Metropolitan Area (IN)	x	x		x	x	x
Chennai Metropolitan Area (IN)	x			x	x	x
Hai Phong City (VN)	x	x	x		x	
Nha Trang City (VN)	x	x			x	
Lisbon Metropolitan Area (PT)	x	x	x	x	x	x
Algarve Region (PT)	x					
Funchal Urban Area (PT)	x	x				
Thames Gateway (UK)	x			x	x	x
Portsmouth City (UL)	x			x	x	x

Table 1.7 shows that all coastal urban areas in this study possess a strong beach tourism sector, supplemented by other attractions such as natural parks, special landscape, socio-cultural activities, historical-cultural heritage, etc. For the areaa with warm climate, beach tourism dominates the industry as it can be running all year round. For more northern areas, where beach tourism is limited mostly to summer period, supplemented activities are introduced to attract tourists the rest of the year. For whatever the touristic formula is, the main objective of all studied coastal areas is to keep an up-and-running tourism industry.

In all case-studies, number of tourists and number of overnight-stays have increased during the last 10 years. Also, number of tourism facilities (accommodation and horeca) also increases.

3.3 Industrial, Trade and Commerce

Contribution of the industrial, trade and commerce sectors in SECOA case-studies vary greatly. However, it is notable that industrial activities have been reducing in the European cases during the last decades. The economies have shifted from manufacturing economies into trade and commerce economies, with high concentration in IT and service sectors.

A reverse trend is seen in the Asian cases, where industrial sector (especially manufacturing) is gaining importance, especially towards exportation. Trade and commerce is also strong in all Asian cases.

3.4 Agriculture

Across the 17 case-studies, farming is shown as a not important feature in coastal areas of the European countries but still having substantial position in the economy of the less developed countries like India and Vietnam.

Arable land (including actual farming area, pasture, orchards and non-use arable area) has different position in different case studies in term of its contribution to the economy, especially through employment. In some cases like the Belgian, UK, Italian cases, and in Algarve region (Portugal), the arable land area accounts for 42% to 78% of the total land areas. However, the actual farm land (including pastures and orchards) is small (around half of the arable area). The employment in the agricultural sector is also marginal in most of the European cases.

Agriculture is still one of the largest land-use categories. However, actual number of farms and the number of employments in agricultural sector are low. The production is also marginal in most of the European cases.

Table 1.8. Arable land area (ha) and agricultural employments.

Case study	Total Agricultural/Arable Area (ha)	% of total land area	Employ-ments (% of the working population)
Rome Metropolitan Area (IT)	553,956.8	68.2%	
Chieti-Pescara Urban Area (IT)	92,552.2	78.1%	
Oostende (BE)	17,246.8	69.2%	
(Zee)Brugge (BE)	39,965.0	64.9%	
Tel-Aviv Metropolitan Area (IL)			
Haifa Metropolitan Area (IL)			
Gothenburg Metropolitan Area (SE)	41,534	22.48%	
Malmo Metropolitan Area (SE)	49,889	71.21%	
Mumbai Metropolitan Area (IN) (2006)	11,095,181	28.5%	2.45%
Chennai Metropolitan Area (IN) (2006)	1,207,850	12%	3.07%
Hai Phong City (VN)			
Nha Trang City (VN)			
Lisbon Metropolitan Area (PT) (2006)	57,257.0	19.1%	
Algarve Region (PT) (2006)	108,615	49.2%	
Funchal Urban Area (PT) (2007)	4,353	12.7%	
Thames Gateway (UK)		42.4%	0.2-2.3%*
Portsmouth City (UL)			0.39%

In all case-studies, most of the agricultural activities happen at the ring. European cases witness in general a reduction in agricultural activities, both in terms of number of businesses as well as of agricultural employments, although at very different rates. There is also a shift in agricultural activities, with less production on cultivation and a shift towards husbandry.

In Asian case-studies, agriculture remains an important sector, with increase in both cultivation and husbandry. Intensive production is also on the rise in all 4 Asian coastal urban areas.

3.5 Fishery

Across all case studies in the project, fishing remains important only in few places. In Europe, Chieti-Pescara (IT), Portmouth (UK) and Gothenburg (SE) are the major quarters accommodating fishing fleets and fishery processing facilities. At all Asian cases, on the contrary, fishing is still an important economic and subsistent activity. The coastal areas of the Asian cases are still filled with small fishing villages, though mingling into resorts and tourism development projects.

Fishing is an important economic activity and plays a central role in the socio-economic development of the two metropolitan cities in India (Mumbai and Chennai) as well as in the two cases in Vietnam. This activity has been important traditionally also. The demand for fresh marine fish has been growing steadily. In the Asian cases, fish markets are the most lucrative for different types of marine fishes. The four Asian cases also address for important ports that are also the main ports to export seafood. Increasing demand has also accelerated the growth of aquaculture.

3.6 Ports

Ports are important features at all coastal areas in this study. They are all different in size and functions but all play important roles in the development of the urban area where they are located in. In some cases, they even shape its development. There are still few small fishing ports remaining but commercial ports prevail in all areas. All ports in the study sites saw increasing throughput during the last decade. The ports in the study areas also aim to develop their added-value activities through becoming a multi-modal node, where shipping, rail, road and inland waterways meet. Secondly, they aim to provide services within the ports (stripping and packaging, combine shipments, etc.) to attract more customers. Therefore, the ports become a complex that edge between manufacturers and customers.

Ports become more and more an employment node in most of the coastal urban areas in this study. For example, the port of Zeebrugge creates around 11,000 direct jobs or around 15% of total employments in the Brugge Metropolitan Area. It also creates around 9,000 indirect jobs. To the south, the Port of Lisbon generates around 40,000 employments and contributes around 5% of the Regional GDP.

Most of the major commercial ports in the project case study areas want an expansion in size to accommodate more activities and services.

3.7 Environmental/Community groups

Environmental groups and non-government organizations (NGOs) play an important role in environmental education, taking up civic and environmental issues, and in promoting greater accountability and transparency in government actions. There are a variety of organizations in the case studies areas who area involved mostly in following activities:

1. Promoting environmental and natural resources protection through projects and advocacy;
2. Capacity building for local people in environmental and natural resources protection through training;
3. Organisation of advocacy actions against (local) governmental policy/projects;
4. Protection of local people's rights.

While many of the organizations are internationally and nationally organized groups, more and more community groups (locally organized groups) are formed, especially in Europe. Depending on the approach adopted, each group has its own focus groups amongs the local where it asserts its activities. Most of the organizations focus on the poorer/disadvantaged stratumof the population, as it seems that their voice is often neglected. This includes women, youth or low-income groups.

In many cases, environmental/community groups were formed to counteract political movements, such as the cases in Italy or UK. Nonetheless, their role is particularly important when development projects mainly aiming at economic growth put in danger natural and cultural heritage. Their main focuses are to protect environment and resources, as well as the right of local people to have a voice in what happens locally. In developing countries (India and Vietnam), environmental/community groups mainly focus on improving local people

livelihoods while contributing to environmental protection and sustainable resource use. Political movements in these countries are none to little existence. Some policy advocacy actions are organized, but often at limited extend.

3.8 Second-homes

The trends development for owning a second residence in the coastal zone for recreation has become more and more prevailing in many coastal areas worldwide. Second-homes are properties owned or rented on a long lease since it is the occasional residence of a household that usually lives elsewhere (Shucksmith, 1983). This definition gives room for various interpretations and comprises different types of property in different countries. By definition, second-home owners are not resident of the commune where they own their recreational property. They often live elsewhere and only stay at their second-homes occasionally, and often seasonally. For the coastal communes, second-homes are most used during summer season and less during other months. However, there are also other forms of temporary residence, as for example along the Swedish coasts where a long trend is that people transform their second homes into permanent residence – legally or informally.

Also, by definition, second-homes are recreational properties. Therefore, it shares many of the characteristics of other recreational properties in terms of tourism impacts on the environment and society. Therefore, second home owners are one of the users that have a direct implication in resources consumption. Their action corresponds mostly to punctual uses. In most of the cases, second home owners are well-off people, who can afford a second property elsewhere for occasional uses.

Studies on the impacts of second-homes (and owners) have been undertaken in many areas worldwide but mostly in developed countries. The main conclusions are that second-homes contribute to economic development (through the use of the residences and other services), (re)generate social development and socio-cultural interactions.

On the negative side, second-homes tend to possess the "defects" of tourism accommodation, which consume more resources (fresh water, electricity, land, etc.) and produce more waste than a normal accommodation. Its positive contribution is often seasonal which creates imbalance in services provision. Also, it attracts only certain types of services, such as recreational personal care (spa, beauty salon, etc.), catering, transport, etc. but does not contribute to the development of education, for example. Also, studies point out that most of the second-home owners are retirees or near the end of their active working life, and therefore contribute to the aging of the host society. This continues in a vicious cycle as the more aged a

society, the more driven away the local youth as social and cultural services tend to be designed to fit to the aging permanent tourists, who are often well-off and ready to pay extra during their holidays. Studies also show that second-home owners can contribute effectively in shaping the development directions of the host community.

Each case study in the project has different form of second-homes and their particulars contribute to the shaping of the local society. Currently in most of the case studies, the presence of second-homes is undeniable but the extent is not well researched in many cases. Also, there is an unascertained potential of second-homes which could be rented out as self-catering accommodation to visitors but are currently only used by the owners' families, friends and relatives; there are no current figures on the level of utilisation by the owners or their willingness to rent their property. In Belgium, UK and Portugal, some data is available on the second-homes and presented below.

In 2007, the coastal communes of Brugge SA and Oostende SA have in total of 82,700 second homes amongst them. Coastal communes Brugge SA are the most popular destinations for second-home owners, with Knokke-Heist leads the list with approximately 18,200 second homes. Blankenberge has roughly 6,600 units and Zeebrugge has around 830 units. They are all at the coastal front.

Coastal communes of the Oostende SA are also a popular destination, with Middelkerke on top with more than 14,000 units, followed by Oostende with around 6,600 units. Bredene also has around 1,000 units of second homes. The number of second homes in Oostende has increased from 5,220 units in 1989 to 6,600 in 1997 (Oostende Gemeentelijk) and kept stablised.

Second homes have been one of the main causes for urban sprawl in the Tagus Estuary, Portugal. In Lisbon Metropolitan Area there is a more predominant occurrence of weekend residences. Regarding the proportion of seasonal use dwellings. Almada and Cascais are the two municipalities that outstand in the study area. It must be said that the great feeder of this second home owners are Lisbon residents. Second homes have a direct correspondence with beach areas. Thus, the south bank of Tagus Estuary is preferably chosen for weekend short-breaks. Costa de Caparica stands out with 75% of dwellings for seasonal use.

According to the 2001 census approximately 0.2 % of homes in the local authority areas in which the Thames Gateway is located were either second homes or holiday accommodation, against an average of 0.7 % for England and Wales. A subsequent estimate suggested that by 2005 approximately 1.0 % of homes in the UK were second residences, reflecting changing patterns of divorce, employment and living arrangements. According to the 2001 census 0.4 % of homes in Portsmouth (340) were either second homes or holiday accommodation, against an

average of 0.7 % for England and Wales. A subsequent estimate suggested that by 2005 approximately 1.0 % of all homes were second residences.

4. Conclusions

Due to the uneven levels of standardised and detail data for different case-studies, it has not been the aim of this chapter to provide a comprehensive comparison between all the case studies. Rather, an attempt is made to give a first impression on the resources and users in study areas, using a preliminary, first observations that need to be specified, substantiated and modified in further research, by more in-depth comparison.

From the first impression, it is indicated that all coastal cities in the project face challenges rising from the relationships between urban development, human mobility and environmental changes. However, different development histories and environmental settings of case studies also mean that these differences are articulated differently, as are policy responses.

All the coastal areas considered are highly populated and heavily urbanized. There is an increase of the population that is registered along these areas. The increase is also more pronounced in larger case studies, which implies an increase of the human stress on this environment. Internal and international migration, as well as a large student population, have contributed to this renewed demographic dynamism.

In terms of land use, in all the metropolitan areas a decrease of the agricultural land is recorded; the industrial, built up and commercial areas are expanding mostly in the ring. Given the ecosystems importance at all sites, many areas, mostly intertidal areas (mudflats and salt marshes) are protected by national and international conservation designations, including Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI).

Economically, in all case-studies, there is a shift in European case-studies towards to information and services economy. While almost all case studies are relatively prosperous by the standards of their national standard, they also contain areas of very high social, economic and environmental deprivation. The unemployment rate in all cases is close to their national average. In all metropolitan areas the tourist sector is in steady growth. A very high increase is recorded in the number of enterprises and a non-negligible increase is also reported in the number of tourists. Cultural heritage is an important resource in all the metropolitan areas.

In term of users, there are both similarities and differences between the case studies, and these of course partly relate to population sizes and locations as well as to the environmental

and socio-economic systems outlined above. The conflicts between these users are also played out in context of very different development potentials.

The dominant users in all metropolitan case studies are the urban population who live within short distances from the coast and enjoy the coastal environment. The only other dominant coast user is the tourist establishment both distributed in specific areas with the former located usually in less urbanised areas and the latter in urban areas especially in the waterfront zones.

The tourism streams are diverse and include both (relatively older) cultural tourists and visitors, and (younger) night-time economy participants. Economically tourism is recognised as a major income potential for the entire coastal stretch and is evident in coastal urban fronts; the majority of the conflicts along the coastal stretch involve further development of tourist establishments. This is enhanced by the increasing influx of visiting tourists. All coastal areas are affected by intense seasonal uses, often during summer season, due to a higher number of temporary inhabitants. It poses problems of water availability and waste production. The numerous beach houses' activities during summer contribute to lower the quality of life of residents. Thus the very valuable cultural and natural resources are put in danger by the intense use of coastal areas. There are diverse employers, ranging from small service establishments to major manufacturing enterprises, but the economic structures of all case-studies are very different. In some cases, the structure is defined and stable (such as Rome, Lisbon, Brugge, Oostende, Gothenburg, Malmo) while in others it is dynamic and changing.

Port activities remain significant in all cases although there is a shift of the port activities, to become port-industry areas with added-values activities. Harbours and airports activities all year long contribute to the pollution problems.

Farmers are an important group of users in eastern Thames Gateway, but of limited importance elsewhere, as is commercial fishing. Fishing is not frequent in the all the European cases but remains an important sector in Asian cases. The same is applied to the agricultural sector.

As would be expected, a range of international and national conservation bodies are represented in most of the case studies, involving public, private and voluntary sectors. Their focus is mainly on protected coastal areas, and on historic cultural and industrial sites, many of which are directly connected to estuarine, coastal and harbour sites. There is also a very large number of local conservation groups in all cases.

CHAPTER 2.

An Overview of Territorial Resources and Their Users in the Rome and Chieti-Pescara Areas

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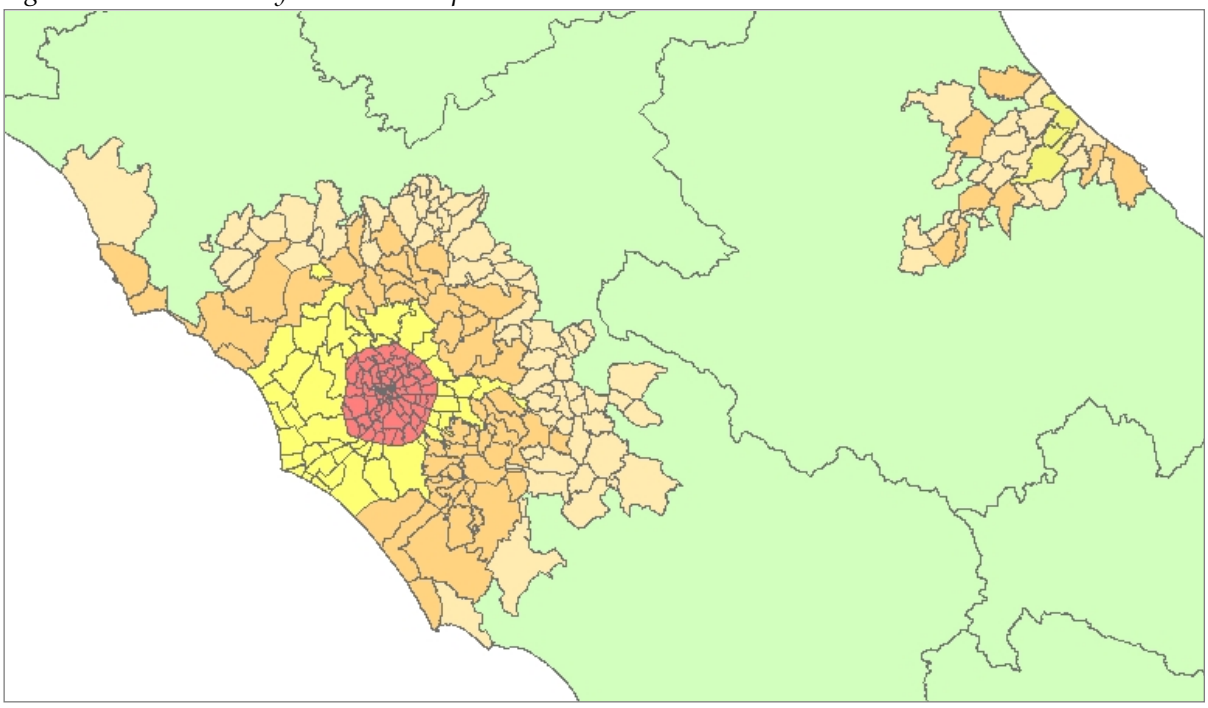
1. Introduction

In this chapter two territories - the Rome metropolitan area and the Chieti-Pescara urban area – will be described and analyzed. Located in the central part of the Italian peninsula, the first one is situated along the Tyrrhenian Sea, whereas the second one faces the Balkans, along the Adriatic Sea. The first one is a large size area including the capital city, while the second is a mid-sized one. They can be considered as connected in a longitudinal way, since their position is symmetrical as regards to the Apennines; they are linked by an important infrastructure (the A24/A25 highway) and the population is gradually expanding towards inlands. The Apennines that are located between the two areas represent a contact point rather than a divide.

The chapter intends to provide a general framework of the areas that could be used in further analyses. The main purpose is offering to readers a wide set of data and information that could be further interpreted and developed. That is why the chapter will be mainly descriptive and will include several maps and tables.

Our analysis aims at highlighting the main spatial and socio-economic characteristics of the two areas where several conflicts, linked to the different objectives of economic development and environmental protection, are taking place. After presenting the data and methodologies used in the study, main territorial resources in the two areas are described in the first part. In the second part, main users of those resources are analysed. In conclusions, we try to assess main contrasts arising by the conflicting interests of different users of the same resources.

Figure 2.1. Central Italy: Rome Metropolitan Area and Chieti-Pescara Urban Area.[*]



2. Materials And Methods

The coastal areas examined in this chapter have been defined based on administrative units. Since data are at the moment available only at municipal level, the definition has been constrained by this fact. The coastal zones, indeed, are overweighed with respect to the reality.

Land use analysis is based on the CORINE land cover and referred to the period of 2000-2006.

In the analysis concerning the demographic dynamics (residents, households, migration), data provided by the ISTAT (National Institute of Statistics) population database have been used.

In the analysis concerning the sectors of economic activities, data concerning the number of local units and the number of jobs in the enterprises have been taken into account for the period of the nineties. Those data come from the Tagliacarne Institute "Geostarter" database. The Tagliacarne Institute is a research institute of national relevance strictly connected with the system of the Chambers of Commerce. This institute produces every year an updated database

[*] Source: own elaboration based on Del Zotto et al., 2010.

containing all the relevant information about enterprises. Our data are analyzed for the period of 1991-1996 (jobs and local units), for the period of 1995-1999 (jobs) and 1995-2000 (local units). The reason for these two different periods presenting overlaps is that those data, even though contained in the same database, have different sources: data referred to the period 1991-1996 have their source in the ISTAT Census of the Industry and of the Services; data referred to the periods 1995-1999 and 1995-2000 have their source in the registers of the Chambers of Commerce (Infocamere). Those data are, therefore, not comparable, but their joint analysis offers the possibility to understand the process for the entire decade.

In the analysis concerning the sectors of economic activities, local units of enterprises have been taken into account for the period after 2001. Those data come from the Tagliacarne Institute database (Geowebstarter).

The use of the Tagliacarne Institute data has two important implications in the analysis: (i) in the agriculture sector only the enterprises developing the so-called "manufacturing agricultural activities" (attività agricole manifatturiere, i.e. those activities connected to agriculture, such as processes of transformation of grapes, olives, milk) are taken into account. It means that the main agricultural activities (farming and breeding) are excluded from our data. This is because for the time period we are analyzing (last decade) those are the only available data. At the moment the Agriculture Census 2010 data are being processed. Thus new data are expected to be available in the near future. Nonetheless, the data currently available are able to provide a clear image of the reality; (ii) in every sector only the activities developed by enterprises are taken into account; this implies that all the activities developed by institutions are excluded from our analysis. Since the majority of public services in Italy is provided by public authorities, it means that the service sector's data are underestimated. Data concerning the number of local units for public schools, public hospitals, public transportation, public postal service, are not included in our analysis.

In the definition of the tourist sector, the number of local units of hotels and restaurants has been taken into account. Tourist overnights are reliable data in the case of the Rome metropolitan area, whereas they have proven to be imprecise in the Chieti-Pescara urban area. They have only been used in the former case.

Cultural and historical heritages have in Italy, above all in the municipality of Rome, an immense value. Because of its extent we have chosen to consider only the heritages owning some international recognition (for instance from UNESCO).

3. Overview of Territorial Resources in the Case Studies

3.1 Rome metropolitan area

3.1.1 Geographical and historical overview

Rome, located in the centre of the Italian peninsula, is the capital of the country and of the Lazio region. Its economy has been traditionally based on the service sector with an outstanding role played by the tourist sector; in recent years, there has been a growth in advanced activities of the service sector, in particular Research and Development by public and private companies. The Rome municipality is at the core of a large metropolitan area. The Municipality of Rome has assumed the role of a "Metropolitan City", which would include exercising the functions of a metropolitan authority on a larger territory than at present.

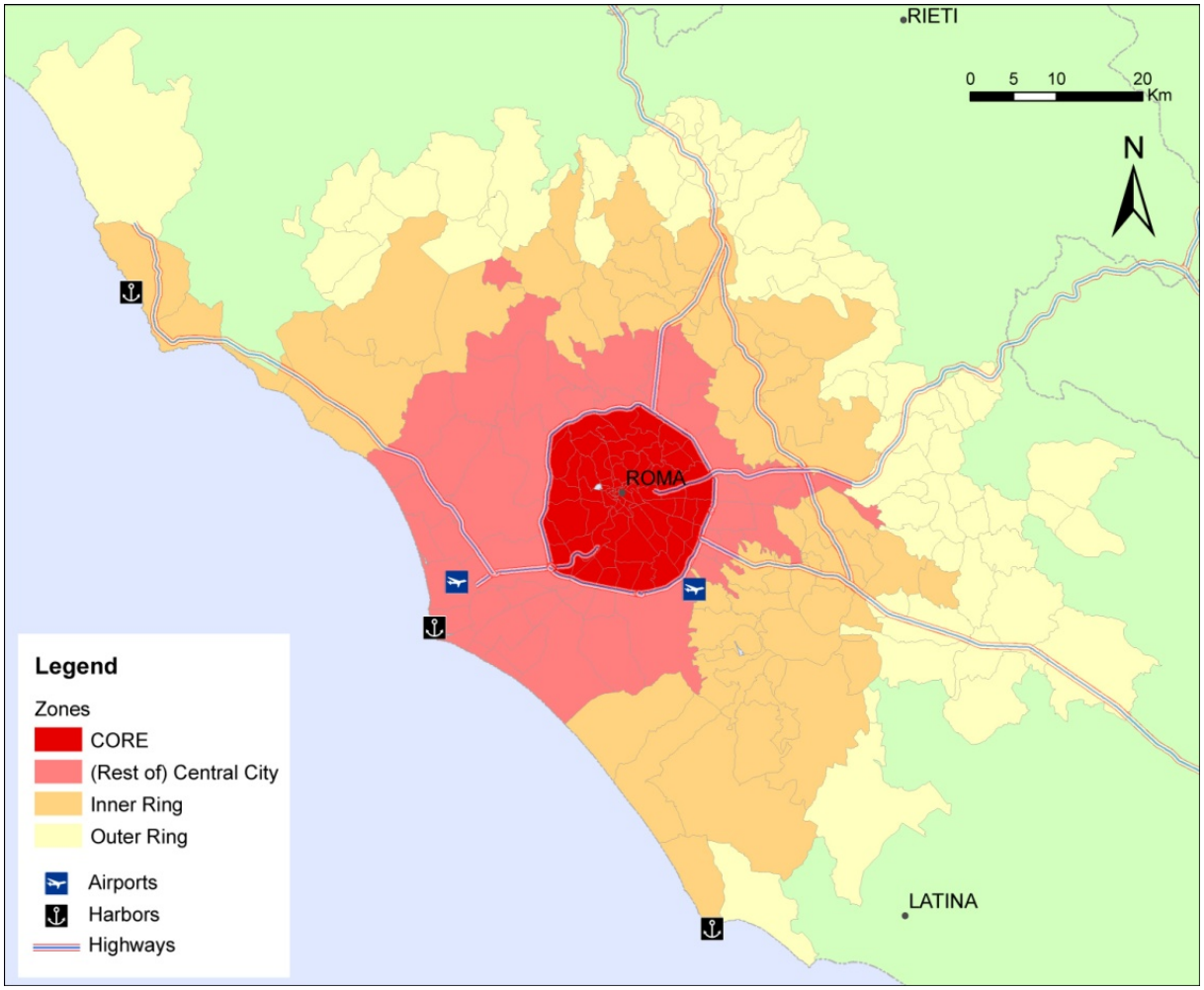
The Metropolitan Areas (MA) in Italy are defined by Law 142/1990. After having provided a strict list of municipal centres of the MA, the law transfers to the regional governments the power of defining the territories, which included those of the 12 MAs, without defining strict criteria of inclusion/exclusion in/from the MA. Instead, it only requires that the municipalities included in the MA have a strong interaction with the main city in relation to economic activities, the essential services for social life, cultural links, and territorial characteristics. In this research, the definition provided by IRSPEL (1991, p. 17), the Regional Institute of Research for the Territorial and Economic Planning in the Latium region, was adopted for the Rome MA[*] (Montanari and Staniscia, 2012).

In order to reach the objectives of our analysis the Rome MA has been divided into three zones, defined as “central city” (core and rest of the central city), “inner suburban ring”, “outer suburban ring”. The central city covers a surface of 1498 km². Its territory is very densely populated but, however, especially in its external part, presents some urban protected areas, which enter as “wedges” in the core of the city. The central city is characterised by a circular road system (the ring-road), which is intersected by some perpendicular roads, as the highway

[*] The following variables were taken into account: Economic activities: daily average flow of people for work reasons from/to Rome. Social services: daily average flow of people for study reasons from/to Rome; daily flow of people attending courses in high schools from/to Rome; yearly flow of people hospitalized in the Roman hospitals. Cultural links: number of second houses occupied by the residents in the municipality of Rome; changes in the residence from/to Rome in the period 1976/1981; changes in the residence from/to Rome in the period 1987/1988. Territorial characteristics: accessibility level to Rome, measured by the transportation costs.

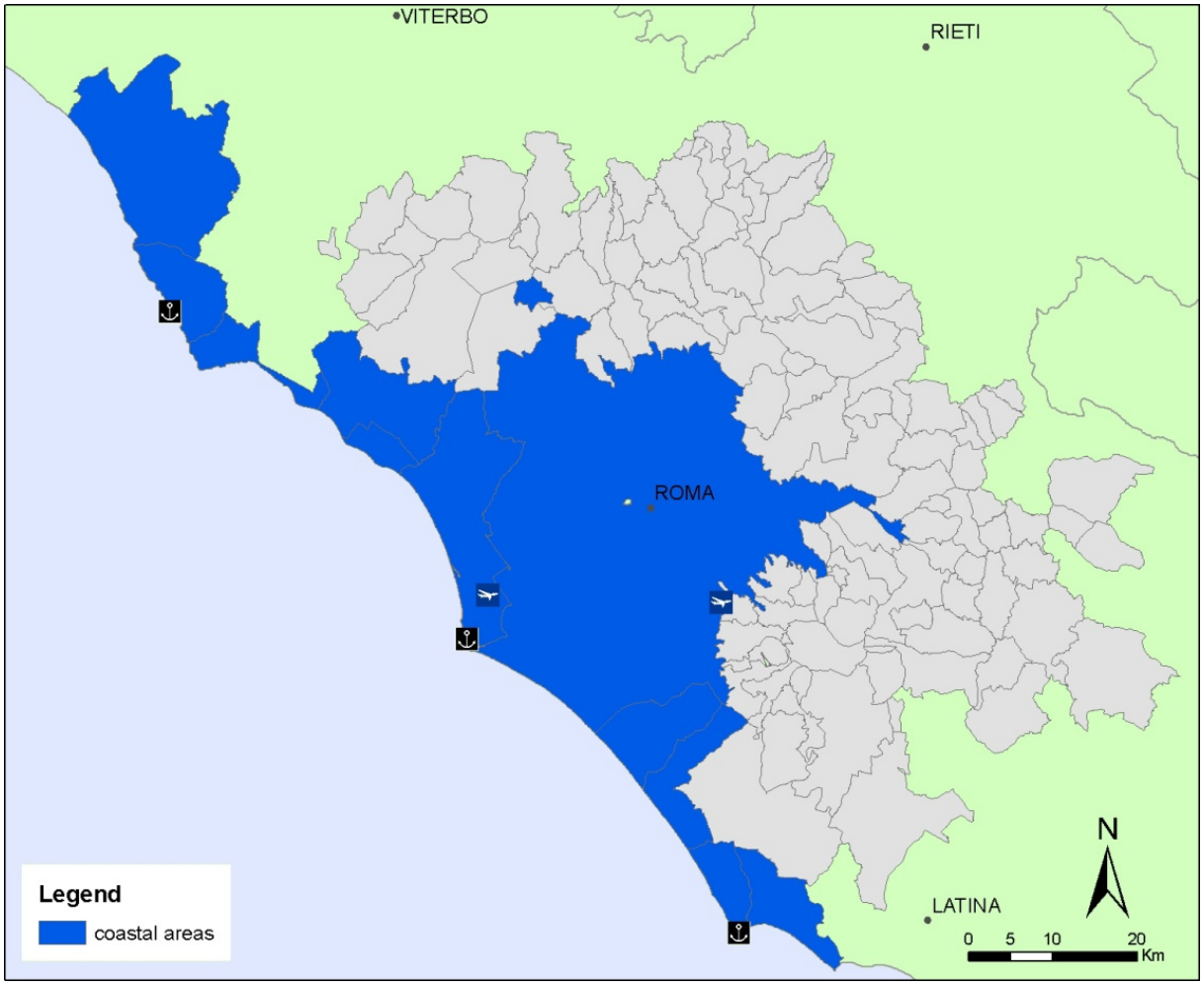
A1 connecting the northwest to the southwest parts of Italy, the A12 connecting the Tyrrhenian cities, the A24/A25 connecting the central-western part of Italy to the central-eastern part. The inner suburban ring covers a surface of 2125 km² and the outer suburban ring covers a surface of 2169 km². All the three areas have experienced an increase of population in the last decade.

Figure 2.2. Rome Metropolitan area, sub-divisions and infrastructures.[*]



[*] Source: own elaboration.

Figure 2.3. Rome MA, coastal zone.[*]



3.1.2 Bio-physical resources

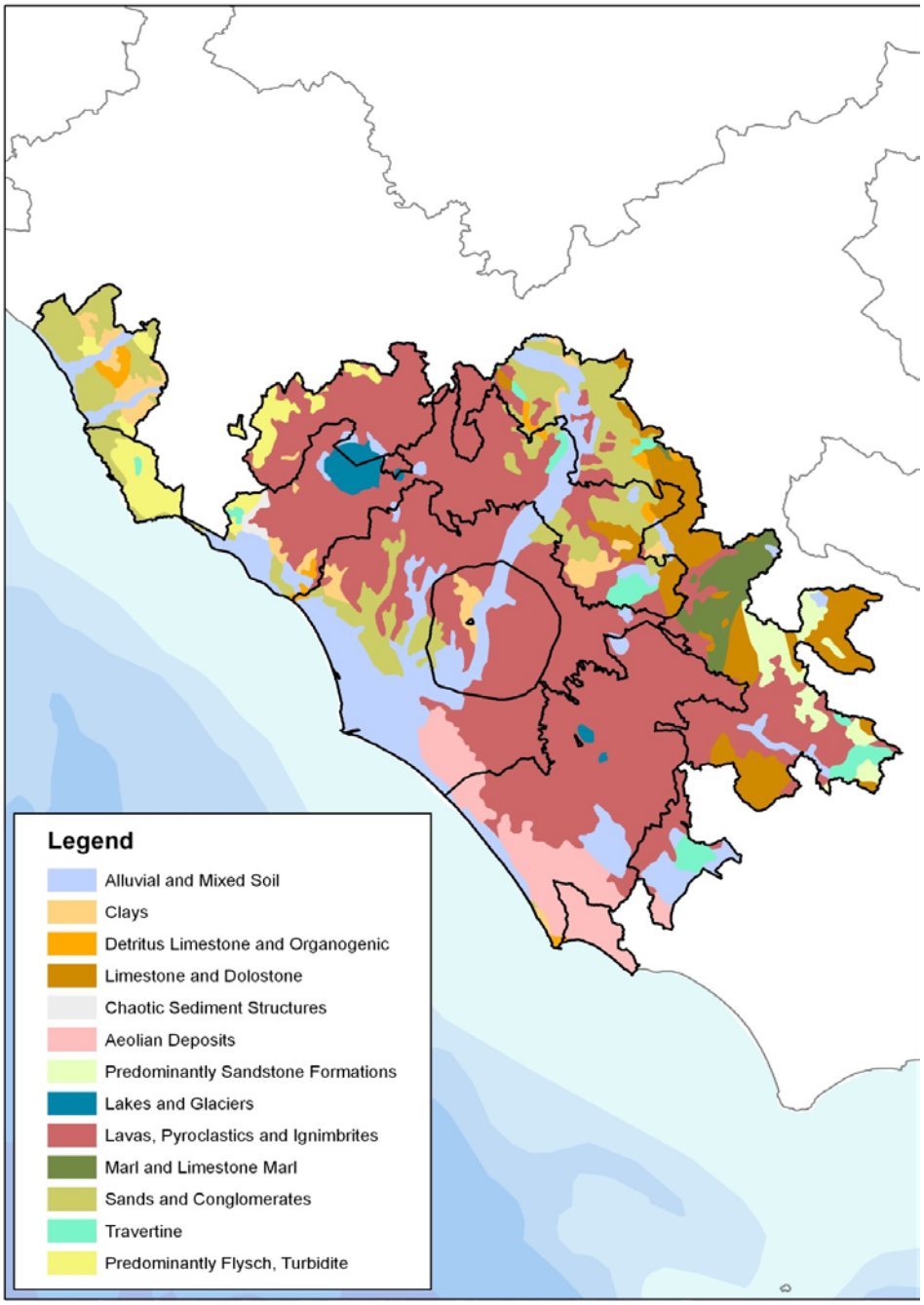
3.1.2.1 Area and typology

The metropolitan area of Rome is mostly hilly with plains next to the seaside. The most internal municipalities located in the outer ring are close to the Apennine mountains, crossing Italy from the north to the south. The area is geologically young, characterized by alluvial plains along the coast, volcanic hills running parallel to the coast, lavas and pyroclastic rocks in the central part, limestone structures in the hilly and mountainous part. The coastal area's length is 150 km and runs from Marina di Tarquinia to Torre Astura. The central part is dominated by the Tiber delta that represents the main sedimentary outputs and determinates the sedimentary state of the area. Beaches are sandy and slightly curved, sometimes rectilinear and bordered by dunes. The northern part (Tarquinia-Santa Marinella) and the southern part

[*] Source: own elaboration.

(Tor Caldara-Torre Astura) present traits of cliffs and rocky coasts. Highly urbanized areas alternate with low urbanized or non-urbanized areas. The latter depends on the presence of protected areas. Coastal erosion is a relevant problem mostly caused by the decreasing amount of sediments carried by the rivers (Lupia Palmieri *et al.,* 2010).

Figure 2.4. Rome MA, geology.[*]

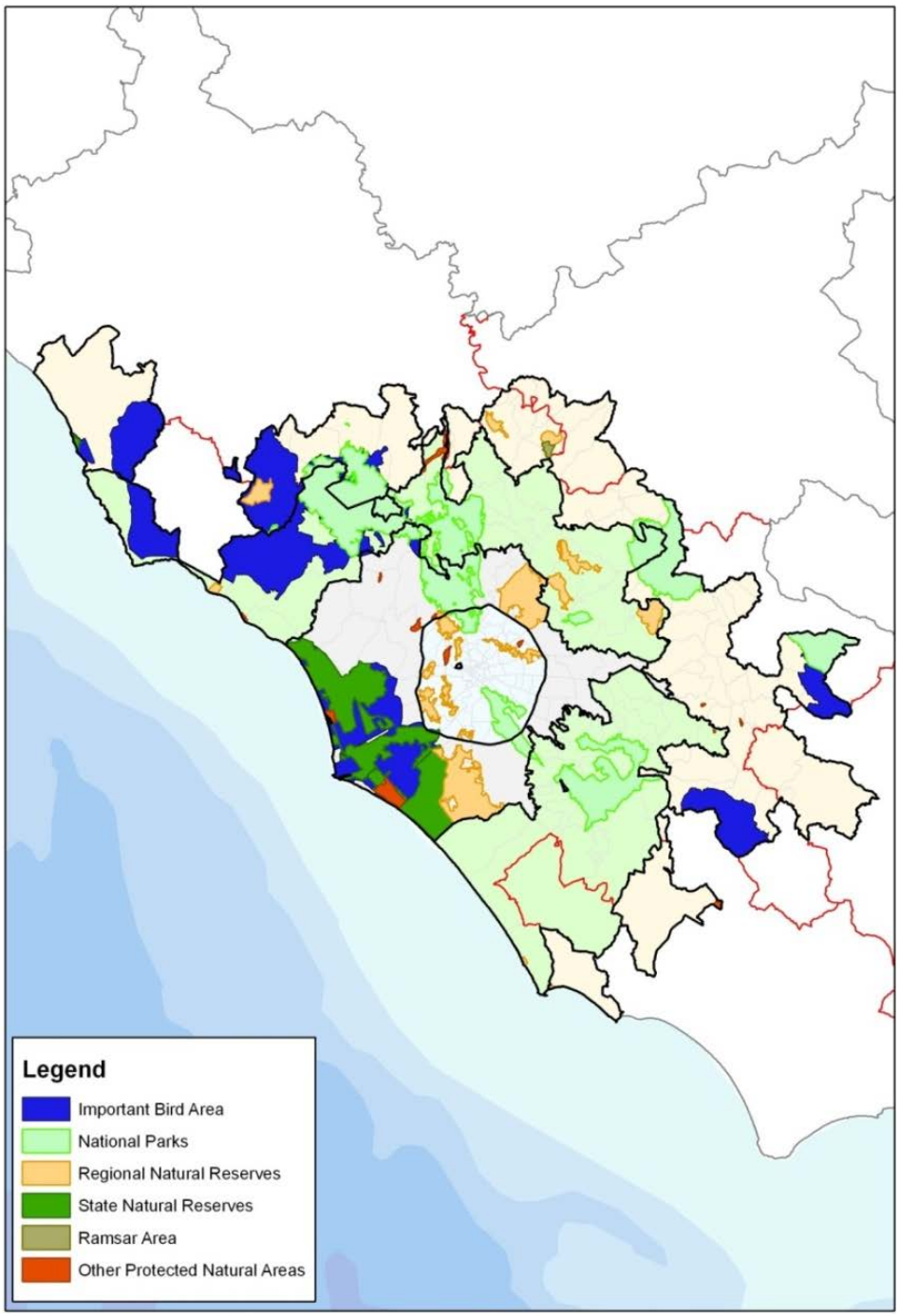


[*] Source: own elaboration based on Del Zotto *et al.,* 2010.

3.1.2.2 Coastal and marine ecosystems

The Rome metropolitan area is characterized by a very rich and diversified ecosystem that, due to its fragility, is in some cases protected. Protected areas can be found in the most important natural reserves of Litorale Romano (15,900 ha) and Castel Porziano (5,900 ha); other protected areas are the Saline di Tarquinia, Macchiatonda, Palude di Torre Flavia, Tor Caldara, Villa Borghese di Nettuno (totally 550 ha). In addition a shoal located between Ostia and Torvajanica, 4 to 8 miles off the coast, is a natural reserve of 1200 ha. Along the coast, in the protected areas where the human action is absent, there are several dunes with their own specific vegetation, mainly shrubs growing in the Mediterranean basin (maquis shrubland). Plains close to the coast present many swamps and pools, surrounded by Hydrophile woods. Several species of mammals, birds, amphibians, fishes, reptiles and insects populate the coastal environment. The core of Rome is surrounded by the so called Agro Romano, a rural area cultivated for centuries. The dominant landscape is characterized by olive and almond trees as well as prairies. The pre-mountain part of the metropolitan area presents a very rich ecosystem with vegetation types ranging from species typical of the Mediterranean basin to those typical of central Europe and sub-alpine areas. Along the two main rivers (Tiber and Aniene) woods and cane ponds can be found. In the surroundings of the lakes (Bracciano, Albano, Martignano and Nemi), thanks to the special soil of volcanic origin, the vegetation ranges from maquis shrubland, riparial vegetation, woods of oaks, chestnuts and beeches. Woods are populated by many species of flowering oil plants (Del Zotto *et al.*, 2010).

Figure 2.5. Rome MA, protected areas.[*]



[*] Source: own elaboration based on Del Zotto *et al.,* 2010.

3.1.2.3 Soil and land-uses

The Rome metropolitan area covers a surface of 5,793 km². The agricultural zones, in terms of land use, represented 68% of the total surface in the year 2006. In the same year the areas exclusively dedicated to industrial firms and commercial spaces represented around 2% of the total, while 9% of the surface was a built-up area in the urban environment. Natural and open spaces totally accounted for 20% of the surface; the rest was covered by roads, railways, ports and airports. What could strike the reader is the large size of the agricultural land. Rome, in fact, even if it may look like a paradox, is the largest rural municipality in Italy. It is, also, the largest municipality in Europe: its inhabited surface area amounts to a little less than that of Greater London and is almost double that of the Parisian territory within the *Petite Couronne*. There is also a peculiar spatial distribution of buildings within the municipality: large empty spaces alternate with large built-up spaces; light and shade effects create spatial discontinuity. This feature led to Rome being described as a city-archipelago (Marcelloni, 2003, p. 31). The vacant, non-built-up areas cover 73 percent of the territory; in Amsterdam and Paris these zones account for just 23 percent of the total. These voids in Rome are often farmland or areas that have a high environmental, historic or cultural value. There are a few spaces in areas no longer used by factories, insofar as Rome has ever been an industrial city. Indeed, traditionally industry was located along a few road axes along which small and medium-sized enterprises grew up, but certainly not large-scale industry. The developed city, therefore, consists of residential-style buildings with some buildings dedicated to commerce and services activities. A characteristic of the Municipality of Rome is the large number of green spaces, archaeological sites, parks and natural reserves. This environmental system is constituted by the preservation of 82,000 hectares, 64 percent of the entire municipal territory (Montanari, Staniscia, Di Zio, 2007).

Between the year 2000 and 2006, the Rome metropolitan area has experienced a loss in the agricultural land and in the open spaces, an increase of the industrial, commercial areas and built-up areas. In the coastal area the trend is the same with a particularly high value in the loss of open spaces (-7.34%) and in the increased of the mixed industrial/commercial areas (+13.88%).

Table 2.1. Rome MA, land use, year 2000, own elaboration on CORINE, 2000.[*]

	Core	Inner Ring	Outer Ring	Coastal Zone
Total Area (sqm)	1498346078	2125811666	2169287794	2331375754
Agriculture Total Area (Sqm)	970319754	1543920739	1474863136	1599440735
Industrial Total Area (Sqm)	18041477	9974239	1807738	19445748
Mixed Industrial\Commercial Total Area (Sqm)	35409600	36614114	15272301	54503473
Natural Habitat Total Area (Sqm)	110383757	302843689	577849416	217519903
Open Space Total Area (Sqm)	32179792	58483731	46918566	36641743
Built up area in urban environment with mixed used (Sqm)	306789910	166319363	51406359	374329149
Road Network Total Length (Km)	1860,64637	183252,5109	78861,91805	2446
Railways Total Lenght (Km)	348,632815	307,0523403	177,2207345	448
Harbors areas (Sqm)	814864	559991	212926	1587781
Airports areas (Sqm)	18224532	4938142	0	22327512

Table 2.2. Rome MA, land use, year 2006, own elaboration on CORINE, 2006.[**]

	Core	Inner Ring	Outer Ring	Coastal Zone
Total Area (sqm)	1498346078	2125811666	2169287794	2331375754
Agriculture Total Area (Sqm)	952783364	1535862109	1472204463	1578717897
Industrial Total Area (Sqm)	20310138	8980752	2390744	21106402
Mixed Industrial\Commercial Total Area (Sqm)	41652655	39006620	16448696	62067703
Natural Habitat Total Area (Sqm)	113213117	302124788	577743711	220418584
Open Space Total Area (Sqm)	29247091	60489396	46918566	33953810
Built up area in urban environment with mixed used (Sqm)	315351464	171529290	52411336	385049895
Road Network Total Length (Km)	1860,64637	183252,5109	78861,91805	2446
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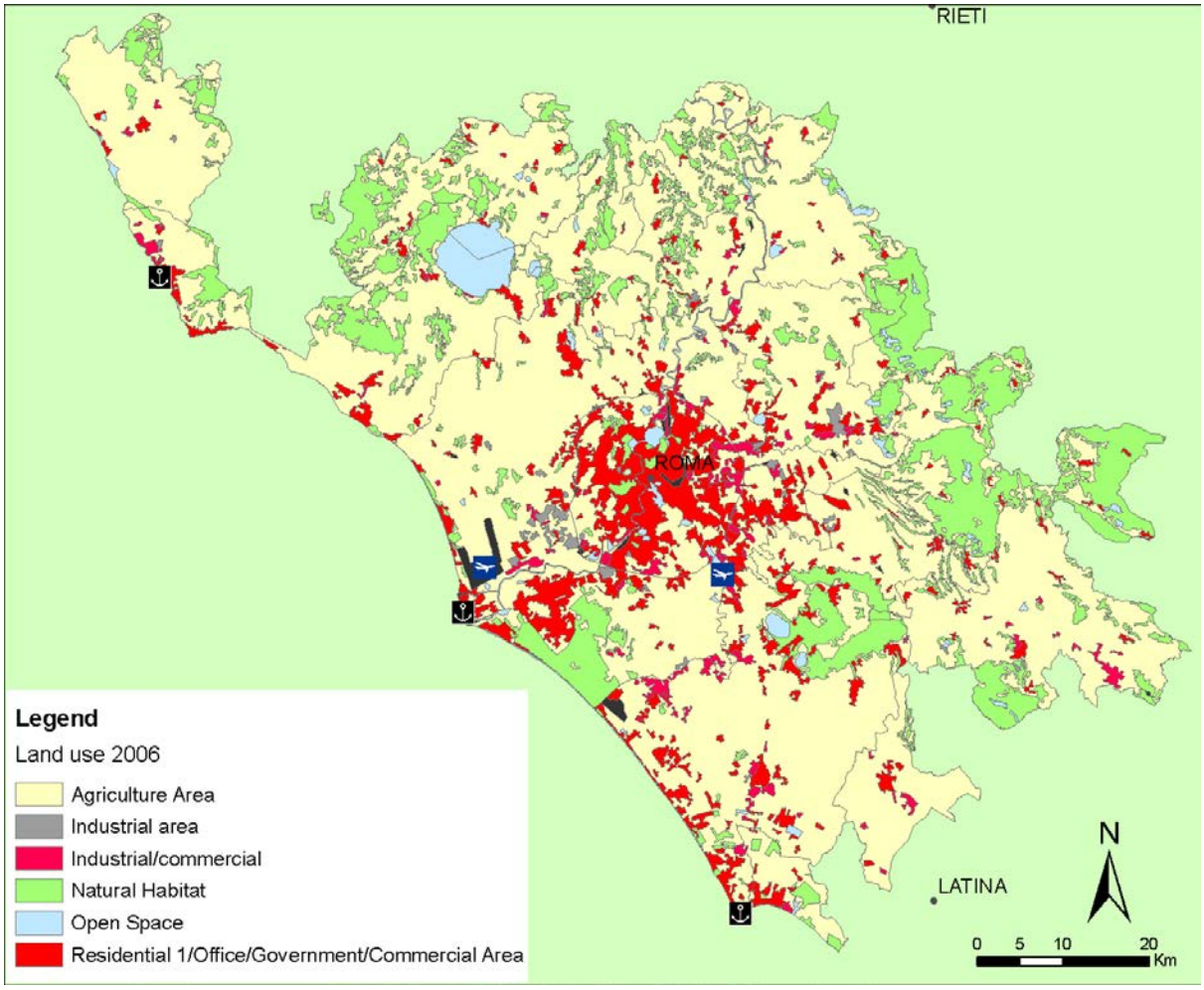
Figure 2.6. Rome MA, land use.[*]



3.1.2.4 Freshwater and access to water

The main rivers in the Rome metropolitan area are: Tevere (Tiber, the most important), Aniene, Arrone, Astura, Mignone, Sacco. The Tiber runs for 405 km, from the Apennines to the Tyrrenian Sea. The presence of two dams for the production of electricity is noted along the river. Their presence provokes a dangerous decrease of sediments and solid materials transported to the sea, which is one of the main causes of coastal erosion; 67 streams and 4 canals are counted in the area.

Parallel to the coast, 20-30 km inland, a line of volcanic hills runs; it is characterized by the presence of four volcanic lakes: Bracciano, Albano, Martignano and Nemi. Bracciano is the

[*] Source: own elaboration based on CORINE, 2006.

largest one with a surface of 5,764 ha, a maximum depth of 160 mt and a perimeter of 31 km. The lake is an important reservoir of drinkable water for the city of Rome.

The region offers several springs, under-lake springs and deep water tables. The most important groups of springs are in the outer ring (the upper valley of the Aniene River and the Monti Lucretili area, in the inner ring (the Bracciano lake area, Genzano and Pomezia) and in the core (Cecchignola, Grottarossa and Castel Giubileo) (Del Zotto *et al.,* 2010).

3.1.3 Cultural and social resources

3.1.3.1 Important cultural features

Rome is one of the richest zones of cultural heritage in the world. Listing all its valuable monuments, ruins, pieces of arts will be endless. The historic centre of Rome, the properties of the Holy See in Rome, San Paolo fuori le Mura (which is also Vatican's extraterritorial property) are listed among the UNESCO world heritage sites, as well as the Etruscan necropolises of Cerveteri and Tarquinia. Ostia Antica (the ancient Ostia city) is listed by UNESCO among the most important one hundred archaeological sites in the world. Focusing our attention on the coastal area, we can find ruins of villas, aqueducts, theatres, *thermae* (hot springs) and roads of different periods of the Roman age. Many museums, fortified towers and castles complete the framework. In order to give an idea of the importance of the cultural resources in Rome, it could be mentioned that the Vatican Museums - located in the centre of Rome, falling within the jurisdiction of the Vatican City - had nearly four and a half million visitors in 2008, over 3% more than the previous year. They represent the sixth most visited museum in the world, having moved up one rank since the previous year. The archaeological circuit "The Colosseum, Palatine Hill and the Roman Forum", alone drew nearly 5 million visitors (Montanari and Staniscia, 2012).

3.1.3.2 Important demographic and social features

In the year 2009 the resident population was equal to a total of 4,259,027 inhabitants, distributed among the central city (core and rest of the central city) (2,790,857 inhabitants; 65.5% of the total), the inner ring (1,110,106 inhabitants; 26.1% of the total), the outer ring (358,064 inhabitants; 8.4% of the total). This situation is the result of a non-linear development along the last two decades.

In the period of 1991-2001, the municipality of Rome, within the central city, experienced a decrease of population, the highest in the whole metropolitan area; the city of

Rome, alone, lost 315,000 inhabitants in 10 years. In the period of 1992-2000, the municipality of Rome experienced a negative migratory rate (on average -2.5 per thousand per year). The municipality of Fiumicino, where the major Rome airport is located and which was part of the municipality of Rome until 1991, indeed, experienced a considerable high positive migratory rate (on average +20.4 per thousand per year). The average yearly migratory rate of the whole central city in the analyzed period was –2.06 per thousand. The inner ring experienced a generalised increase of population, particularly high in the most southern municipalities. Few exceptions are represented by some eastern municipalities, which registered a net loss of residents. In summary, the area registered an increase of more than 64,000 units in the considered period. The inner ring experienced a generalised positive migratory rate, particularly high (> 25 per thousand per year) in a few municipalities surrounding the municipality of Rome. The total average yearly migratory rate was +15.5 per thousand. The outer ring registered a weak increase of population in the northern and southern parts and a loss of population in its eastern part. It registered a total increase of more than 16,000 residents in the considered period. The outer ring experienced a weak positive migratory rate in the majority of the municipalities, with some positive exceptions of high migratory rate in the northern part. The average yearly migratory rate was +8.7 per thousand (Montanari and Staniscia, 2003).

In the period 2003-2009 the Rome metropolitan area registered an increase of population of 10.5%; this increase is not equally distributed: it is higher in the inner ring (+17.71%), followed by the outer ring (+12.75%) and the central city (+7.65%). The coastal area registered a relevant increase equal to +9.20%. The process is mainly due to a positive migratory rate, also influenced by the real estate price.

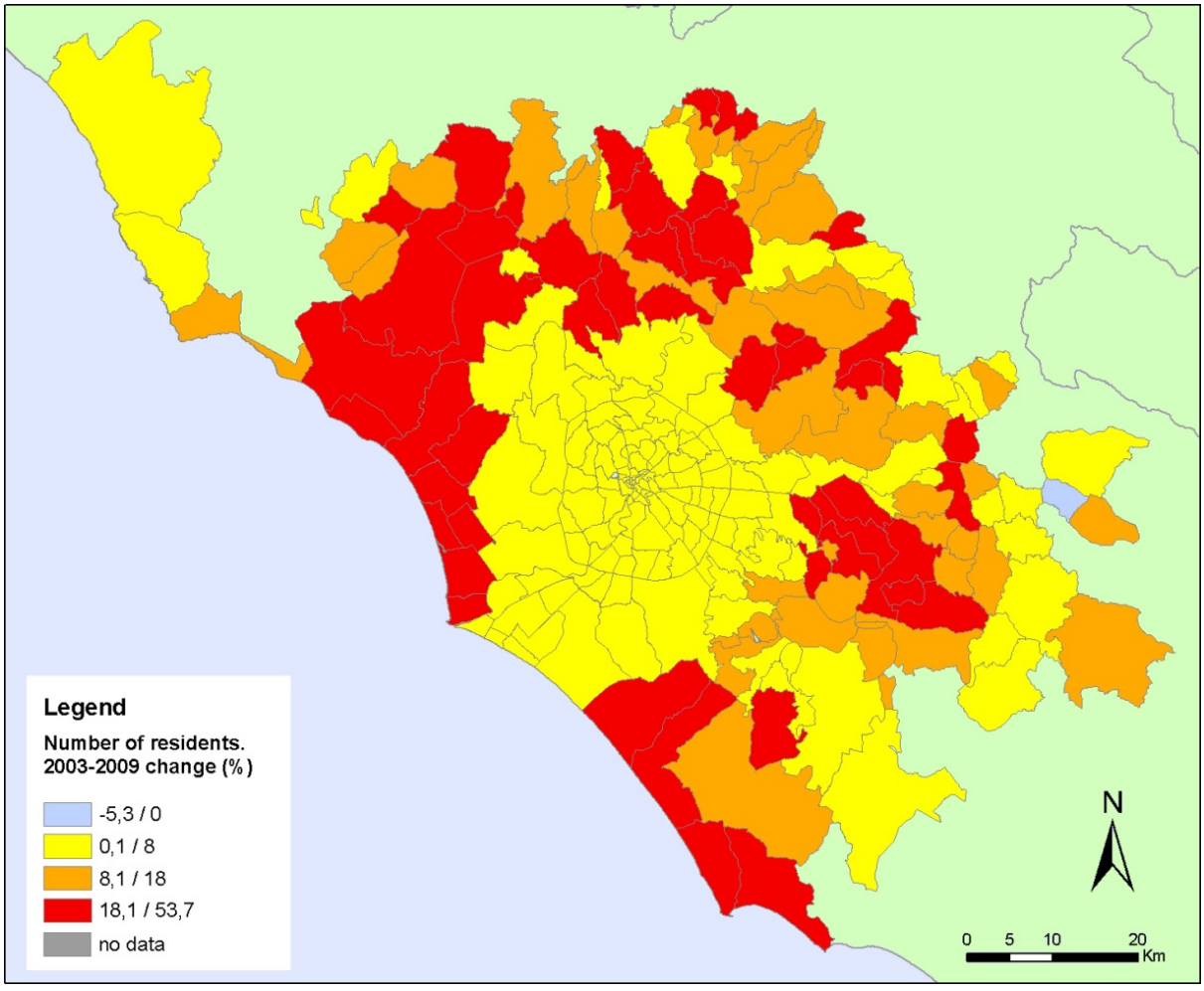
The migratory rate was always positive in the period 2002-2009 in the inner and outer rings. It was negative, only in the central city, only for the years 2002 and 2005. The highest migratory rate was registered in the central city, in the year 2006: +60.6 per thousand. In the coastal area, the migratory rate was always positive, oscillating between a minimum of 1.26 per thousand (2002) and a maximum of 56.56 per thousand (2006).

In the period of 2003-2009 an increase (+11%) in the number of households is reported in the Rome metropolitan area. This increase is particularly high in the inner ring (+20.3%), followed by the outer ring (+15.4%) and the central city (+7%). The coastal area registered an increase of 8.7%. The average number of components of the households was 2.44 in the year 2003, 2.43 in the year 2009, in the metropolitan area. It is interesting to notice that, even if it

could be irrelevant, a slight increase in the average size of households is registered in the central city and in the coastal area.

The increase of residents along the coastal area is connected to the real estate market dynamics. On the seaside, indeed, the prices of houses and apartments have always been lower if compared to the prices in the suburban areas of the core. The coastal area, thus, resulted in to be attractive for new young couples with children and for singles who preferred low cost of housing, better quality of the environment, and the proximity to workplaces.

Figure 2.7. Rome MA, population change.[*]



[*] Source: own elaboration.

3.1.3.3 Important economic features

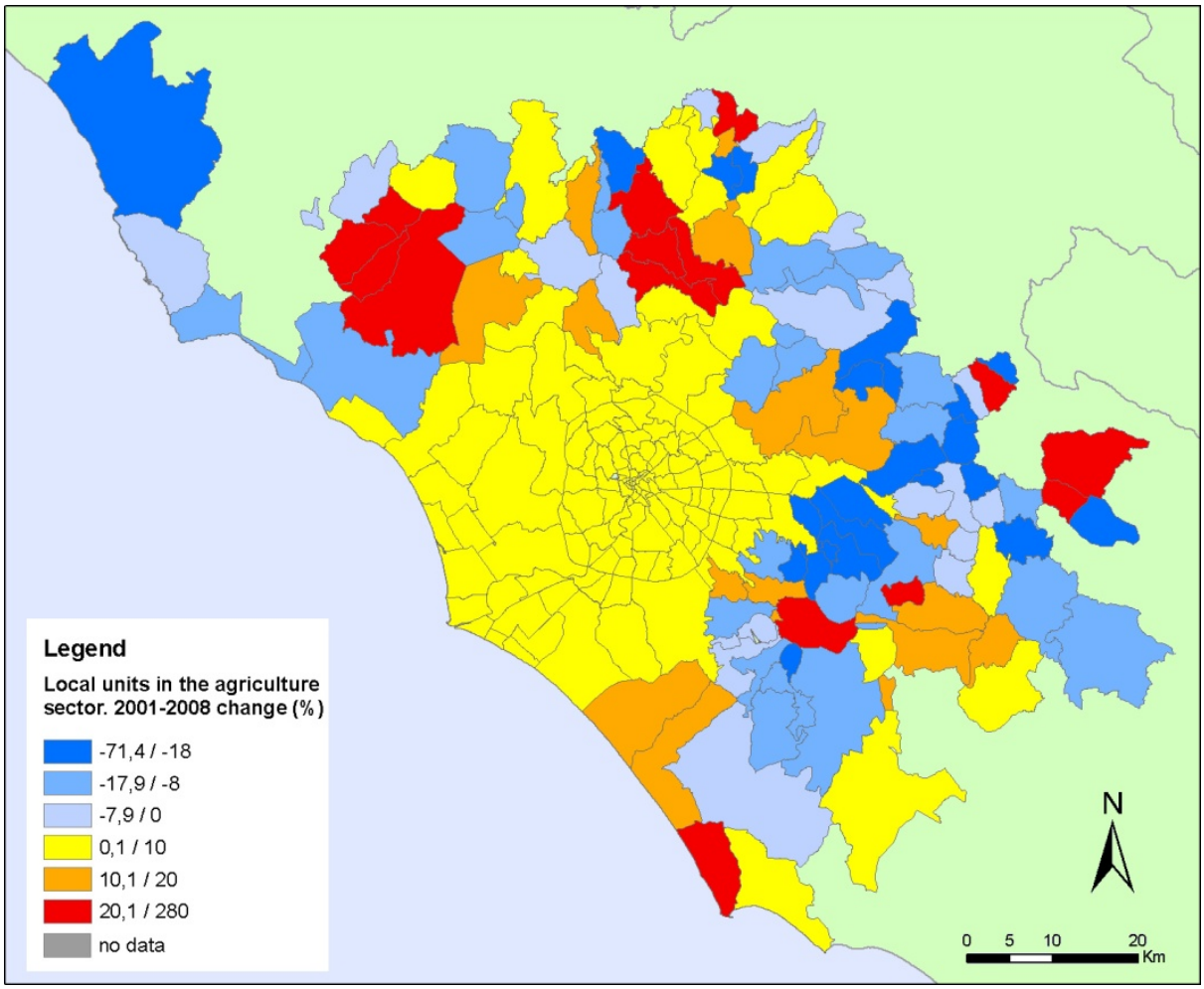
In the year 2009 Rome metropolitan area had 1,641,279 employees, 70.1% in the core, 22.8% in the inner ring, 7.1% in the outer ring; 81% of employees were in the tertiary sector, a percentage that reached 84.5% in the core. In the year 2008 Rome metropolitan area had 465,695 local units of enterprises, 71.9% in the core, 20.8% in the inner ring, 7.3% in the outer ring; 71.9% of the local units were in the tertiary sector, a percentage that reached 76.9% in the core. This situation is the result of the simultaneous action of different forces along the last twenty years.

During the first half of the nineties, all the sectors registered a general increase in the number of local units, in all the sub-areas, with the exception of the "leisure" sector (which registered a decrease in the inner ring and in the outer ring) and of the "commerce" sector (which registered a decrease in the outer ring). The general increase was particularly significant for the "offices" sector in the central city. The general trend was towards a concentration of local units in the central city, along an ideal path of development which, starting from the periphery (the outer ring), increasing to the centre (the central city itself). In the period 1991-1996, in fact, the number of local units in the sectors taken into account registered a very low increase in the outer ring (+ 311 units), a better increase in the inner ring (+ 5,385 units) and a much better performance in the central city (+ 44,670 units). During the second half of the nineties, the trend to the growth of economic activities was confirmed and even enhanced, particularly in the "commerce", in the "leisure" and in the "offices" sectors. The same trend of a concentration in the central city of the local units was shown, even though the differences in the rate of growth were smaller in comparison to the ones, which had characterised the former period. In the period 1995-2000, in fact, the number of local units increased in all the sub-areas, even though with different intensities: + 3,161 units in the outer ring, + 16,425 units in the inner ring, + 114,146 units in the central city. The situation changes dramatically if we take into account the number of jobs. If we analyse, in fact, the first half of the nineties, we notice a general decrease in the number of jobs in all the sub-areas in the "manufacturing", "commerce", "leisure" sectors and a decrease (only in the Central city) in the "transport and communication services" sector. The only consistent increases in the number of jobs can be found in the "offices" sector, especially in the central city. This displays a very clear tendency to concentrate the number of jobs in the central city. In the other sectors, which register a decrease, the peripheral areas (inner ring and outer ring) present a better performance, although in a negative

situation, if compared to the central city. Looking at the total number of jobs of the considered sectors, in the period 1991-1996, the outer ring registers a loss of 4,821 places of work, the inner ring a loss of 12,424 places of work, the central city registers a loss of 37,560 places of work. When the number of jobs, then, is considered, the situation is the opposite to the one which emerges when the local units are considered: the central city, in fact, is the sub-area registering the worse performance. The situation partially changes in the second half of the nineties. In this period, in fact, a negative trend in the change of the number of jobs can, still, be registered for the "manufacturing" and the "commerce" sectors in all the sub-areas, but a positive trend can be registered for the "leisure", the "public services" and the "offices" sectors (except for the outer ring in the first two sectors), in particular in the central city. This latter is, in fact, the most dynamic area for the services, in general, during this period. The inner ring, indeed, even in a negative trend, can be considered as the less weak for what concerns the "manufacturing" and the "commerce" sectors. Looking at the total number of jobs in the mentioned sectors in the period of 1995-1999, we notice a reduction of jobs in the outer ring (- 4,463), a creation of jobs in the inner ring (+ 3,349) and, dramatically more, in the central city (+21,884). It is possible to remark a tendency about the substitution of jobs, with a reduction in the traditional sectors (manufacturing and commerce) and a creation in the less traditional sectors. This trend can be found in all the sub-areas and it is more relevant in the central city (Montanari and Staniscia, 2003).

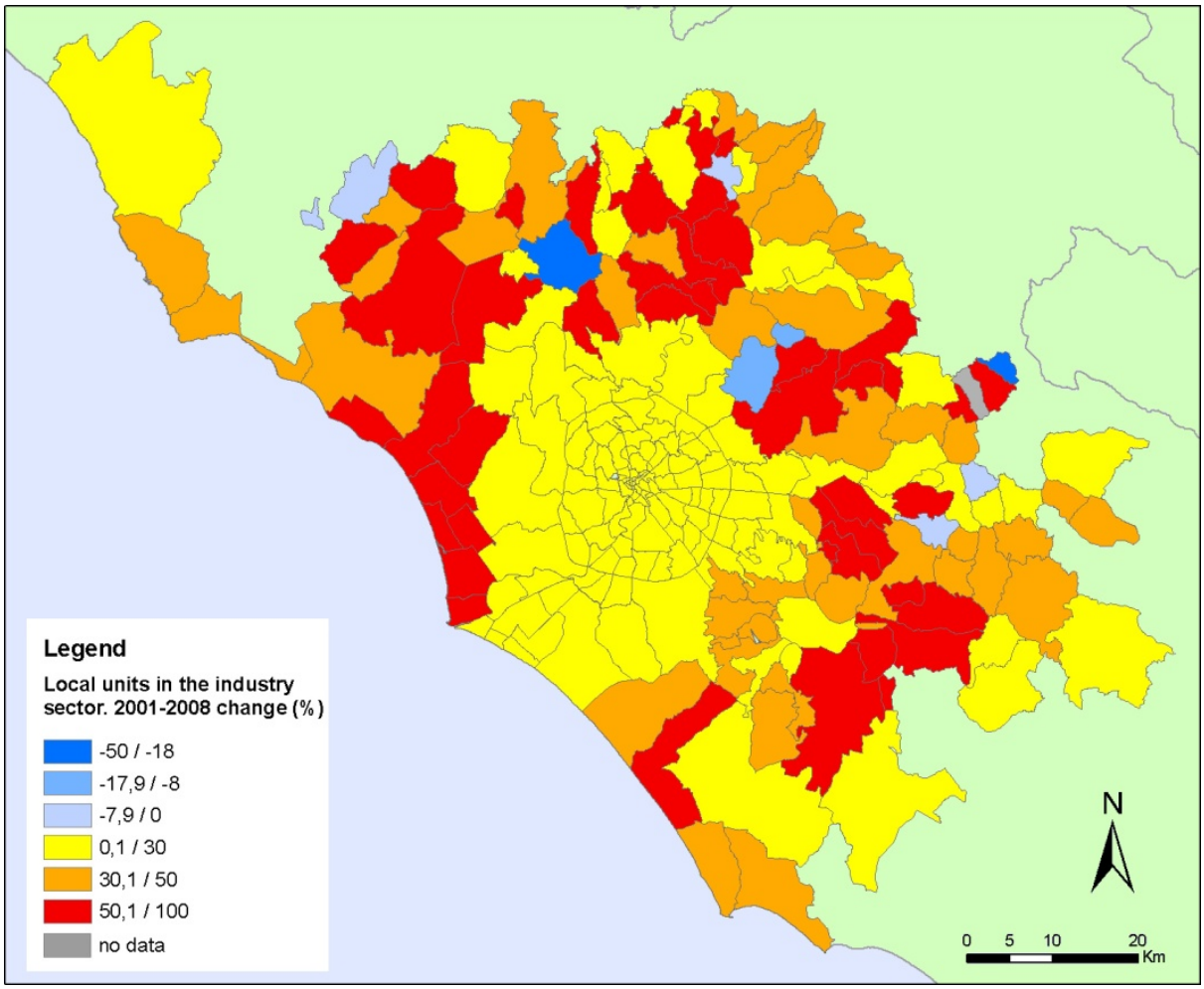
In the period of 2001-2008 the agriculture sector registers a general decrease in the number of local units in the Rome metropolitan area; this final value is the result of different trends. In the central city, indeed, an increase of 3.4% is reported, while in the inner ring the value is -4.2% and in the outer ring -8%. The coastal area records a slight decrease of 0.6%. In the industrial sector the dynamism is totally different: a total increase of 20% is reported in the number of local units at metropolitan level. The increase is particularly significant in the inner ring (40.1%) and in the outer ring (34%) and less important in the central city (12.3%). The Rome coastal zone registers an increase of 15%. In the service sector the Rome metropolitan area registers a remarkable increase in the number of local units: +32.4% between 2001 and 2008. The inner ring is very dynamic (+39%), followed by the central city (31%) and the outer ring (29,6%). The coastal area in the same period reports an increase of 31.9%. The described trend of the local units of the enterprises confirms and is confirmed (by) the trend in the land use.

Figure 2.8. Rome MA, dynamics in the agriculture sector.[*]



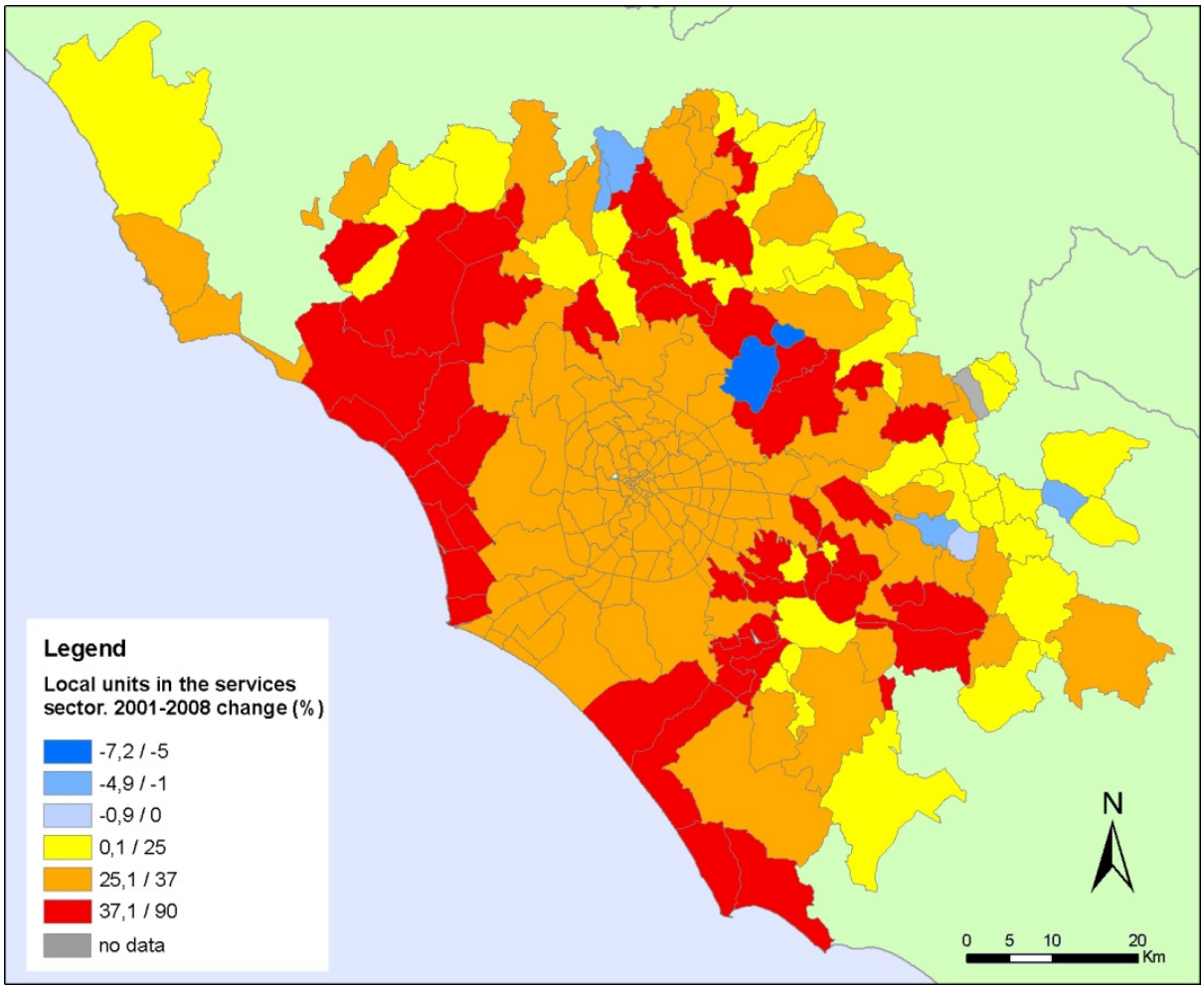
[*] Source: own elaboration.

Figure 2.9. Rome MA, dynamics in the industrial sector.[*]



[*] Source: own elaboration.

Figure 2.10. Rome MA, dynamics in the services sector.[*]



[*] Source: own elaboration.

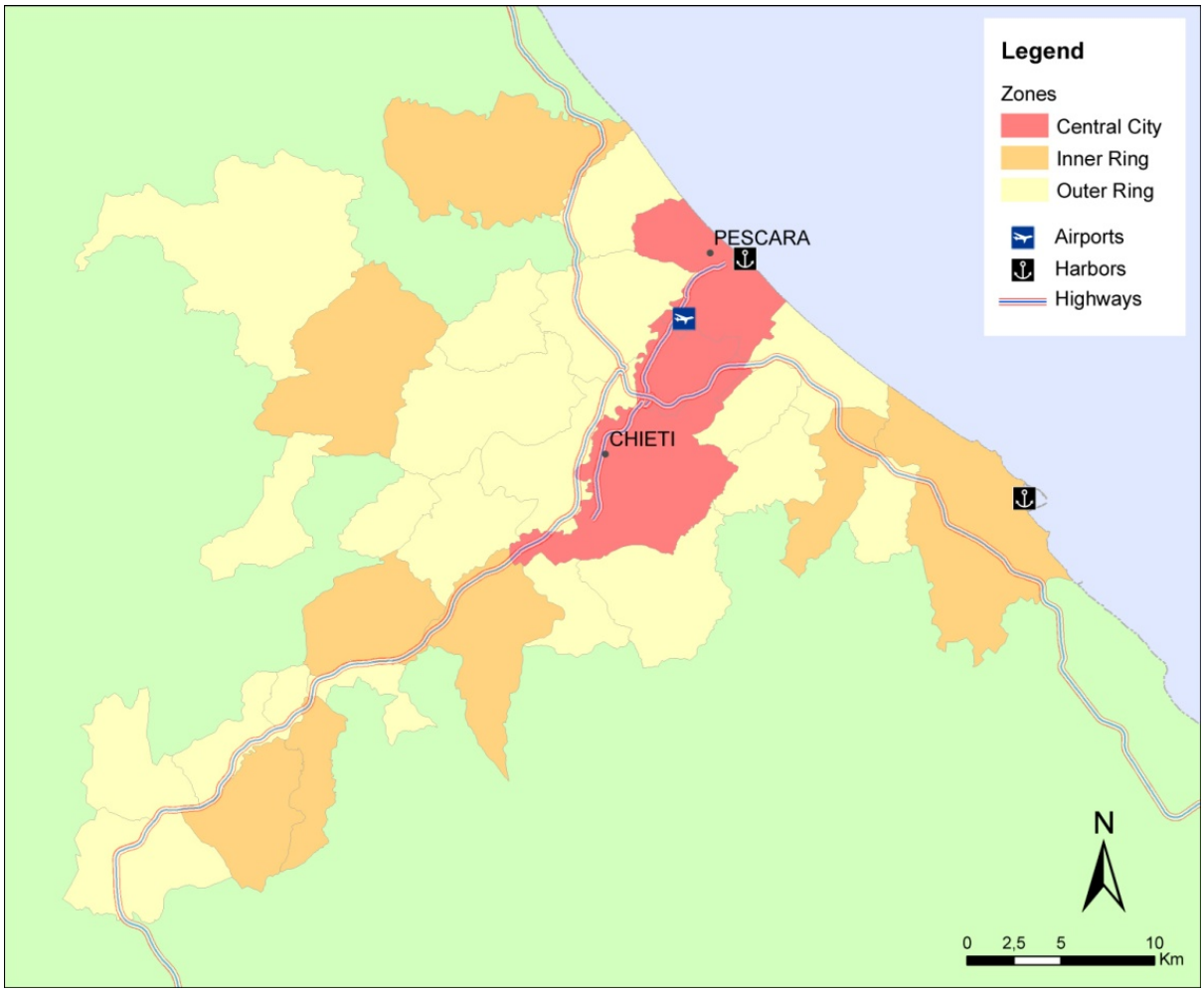
3.2 Chieti-Pescara urban area

3.2.1 Geographical and historical overview

The Law 142/1990 mentioned above did not include the cities of Chieti and Pescara. Our research, thus, had to adopt a "*functional*" approach, based on socio-economic parameters. Given the aim of our study being to study human activities – both residential and economic – on the coastal area, the choice was an Urban Area, which included the most active municipalities, both from an economic point of view and in terms of residential dynamics. Municipalities belonging to the same productive system, in a network logic were selected. Chieti-Pescara urban area has been divided, for our purposes, into three parts: "core-central city", "inner suburban ring", "outer suburban ring". The rings have been defined following a network logic, without necessarily respecting the criterion of spatial contiguity (Montanari and Staniscia, 2012).

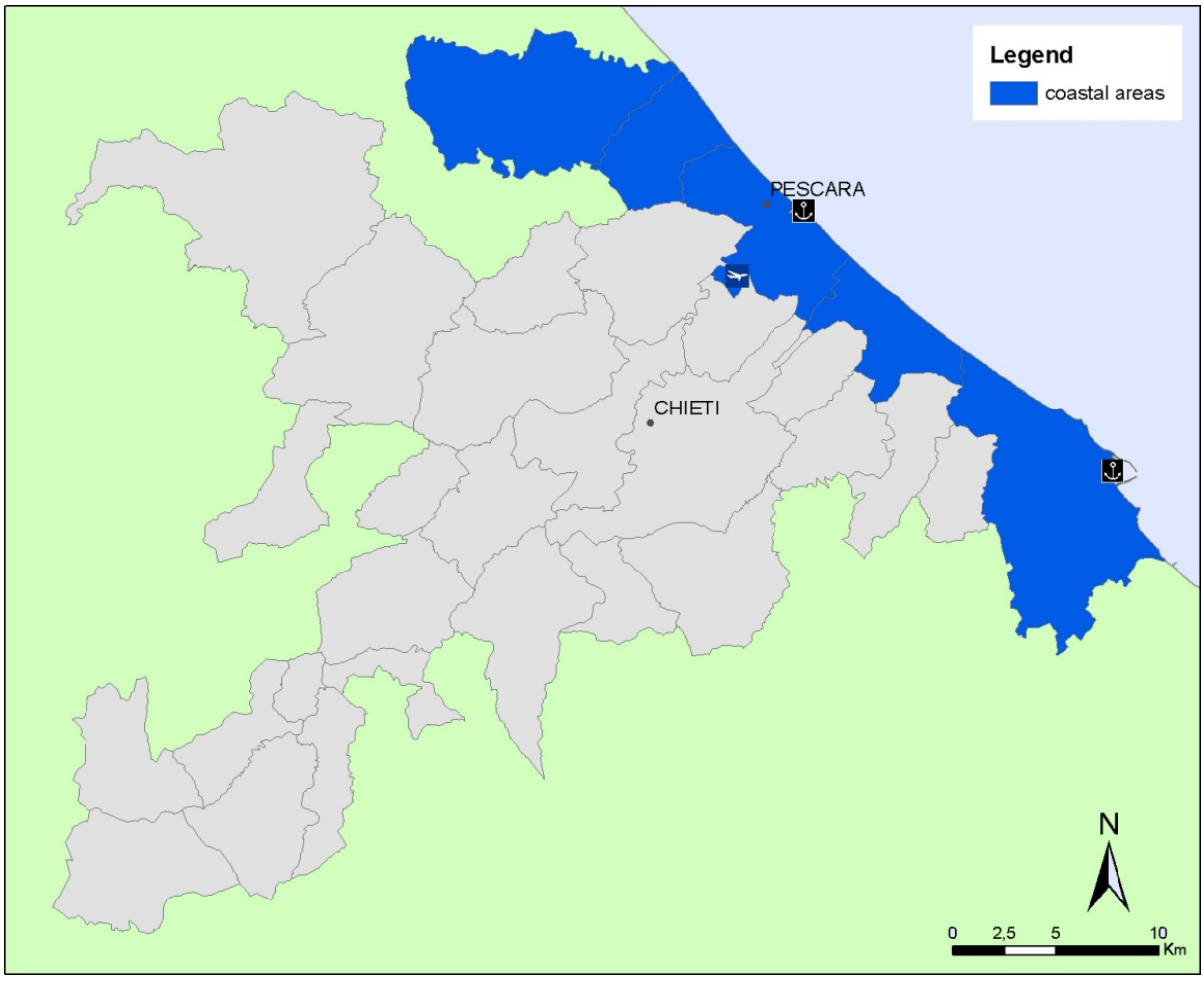
The central city covers a surface of 111 km², the inner ring covers a surface of 332 km² and the outer ring covers a surface of 532 km². This area is limited by the sea, at the east, and by the National Park of Majella, to the west. The central city is constituted by the main cities - Chieti and Pescara - the first one having an ancient origin on the hill, the second one having a recent origin along the plain and the coast. The Pescara City can be considered as the spontaneous "branch" of the city of Chieti, following the technological innovations that characterised the XXth century. In recent years, a new settlement along the Pescara River was created. It is constituted by houses, business parks, shopping centres and industries, without points of discontinuity. The Chieti-Pescara urban area is characterised by a linear system of infrastructures, with many points of intersection, which creates a kind of network of roads. In particular, what has to be underlined is the presence of two perpendicular highways: the A24/A25 connecting the central-western part of Italy to the central-eastern part, and the A14 connecting the northeast part of Italy to the southeast part. To those highways, a local freeway (asse attrezzato) must be added, which connects the city of Chieti with the city of Pescara, intersecting both the A24/25 and the A14 highways (Montanari and Staniscia, 2003).

Figure 2.11. Chieti-Pescara Urban Area, sub-divisions and infrastructures.[*]



[*] Source: own elaboration.

Figure 2.12. Chieti-Pescara UA, coastal zone.[*]



3.2.2 Bio-physical resources

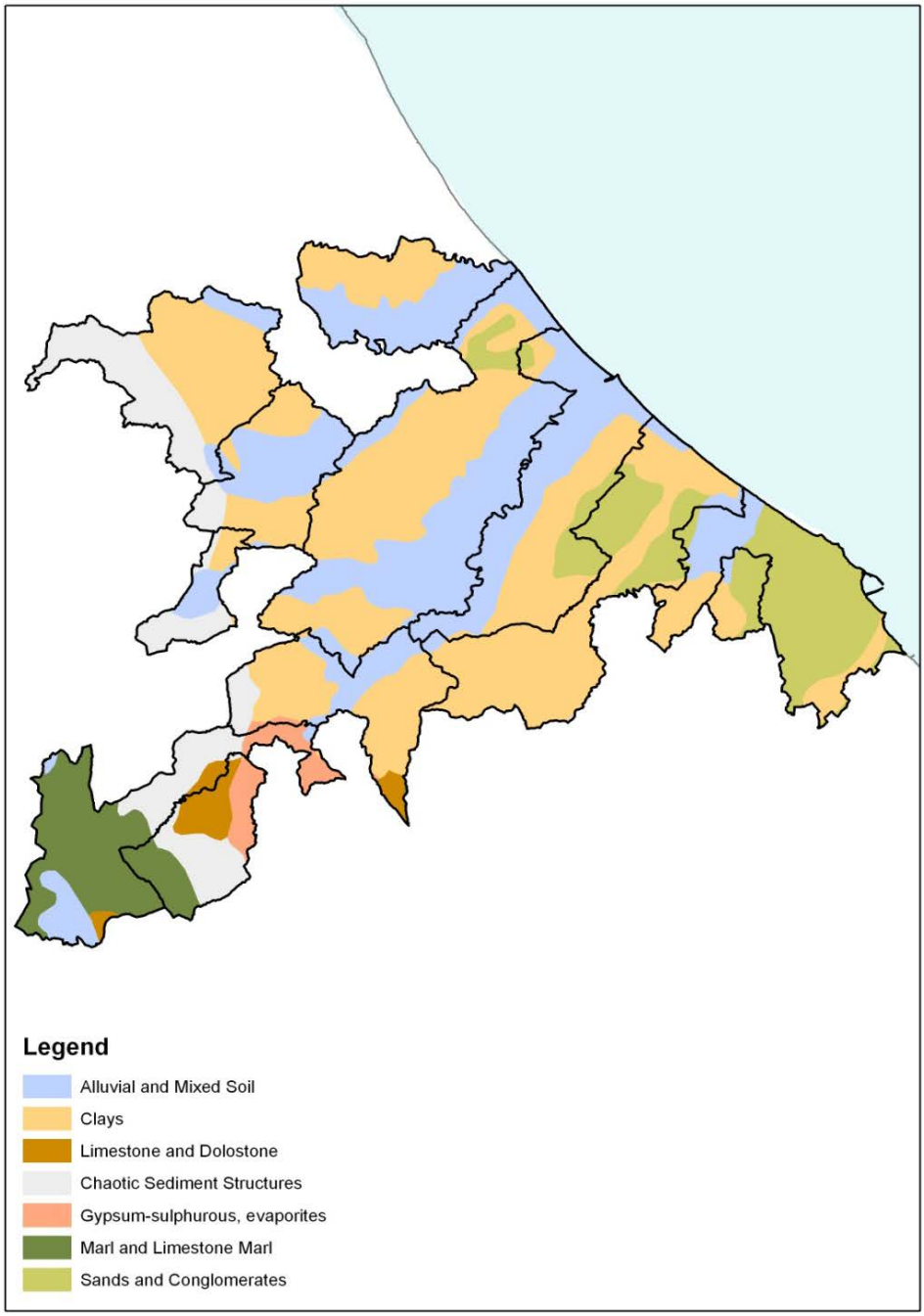
3.2.2.1 Area and typology

The area can be considered as divided in three main physical regions running parallel to the seaside: the coast, the hills, the pre-mountainous areas. The coastal area runs for 35 km from Città Sant'Angelo to Ortona and is mainly characterized by sands and conglomerates (in the southern area) and by alluvial and mixed soil in the rest of the territory. The hilly part is dominated by clays, while the pre-mountainous part by marl and limestone structures. The coastal area is mostly sandy except for the southernmost part (between Torre Mucchia and the Ortona harbour) characterized by cliffs. The width of the beaches is on average 100 m but in the southern part it reaches 10-15 m. The dynamics of sediments is determined mainly by the waves

[*] Source: own elaboration.

since the tidal movements are negligible. The coast is totally urbanized except for some rural areas in the southern sector. Erosive processes are important, but long tracts of the coast are protected (even if not always successfully) by coastal engineering structures (Lupia Palmieri *et al.*, 2010).

Figure 2.13. Chieti-Pescara UA, geology.[*]

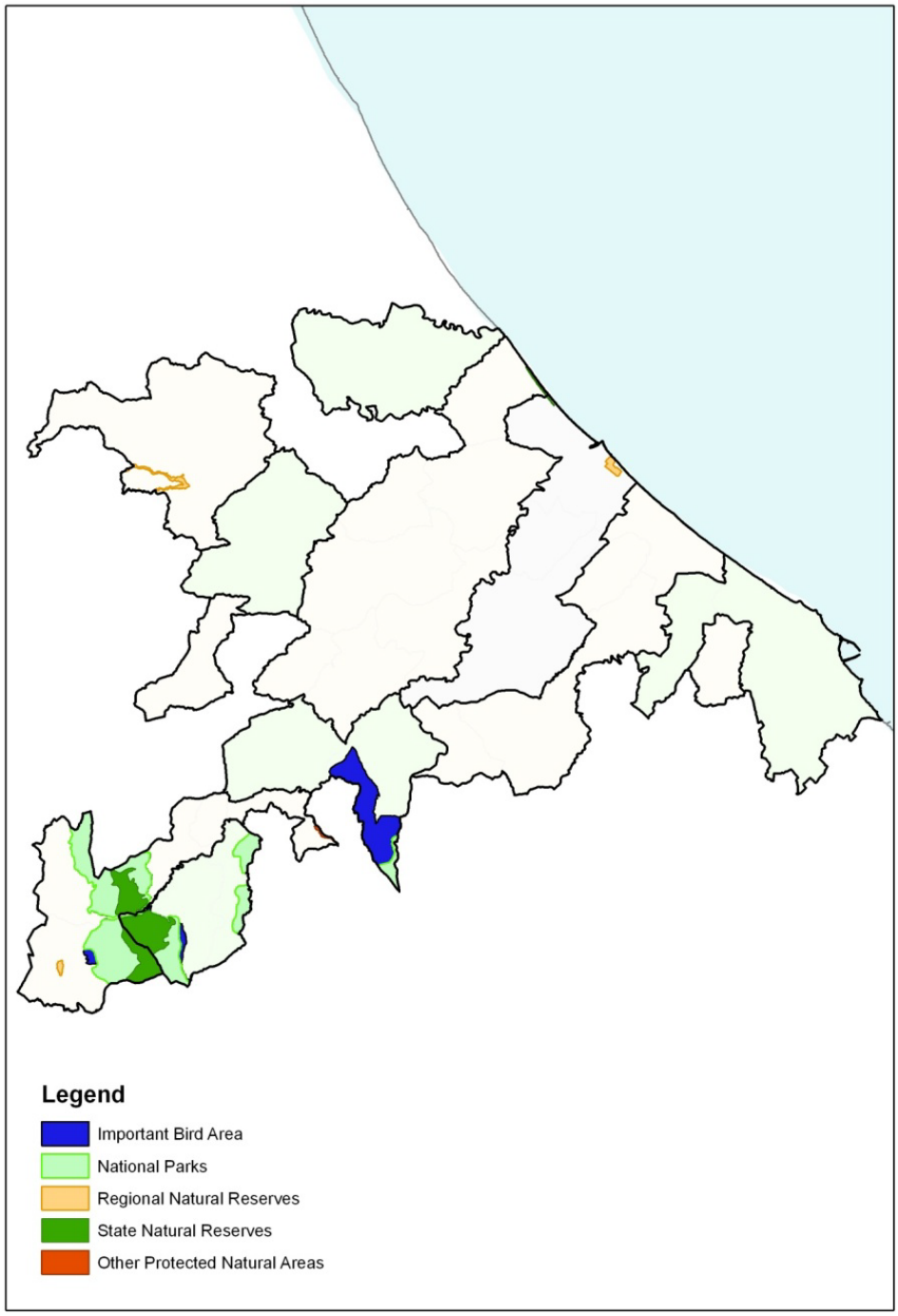


[*] Source: own elaboration based on Del Zotto *et al.*, 2010.

3.2.2.2 Coastal and marine ecosystems

The main ecosystems of this region can be considered: the coast, the wetlands and the pre-mountain part (pre-Appennini). The coastal area is very urbanized and the little space of green areas is represented by two pine-trees woods (pinete) hosting several species of birds. The spring of the Pescara River is surrounded by cane thickets, riparial woods, maquis shrublands hosting severl amphibians and mammals. The surroundings of the Penne Lake (see par. iv) are also a varied ecosystem with riparial vegetation and hydrophile plants and, further from the banks, a mixture of maquis shrubland and agricultural areas dedicated to growing cereals and olives. The pre-Appennini area presents an high altitude and the vegetation and fauna typical of a mountain region. The presence of protected areas guarantees and allows the existence of important animal species like bears, wolves and dears, even if in very small numbers (Del Zotto *et al.*, 2010). In the year 2001 a Coastal National Park has been introduced in the national system, the Parco della Costa Teatina. More than ten years have passed and the Park has not been implemented yet since no agreement concerning its boundaries has been reached so far.

Figure 2.14. Chieti-Pescara UA, protected areas.[*]



[*] Source: own elaboration based on Del Zotto *et al.*, 2010.

3.2.2.3 Soil and land-uses

The Chieti-Pescara urban area covers a surface of 974 km². In the year 2006, 78% of the area was represented by agricultural lands, 2% was destined to industrial and commercial use, 6% was built-up area, 13% natural habitats and open spaces, the rest was destined to roads, railways, ports, airports. Between 2000 and 2006, agricultural land and natural habitats experienced a small contraction (respectively -0.20% and -0.26%), while the industrial land experienced a large shrinking (-20%). The built-up areas and the mixed industrial/commercial areas increased their relative weight in the region. The coastal area followed the same trend presenting a higher reduction of the industrial area (-24.23%) and a lower increase of the built-up area (+2.13%).

Table 2.3. Chieti-Pescara UA, land use, year 2000.[*]

	Core	**Inner Ring**	**Outer Ring**	**Coastal Zone**
Total Area (sqm)	110620207	331790476	531744678	211577242
Agriculture Total Area (Sqm)	71263667	269022005	426459446	158776540
Industrial Total Area (Sqm)	587910	874883	1134532	1035752
Mixed Industrial\Commercial Total Area (Sqm)	9071228	4140593	3557210	5606896
Natural Habitat Total Area (Sqm)	1980404	46094327	75014488	11220364
Open Space Total Area (Sqm)	835369	850595	2557416	1140230
Built up area in urban environment with mixed used (Sqm)	24576678	10247989	22996050	31686758
Road Network Total Length (Km)	342068,475	365654,427	155166,4205	371
Railways Total Lenght (Km)	29,1762153	35,68317224	35,05505342	48
Harbors areas (Sqm)	129303	311082	0	440385
Airports areas (Sqm)	1786534	0	0	1344232

Table 2.4. Chieti-Pescara UA, land use, year 2006.[**]

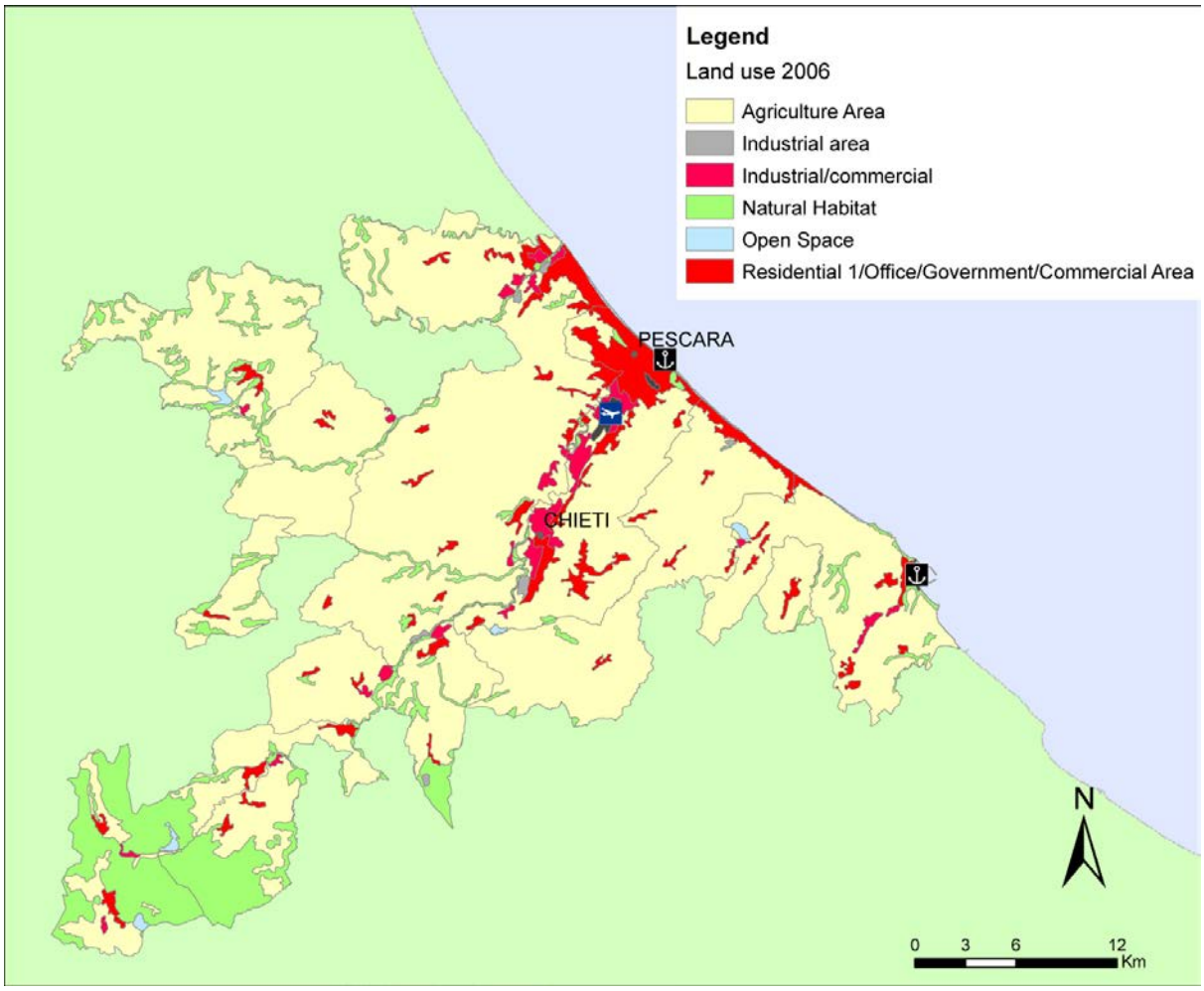
	Core	**Inner Ring**	**Outer Ring**	**Coastal Zone***
Total Area (sqm)	110620207	331790476	531744678	211577242
Agriculture Total Area (Sqm)	70798270	268114744	425816874	158431935

[*] Source: own elaboration based on CORINE, 2000.

[**] Source: own elaboration based on CORINE, 2006.

Industrial Total Area (Sqm)	681690	268692	1126041	784825
Mixed Industrial\Commercial Total Area (Sqm)	9163157	5029408	3560405	5776575
Natural Habitat Total Area (Sqm)	1980404	46094327	74765239	10971115
Open Space Total Area (Sqm)	835369	850595	2557416	1140230
Built up area in urban environment with mixed used (Sqm)	24856365	10872626	23893166	32361860
Road Network Total Length (Km)	342068,475	365654,427	155166,4205	371
Railways Total Lenght (Km)	29,1762153	35,68317224	35,05505342	48
Harbors areas (Sqm)	129303	311082	0	440385
Airports areas (Sqm)	1786534	0	0	1344232

Figure 2.15. Chieti-Pescara UA, land use.[*]



[*] Source: own elaboration based on CORINE, 2006.

3.2.2.4 Freshwater and access to water

The Pescara River runs through the Chieti-Pescara urban area, originating from Monti della Laga, running for 145 km to the Adriatic Sea. Areas around the mouth of the river are at risk of flooding during peak discharge season. The river's water is used for the production of electricity. The Aterno River flows for 45 km originating from Maiella Mountain and flowing into the Adriatic Sea in Francavilla al Mare. Other rivers of the area are: Foro, Fino, Tavo, Saline, Piomba. The Aterno and Foro waters are used for agriculture purposes. The Fino and Tavo waters are diverted for industrial usage, gravels are removed; they are severely polluted because of industrial draining and sewages.

The Penne Lake is part of a natural reserve; it represents a well protected area for several species and an interesting ecotourist destination (Del Zotto *et al.,* 2010).

3.2.3 Cultural and social resources

3.2.3.1 Important cultural features

The Chieti-Pescara urban area is not as rich as the Rome metropolitan area in terms of cultural resources. The inner and the outer rings host some valuable medieval churches and ruins of the Roman age while the coastal area is characterized by modern and contemporary cities.

3.2.3.2 Important demographic and social features

The resident population in the year 2009 was equal to a total of 424,283 inhabitants, distributed among the central city (189,403 inhabitants; 44.6% of the total), the inner ring (65,033 inhabitants; 15.33% of the total), the outer ring (169,847 inhabitants; 40.07% of the total). In the period of 1991-2001, the central city registered a loss of population due to a decrease in the two main cities (Pescara and Chieti). The net loss was more than –11,000 inhabitants. The coastal municipality experienced a negative migratory rate (-4.6 per thousand per year), the highest negative peak in the whole metropolitan area. The internal municipalities, indeed, experienced a positive rate. The total average yearly migratory rate was –1.8 per thousands. The inner ring

registered a weak increase of population due to a strong increase in the coastal northern municipality. The final result was an increase of more than 800 units. The coastal municipalities experienced a high positive migratory rate, which reached its peak in the northern coastal municipality (+15.2 per thousand per year). The other municipalities registered a weak positive migratory rate, with the only exception of the most internal municipality. The total average yearly migratory rate was +6.5 per thousand. The outer ring registered a relevant increase of population, particularly high in the two coastal municipalities and in the ones surrounding the central city. The total increase was of more than 11,000 inhabitants (more or less equivalent to the loss of the central city). The outer ring registered a generalised positive migratory rate with the only exception of the most internal municipalities. The coastal municipalities and the ones surrounding the central city registered the highest positive peaks. The total average yearly migratory rate was +9.1 per thousand (Montanari and Staniscia, 2003).

In the period 2003-2009, the Chieti-Pescara urban area registered an increase of population of nearly 6%; this increase was not equally distributed: it was higher in the outer ring (+9.1%), followed by the inner ring (+7%) and the central city (+2.9%). The coastal area registered a remarkable increase equal to +5.8%. The process was mainly due to a high positive migratory rate partially influenced by the dynamics of the real estate market.

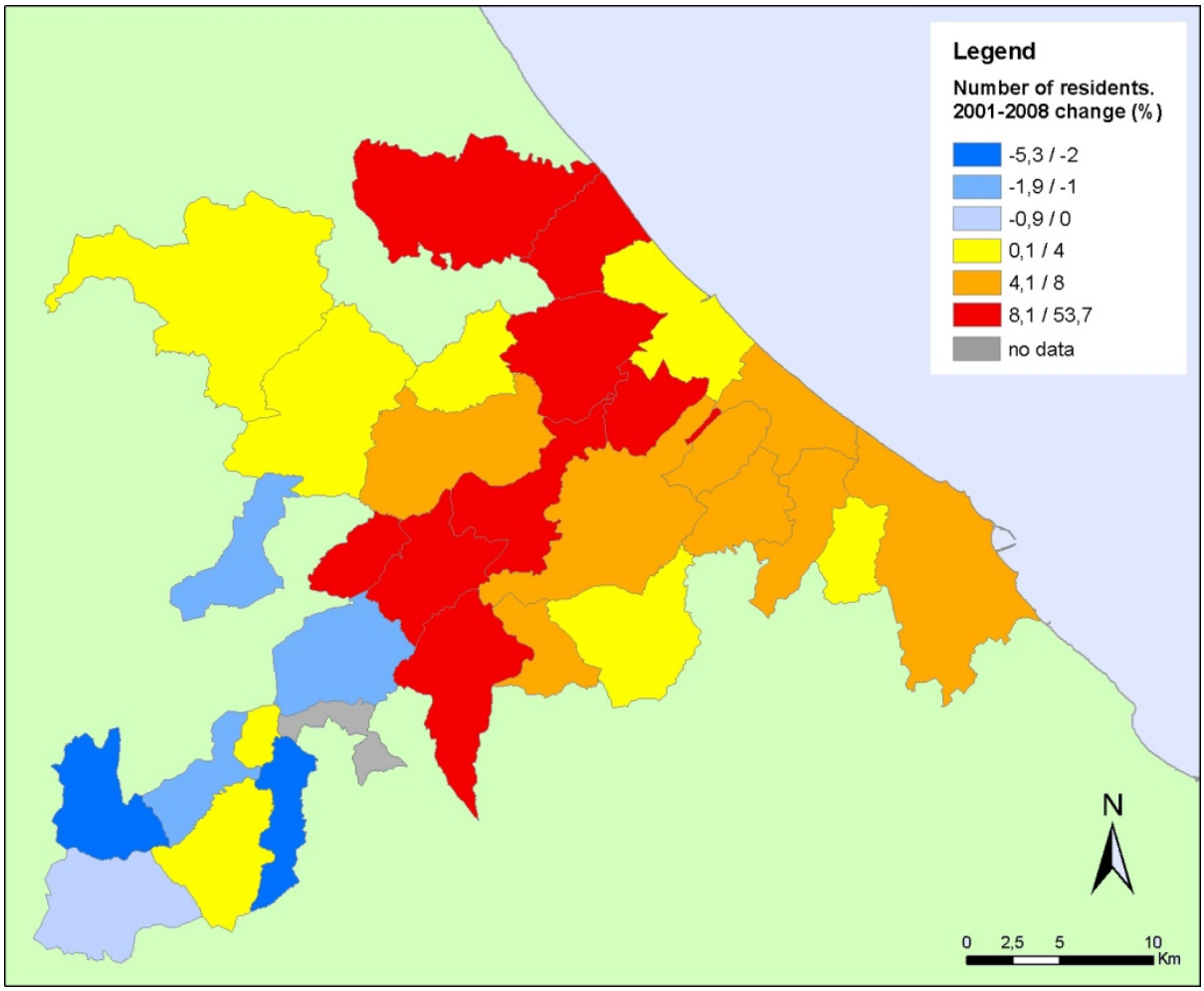
The average annual migratory rate in the period 2002-2009 was always positive, the only exception being the central city in the year 2005 (-0.29 per thousand). The highest migratory rate calculated for the entire period was recorded in the outer ring (+13 per thousand), while the lowest was registered in the central city (+8.9 per thousand). The coastal area experienced a high migratory rate (+12.36 per thousand in the period), with peaks of 33 per thousand (2002).

The households in the Chieti-Pescara urban area recorded an increase in the period 2003-2009 (+15.9%). This increase is distributed as follows: +16% in the central city, +11.9% in the inner ring, +17.2% in the outer ring. Along the coastal area the increase is particularly significant: +20%. The average size of the households decreased in the 2003-2009 interval: from 2.71 components per household to 2.48.

The population dynamics in the coastal municipalities can be largely explained considering the dynamics of the real estate market. Housing princes in this area, indeed, have always been very low if compared to other Italian urban areas. The amenity of the seaside

joined with this fact has attracted population along the coast since the seventies. This process has experienced a slowdown after the year 2001 due to the introduction of Euro; since then, in fact, houses' prices doubled.

Figure 2.16. Chieti-Pescara UA, population change.[*]



3.2.3.3 Important economic features

In the year 2009 Chieti-Pescara urban area had 157,400 employees, 45.3% in the core, 14.9% in the inner ring, 39.8 % in the outer ring; 69.6% of employees were in the tertiary sector, a percentage that reached 76.7% in the core. In the year 2008 Chieti-Pescara urban area had 51,793 local units of enterprises, 46.7% in the core, 16 % in the inner ring, 37.3% in the outer

[*] Source: own elaboration

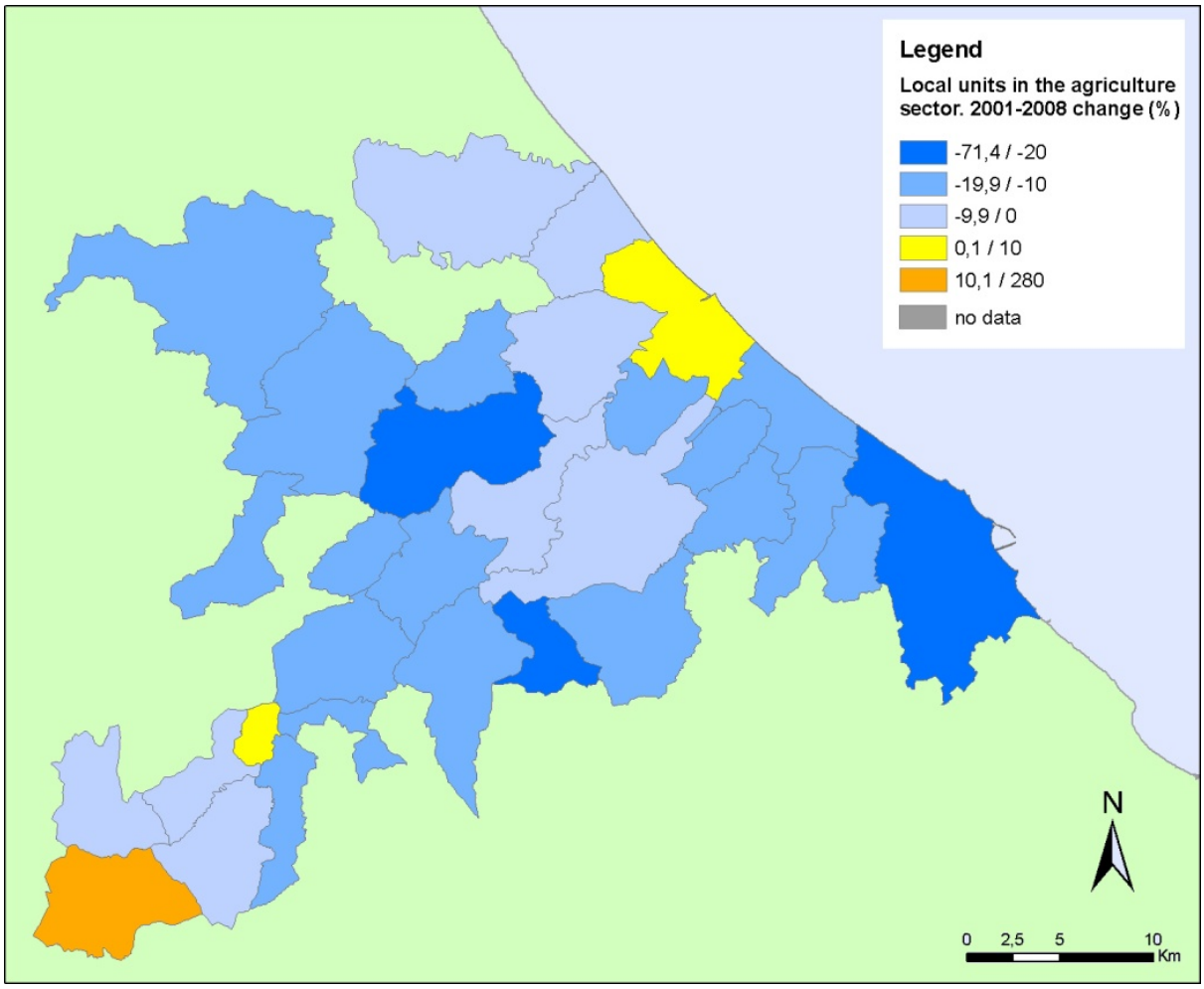
ring; 61.4% of the local units were in the tertiary sector, a percentage that reached 73% in the core. This situation is the result of the simultaneous action of different forces along the last twenty years.

During the first half of the nineties all the sectors, except for the "leisure", registered an increase in the number of local units in all the sub-areas, with the exception of the "commerce", which registered a decrease in the inner ring. The most relevant increases can be noticed in the "commerce" and in the "offices" sectors in the central city of the area. The central city, in fact, was the most successful sub-area in the creation of local units; the inner ring, indeed, was the most repulsive area: the number of local units created in the central city, in the considered sectors, in the period 1991-1996, is 2,150; the number of local units created in the inner ring is, in the same period, only 6. What can be noticed is a better performance of the outer ring if compared to the inner ring; in the outer ring, in fact, the number of local units increases more: + 955. During the second half of the nineties the situation is almost unvaried, in relative terms, but it changes in absolute sense. The central city continues to be the most attractive area for all the sectors, especially for the "commerce" and for the "offices". The outer ring continues to show a better performance in comparison with the inner ring. The creation of local units in the mentioned sectors is particularly remarkable in the outer ring (+ 1611 local units in the period 1995-2000) and, even more, in the central city (+ 2602). The situation drastically changes if the number of jobs is taken into account. The first, an important aspect to be underlined is that the "manufacturing" and the "leisure" sectors register a decrease in the number of jobs in all the sub-areas in the period of 1991-1996. The decrease is higher in the central city. In this area, in addition, a decrease in the number of jobs in the "commerce" and "transport and communication services" sectors has to be noticed. Except for the "offices" sector, a general trend of a better performance moving from the central city to the outer ring can be noticed along this first period. Looking at the values, in fact, it can be noticed that in the central city a reduction, in the mentioned sectors, of 3,931 jobs takes place; in the inner ring the reduction is of 402 jobs whereas the outer ring registers a creation of 709 jobs. The change varies remarkably from the central city to the outer ring, this latter registering a better performance. The situation changes again when the second half of the nineties is analyzed. During this period, in fact, to the decrease in the number of jobs in the "manufacturing" and in the "leisure" sectors, a

decrease in the "commerce" and in the "offices" sectors must be added, in all the sub-areas. It means that the only successful sector is the "public services" one. Even considering the decreases, the less weak area is the inner ring, which registers less substantial losses of jobs. The central city, in fact, registers, in the period 1995-1999, a loss of 5,418 jobs, the inner ring registers a loss of only 635 jobs, the outer ring registers a loss of 4,971 jobs. What can be argued from those data is that there is, in the Chieti-Pescara urban area, a general trend of the creation of local units, especially in the central city and a general trend of the reduction of jobs, especially in the central city, too. It is, therefore, possible to remark a trend to create in the central city local units characterised by a smaller average dimension and less job-intensive (Montanari and Staniscia, 2003).

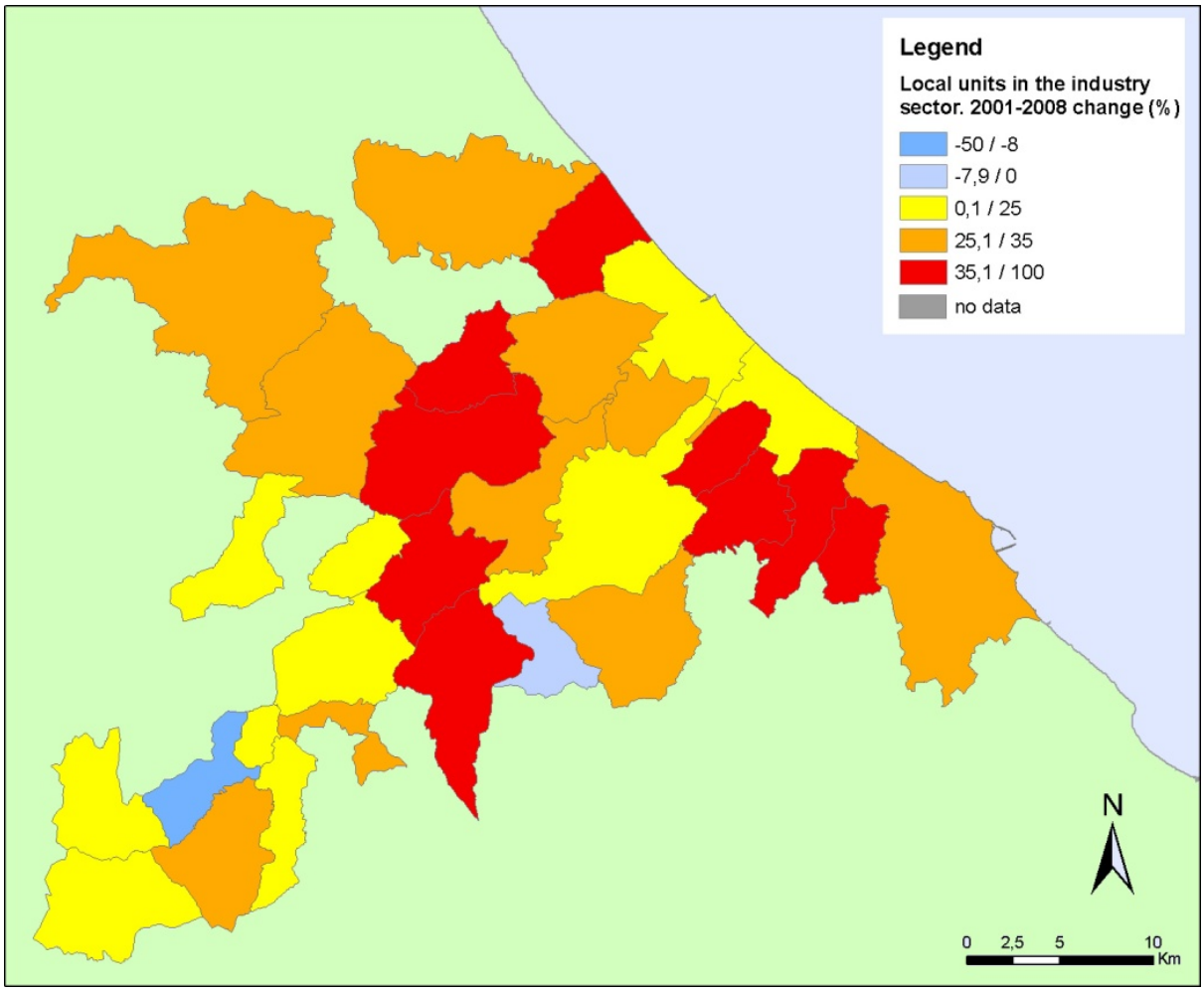
In the period of 2001-2008 the number of local units in the agriculture sector registered a general decrease in the Chieti-Pescara urban area (-13.5%); this final value is the result of negative trends in all the sub-areas. The decrease in the number of local units was particularly severe in the inner ring (-17.4%) and in the outer ring (-12.7%) and was not negligible in the central city (-4.5%). The coastal area lost local units: -13.8%. In the industrial sector the dynamism was totally different: a total increase of 23.8% in the number of local units was reported at metropolitan level. The increase was particularly significant in the outer ring (31%) and in the inner ring (28%) and slightly lower in the central city (16%). The Chieti-Pescara coastal zone registered an increase of 20.3%. In the service sector the Chieti-Pescara urban area registered a remarkable increase in the number of local units (19.5%) between 2001 and 2008. The inner ring was the most dynamic area (+26.5%), followed by the outer ring (+23.4%) and the central city (+16%). The coastal area in the same period reported an increase of 16.2%. The described trend of the local units of the enterprises is only partially confirmed (by) and coherent (with) the trend in the land use.

Figure 2.17. Chieti-Pescara UA, dynamics in the agriculture sector.[*]



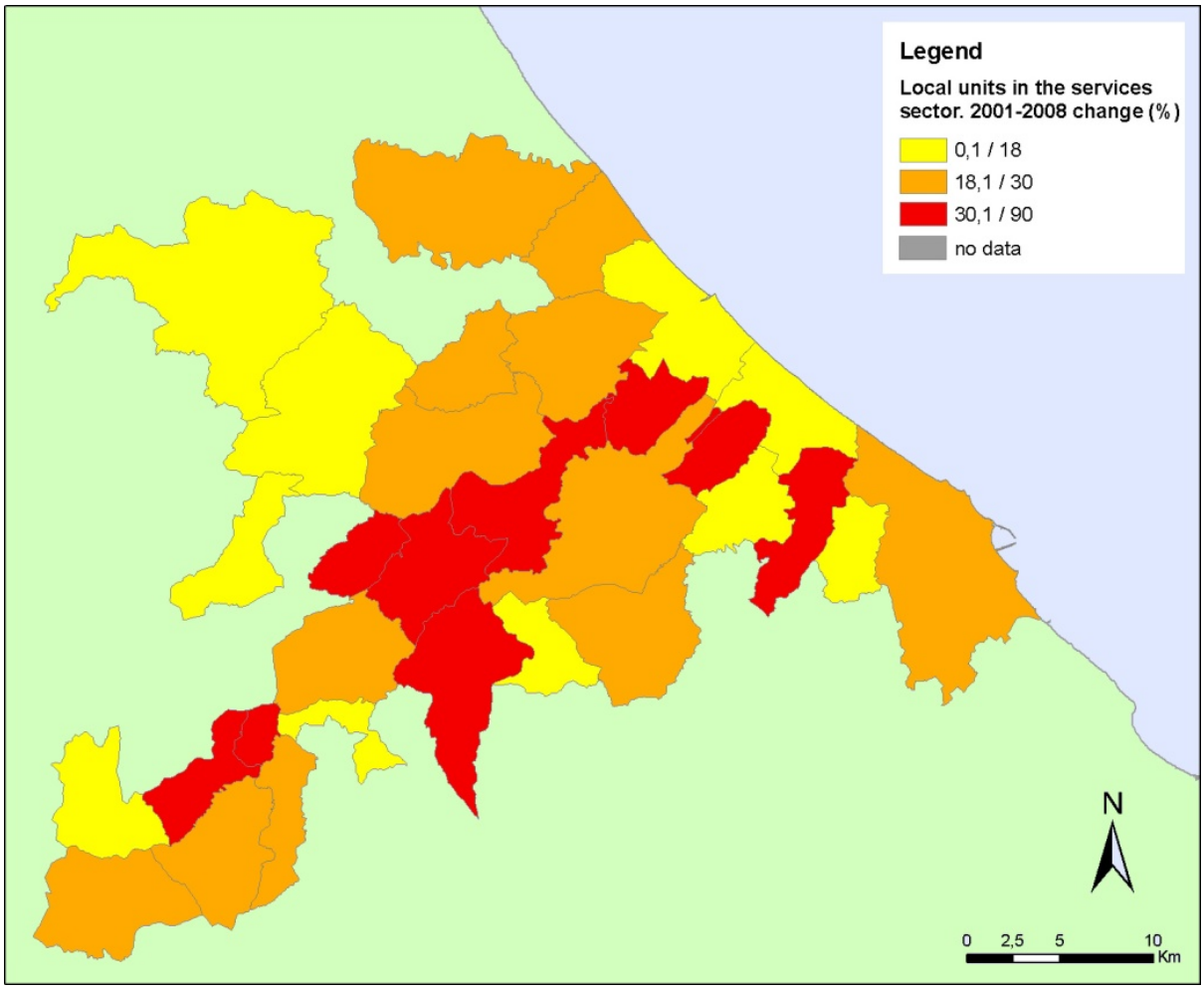
[*] Source: own elaboration.

Figure 2.18. Chieti-Pescara UA, dynamics in the industry sector.[*]



[*] Source: own elaboration

Figure 2.19. Chieti- Pescara UA, dynamics in the services sector.[*]



4. Overview of Users in the Case Studies

Residents and enterprises described in the former paragraphs are daily users of the available resources. In the following pages we concentrate our attention on additional users, particularly important in coastal areas.

4.1 Tourists

The number of hotel and restaurants in the Rome metropolitan area experienced a very high increase in the period 2001-2008. If we look at the central city, we notice that the number of

[*] Source: own elaboration

local units in the tourist sector increased by 62%. This increase is oversized with respect to the increase of tourists in the same period. The number of overnight stays, in fact, registered an increase of 8.7%. In the inner ring the situation was inverse: 44% was the increase in the number of local units, while 78% was the increase in the number of overnight stays. In the outer ring the growth of local units was equal to 37% while overnight stay grew by 44%. The Rome coastal area was largely affected by this process of growth: the increase in the number of local units almost reached 60%, while the number of overnight stay increased 11.4%.

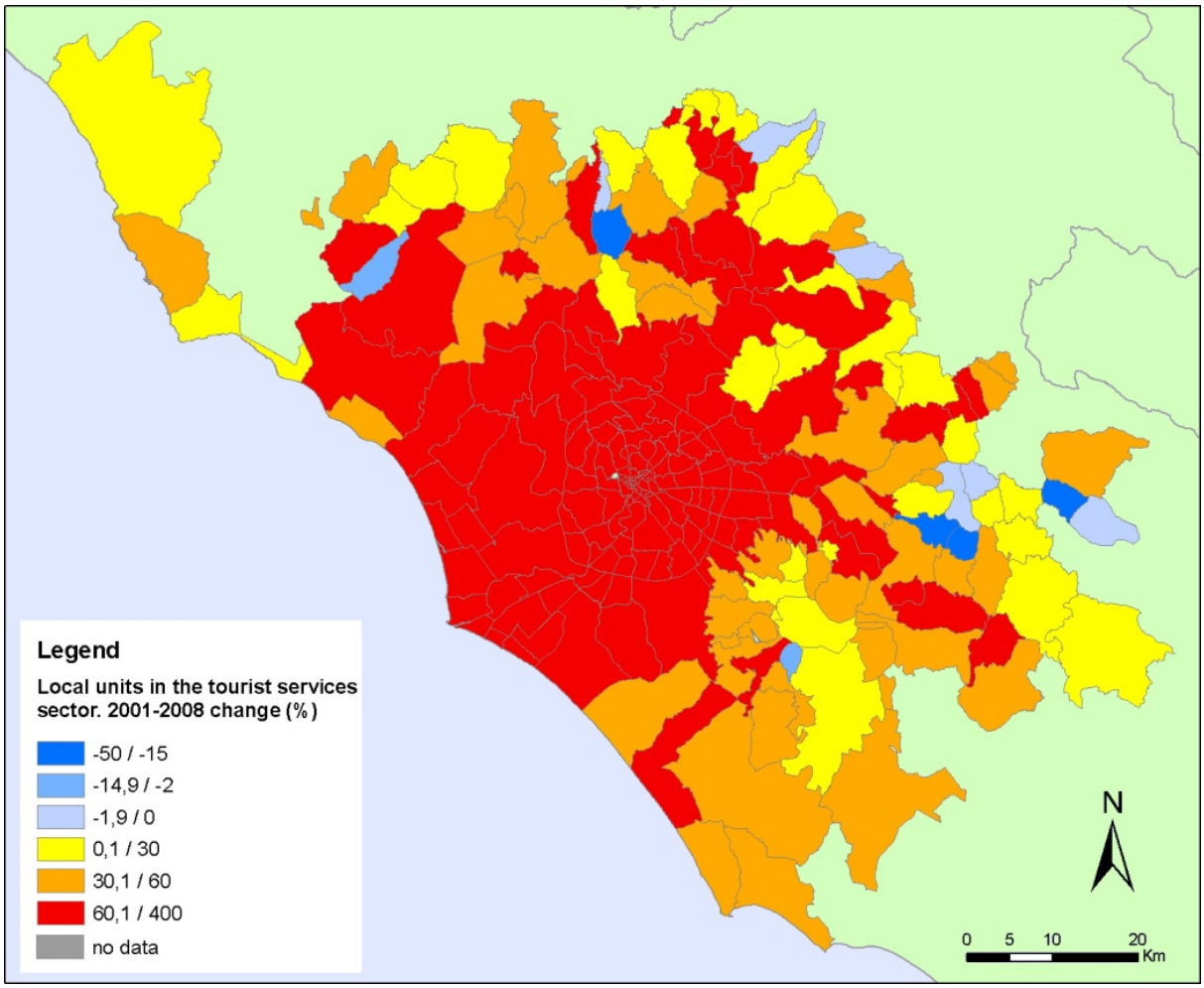
The number of tourists in the metropolitan area of Rome has registered, in the last ten years, an increase higher than 10%. The number of tourists visiting the core every day exceeds 60,000, with an average annual total in the last year that exceeds 20,000,000. If we look at tourist accommodation, we can observe an increase in the number of beds in hotels. This trend, obviously, has not yet incorporated the effects of the crisis that we will probably observe in the next years (Montanari and Staniscia, 2012).

In the Chieti-Pescara urban area, in the period 2001-2008, the number of local units in the tourist sector (hotels and restaurants) registered a general increase; it was equal to 33.3% in the central city, 24.5% in the inner ring, 35% in the outer ring. The growth was remarkable along the coastal area: +30%.

The Chieti-Pescara urban area is characterized by a substantial and constant number of tourists in the last ten years and by very fluctuating supply in terms of accommodation. The average number of tourists on any one day of the year was around 3,300 in the year 2001 and reached around 3,500 in the year 2008. The increase was more marked in the core than in other areas; in the coastal zone it was below average. The number of overnight stays was above 1,100,000 in the year 2007. The number of beds followed a non-linear development path in the coastal area: a significant decrease at the beginning of the decade, an increase up to the mid decade and a new negative wave up to the end of the period. Those fluctuations are mainly due to the structural problems of the sector in the area. The traditional beach tourism (sea, sun, sand) that had characterized the region during the past decades is in crisis, a crisis that intervened relatively lately. The tourist operators are still looking for an alternative tourism development model and the public authorities are not able to support this process. This is why the processes of restructuring are continuously going on and they have not led, so far, to any stable solution (Montanari and Staniscia, 2012).

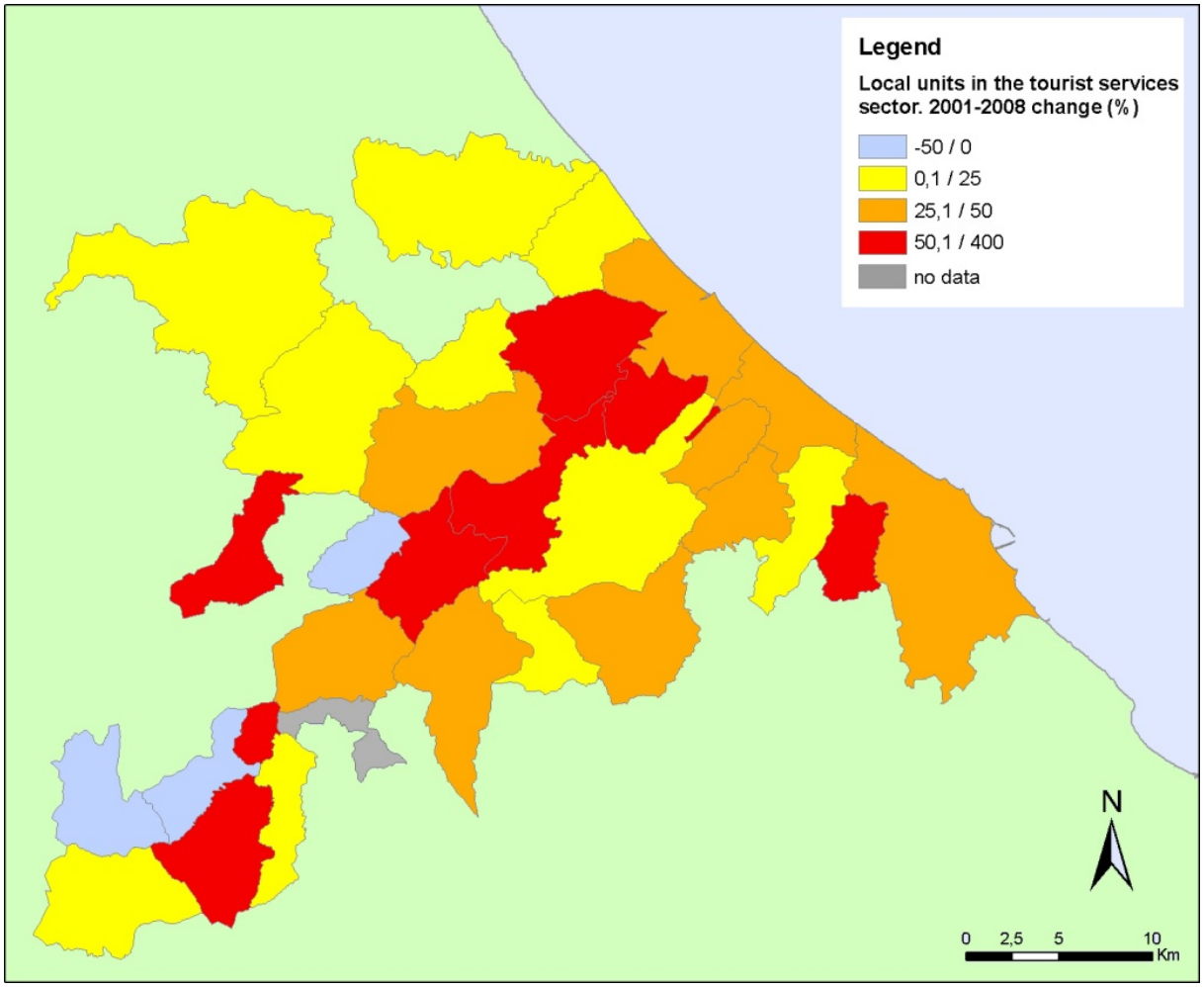
Focusing our attention on the Rome coastal area, the tourist presence is linked both to the summer beach activities and to the all year long tourist activities related to the historical goods and cultural heritage. Passengers of cruise ships as well as business people have to be added. A very high pressure on the coast is undeniable. In the case of the Chieti-Pescara urban area, tourist presence is mainly linked to the summer beach activities and to the business during the rest of the year. There are not, in fact, along the coast, relevant historical goods and cultural heritage.

Figure 2.20. Rome MA, dynamics of the tourist industry.[*]



[*] Source: own elaboration

Figure 2.21. Chieti-Pescara UA, dynamics of the tourist industry.[*]



[*] Source: own elaboration

Figure 2.22. Rome coastal area, overnight stays, 1998-2008, excluding the Rome municipality.[*]

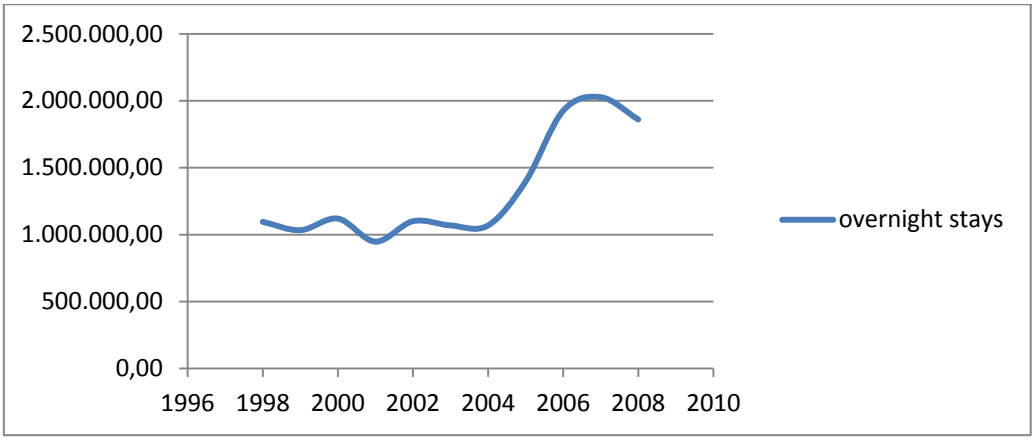


Figure 2.23. Rome coastal area, number of hotels, 1996-2008, excluding the Rome municipality.[**]

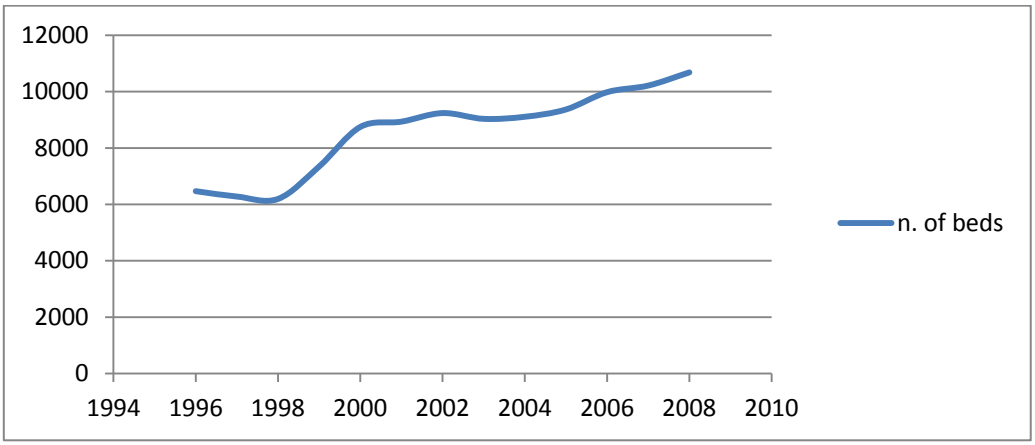
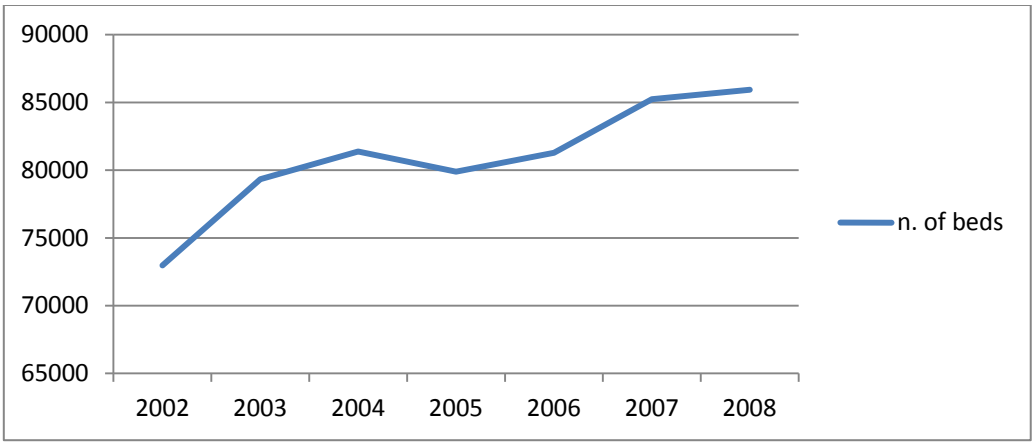


Figure 2.24. Rome municipality, hotels, 2002-2008.[***]



[*] Source: own elaboration on EBTL, 2010.

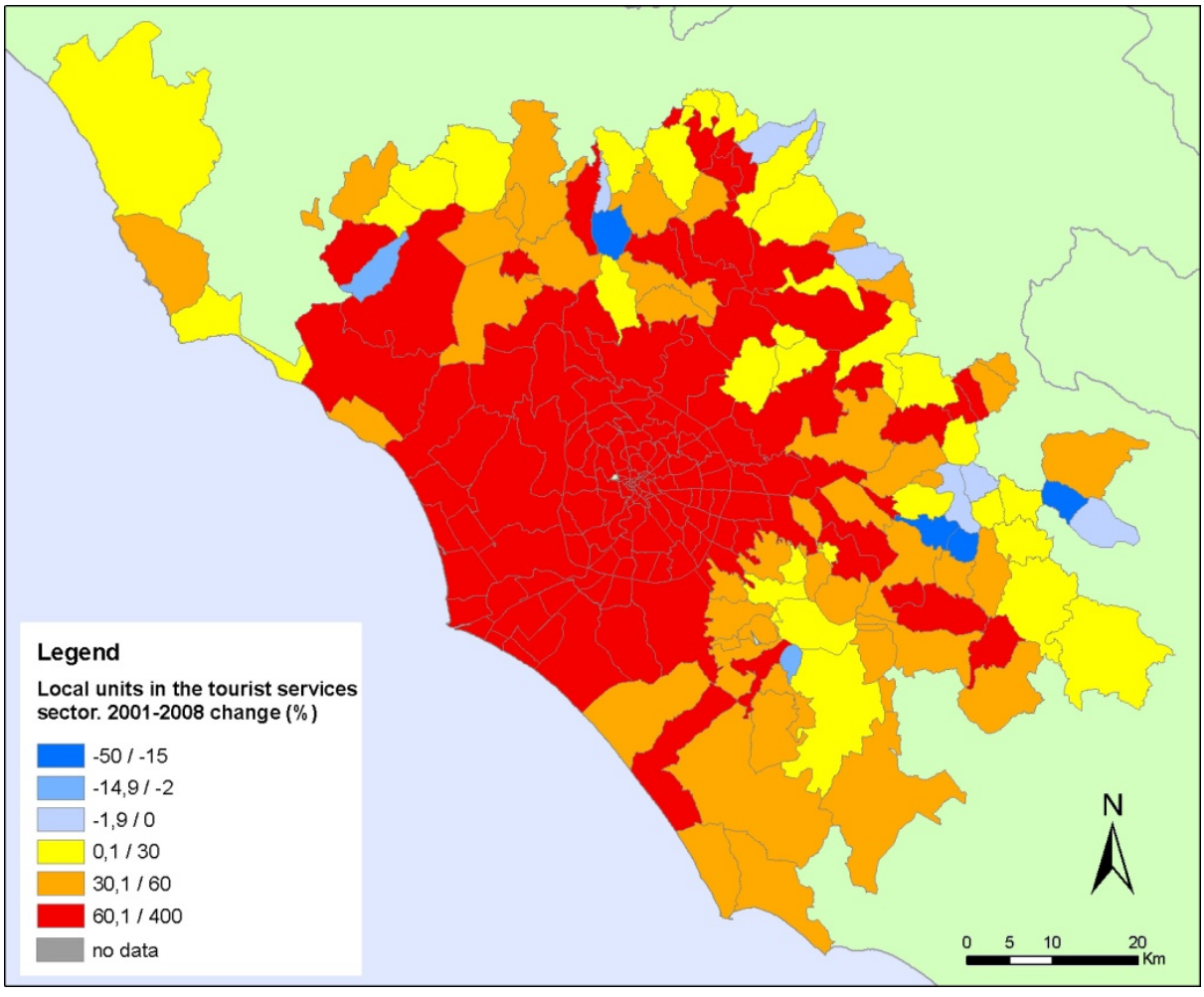
[**] Source: own elaboration on EBTL, 2010.

[***] Source: own elaboration on Municipality of Rome.

4.2 Trading and commerce

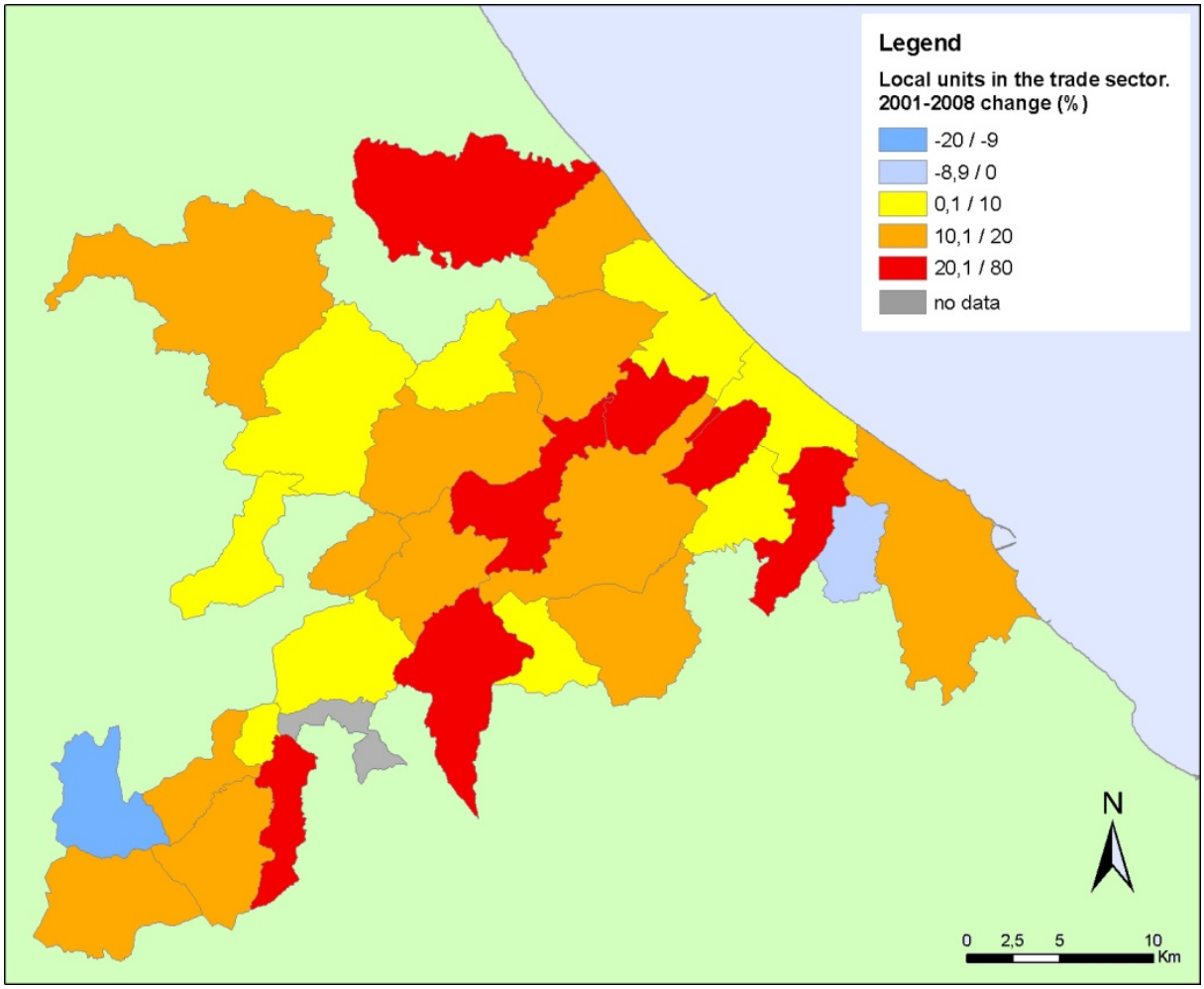
In both metropolitan areas a general development of activities in the commerce sector is recorded. In the period 2001-2008 the Rome central city experienced an increase in the number of local units equal to 18%. The increase was even more marked in the inner ring (+28%) and in the outer ring (+20%). Along the coastal area it reached +19.2%. In the case of the Chieti-Pescara urban area, the growth was lower but still relevant: +7.6% in the central city, 17.2% in the inner ring, 15% in the outer ring. Along the coastal area an increase of 8.4% was registered. This growth was accompanied by the disappearance of many small shops and the creation of numerous malls and shopping centres that surrounded the cores of the areas. This process of economic deconcentration accompanied residential deconcentration that, in many cases, was characterized by sprawl.

Figure 2.25. Rome MA, dynamics of the commerce sector.[*]



[*] Source: own elaboration.

Figure 2.26. Chieti-Pescara UA, dynamics of the commerce sector.[*]



4.3 Fishing fleets

The Rome metropolitan area is characterized by a low rate of activity in the fishing sector, while the Chieti-Pescara urban area shows a sector more important in the local economy. While the Rome metropolitan area accounts, in the year 2001, for 201 local units in the fishing sector, the Chieti-Pescara accounted for 138 in spite of its smaller territorial size. The fishing sector shows, in spite of this, a positive dynamism in the Rome metropolitan area (+41.7% in the period 2001-2008) and a negative dynamism in the Chieti-Pescara urban area (-18.8% in the same period).

[*] Source: own elaboration.

4.4 Ports

The Rome metropolitan area owns three harbors: Civitavecchia, Fiumicino and Anzio, characterized by different functions and scopes. The harbor of Civitavecchia, built by the emperor Traiano (103-110 A.D.), has today a commercial function – almost 7 millions tons of goods moved in the year 2008 -; it works as a port for passengers – more than 4 millions passengers in the year 2008 – and for cruise passengers – almost 2 millions in the year 2008. It is the main sea gate to the city of Rome. Its existence poses many problems for traffic and congestion of the main road axis connecting the city of Civitavecchia with the core of Rome. The harbor of Fiumicino was built by the emperor Claudio. It is today a commercial harbor, particularly dedicated to liquid bulks (more than 5 million tons moved in the year 2008) but also a connecting point through ferry boats to close islands (Ponza, Flegree and the Gulf of Aranci in Sardinia) and a marina. The passenger traffic is not very relevant in numbers if compared to Civitavecchia: around 60,000 passengers registered in the year 2008. The harbor of Anzio is located at the south end of the Rome metropolitan area. Its main function is connecting passengers to the Ponza island.

The harbor of Pescara was built in 1995 and has a double function: for movements of goods (around 350,000 tons moved in 2006) and for passengers mainly moving to Eastern European destinations (Croatia and Albania). The number of passengers, as well as the number of goods, is not very high (less than 50,000 in 2006) but growing. Ortona is the main harbour of the Chieti-Pescara urban area and has an important commercial function. Almost 1.4 million tons of goods were moved in 2005 and 881 ships moored in the same year.

Several marinas can be reckoned along the Rome coastal area: Civitavecchia, Santa Marinella, Fiumicino, Ostia, Anzio and Nettuno as well as along the Chieti-Pescara coastal area: Pescara and Ortona.

4.5 Energy production companies

In both metropolitan areas the period of 2001-2008 experienced a growth in the energy production companies. In the Rome metropolitan area the number of local units increased from 331 to 772 (+133.23%), while in the Chieti-Pescara urban area figures remain smaller (38 local units in 2001; 66 local units in 2008; an increase of 73.68%). It is worth mentioning the fact that the number of local units located in the coastal area is very high: 87% in Rome and 56% in

Chieti-Pescara in the year 2008. It is worth noticing that the energy power plant in Civitavecchia (inner ring of the Rome metropolitan area) is, for long time, a source of conflicts.

4.6 Environmental groups and community groups

In both areas environmental and community groups are present and active. Their action, coherently with the Italian culture, is often linked or in deep contrast with the political players. Their role is particularly important when development projects mainly aiming at economic growth put in danger natural and cultural heritages. The most important associations, active at national level, are WWF Italia, GreenPeace, LegAmbiente, Italia Nostra, FAI, MareVivo. Also very active are the associations linking the idea of high quality production and services and environmental and cultural preservations. Among the most important we can mention are Slow Food, AgriTurist, TerraNostra. Less active can be considered the consumers' associations – even existing – since the Italian legislation does not confer to them an ample freedom of actions. Among the others we can quote Altroconsumo, Codacons, Adiconsum. Furthermore ad hoc environmental and citizens' associations have been created in the Rome metropolitan area for the problems linked to the pollution generated by the energy power plant and the port of Civitavecchia and in the Chieti-Pescara urban area for the on-going debate about the definition of the national park boundaries.

4.7 Second homes

In the coastal zone of the Rome metropolitan area (including the municipality of Rome) in the year 2001, second homes were 219,735 and the total number of dwellings was 1,360,478, i.e. second homes represented 16.15% of the total. In the coastal zone of the Chieti-Pescara urban area, second homes registered in the year 2001 were 16,900 and the total number of dwellings was 95,159, i.e. second homes represented 17.75% of the total. Both in the case of the Rome metropolitan area and Chieti-Pescara urban area, the new trend, especially after the economic crisis, by the owners, is to rent their second homes, mostly to students, young couples, immigrants. The result is an overload of residents in the coastal areas all year round (Montanari & Staniscia, 2011).

5. Conclusions

In both metropolitan areas phenomena of coastal erosion are registered. In the case of the Chieti-Pescara urban area many engineering structures are recorded, often ineffective in their scope of protecting the coast.

Both coastal areas are very highly populated and heavily urbanized.

In both metropolitan areas an increase of the population is registered along the coastal areas; this increase is more marked in Rome; that means an increase of the human stress on this environment.

In both areas natural habitats and open spaces are decreasing, even if at a slow pace.

In both the metropolitan areas a decrease of the agricultural land is recorded; the industrial areas are expanding in the metropolitan area of Rome and reducing in the urban area of Chieti-Pescara; the built-up and commercial areas are expanding in both regions.

An increase of the pollutant economic activities (industrial sector), a decrease of the economic activities (agricultural sector) with a potential use for the landscape protection, and an increase of the service activities are recorded along both coastal areas. The increase in the weight of the industrial sector is particularly relevant in the Chieti-Pescara urban area as much as the losses (in terms of local units) in the agricultural sector.

In both metropolitan areas the tourist sector is in rapid growth. A very high increase is recorded in the number of enterprises and a non-negligible increase is also reported in the number of tourists.

In both metropolitan areas a relevant growth in the commerce sector is recorded, linked to the increase of shopping centres and malls, and to a process of economic deconcentration.

Fishing companies are not numerous in the Rome metropolitan area; they are relatively more important in the Chieti-Pescara urban area. The sector is growing in the first case study, while declining in the second case study.

Cultural heritage is an important resource in the Rome metropolitan area, while natural resources have an high value in the Chieti-Pescara urban area.

Both coastal areas in the past decades have experienced a very rapid increase of population. In the case of the Rome region this increase was linked to the high prices of the real estate in the core; in the case of the Chieti-Pescara area, the growth was linked to a preference for living along the seaside, made possible by the slow dynamism of the real estate market. Both coastal areas have experienced phenomena of growing large commercial surfaces. Those two phenomena have induced a growing traffic and road congestion as well as a decline in the quality of local services.

Both coastal areas are affected by an intense use in the summer season, due to a higher number of temporary inhabitants. It poses problems of water availability and waste production. Harbours and airports activities all year long contribute to the pollution problems. The numerous beach house activities during the summer contribute to lower the quality of life of the residents. The very valuable cultural and natural resources are put in danger by the intense use of the coastal areas. All those elements risk to compromise the sustainability of the coastal development.

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CHAPTER 3.

Sustainability in Coastal Urban Environment: Identifying Resources and Users in Belgian Case Study Areas

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1. Introduction

Urban areas are the centres of development characterized by complex elements and processes, often with high population density, varied economic activities and diversified mobility patterns. They are also the centres of many environmental issues such as air pollution, solid waste, wastewater and industrial wastes, and resource consumption. Coastal urban areas have not only all the characteristics of urban areas, but also characterized by their coastal environment, in term of resources and space.

In an attempt to understand the problems that coastal urban areas are facing, especially in term of sustainable resource management and conflict resolution, this chapter aims to look into the specific characteristics of the two Belgian urban areas - Oostende and Brugge - to identify their important resources that affect their development as well as to identify various group of resource users that can take parts in this or other form of resource utilization and conflict over those usages.

The chapter starts with describing the boundaries of the two Belgian case study areas, using the defining criteria such as employment and commuting to differentiate between a core and a ring for each of the case. Then, the chapter describes various natural and socio-cultural resources that the cases possess before moving on to provide an overview of various users and their characteristics. Finally, in the conclusion, main resources and users are identified and an overview of various conflicts over resource uses is presented.

2. Description of the Areas and Their Resources

2.1 Delimitation

The Belgian coast lies central in the European core area, at the southern point of the North Sea. It is a densely populated area with important economic and tourist activities.

The coastline consists of wide sand beaches, usually followed by a small dune belt. Landwards, there is a flat, long and wide polder landscape, excellent for agriculture. Seawards numerous sand banks can be found.

Thanks to its well-established road network, the coast is easily accessible for a broad (European) hinterland, with cities like Brussels, Cologne, Lille, Amsterdam, Paris and London. The densely build-up areas and the linear road infrastructure makes Belgian coast look like one small continuous agglomeration. Small open areas only occasionally interrupt this scenery.

Within the framework of the SECOA project, a spatial framework was defined for the organization of data collection and analysis in the case study areas. This framework comprises of three zones:

- The *metropolitan core* can be seen as the administrative area of the metropolitan area. The largest numbers of jobs are also generated in this area. Minimum employment numbers are used to decide whether or not to allocate a sub-area to the core.

- The surrounding *outer metropolitan ring* is functionally linked to the core. The boundaries for this ring are defined by journey to work flows in the first part. The ring should be constituted of those areas where at least 15% of the workforce travels from the area to the core. Additional information can come from other functional linkages e.g. transport flows, migration flows.

- Given the nature of this project, a *coastal strip* or *shoreline sub unit* should be defined. This can be statutorily defined, or in terms of a fixed buffer.

The study areas in the Belgian cases have been defined taking into consideration the above-mentioned characteristics, as well as other methods of demarcation used in Belgium, especially the works of Van der Haegen (*et al.,* 1979; and 1996). Based on a national census, the status 'Stadsgewest' has been given to regions in Belgium primarily based on employment and commuting data. These regions are made up from several other, cumulative, spatial zones (Van der Haegen *et al.,* 1979, Le *et al.,* 2012).

The first assessment and demarcation of *stadsgewest* was done in 1996 when 15 regions were designated as *stadsgewest.* A revision of that status has been carried out in 2007, using the census of 2001 by Van Hecke (*et al.,* 2007). The result disqualifies one area as a *stadsgewest*, gives the status for a region for the first time, and two new regions are created by dividing an old one. At this point, Belgium has 18 areas that have been given the status *stadsgewest*. Both Belgian case-studies in the project SECOA (Oostende and Brugge) are *stadsgewest.*

For the SECOA case studies in Belgium, we define the metropolitan **core** as being equal to the *stadsgewest (agglomeration + banlieue).* The *forensen* communes of the stadsgewest make up the metropolitan **ring**.

For Oostende Study Area (SA) includes following communes (Van Hecke *et al.,* 2007):

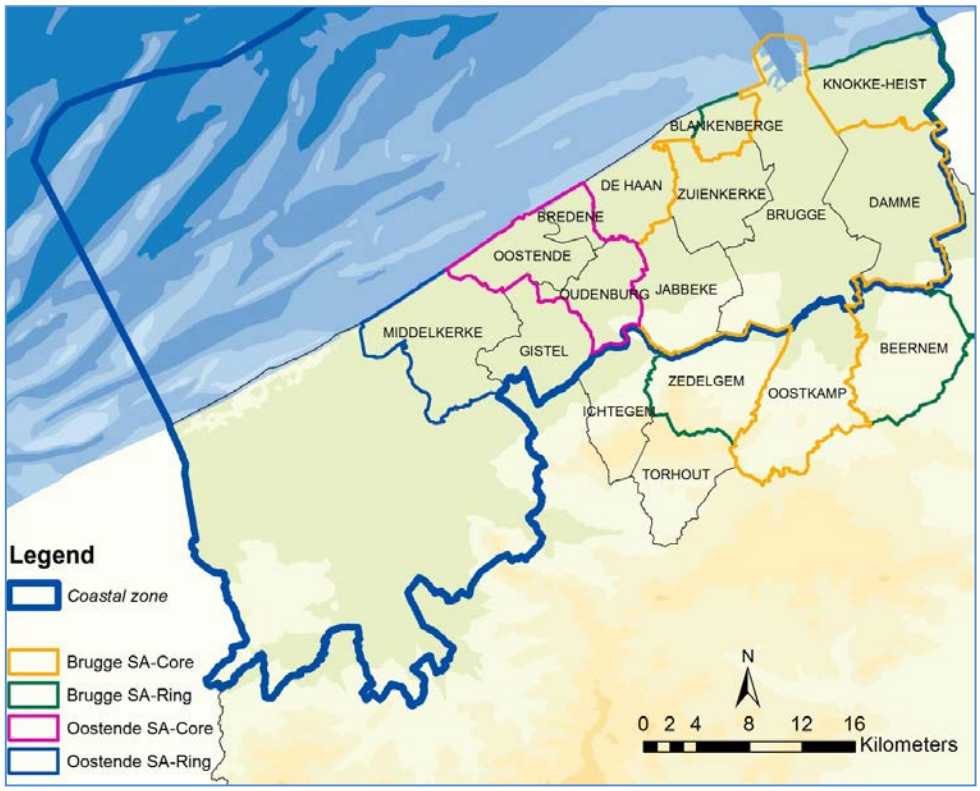
- Agglomeration (Core): Oostende and Bredene
- Banlieue (Core): Oudenburg
- Forensen (Ring): Gistel and Middelkerke

For the Brugge Study Area (SA) these include the following communes (Van Hecke *et al.*, 2007):

- Agglomeration (Core): Brugge
- Banlieue (Core): Damme, Jabbeke, Oostkamp and Zuienkerke
- Forensen (Ring): Beernem, Blankenberge, Knokke-Heist and Zedelgem.

For both case-studies, the coastal zone is defined using the statutory coastal zone definition. The whole of the Oostende SA lies within the coastal zone demarcation. Three communes of the Brugge SA fall outside the coastal zone: Oostkamp, Berneem and Zedelgem (Belpaeme *et al.*, 2004). The situation is visualized in figure 3.1.

Figure 3.1. The study areas: Brugge SA and Oostende SA.



In a Belgian context the coastal cities of our case study in Brugge are known as 'the Eastern coast', the coastal cities of the case study in Oostende as 'the Middle coast'. Oostende is the most important coastal city in Belgium and is situated at the center of the Belgian coastline. Brugge lies more to the North and the heart of the city is found 30 km inwards. It is connected to the sea through Zeebrugge, once a small fishing town but became a part of the city of Brugge once a seaport has been built there, connecting Brugge with the sea.

Because of the fact that the Belgian coast is rather small, a proximally 67 km long, the description of the state of the environment will cover both case studies. Moreover, both cities are of high importance for the Belgian coastal region in the generation of jobs, cultural activities, education etc. So when one takes a look at the description of the boundaries of the case studies, they will rapidly notice that both metropolitan rings are connected to each other.

2.2 Physical environment

The Belgian coastal zone is a highly dynamic environment. The combination of waves, tides and wind influences the loose sediments which make up the soil in the zone that extends up to the edge of the coastal dunes, and results in a constantly moving landscape. Further inland, however, the marine influence is much less apparent.

The coastline is always in motion due to the erosion and deposition of sand under the influence of the waves. Many places in the landscape still show visible traces of the genesis of the coastal plain, and even recent maps, aerial photographs and satellite images reveal certain traces from the past. Historical cartographic material provides important information for the reconstruction of the genesis of the Belgian coast.

A relatively narrow dune belt with a width of only 100 m to 3 km constitutes the transition between sea and land. In most seaside resorts a permanent protective seawall replaced the dune belt. These manmade defenses are continuously checked and improved to guaranty optimal safety for changing situations.

The dune acreage, which still amounted to almost 6,000 ha at the beginning of the twentieth century, has almost been halved and, more particularly, highly fragmented. This is the result of urbanization and growing tourist activity. Only a few locations still feature uninterrupted dune complexes. The origin, morphology and dynamism of the coastal dunes are to a large extent connected with the (wind) climate along the coast, the coastline orientation, the vegetation and the presence of broad sandy beaches.

The coastal dunes are created by an accumulation of sand from the beach. Although the predominant wind direction is in the direction of the sea (southwest as opposed to the west-southwest - east-northeast oriented coastline), the winds transporting sand (>15 km/h) blow in a slightly land-inward to coast-parallel direction, thus blowing sand toward the dunes. A continuous supply of sand ensures that the dunes continue to grow and gradually loose their halophilic character. The halophilic vegetation is replaced by halophobic vegetation, which is able to develop due to a supply of fresh groundwater. The dominating plant on the seaward

side of the coastal dunes is marram grass (*Ammophila*). Inland the dune soil is better fixed and the vegetation displays more variety with thicket, grassland and dune forest.

Behind this small stretch of buildings are the polders, which are the a low-lying tracts of land enclosed by embankments known as dikes, that forms an artificial hydrological entity, meaning it has no connection with outside water other than through manually-operated devices. The polders constitute a very homogenous agrarian area of low building density used for extensive agriculture. Next to pastures and grasslands, which account for 40 % of the total area, the area also comprises fields mainly used to cultivate grain crops.

The polders also feature many areas with a high natural and landscape value. The collaboration between environmental movements and farmers supports the sustained development of the coastal region.

2.2.1 Geography and geology of the study area

Both case-study areas geologically and geographically identical and parts of the larger French-Belgian North Sea Coastal barrier. The French-Belgian North Sea coast is a 120 km long, almost rectilinear sand beach barrier stretching from the Cap Blanc Nez chalk cliffs (France) to the mouth of the Westerschelde (Belgium/Netherlands).

These sandy beaches have been built up through thousands of years by wind, waves and tides on a supply of loose sand grains at the seaward side of a complex coastal barrier, perhaps an island barrier, whose location changed with time. At the same time, in the more sheltered area landward of the coastal barrier, an intertidal flat developed by depositions of mainly fine-grained material and by intermittent peat formation.

The French-Belgian coastal plain extends some 10 to 20 km landward from the beach barrier. Most of the plain's present-day elevation is between mean and high tide sea level. As such, the sea would inundate the plain twice a day, should it not be protected by a continuous system of beaches, dunes and dikes. The area behind these protections is called the polder.

The coastal barrier nowadays is still the sea-defence for the coastal lowlands, and this fact alone with the outstanding economic and touristic significance of the sea front area itself, justifies the French and Belgian governments' efforts for rational management and better understanding of this dynamic environment.

2.2.2 Climate

The proximity of the sea gives the coastal region a unique climate. Moreover, local climatic differences occur along the coast. The annual rainfall at the coast is around 670 mm (as compared to 780 mm in Brussels) (Dehenauw, 2002). The cool, slowly warming seawater keeps temperatures low in the lower air layers. The temperature difference with the colder, higher air layers is smaller, and therefore heavy (thunder-)storms are less frequent compared to inland regions. In the months of October and November, however, the water tends to be warmer, causing the temperature in the lower air layers to be higher.

Along the coast the average annual sunshine hours number 1,700 (1,550 hours in Brussels). The main difference is measured in the summer, when the sun shines up to 20 hours longer along the coast than inland, which is preferable for tourism (Dehenauw, 2002).

Under the influence of the colder water mass, temperatures along the coast are considerably lower than inland, especially during the summer. If there is a sea breeze, the difference in temperature between the coast and the "Kempen" region exceeds 10°C. In winter the situation is reversed due to the relatively warm seawater. Due to the cooler temperature, fewer cumulus clouds form above the sea and along the coast. These clouds only develop inland, a couple of kilometers behind the coastal zone.

There is much more wind at the coast than inland. The predominant wind direction is southwest. The highest wind speeds are measured in winter as storms occur more frequently during this season.

2.2.3 Hydrology

The Belgian coast has semi-diurnal tidal regime, with an average tidal difference of 4 meters. The tide wave moves along the coast from west to east. The tidal difference decreases in the same direction by ± 0.5 m. Spring tides occur twice a month and the tidal variation has reached its maximum (± 5 m); neap tides occur twice a month when the tidal difference has reached its minimum (± 3 m).

The tidal curve has an asymmetric shape because the low tide lasts half an hour longer than the high tide. Meteorological circumstances can significantly influence the curve as well. Long-lasting intense winds may influence the water level, resulting in extremely low or high water levels.

The movement of the water surface causes important tidal currents with the same periodicity as the tide. The flood current moves in the same direction as the tide, while the ebb

current moves in the opposite direction. Close to the coast the flood and ebb currents usually run parallel to the coast. The currents running parallel to the coast are strongest during high and low tides. During spring tide the flood current at the Zeebrugge port entrance can reach a speed of 2 m/s. On the open sea the transition from flood current to ebb current and vice versa, when the current temporarily almost comes to a halt more or less coincide with the half-tide level.

The wave climate along the coast is mainly determined by meteorological circumstances (predominantly westerly winds) and by the shallow depth of the sea. Under normal circumstances the wave height (the difference in height between trough and crest) along the coast is lower than 1 meter. During (heavy) storms wave heights of over 5 meters can occur.

The wave period (the time between two consecutive waves) is 3 to 4 seconds under calm weather conditions, but during storms it can amount to 10 to 15 seconds.

2.2.4 Natural ecosystems

Due to its location on the boundary that exists between sea and land, the coast has a specific ecological value at sea, on land as well as in the transition zone. This awareness started to grow as late as the end of the 20th century, but since then policies and attitudes have changed and nowadays people participate actively in the restoration of the environment.

Compared to the oceans, the North Sea is only a small, shallow pool. But it is precisely this that makes marine life in the North Sea so rich. This is particularly true of the shallow waters and on the bottom of the Belgian part of the North Sea, which features a wide diversity of animals and plants. However, their habitat and the whole ecosystem are under great pressure because of intense human activities, more specifically fishery, sand and gravel extraction, shipping and tourism.

The beach and the dunes constitute the boundary between sea and land. Despite the human activities that use a large part of this area and exert great pressure on the fragile ecosystems, a number of ecologically very valuable areas have been preserved.

The beach reserve "De Baai van Heist" (50 ha) is located on the beach plain created by sand and silt deposits in the lee of the eastern breakwater of the port of Zeebrugge. The bare beach plain has developed into a very diverse and dynamic coastal area. Under the lee of the wet beach en some thin covered beach banks, we now find a 'green beach' with embryonic dunes, silt, salt march and low dunes.

The dunes along the Belgian coast are very vulnerable ecosystems that have only recently been incorporated into a protection plan. The three largest nature reserves along the coast are "De Westhoek", "Het Zwin" and "Ter Yde". “Het Zwin” is located in our study area of Brugge. Het Zwin is one of the most important nature reserves in Belgium. It has a coastal length of a proximally 2.3 km in the Belgian-Holland border region. About 2 km is located in Belgium, in the commune of Knokke-Heist. The total area covers 158 ha, 125ha in Belgium. It is made up by dunes, followed by salinated intertidal sandy planes.

Large parts of the reserve only become flooded during spring tide or during storm surges. The whole area is only under unusual circumstances inundated. The quantity varies depending the height of the tide and the wind direction. The water flows through ditches to the small western lakes. On its retrieval a part of the water is held back by means of artificial valves. This insures a permanent water level in the reserves during periods of low water levels. These (semi) permanent pounds contain several sea fishes. This intertidal play brings forward the irregular deposit of sand and clay and give rise to small differences in height. This, in combination with the tides is the origin of a variety in vegetation; it is like a patchwork of salt loving plants. The soil is the habitat of millions of worms, snails and bivalves, an excellent diet for birds. Numerous birds come here to breed, rest, fly over, etc. Especially during the winter months one can count over tens of thousand birds here.

Areas along the coast where the natural transition between dunes and polders is still intact have become extremely rare. The coastal hinterland mainly consists of polders, land previously reclaimed from the sea by systematic dyke construction and drainage. The flat polder area is mainly used for agriculture, for the purpose of which a draining system with sluices and canals has been constructed. The areas with a higher elevation are largely used as arable land, whereas a number of vast pasturelands featuring a specific pasture bird fauna can be found in the lower areas.

Older forests along the coast can be found in the dunes and in the transition zone between the dunes and the polders. The original aim of the forestation of the coastal dunes was to protect the agricultural lands in the hinterland. They form a wind screen and hold the sands together. The most important dune forests along the western coast of Belgium are the Calmeynbos, the Doornpanne and the forest reserve Hannecartbos. Along the eastern coast are the dune forests of De Haan and the Blinkaertbos and the Zwinbosjes in Knokke.

In the dune forest of De Haan, successive vegetation belts in a dune area can be visible, starts with resistant grasses and herbs (marram, fescue...) at the high-water mark, subsequently

bush species (creeping willow, sea buckthorn, elder...) and eventually timber. In the past conifer species (common pine, Corsican pine...) were planted behind a screen of native deciduous tree species (oak, maple...), but nowadays, they are being replaced by deciduous tree species.

New forests have already been planted near Oostende (Keignaertbos) and Blankenberge (Zeebos). Other forests are planned near Nieuwpoort and Knokke.

In our study area several other, officially recognized, protected areas can be found. Some of them are in private ownership of nature protection groups; the government owns the other ones. In total, 248ha of protected natural areas in 7 reserves can be found in the Oostende SA (in the communes of Middelkerke, Oudenburg and Bredene) and 530ha in 19 reservesin Brugge SA (in the communes of Jabbeke, Brugge, Zedelgem, Oostkamp, Blankenberg, Damme and Knokke).

2.2.5 Marine and coastal resources

2.2.5.1 Biological resources

This Belgian Register of Marine Species (BeRMS) only contains the names of species currently or historically occurring in the Belgian part of the North Sea. As of September 2010, only species occurring in the marine environment up till (but not including) the coastal dune front. In total, 2187 species have been documented. The majority of these species are invertebrates with Nematoda being the most abundant invertebrate species group (472 species). Within the vertebrates, fish and birds are the most abundant (respectively 127 and 75 species). Of those 2187 species, 118 are considered to be vagrant, exotic or drift species, which means they are observed limitedly in the Belgian part of the North Sea without having an established population here (Vandepitte *et al.*, 2010).

Inventories of the species of the coastal zone, including the salt marshes, mud flats, dunes and the adjacent brackish areas are not available at this moment (Vandepitte *et al.*, 2010).

Non biological resources

The most notable non-biological resource in the coastal zone of Belgium is sand and gravel. The extraction of sand and gravel in the Belgian part of the North Sea is an alternative to the scarcity of sand quarries in the country. The sand and gravel mined is mainly used in construction, where it serves the production of concrete and for raising and widening of the beach with sand (sand nourishment) so as to curb coastal erosion (VMM, 2007).

Sand extraction has besides the purely physical effect (interaction between morphology, hydrodynamics and sediment process), also a biological impact. This impact is both direct, e.g.

by the suction of soil animals by a suction dredge, and indirectly through an increase in turbidity and an increased mobilization of pollutants (VMM, 2007).

2.2.5.2 Natural Hazards

Due to its geographical placement, the Belgian coast won't have to worry about earthquakes or tsunamis. The most imminent threat is storm. Much of the coastal area in the southern North Sea is low-lying and therefore vulnerable to the predicted increase in flooding, inundation and erosion. Most damage to coasts is caused by extremely high sea levels and waves during storm surges. There is a need to monitor the frequency of extreme weather in support of risk assessment and management schemes in coastal zones. An indicator for this is keeping track of the number of days of gales per years. On these days the maximum wind speed is equal or higher than 30 knots (15.34m/per second).

Coastal erosion is measured as the gradual loss of sediment and a coastline is described as 'eroding' when this loss of sediment exceeds a certain critical standard or baseline. Methodologies and standards for establishing whether a coastline is accreting, eroding or stable are not uniform among coastal states. The part of the beach profile that is considered for erosion studies also differs from country to country. Monitoring the evolution of accretion and erosion, sea level and the effects of extreme weather is of crucial importance for developing proper local risk assessment and adequate policies in shoreline management.

The IPCC Fourth Assessment report (2007) on climate change predicts a rise of 14-59 cm in global (mean) sea level by 2100, as a result of the thermal expansion of ocean water and melting of the ice sheets. Coastal areas, and in particular low-lying areas and regions where a negative or downward vertical land movement is taking place, are facing greater threats.

In Belgium this parameter is describe as a revised local reference datasets from the Permanent Service for Mean Sea Level (PSMSL) are reduced to a common datum approximately 7,000mm below mean sea level in order to enhance global comparability.

Coastal lowlands are considered the most vulnerable to Sea Level Rise and related inundations. In this respect, Belgium, together with the Netherlands, where more than 85% of the coastal zone is located below 5 meters elevation, is highly vulnerable.

With these parameters, and given the socio-economic characteristics of the Belgian coastal zone, one can see that the area is very vulnerable to flooding due to the increasing numbers of people and economic assets near the coast.

For this, the government has invested great effort in coastal safety. In Belgium coastal protection is a regional responsibility. Up to now, the Flemish government (Flemish region) has defined the minimum safety level of the coastal protection at once in 1000 year. However, this safety standard is not implemented in any law or decree. Every 5 years the safety of the entire coastline is checked and yearly monitoring enables to update the achieved safety level. Every year small beach nourishment activities are carried out. For several years no new sea walls have been built, because these hard safety measures intervene with the natural dynamic of the coastline whereas soft measures, like nourishments work together with the accretion and erosion processes.

A lot of coastal communities however do not achieve the safety standard. So far, a minimum safety level of once in 100 year is guaranteed along the entire coastline. The yearly budget does not add up to meet the standard. There is a need for long-term planning. Hence, for the first time, the Coastal Division of the Flemish region started up a study to work out an 'integrated master plan for Flanders future coastal safety'. The aim of this study is to protect the Flemish coast against erosion and flooding on a short and long term basis, looking ahead at the year 2050, based on the principles of ICZM. Therefore the time aspects of investments, sea level rise, beach erosion, etc. are also taken into account. This integrated master plan must in particular define the measures needed to develop and guarantee a safe coastline (Mertens *et al.*, 2008). This master plan was approved by the Flemish parliament in 2011 and made public. Based upon their proposals, the necessary measurements will be taken to guarantee coastal safety for natural hazards caused by storms and flooding.

2.3 Socio-economic conditions

There is already al lot of socio-economic information available and processed in Belgium for the SECOA case studies. However, there is a small problem in the overlap of the proposed case-study area. Given the small areas covered by the communes and cities in Belgium, most analyses have been carried out on a larger statistical unit than the commune or city level. All studies look almost exclusive at the level of the arrondissement (if we look at legal boundaries) or at the level of RESOC areas (for socio-economic analyses). Both areas cover the same spatial boundaries for our case studies.

Within one RESOC region, a consultation committee is established comprising members of the local authorities (communes, cities and provinces involved), members of the employer

organizations and members of the employees (syndicate) organization. They work together to stimulate regional social economic development and propose pacts and leverages to promote this. These become active once ratified in the different councils.

The problem here is that these areas are larger than our case study area. The reason for this is partly caused by the fact that both case-studies are in close proximity to each other. Taking the definition of the metropolitan ring, and our own definition of 'stadsgewest', some communes between Brugge and Oostende fall out of the scope. The workforce, and other parameters that stipulate their mean attraction pole, are divided between the two cities, so none of them can act as the core city, based upon the minimal percentage to be acquired.

Nonetheless we will use some of their analyses, because they provide a good view on the region under investigation. If possible we will deduce the result to our study area. Also numbers and maps will be provided at a smaller statistical level and within the scope of the study area.

2.3.1 Overview

In 2008 a socio-economic analysis was made for the RESOC regions (SVR, 2008). We will present their findings here and afterward update them with the latest numbers possible.

Concerning welfare, it is hard to say that Oostende is a top region. The GNP per inhabitant (€ 21,735) was ranked second lowest of all RESOC areas in Flanders in 2007; 76% of the average in Flanders. The available income averaged at € 14,978 in 2004, this was 92% of the Flemish average and was relatively lower than in 1995.

However, the average tax return (€13,122) was higher than in 1995, but still only reaches 93,3% of the Flemish average, but in line with the average of the province of West Flanders.

As in the rest of the province, the number of people who benefit from a special treatment in health insurance (102.3 per 1000 inh.) is higher than in the rest of Flanders, even up to 22% in the timeframe 1998-2006. There are also a higher number of people who receive the minimum unemployment benefit.

The number of births in underprivileged families (7.6 per 100 births) is also much higher than in Flanders and even in the province of West-Flanders.

The situation in the area of Brugge is better; it is the most thriving RESOC area of the province of West-Flanders (West-Vlaanderen). The GNP reaches 96.6% of the Flemish average, but is still almost 3% better than the average of the province. The available income is more or

less the same than in Flanders, but with € 16,715 per person it is again higher than in the province (5%). Tax returns, people who benefit from health insurance and those counting on minimum paychecks from the unemployment service follow the same trend.

The number of births in underprivileged families is even lower than in the rest of Flanders, up to 6.9% lower.

Table 3.1. Tax return, unemployment rate and GDP data.[*]

Parameter		**2001**	**2004**	**2007**
Tax Return (€)	Arr. Oostende	11,301	13,086	14,555
	Arr. Brugge	12,408	13,992	15,928
Unemployment		**2003**	**2006**	**2009**
	Arr. Oostende	7,883 (9.5%)	7,646 (8.7%)	7,203 (8%)
	Arr. Brugge	11,551 (7.2%)	10,901 (6.5%)	9,372 (5.5%)
Gross Value Added (€)		**1998**	**2003**	**2007**
	Arr. Oostende	2,557 M	2,411 M	3,091 M
	Arr. Brugge	5,973M	5,888 M	7,195 M

The labour productivity for the Oostende region showed in the period of 1995-2005 a higher increase than in the whole Flemish region, but is was still only 92% of the overall average. Significant for this region is that the added value of the secondary sector is rather small, with 13.1% it ranks second last of all regions. Yet this is a slight improvement compared to 1995. The contribution of the tertiary and quarterly sector on the other hand is ranked at the top.

In absolute numbers, there were 3,070 jobs created in the period of 1995-2006 within the Oostende region, the total created employments amount to 55.8% of the total available working force (15-64 years), is the third lowest number (Flanders region 61.3%). The employment rate also didn't increased as much as in the rest of the Flemish region and the province. These bad numbers are also reflected in the number of self-employed persons. In 2006 they were numbering 10,888, almost 4% lower than 10 years before. The same trend was visible in the whole province, but for Flanders it increased with 0.5%. As practically for the whole Flemish

[*] Source: GOM West-Vlaanderen, 2001-2010.

region, the still available area for industry is very low, only 7.6 ha wasn't yet occupied in 2006. So changes in their employment rate aren't expected.

The economic activity in the primary sector is slightly higher than in the rest of Flanders, mainly due to the good agricultural grounds in the polders. The secondary sector, mainly industry, is poorly represented (16.1%) compared to the average. The segment of tertiary activities is comparable with the overall numbers, but what is notable is the great increase of the quarterly sector in this region, mainly financial and business activities.

The region was responsible for 8,385 newly generated jobs between 1996 and 2006 and employment numbers rose with 9.2%, in-between those of the province and those of Flanders. Both numbers for employed and self-employed people rose. By the end of 2007, 93.3% of the available land for industry was occupied, which only leaves 7.6 ha open for new projects.

Table 3.2. Socio-economic parameters.[*]

Parameter		**2002**	**2005**	**2008**
Number of Businesses	Arr. Oostende	/	10,147	12,789
	Arr. Brugge	/	22,899	24,019
Number of Self-employed people	Arr. Oostende	9,845	10,967	11,113
	Arr. Brugge	22,331	24,937	25,268
Area occupied by Ter. sector (ha)	Arr. Oostende	422.3	444.0	502.7
	Arr. Brugge	1,008.3	1,041.9	1,106.6

A more economic insight is given when we look at the number of businesses and their employment numbers, and the land-use parameters of the different sectors.

Compared to 2001, there were 7% more new businesses in 2008 at the core area. This augmentation was mainly generated in the 3rd and 4th sector. The secondary sector had a significant loss and the primary sector remained relatively stable. Overall employment numbers rose, but they show the shift of activities in the area more clearly than the number of businesses. In only seven years time, there are almost 50% less people active in the agricultural sector, the secondary sector had to experience a 16,8% drop.

[*] Source: GOM West-Vlaanderen, 2001-2010.

Table 3.3. Overview of the evolution of the sectors in stadsgewest Brugge 2001-2008.[*]

Sector	Number of Businesses								Employment							
	Primary	Secondary			Commerces and services			Total	Primary	Secondary			Commerces and services			Total
		Industry	Construction	Total	Tertiary	Quarternary	Total			Industry	Constru c-tion	Total	Tertiary	Quarternary	Total	
2001																
CORE	120	421	428	849	2975	777	3752	4722	546	10498	3068	13566	23208	29928	53136	67302
RING	106	221	323	544	2039	319	2358	3008	461	4162	1158	5320	8420	6787	15207	20988
2008																
CORE	123	374	412	786	3265	878	4143	5052	285	8902	2472	11374	27412	33199	60611	72270
RING	90	196	313	509	2164	324	2488	3087	147	4631	1585	6216	9351	6965	16316	22679
EVOLUTION 2001-2008 in BRUGGE SA																
CORE	2.5	-11.2	-3.7	-7.4	9.7	13.0	10.4	7.0	-47.8	-15.2	-19.4	-16.2	18.1	10.9	14.1	7.4
RING	-15.1	-11.3	-3.1	-6.4	6.1	1.6	5.5	2.6	-68.1	11.3	36.9	16.8	11.1	2.6	7.3	8.1

The ring experienced the same plunge in its primary sector, employment went 68.1% down, and there were even 15% less active employers. The secondary sector had a slight setback of 6.4%, but employment rose with 17%, mainly due to more operations in the construction sector, which caused an employment rise of more than one third. Also here we see a rise in the 3rd and 4th sector, but less severe than in the core.

In the 8-year period under investigation, the activity pattern in the core of Oostende remained relatively stable. Only the number of businesses in the secondary sector dropped roughly 8%, but employment ciphers remained the same. Noteworthy is the steep decline in employment in the agriculture, it dropped 3 quarters, but there is only one business less. There are not that many new players in the commerce and service sector, yet employment here also rose with 10%.

[*] Source: GOM West-Vlaanderen, 2001-2010.

Table 3.4. Overview of the evolution of the sectors in stadsgewest Oostende 2001-2008.[*]

Sector	Number of Businesses								Employment							
	Primary	Secondary			Commerces and services			Total	Primary	Secondary			Commerces and services			Total
		Industry	Construction	Total	Tertiary	Quarternary	Total			Industry	Construction	Total	Tertiary	Quarternary	Total	
2001																
CORE	48	172	162	334	1771	390	2161	2544	220	3907	1033	4940	11895	11191	23086	28305
RING	28	48	87	135	580	103	683	846	70	520	423	943	1912	789	3581	4594
2008																
CORE	47	159	147	306	1,778	425	2,203	2,556	59	3,710	1,245	4,955	13,768	12,289	26,057	31,071
RING	26	63	78	141	575	107	682	849	55	535	439	974	2117	1844	3961	4990
EVOLUTION 2001-2008 in Oostende SA																
CORE	-2.1	-7.6	-9.3	-8.4	0.4	9.0	1.9	0.5	-73.2	-5.0	20.5	0.3	15.7	9.8	12.9	9.8
RING	-7.1	31.3	-10.3	4.4	-0.9	3.9	-0.1	0.4	-21.4	2.9	3.8	3.3	10.7	133.7	10.6	8.6

The surrounding area of Oostende shows the same trends, but the loss in jobs in the agricultural sector is less severe, with only 20%.

2.3.2 Agriculture and Aquaculture production

The livestock numbers are well documented in the communes of Belgium due to strict regulations concerning manure production. Data on the production of crops is only available at the provincial level (West-Flanders) due to the fact that most of the farmland of a farming household spreads across several communes.

Table 3.5. Overview of the livestock in the area of Brugge.

Category	Ring			Core		
	1997	2007	Evolution	1997	2007	Evolution
Number of pigs	169,048	143,936	-14.9	183,492	141,866	-22.7
Number of poultry	644,762	477,616	-25.9	623,560	504,832	-19.0
Number of bovine animals	40,353	32,166	-20.3	71,790	57,487	-19.9
Total of animals	854,163	653,718	-23.5	878,842	704,185	-19.9

[*] Source: GOM West-Vlaanderen, 2001-2010.

In Brugge, as was notable in the employment numbers, the total production in farm animals has dropped, both within the core, as within the ring. Moreover, there is no significant aquaculture present at our case study area.

Table 3.6. Overview of the livestock in the area of Oostende.

Category	Ring			Core		
	1997	2007	Evolution	1997	2007	Evolution
Number of pigs	80,682	74,227	-8.0	25,636	20,900	-18.5
Number of poultry	77,356	83,256	7.6	37,148	47,515	27.9
Number of bovine animals	17,512	14,513	-17.1	8,882	6,329	-28.7
Total of animals	175,550	171,996	-2.0	71,666	74,744	4.3

2.3.3 Industrial actitivies

The industrial sector declines in the metropolitan core of Brugge. Not only the number of businesses drops, also the workforce sees a decline. There are also no significant changes in the request for environmental permits of class I – in Belgium these are necessary to conduct activities that can have a significant impact on the environment. This can signifies that not a lot of new activities were started in this timeframe or prolonged.

The ring also has to deal with a setback in employers, but not in employees. The workforce not only rises in the industry, but also in the construction business. This evolution is also visible in the number of permit requests. The steep rise in request, but the decline in businesses can signify that the existing ones expended their activities. To do this they needed new permits, and an addition to their human resources

Table 3.7. Evolution of Class I permit request in 1999-2010 in Brugge.[*]

	1999-2004	2005-2010	Evolution (%)
CORE	154	150	-2.6
RING	228	299	31.1

[*] Source: Provincie West-Vlaanderen.

In the Oostende area we also see a slight decline in permit request in the core and a rise in the ring. This signifies that the core is shifting to an economy more and more base on the 3rd en 4th sector, activities that do not need a class I permit.

The number of industrial corporations declines slightly in the core, but augments by a third in the ring. Yet the number of jobs remains more or less the same in both areas.

Table 3.8. Evolution of Class I permit request in 1999-2010 in Oostende.[*]

	1999-2004	2005-2010	Evolution (%)
CORE	80	75	-6.3
RING	75	97	29.3

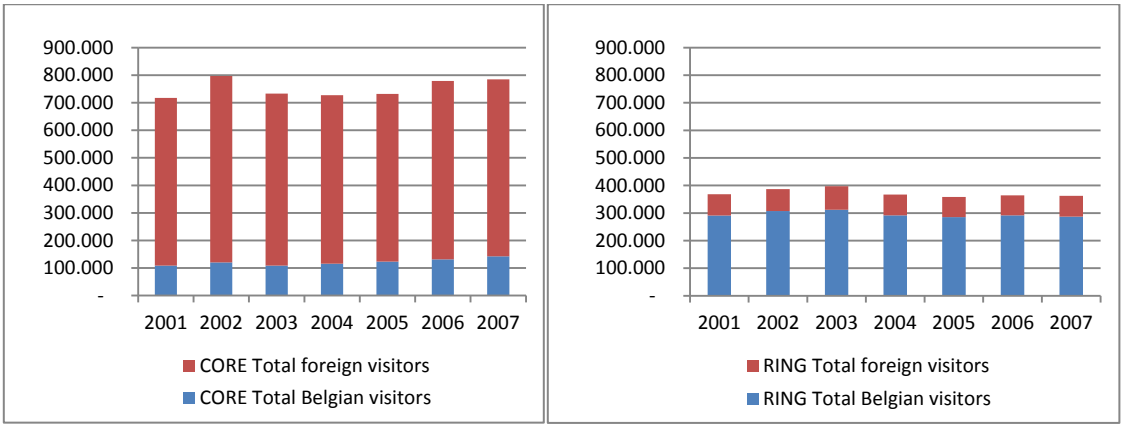
2.3.4 Commercials, services and tourism

In both areas we see that the economy becomes a post-industrial one, with a heavy focus on services. In both cores and rings we see a rise in the activities in these sectors, and a sharp rise in employment. In the Brugge area it is more significant in the core than in the ring, in Oostende it is more or less the same. This is probably due to the morphology of both areas. The ring of Brugge is bigger and a bit more rural than the one of Oostende.

Brugge city is considered one of the most attractive historic-cultural cities in Europe. In 2007, Brugge SA attracted a total of approximately 1,150,000 visitors, and 69% of these had visited the core area (mainly Brugge Municipality). There is an exceptionally high proportion of foreigners – 62.5% of the total: of these, 90% visited the core. 67% of the Belgian visitors were more likely to visit the ring area, mainly Blankenberge (over 40%) and Knokke-Heist (over 20%). The pressures generated by tourism, particularly in context of the historic urban structures of Brugge represent major challenges.

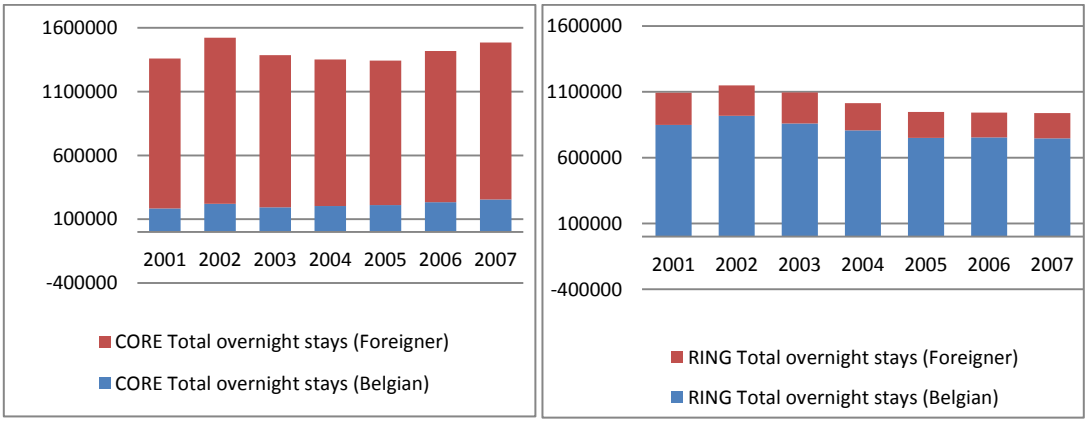
[*] Source: Provincie West-Vlaanderen.

Figure 3.2. Evolution of visitors to the Brugge SA.[*]



Overnights stays in Brugge SA is dominated by stays in the core area (over 60% of the total). The core and the ring attract different groups of tourists. While the core (with the dominant of Brugge Municipality) attracts mostly foreign tourists, Belgian tourists tend to opt for the ring locations.

Figure 3.3. Number of overnight stays in the core and the ring of Brugge SA.[*]



A large number of visitors comes to Brugge for business purposes, especially in recent years, while Brugge is strongly promoted as a congress centre. In 2009, Brugge hosted 165 registered events, including 12 major conferences (with more than 200 participants). In total, 15,000 people have visited Brugge in 2009 for meetings/conferences.

Visitors to Brugge come year round, with the lowest number in January and highest in August: there is some seasonality, but it is relatively modest compared to the seasonality that is

[*] Source: Data from Lokale Statistieken, 2010.

[*] Source: Data from Lokale Statistieken, 2010.

experienced, for example, by coastal resorts in Northern Europe. On average, Brugge alone hosts around 1.4 million visitors annually.

Table 3.9. Number of overnight stays during the period 2005-2009.

	2005-2006	2006-2007	2007-2008	2008-2009
November	80,922	84,937	92,254	102079
December	104,846	112,073	113,711	121,432
January	47,867	53,852	55,913	57,384
February	73,978	74,993	83,903	75,435
March	84,843	96,567	105,403	87,240
April	130,561	136,815	125,819	140,608
May	132,345	135,574	147,106	138,498
June	116,790	113,702	126,925	114,930
July	143,447	147,199	166,583	159,583
August	155,939	164,553	179,853	172,062
September	126,813	129,530	125,566	125,155
October	123,742	121,873	127,825	132,101
Total year	1,322,093	1,371,668	1,450,861	1,426,507
Total winter (Nov-March)	392,456	422,422	451,184	443,570

While Brugge municipality is the best known tourism destination internationally, there are also significant flows (from within the metropolitan area, as well as from elsewhere, to the coast. Brugge SA, Knokke-Heist, Blankenberge and Zeebrugge are the three coastal communes that are in the "most-popular" list for day-tourists. Knokke-Heist is in second place, right behind Oostende, with 3.2 million day visitors in 2009. Blankenberge is in fourth place with 1.9 million day visitors and Zeebrugge also attracted 0.2 million the same year.

Oostende SA is one of the most popular tourist destinations in Belgium. The total number of visitors to the region has been relatively stable during the last decade. The core area has seen a decreasing trend in the number of foreign visitors while the number of Belgian visitors has increased, resulting in a small increase in the total number of visitors. Meanwhile, the ring has experienced a slight decrease in the number visitors.

The core attracts most of the visitors (around 80%), especially foreign visitors. While the core is popular with foreigners, Belgian tourists tend to go to the ring area. Amongst the communes in the region, Oostende Municipality single-handedly accounts for around 88% of the visitors to the core areas and 70% of the visitors to the whole region.

Oostende Municipality is the most popular destination for overnight stays. It accounts for nearly 60% of the total number of overnight stays in the SA and more than 80% of the total number of overnight stays in the core. This is higher than its share of total population in both cases. In 2001, around 60% of Belgian overnight-stays were spent in the core. By 2007, this figure was around 70%. Amongst foreigners, most of the overnight stays were spent in the core (around 80%).

Table 3.10. Total number of overnight-stays in the Oostende SA.[*]

		2001	2002	2003	2004	2005	2006	2007
Gistel	(1)				2,543	3,933	2,543	
	(2)				1,020	1,147	2,198	
	(3)				3,563	5,080	4,741	
Middelkerke	(1)	475,446	516,716	465,374	446,721	421,683	446,143	385,920
	(2)	156,790	162,000	161,396	161,333	138,081	132,486	101,948
	(3)	632,236	678,716	626,770	608,054	559,764	578,629	487,868
Bredene	(1)	139,240	132,158	160,199	139,610	139,313	153,473	166,724
	(2)	80,063	83,868	82,220	75,607	65,398	69,657	80,039
	(3)	219,303	216,026	242,419	215,217	204,711	223,130	246,763
Oostende	(1)	606,971	646,146	676,518	648,890	698,168	691,190	681,332
	(2)	462,596	461,060	459,204	421,245	414,139	373,989	361,816
	(3)	1,069,567	1,107,206	1,135,722	1,070,135	1,112,307	1,065,179	1,043,148
Oudenburg	(1)	9,263	9,185	7,526	6,544	8,005		8,167
	(2)	6,451	6,195	6,053	3,474	4,555		5,080
	(3)	15,714	15,380	13,579	10,018	12,560		13,247
CORE	(1)	755,474	787,489	844,243	795,044	845,486	844,663	856,223
	(2)	549,110	551,123	547,477	500,326	484,092	443,646	446,935
	(3)	1,304,584	1,338,612	1,391,720	1,295,370	1,329,578	1,288,309	1,303,158
RING	(1)	475,446	516,716	465,374	449,264	425,616	448,686	385,920
	(2)	156,790	162,000	161,396	162,353	139,228	134,684	101,948
	(3)	632,236	678,716	626,770	611,617	564,844	583,370	487,868
(1) Total Belgian visitors; (2) Total foreign visitors; (3) Total visitors								

[*] Source: Data from Lokale Statistieken, 2010.

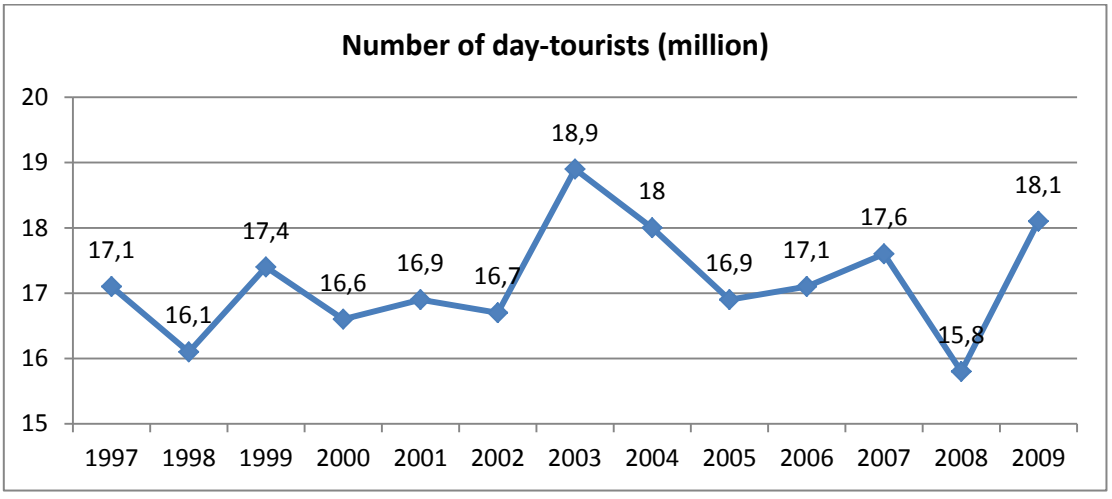
Overall, the number of overnight stays in the ring has decreased during the period 2001-2007 while the figure for the core remain stable – indicating a tendency to greater centralization of tourism flows.

Oostende is also a popular destination for day tourism to the coast. During the summer, extended train services are operated with larger train capacities. In this season, there are 6 more direct trains from Brussels to Oostende in the morning during the weekends and three more during the weekdays. Returning from Oostende to Brussels, there are 5 extra direct trains in the late afternoon during the weekends and three extra trains during the weekdays.

According to a survey in 2007, Oostende is the most popular destination for day-tourism amongst Belgians, being a chosen destination of 24% of Belgian day-tourists (Vanden Brouck, 2008) both in the summer and in the winter. Middelkerke and Bredene in the Oostende SA are also amongst the most popular sites. Middelkerker attracts 5% of day-tourists during summer and 6% of day-tourists during the winter. Bredene attracts around 5% of day-tourists during the summer but around 1% during the winter. In total, Oostende SA accounts for 35% of total day-tourists to the Belgian coast during summer and approximately 30% of the total to the Belgian coast during the winter. These represent significant flows of people into the coastal regions.

It is estimated that around a third of the Flemish population goes at least once to the coast during the summer. This number in winter time is one fifth. The coast is less popular area for the population of Brussels and Wallonie regions, with 10.5% and 15.9% respectively in summer and 7.2% and 8.9% respectively in winter (Vanden Brouck, 2008). It is estimated that around 18,1 million day-tourists visited the coast in 2009. The peak estimate was in 2003 with 18,9 million visitors (Vandaele and Callens, 2010).

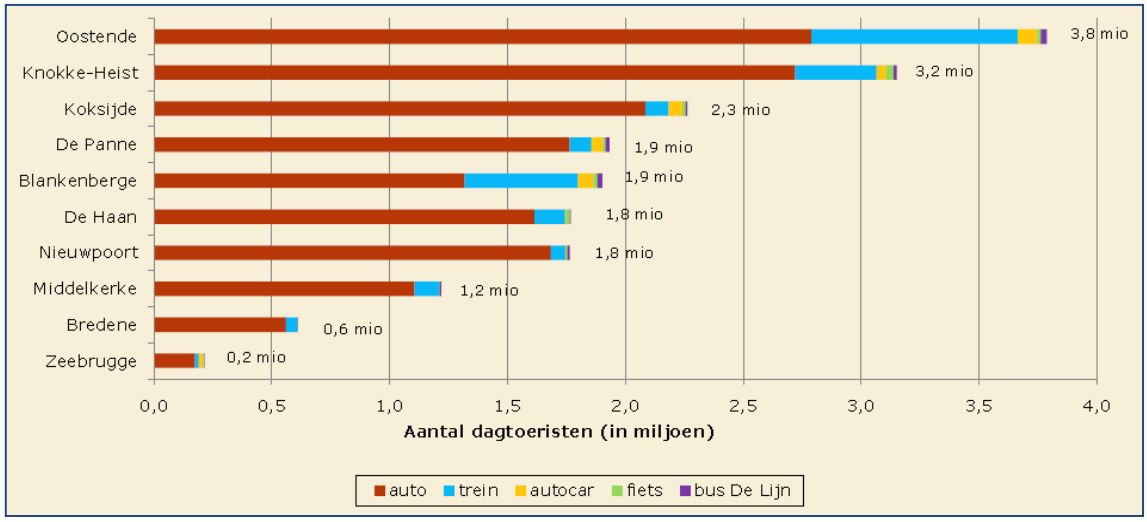
Figure 3.4. Evolution of day-tourists 1997-2009.[*]



[*] Source: Vandaele and Callens, 2010.

On the busiest day at the coast there were around 250,000 day-visitors and around 350,000 visitors that stayed overnight (Vandaele and Callens, 2010). Around one third of the total day-tourists visit the coast during the summer (July-August). The rest are spreads throughout the year. Most of the day-tourists come to the coast in private cars. Only 12% of the visitors come with the trains (Vandaele and Callens, 2010). They generate considerable congestion on particular routes to and within the coastal region, especially in summer.

Figure 3.5. Number of day-tourists to the coastal communes in 2008, divided by mode of transport.[*]



[*] Source: Westtoer, 2010.

3. Resource Users Overview

3.1 Inhabitants

3.1.1 Brugge SA

The Brugge Study Area (SA) accommodates in total 255,875 people, and has a total area of around 61,600 ha. Table 3.11 gives detail on the population by each commune in the study area, divided by age group (West-Vlanderen Ontcijferd, 2001-2010).

Table 3.11. Population of the Brugge SA at the end of 2008.

Commune	0-17 y	18-64 y	65+ y	Total	Density
Berneem	2,924	9,313	2,660	14,897	208
Blankenberge	2,675	11,183	4,789	18,647	1071
Knokke-Heist	4,697	19,543	9,644	33,884	600
Zedelgem	4,552	13,812	3,677	22,041	365
Sub-total Ring zone	*14,848*	*53,851*	*20,77*	*89,469*	*435*
Brugge	20,823	71,589	24,274	116,686	843
Damme	2,062	6,749	2,021	10,832	121
Jabbeke	2,876	8,543	2,335	13,754	256
Oostkamp	4,562	13,928	3,848	22,338	280
Zuienkerke	560	1,8	436	2,796	57
Sub-total Core zone	*30,323*	*100,809*	*32,478*	*163,61*	*406*
Brugge SA	45,171	154,660	53,248	253,079	415

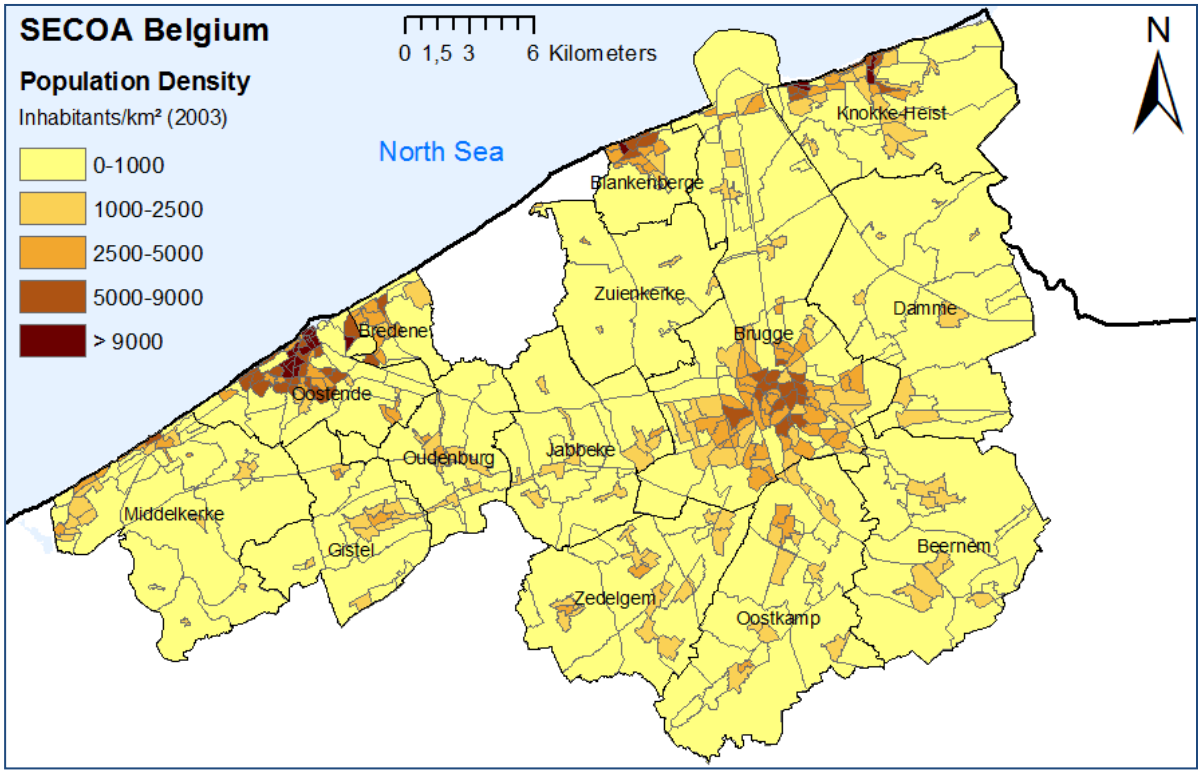
Population has increased slowly in both the core and the ring of the Brugge SA with the growth in the ring a little higher than in the core – in other words, there is modest relative decentralization. Population growth has been faster during the period 2000-2008 (0.95%) than during the period 1991-1999 (0.86%).

The core area of Brugge SA accommodates two-third of the total population of the Study Area. Brugge Municipality (the central core) accounts for 70% of the total population of the core and 45% of the total population of the Study Area.

The ring has a relatively older population with 23% of the total ring population being over 65 year-old. Blankenberge and Knokke-Heist have the highest proportions of aged population (26% and 28% respectively). In comparison, 20% of the core population is over 65 year-old, with Brugge having the highest proportion of 21%. In the ring, the proportion of young population (under 17 year-old) is lower than the proportion of older population (over 65) while in the core the situation is reversed.

The average density of the whole study area is 415 persons per square kilometer, with the ring and the core having somewhat similar densities. Brugge Municipality is the most populous area with a density two times higher than the regional average. Brugge Municipality is one of the most populous areas in the Province of West-Flanders (West-Vlaanderen Ontcijferd 2010). Blankenberge (in the ring and at the coastline) is the third most populous commune. Some sections within Brugge have a density of between 5000-9000 people/km^2. In Blankenberge and Knokke-Heist, there are some sections with densities over 9000 people/km^2 (see Population Density map below).

Figure 3.6. Population density of the two Belgian case studies in 2003.



In the ring, private household size has decreased steadily from 2.43 in 1992 to 2.2 in 2008. The core has experienced a brief increase in private household size in the period 1992-1993 but subsequently there has been a steady decrease. Nevertheless, private household size in the core is still higher than in the ring. This phenomenon might be linked to the higher proportion of migrants in the core, those often live in larger household units.

Data on in-migration for each commune within the Brugge SA and the core and ring of the study area shows that Brugge Municipality is the commune with the highest in-migration flux during the period 1997-2007, accounting for 80% of the total in-migrants in the core. Within the core, Zuienkerke has the fastest growth in in-migration. In the ring, Knokke-Hesit is the most popular destination for in-migrants, followed by Blankenberge. However, in relative term, Blankenberge has the highest proportion of in-migrants as a proportion of the total population.

Around two third of the people moving in the Brugge SA go to the core. However, the figures show that the growth due to in-migration is becoming slower in the core compared to the ring. It increased 11.85% in the core compared to 16.08% in the ring, 1997-2007, even though the former remains the main focus in absolute terms.

Out-migration in Brugge SA is as fast as in-migration, and sometimes out-paced it. Most of the people moving out of Brugge SA are from Brugge Municipality. In the ring, Knokke-Hesit and Blankenberge also have high rate of out-migration. Out-migration seems to mirror in-migration in most communes, with Zuienkerke and Blnakenberge experiencing the fastest out-migration in the ring.

Internal migration shows the movement within the country. Internal migration data for the communes in the Brugge SA show a diverse picture. In the Brugge Municipality, a generally high in-migration Figure 3.was seen between 1997 – 2002 when there was always a positive influx of internal migrant (from other communes in Belgium). There was a dip in 2002 when there was a small negative influx but internal picked up during the period 2003-2005. During the period 2005-2007, there was a steady negative influx of internal migrants to Brugge, indicating that less people from other Belgian communes came to settle in Brugge compared to the number of people moved out of Brugge. During the same period 1997-2007, there was a positive influx into most of the communes surrounding Brugge. Blankenberge and Knokke-Heist were the two communes with positive high influxes throughout, both in term of absolute numbers and in term of the proportion of migrants in relation to the population. Oostkamp is

the third commune which has experienced an increasing trend in in-migration internally. For other communes, internal migration was variable. In relative term, Zuienkerke saw the most of its population moved to other Belgian communes.

In 2000, most of the residential relocations within the Brugge SA occurred within the core. Migration from ring to core or from core to ring is very limited in absolute terms in comparison to migration between the communes in the core. In 2000, core mobility was 59.35% of the total mobility while it was 27.05% in ring mobility. Movement from ring to core is similar to the rate from core to ring.

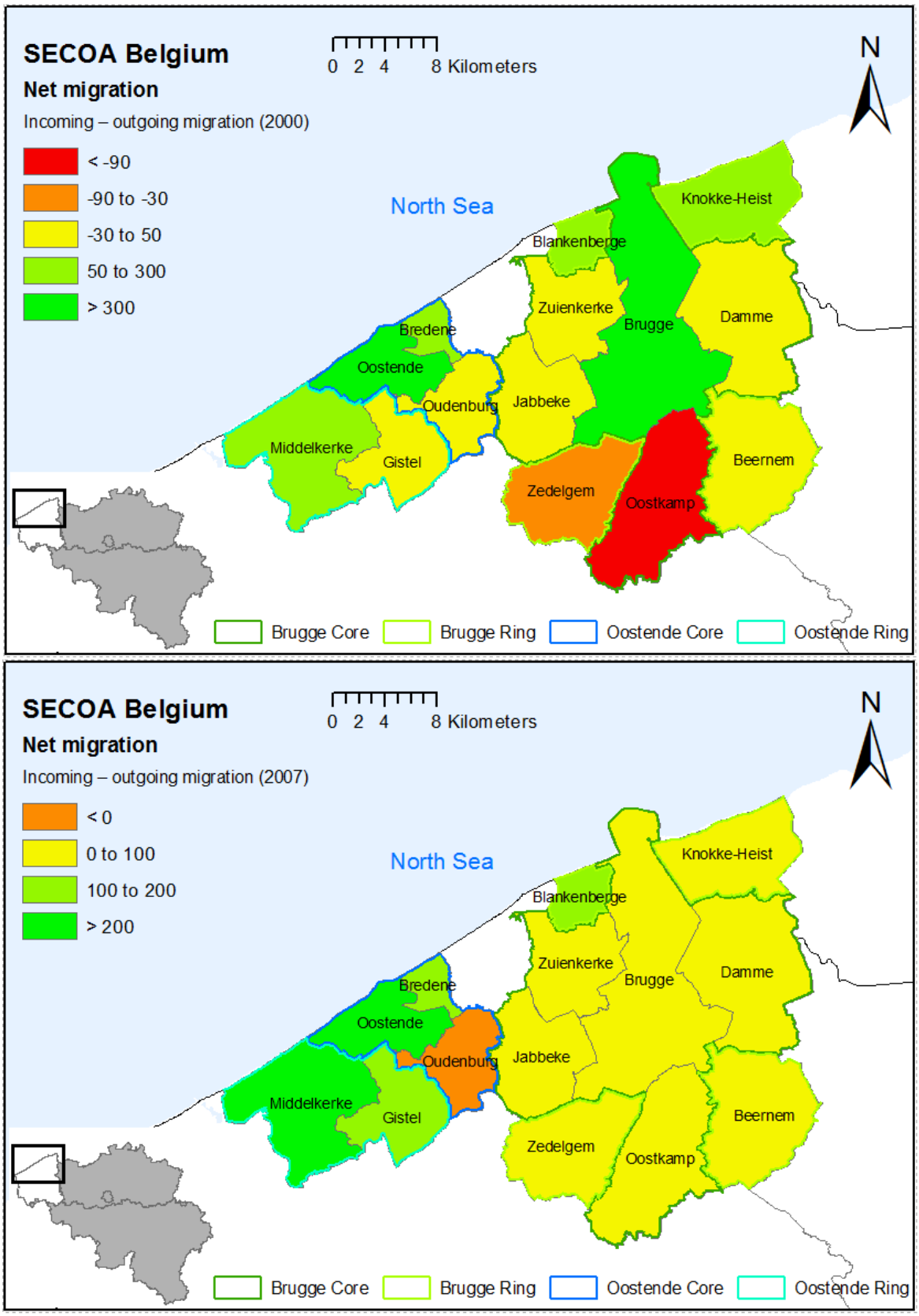
Table 3.12. Migration between the ring and the core of the Brugge SA in 2000.

Year 2000	From \ To	Core	Ring	Total
Brugge SA	Core	10121	1077	11198
	Ring	1242	4612	5854
	Outside	2432	2383	

External migration shows the movement amongst different countries, i.e. number of people moving in and out of Belgium, also called international migration. Brugge Municipality in general the most popular destination for foreign migrants.

During the period 1997-2002, many communes saw a negative Figure 3.for external migration, which signifies that the number of people moving in from abroad was lower than the number moving out to foreign destinations. Brugge and Knokke-Hesit are the two communes with the strongest positive trends throughout the period 1997-2007, with more people coming in than went out.

Figure 3.7. Net Migration 2000 and 2007.



3.1.2 Oostende SA

The Oostende Study Area (SA) accommodates a total of 124,209 people, distributed across a total area of around 20,500 ha. Table 3.12 gives details of the population of each commune in the study area, disaggregated by age groups (West Vlanderen Ontcijferd, 2001-2010).

Table 3.13. Population of the Oostende SA by end 2008.

Commune	0-17 y	18-64 y	65+ y	Total	Density
Gistel	2,526	7,171	1,997	11,694	269
Middelkerke	2,832	10,876	4,911	18,619	243
Sub-total Ring zone	*5,358*	*18,047*	*6,908*	*30,313*	*252*
Bredene	3,123	10,049	2,695	15,867	1191
Oostende	10,631	40,602	17,812	69,045	1834
Oudenburg	1,764	5,484	1,736	8,984	253
Sub-total Core zone	*15,518*	*56,135*	*22,243*	*93,896*	*1087*
Oostende Area	41,752	148,364	58,302	248,418	605

The population has increased slowly in both the core and the ring of the Oostende SA with the growth rate of the ring being a little higher than that of the core: therefore, as in Brugge, there is relative population decentralization. Population growth has been faster during the period 2000-2008 than during the period 1991-1999. Although the population grows slowly, Oostende SA still has one of the fastest growth rates in the Province of West-Flanders. There is a high degree of concentration of population, and population growth Most of the growth occurs in the core. The core area of Oostende SA accommodates two-third of the total population of the Study Area, with three-fourth of that population concentrated in Oostende Municipality.

Oostende Municipality, the city core, has the oldest age structure, with nearly 30% being aged over 65. Only Middelkerke, in the ring area, has an older age profile.

The average density of the entire study area is 605 people per square kilometer. The core zone has a much higher density than the ring, with Oostende Municipality having a density 3 times higher than the regional average. Oostende Municipality has the highest population density in the Province of West-Flanders (West-Vlaanderen Ontcijferd 2010). Together, Oostende and Bredene Municipalities are the two most populated communes in West-Flanders. Both border the sea. The third most populated commune in West-Flanders is also a coastal

commune, Blankenberge. In Oostende, there are many sub-areas with population densities of over 9000 people/km^2, many of them on the coast (see the Population Density map in the Brugge case study).

In contrast, coastal communes have lower household sizes, with the average household size in most such communes being below 2.3. In the Oostende SA, Gistel (in the ring) had the largest household size of 2.45 in 2008. Oostende Municipality has the lowest private household size in the Province of West-Flanders of just 1.97 (West-Vlaanderen Ontcijferd 2010). In both the core and the ring, the average size of private households has decreased during the last fifteen years.

During the period 1997-2007, the Oostende SA has experienced a gradual increase in in-migration. Oostende is the most popular destination, followed by Middelkerke, then Bredene. All three are located at the coast. The core receives around three-fifth of the total in-migrants – slightly less than its share of total population, suggesting that migration is also contributing to the overall patterns or modest relative population decentralization.

Most of the people leaving the area were from Oostende Municipality, Middelkerke and Bredene. There were also far more people leaving the core than the ring. In the Oostende Municipality, the out-flux of population declined during the period 1999-2002 then picked up again in the period after 2002. Out-migration in the core accounts for around 76.5% of the total out-migration of the SA. The proportion remains quite stable during the period 97-07.

Internal migration reflects the movement of population amongst Belgian communes. In the Oostende SA, Oostende Municipality experienced positive internal migration between 1998 and 2006, with a peak in 2002. In 2007, Oostende Municipality had a negative figure, indicating that people moving out of the area outnumbered the number moving inwards. In general, more people moved into the ring than the core, even thought the latter accounted for some two thirds of the total population of the metropolitan area. In the Core, there is a declining trend in internal migration, with less and less people moving in – although the overall net internal migration continues to be positive.

External migration reflects international migration into and out of Belgium. Oostende Municipality is the main destination for international migrants in the metropolitan area, with positive international migration figures during the last 5 years. Most (more than 90 % in 2007) of the international migrants choose the core to move in.

3.2 Industrial/Commerce/Agricultural holdings

The number of businesses in the primary sectors (agriculture, forestry and fisheries) has been increasing marginally in the core and reducing more noticeably in the ring in both Brugge SA and Oostende SA during the last decade. The number of businesses in industry and construction in Brugge SA has reduced by around 7% between 2001 and 2008 in both the core and the ring while in Oostende SA the reduction is observed in the core (at the rate of 8.4%) while a 4.4% increase is observed in the ring during the same period. For Brugge SA, businesses in commerce and services have been increasing in both the ring and the core, with the core sees the most development (around 10.5%). Meanwhile, in Oostende SA, commerce and service sectors has not picked up the places left by other sectors, with a marginal increase of near 2% in the core.

Overall, in both SAs, commerces and services are the major players, accounting for more than 80% number of businesses. They also provide substantial employment (more than 80% in Brugge SA and more than 70% in Oostende SA).

3.3 Tourism establishments

Brugge city is considered one of the most attractive historic-cultural cities in Europe. In 2007, Brugge SA attracted a total of approximately 1,150,000 visitors, and 69% of these had visited the core area (mainly Brugge Municipality). During the last 5 years, number of lodging establishments remains stable in the central core (the Brugge Municipality).

Table 3.14. Number of lodging establishments in the Brugge Municipality.[*]

Type of lodging	2006	2007	2008	2009
Number of hotels	109	111	111	113
Number of hotel rooms	3,112	3,171	3,264	3,497
Number of hotel beds	6,998	7,118	7,180	7,693
Number of guesthouses	143	157	168	168
Number of guesthouse rooms	301	337	362	363

By 2002, Oostende had 45,678 beds, accounting for 9% of the total beds in the coastal area of Belgium. Three fourth of the amount are come from individual rental of vacation

[*] Source: Annual report of Brugge Municipality, 2009.

premises and second homes. The rest come from hotels and campsites. Although the number of tourists has increased year on year, the number of hotel beds has decreased year on year. This has important implications in terms of economic impacts, and patterns of visits – although data is lacking for both these aspects.

Table 3.15. Evolution of number of hotels in Oostende Municipality and the Coast 1997 – 2002.[*]

Year	Oostende		The Coast	
	# establishments	Total rooms	# establishments	Total rooms
1997	70	2,360	418	8,972
2000	68	2,388	387	8,443
2002	65	2,387	367	8,062
% difference 97-02	-7,1	1,1	-12,2	-10,1

3.4 Harbours

There is a port at each of the two Belgian case-studies. They are the main industrial players in the study-areas as they accommodate various types of industrial facilities within the port's area.

3.4.1 Port of Zeebrugge

Zeebrugge is internationally renown as a quick port of call where even the biggest vessels can easily moor regardless of the tide. The handling time is also limited to a minimum thanks to the high productivity and the specialized know-how of the dockworkers. Subsequently, the cargo also needs to be transported free of congestion to the customers in the European Hinterland. In order to safeguard this fluent cargo traffic, the inland connections need to be optimized constantly.

The port authority, together with the responsible bodies continually, sees to it that maritime access and connections by road, rail and inland navigation are able to ensure the mobility of the present and the future cargo volumes.

The port of Zeebrugge is a rapidly growing port within the range of ports from Hamburg to Le Havre. The port handles a volume of 45 million tons on an annual basis. The core business of Zeebrugge consists of throughput of unit loads (roro freight and containers).

[*] Source: Tourism Vlanderen, 2005.

They take up three quarters of the total port activity. The last years the container traffic has surpassed the volume of roro traffic.

During the last 10 years, container traffic in Zeebrugge has more than doubled. The seawardly location on the coast, the unlimited maritime access and the modern port equipment are important assets for Zeebrugge. These assets are essential for the newest generation of Ultra Large Container Carriers (ULCCs). Container ships with a capacity of more than 10,000 TEU are almost a daily feature in Zeebrugge. At the same time, the new infrastructure offers new impulses, mainly around the Albert II dock.

Nowadays 28,000 people have a job directly or indirectly related to the port. In 2008, the direct employment in Zeebrugge increased with 3.6% (up to 11,111 full-time equivalents). This increase can be attributed to the maritime cluster where 410 extra full-time equivalents have been deployed (mainly in the handling of goods). In 2008, the indirect employment amounted to 16,902 full-time equivalents. This can be divided into 10,714 full-time equivalents in the maritime cluster and 6,188 full-time equivalents in the non-maritime cluster. Also in this segment the employment in the maritime sector increased heavily.

The port policy aims at a balanced division over the various ways of transport. The road transport is dominant in Zeebrugge, but railway transport is also well developed. Currently, Zeebrugge still lacks an adequate connection with the European inland navigation, which is temporarily compensated through the deployment of estuary ships.

The strong increase of container traffic largely determines the evolution of the modal split. In 2009 the port handled 25 million tons of containers (2.3 million TEU). At a rough estimate, in 2030 the Western outer port will handle about 5 million TEU. The hinterland for containers is reached by road, by railway and via navigation.

3.4.2 Port of Oostende

The port of Oostende, situated in Europe's busiest maritime area, is undoubtedly a versatile shortsea port. It can accommodate all types of coastal maritime traffic. The port of Oostende has been in the passenger business for over 150 years since the establishment of the very first regular service between the UK and the continent in 1846. There is no dedicated passenger service nowadays, but Trans-Europe Ferries combines passenger and freight service on its line to Ramsgate. A contemporary passenger terminal and an entirely new cruise quay with a length of 250 m and a depth of 10 m are important assets to attract cruise companies to

Oostende. Ships berth in the middle of town and the historical cities of Flanders are within easy reach.

In the past few years, the expansion of the ro-ro port got the main focus in the modernisation of the outer port. Nowadays Oostende is an important short sea hub for traffic to the UK. The port handles about 300,000 ro-ro units per year.

The general cargo port is an essential element in the port activities. Seadregded aggregates are important import products as well as other products such as ferro sillicium, building materials, timber and fertilisers.

The construction of windmills on the Thorntonbank in the North Sea, has brought an entirely new industry to the Port of Oostende The port has invested in a new infrastructure on the East Banks of the port, which made it possible to construct and transport the windmills to sea. New projects are planned in the future.

Until 2008 there was a steady increase in the traffic of goods reported in the port. In 2008 they first reached a total amount off over 8 million ton. This was well within the expected growth rate of 5%. The biggest addition for this was to be found in 'general cargo', mainly minerals, sand and gravel, with an increase of 14.1%. The main activity at the port, roro-traffic also improved with 4.6%.

Although a positive evolution was expected for 2009, activities plunged, due to the global economic crisis. Several businesses had a hard time, and one off the biggest players in Oostende on the market of roro-traffic, Cobelfort, ceased its activities.

3.5 Second home owners

In 2007, the coastal communes of Brugge SA and Oostende SA had in total of 82,700 second homes (Gunst *et al.,* 2008). Coastal communes within Brugge SA are the most popular destinations for second-home owners, with Knokke-Heist leading the list with approximately 18,200 second homes. Blankenberge has roughly 6,600 units and Zeebrugge has around 830 units (Gunst *et al.,* 2008).

The coastal communes of the Oostende SA are also a popular destination, with Middelkerke being first ranked with more than 14,000 units, followed by Oostende with around 6,600 units. Bredene also has around 1000 second homes units (Gunst *et al.,* 2008).

Between 1989 and 2007, the total number of second homes in the coastal communes (both Brugges SA and Oostende SA) has increased by more than 25,000 units or 43%,

representing an annual increase of approximately 2% (Gunst *et al.,* 2008). Most of the second homes are at the sea-front, right onto the beaches.

Approximately 60% of the second homes are used by the owners (46%) or made free for his/her acquaintances (14%) for tourism/recreation purposes. Around 40% of the second homes are used as tourist lodging facilities (rented accommodation) (WES, 2008).

The coastal communes of the Oostende SA are a popular destination for second home owners, with Middelkerke on top with more than 14,000 units, followed by Oostende with around 6,600 units. Bredene also has around 1000 second homes (Gunst *et al.,* 2008). The number of second homes in Oostende has increased from 5,220 units in 1989 to 6,600 in 1997 and has since been relatively stable.

4. Conclusions

The two Belgian case-studies lie next to each other and occupy more than a half of the Belgian coastal zone. They are similar in many aspects but also have distinct features. While Brugge develops based on two main pillars: its multifunctional cargo port area and its touristic heritages, Oostende relies on strong beach tourism and a port as a passenger gateway. Both cases have witnessed their strong urbanization process decades ago and their development has become stabilized during the last decade. The economies rely more and more on commerce and service sector rather than traditional industrial activities. Agriculture has reduced to a marginal role, both in term of production and in term of employment.

Most of the resources are not exploited for their material values but for their extrinsic values through the protection of natural ecosystems and habitats. The most important resource in both case study areas is actually the scarce spaces where multiple uses are taking place. The major users include the local inhabitants, visitors, second-home owners, and various community groups. In Brugge, the port of Zeebrugge is one of the major users as it occupies a large area, which contains also valuable nature sites as well as important road, rail and waterway links to the hinterlands. In Oostende, competition at the beachfront is one of the main issues. Other issues confronted by the two cases are environmental protection, natural habitat conservation, better mobility condition for both local inhabitants and tourists, and social welfare and cohesion.

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CHAPTER 4.

Thematic Profile of Coastal Environmental Resources and Users - Israel

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1. Introduction

The Israeli Mediterranean coast is a relatively small stretch of land and is under immense pressure due to its many users and shortage of available land. Over the years pressures on the coastline have intensified with conflicting agendas involving the sustainable approach and the economic development approach. Whilst some development may be avoidable the increasing population and economic ambitions of both private and public sector are intensifying the demand for coastal property. The social agendas however must coexist with natural processes that often clash and affect the outcome. The clashing agendas and processes are not unique to the Israeli case study however the relatively small coastal stretch and the diminishing available land intensify the conflicting uses and consequences of social and natural processes.

The main objective of this chapter is to introduce the pressures and resources shaping the coastal stretch and providing a comparative point of view between two of Israel's coastal metropolitan areas; Haifa and Tel Aviv. The report provides physical and social attributes that exemplify the pressures on the Israeli coast and consequently trigger environmental and land use conflicts. The report focuses on the two metropolitan case studies; however as both metropolitan areas cover the entire Mediterranean coastal stretch the report also provides an overview of the Israeli coastline and natural features along the coast. For the purpose of this chapter, the definition of both metropolitan areas has been altered to include areas which in the original definition by the central bureau of statistics are left out. The original definition dates back to the last census of 1995 therefore the definitions are likely to be outdated hence the extended definition in this chapter.

Although both case studies are adjoined, sharing the same coastal stretch, the characteristics widely differ. The differences can firstly be attributed to historical processes shaping social and economic trends in both metropolitan areas. Currently the Tel Aviv metropolitan area and core serve as the national hub for economic activity whereas the Haifa metropolitan area is viewed by some as peripheral. Although the proximity of both case studies the physical attributes and pressures vary thus uniquely characterising each case study and affecting coastal development and processes.

The first part of this chapter provides an overview of both case studies focusing on the diverse attributes shaping each coastal stretch. The overview includes an historical overview of each case study and geographical attributes. This begins with a general overview of the Israeli coastline and coastal attributes unique to the Israeli coast and is followed by the case study

overview. The second part of this chapter provides an overview of biophysical resources and land use trends along the coast. As both case studies are adjoined on the same coastal stretch the overview initially provides an overview of the entire coastal stretch; however, some aspects are broken down to metropolitan areas. The third part of this chapter focuses on an overview of users and uses comparing social trends along the coast. The trends consist of demographical attributes and social agendas promoting development along the coast. Similar to before the section covers both metropolitan areas but with a comparative overview demonstrating the differences between both case studies. The final section is a brief introduction to land use and environmental conflicts along the Israeli coast since the year 2000. Significantly, this section exemplifies the consequential outcome of the diverse pressures on the Israeli coast.

2. Materials and Methods

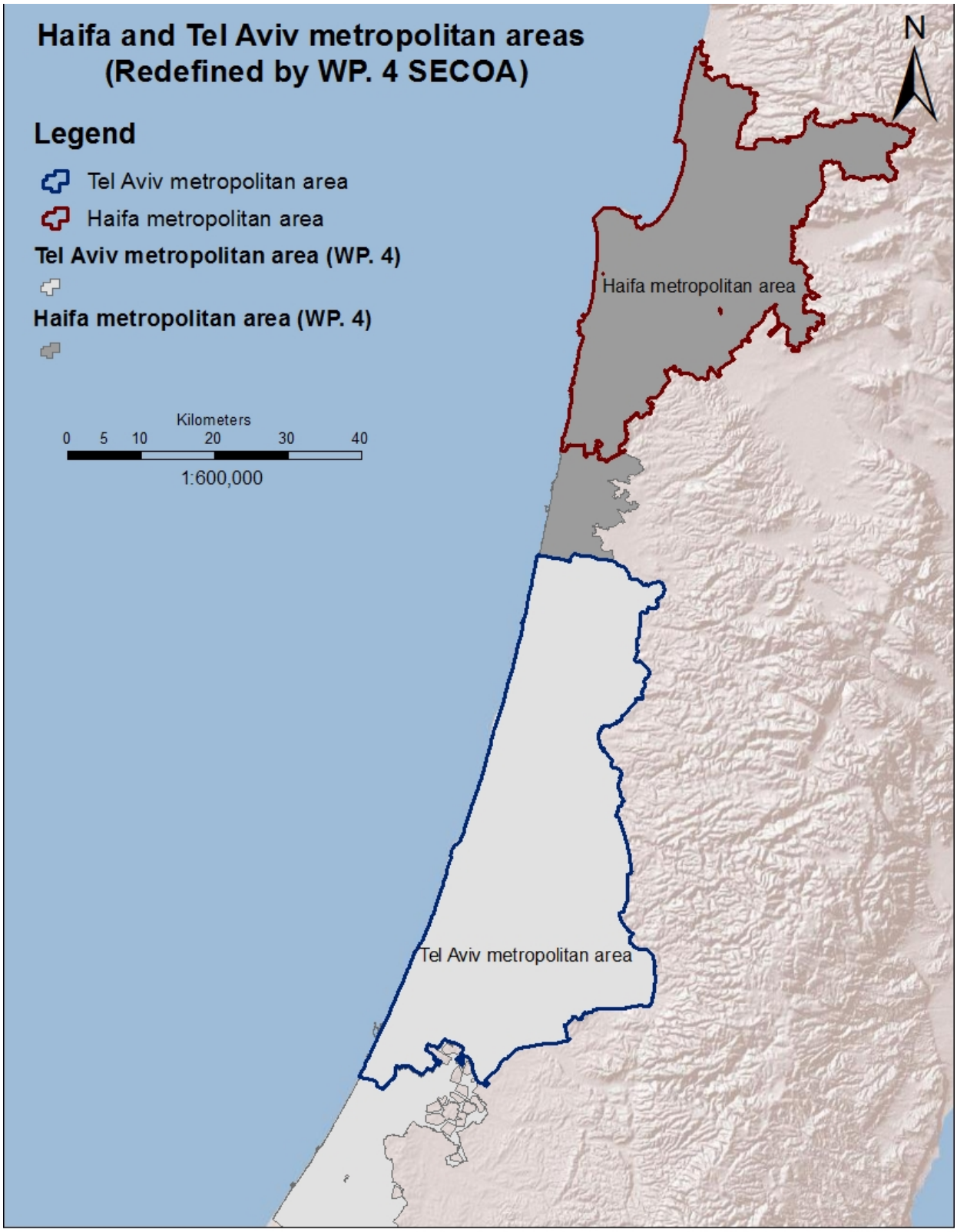
2.1 Materials

The materials gathered and applied in this research consist of geographical data and physical data acquired from various sources. The majority of the data was received from associates' work on other work packages in the SECOA project and previous studies conducted by Professor Eran Razin. The majority of the data gathered on the social aspects was gathered from work package 3 (SECOA) and the physical data from work package 2 (SECOA). The data used in other work packages was gathered from geological surveys, central bureau of statistics and annual surveys. Geographical data was produced by the authors and gathered from other sources mentioned above. Statistical data includes annual reports and the 1995 & 2008 population censuses.

2.2 Methods

Three principal methods were employed throughout the research: the first was the analysis of annual statistical data; the second method was the use of GIS datasets, and lastly assembling data from various other sources and conversion to either datasets or GIS datasets. The list of conflicts presented in the concluding remarks was based on data gathered from various sources including newspaper clips, personal interviews, annual reports and various internet sources.

Figure 4.1. Haifa and Tel Aviv metropolitan areas.



The analysis of social aspects was based mainly on data gathered from the 1995 & 2008 censuses and data from the central bureau of statistics, focusing on demographic data, employment rates, gender distribution and age distribution. The data gathered is processed into tables and figures presenting the results and distributions. The land use analysis is based primarily on GIS based layers presented in maps and tables. The two censuses were used to provide comparative data for the geographical and historical overview. The analysis of physical attributes was based on GIS layers from the geological survey providing an overview and visual data of the physical attributes along the coast. The data is presented in maps, tables and graphs providing visual and actual data. Excluding maps 2-6, the maps in this report were produced by the authors for the purpose of this report and future research.

3. Overview of Resources in the Case Studies

3.1 Attributes of coastal settings that generate conflicts in the Israeli context

Israel is situated on the eastern Mediterranean coastline with a coastal front stretching approximately 196km from the cliffs of Rosh Hanikra in the north to the Gaza strip in the south. Two of Israel's major metropolitan areas are located on the Mediterranean coastline (Figure 4.2), the Haifa metropolitan area situated in the north and Tel Aviv, the economic core of Israel. Unique attributes of the coast attract diverse uses and users of the coast and demonstrate the immense pressures inflicted upon the coastline, triggering conflicts and competition over the finite coastal supply. Israel`s coastal attributes are not dissimilar to other coastlines, however with a shorter coastline and unique attributes due to its geographical location, coastal systems are greater affected and generate conflicts. The following paragraphs provide a brief description of coastal attributes that generate conflicts followed by a summary of these attributes in the Israeli context.

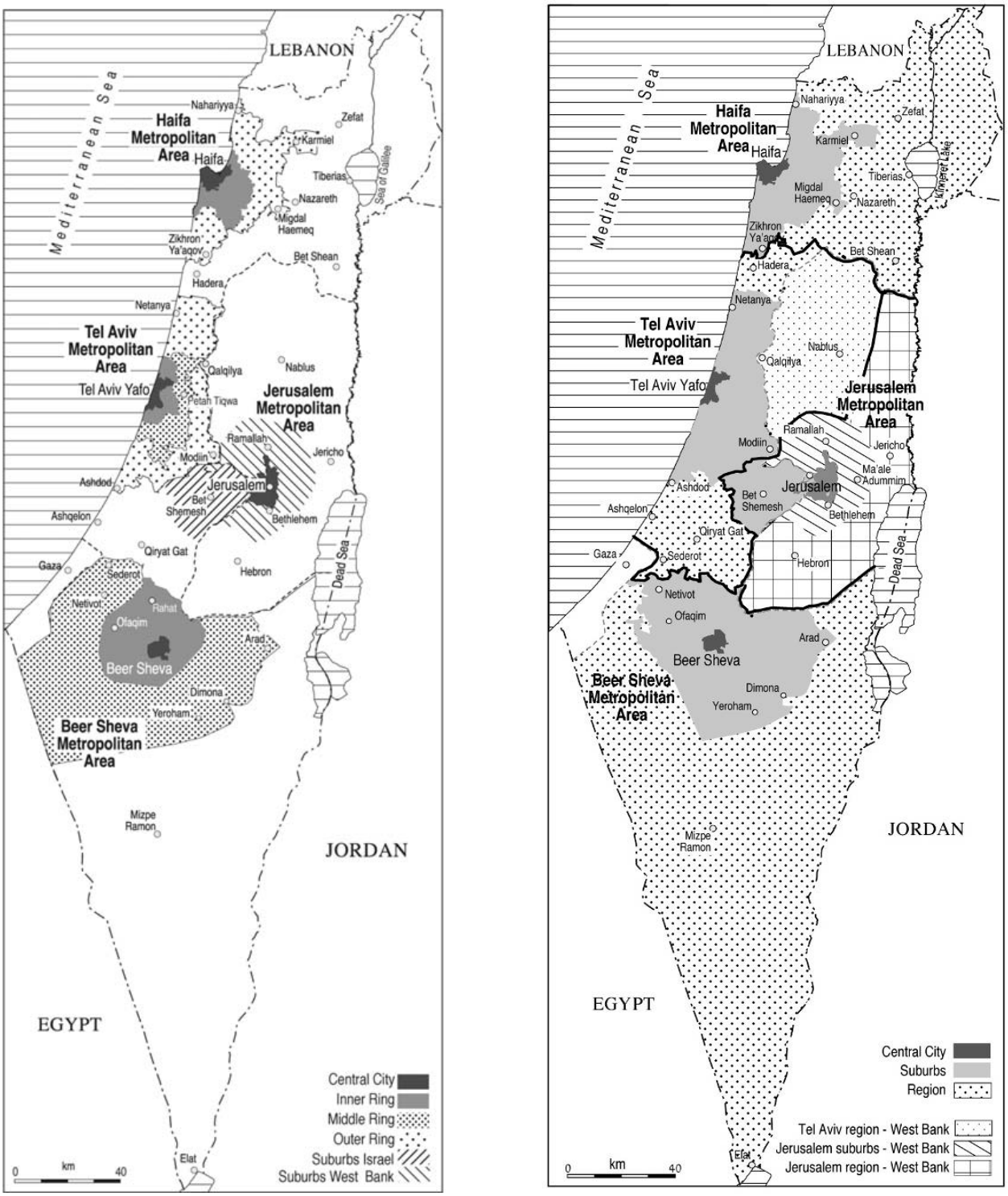
Interconnectedness in the Israeli context is best depicted by the upstream-downstream relations between the Israeli coast and the Nile River and the delta (Stanley 1989). The majority of sediment reaching the Israeli coast originated in the Nile River carried along the Mediterranean streams eventually reaching the northern coastal stretch (Zviely *et al.,* 2007). The sediment carried by wind and currents are conditional to disruption by human activity along the route (Goldsmith and Golick, 1980). Human activity along the Nile has already affected the supply of sediment to the delta (Bohannon, 2010) and development along the Israeli coast and

the Gaza strip has disrupted the continuous flow of sediment (Zviely & Klein, 2001; Zviely and Klein, 2003).

One of the unique environmental attributes along the Israeli coast is its sandstone cliffs shaped by crashing waves and geomorphology systems (piping). The cliffs range from the southern beaches to the north of Israel forming a unique stretch of land that is continuously eroding and under constant threat by human and natural activities (Almagor, 2002). Development along the coastline is recognised as one of the causes for the depletion of the sandstone cliffs that run along the Israeli coast. Rainfall in the past was absorbed in the cliffs, but flows along the cliffs due to inappropriate irrigation systems have created channels along the cliffs thus further destabilizing the cliffs (Davidovich, 2009). The retreating cliffs threaten development along the cliffs that has taken place over the years ignoring potential hazards (Zviely and Klein, 2004; Perach and Almagor, 2000).

Of the 196km of coastal front in Israel approximately 53km remain untouched and undeveloped leaving an estimated 2.5 cm of accessible coast per capita. The Israeli coastline is under pressure of population growth and development intensity. The pressures for development on the one hand and the struggle for sustainability on the other have intensified the debate on remaining coastal properties under pressure of development. With scarce undeveloped land remaining the supply cannot satisfy the demand (Brachya, 1993; Amiran, 1977).

Figure 4.2. Metropolitan areas (left) and regions (right) in Israel. Early 2000s.[*]



[*] Source: Tel Aviv, Haifa and Beer Sheva – Central Bureau of Statistics definitions. Jerusalem – authors' definition.

3.2 Case study 1: Tel Aviv

3.2.1 Geographical and historical overview

3.2.1.1 The dominance of the Tel Aviv metropolitan area

The Tel Aviv metropolitan area is Israel's dominant economic and cultural heart, Israel's "global city-region" (Felsenstein *et al.*, 2002), the prime setting for metropolitan processes that resemble those taking place in global cities outside Israel, and the focus of most debates over metropolitan reforms. The Tel Aviv metropolis is the core region in a clear core-periphery structure characterizing Israel's space economy.

The dominance of the Tel Aviv metropolis in Israel's space economy has probably become evident more than ever before, since the 1990s, with the metropolis attracting the young, professional, highly qualified labour, seemingly draining other parts of the country from leading talent and creativity in business services, high-technology, entertainment and culture. The share of the Tel Aviv metropolis within constant 1995 CBS boundaries (excluding Ashdod) declined steadily, from 47% of Israel's population in 1970 to around 41% in 2000, but remained stable in the first decade of the 2000s (Table 4.1), indicating growing dominance of the metropolitan area if taking into account that its boundaries have practically expanded. More remarkably, the share of the metropolis in Israel's employment (1995 constant boundaries) declined slightly in the 1970s, but has gradually increased since 1980, reaching 49.5% in 2008 – a similar figure to that of 1970, when a large part of the area within 1995 boundaries was not part of the metropolitan area (Table 4.1). Including Ashdod, over 50% of the places of work in Israel are in the Tel Aviv metropolis, and the growing gap between the share of the metropolis in Israel's population and its share in employment indicates high rates of participation in the labour force, low unemployment and increased commuting to the metropolis from beyond its formal statistical boundaries.

Table 4.1. Population and employment in the Tel Aviv metropolitan area by rings, 1970-2005.[*]

	1970	1980	1990	1995	2000	2005	2008
	Number of inhabitants (% of the metro area)						
The city of Tel Aviv	27.0	18.7	16.0	14.8	13.6	13.3	13.1
Inner ring[**]	35.1	37.3	35.5	33.6	30.6	28.6	27.8
Middle and outer rings[***]	37.8	44.0	48.5	51.6	55.8	58.1	59.1
Total metro[****]	100	100	100	100	100	100	100
Total metro (thousands)[****]	1420.1	1795.1	2126.5	2358.3	2611.5	2839.8	2997.2
Total metro (thousands), including Ashdod					2785.7	3040.4	3206.4
	Number of inhabitants (% of Israel - total)						
Total metro[****]	47.3	45.8	44.1	42.0	41.0	40.6	40.6
Total metro, including Ashdod					43.7	43.5	43.5
	1970	**1980**	**1990**	**1995**	**2000**	**2005**	**2008**
	Number of employed persons[*****] - place of work (% of the metro area)						
The city of Tel Aviv	49.2	39.6	37.7	34.6	31.6	28.1	28.0
Inner ring[**]	18.8	21.0	24.5	24.9	22.9	22.3	21.6
Middle and outer rings[***]	32.0	39.4	37.9	40.5	45.5	49.6	50.4
Total metro	100	100	100	100	100	100	100
Total metro (thousands)[****]	480.7	587.4	707.2	949.1	1065.4	1200.0	1339.2
Total metro (thousands), including Ashdod							1406.1
	Number of employed persons[*****] - place of work (% of Israel – total)						
Total metro[****]	49.9	46.8	47.4	48.2	48.0	48.1	49.5
Total metro, including Ashdod							52.0

[*] Source: Based on data of the Central Bureau of Statistics, Labour Force Surveys. The labour force survey data includes only the civilian labour force, and does not include Palestinians residing in the Palestinian territories and working in Israel.

[**] Inner ring – Rest of Tel Aviv District.

[***] Middle and outer rings – Central District. Figures of the outer ring exclude the city of Ashdod located in the Southern District.

[****] Excluding Ashdod.

[*****] The labour force survey data includes only the civilian labour force, and does not include Palestinians residing in the Palestinian territories and working in Israel.

3.2.1.2 Growth and expansion of the metropolitan area

According to the statistical division of the Tel Aviv metropolitan area into rings, the central city of Tel Aviv had, at the end of 2008, a population of 392,500 (Figure 4.3); the inner ring had 834,600 inhabitants; the middle ring had a population of 1,004,400; and the outer ring 975,100, bringing the total population of the metropolitan area to 3.2 million. Taking into account the gradual expansion of its boundaries, the share of the Tel Aviv metropolis of Israel's total population has been fairly stable at around 44-45 percent. The core city of Tel Aviv is surrounded by cities, such as Ramat Gan and Herzeliyya (Figure 4.3 & 4.4), that started as agricultural settlements and through a fast urbanization process became regarded, already in the 1950s, as the inner ring of the conurbation.

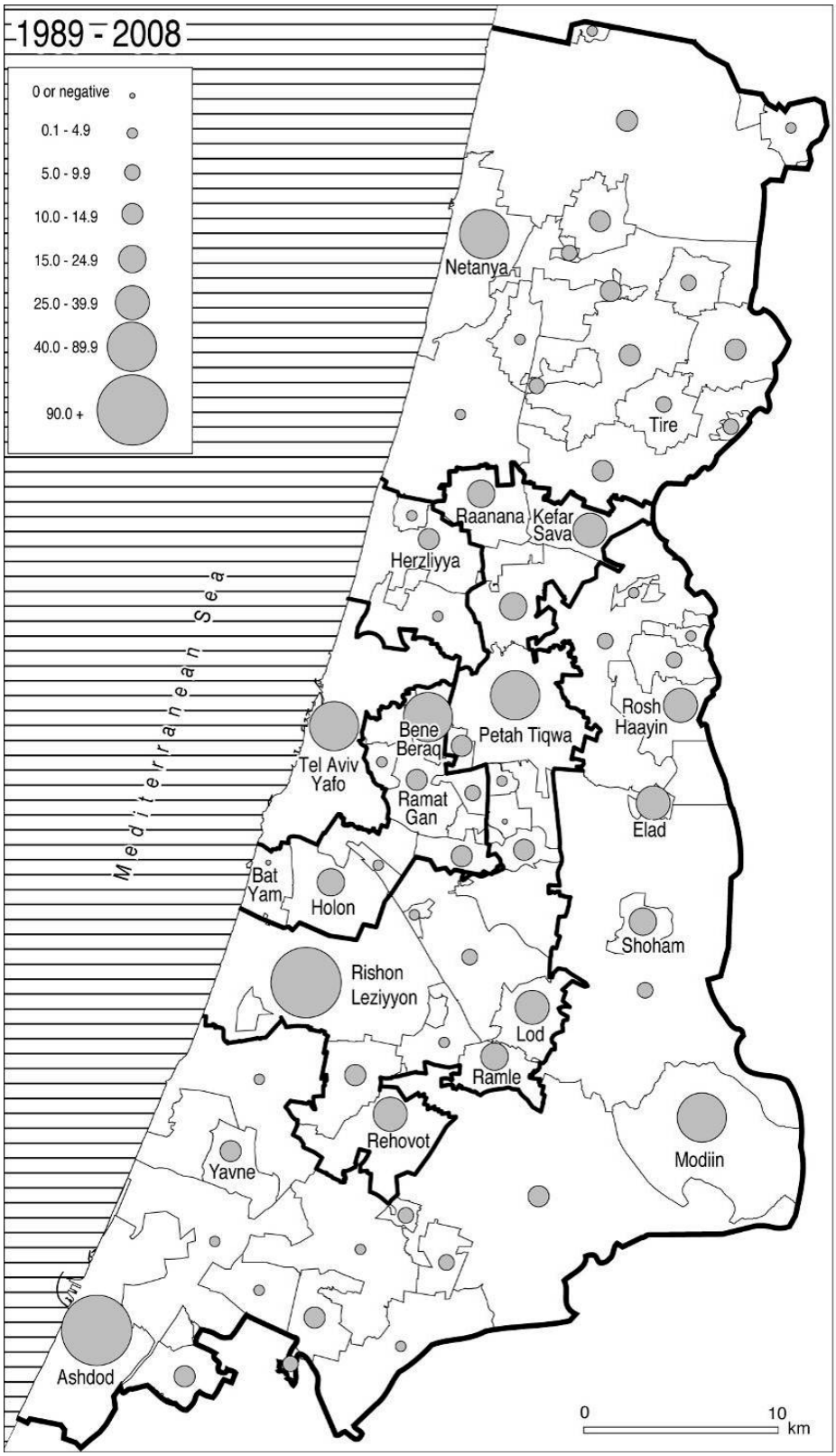
From the 1980s, a wave of suburbanization created an overspill of development beyond the middle ring represented by publicly planned establishment or growth of towns and cities such as Rosh HaAyin, Yavne, Shoham and Modiin (Figure 4.4). The large port city of Ashdod, located at the southern fringe of the metropolitan area, also became part of the labor market of the Tel Aviv region in that period. Another part of this overspill has been of spontaneous suburbanization of rural settlements. The fast growth of the outer ring was enhanced by the growing number of private vehicles and the continuous decline of the agricultural base of many of the rural settlements in this area. Mass immigration from the former Soviet Union had a major role in setting in motion the evolution of this outer ring of rapid metropolitan growth in the 1990s.

Job deconcentration in the Tel Aviv metropolis, particularly from the central city to the middle and outer rings, has been rapid, accelerating in the 1990s and becoming more rapid than the deconcentration of population. The share of the city of Tel Aviv in metropolitan employment decreased from 50% to less than 30% (Table 1), but rapid suburbanization of population has kept the jobs/population ratio in Tel Aviv far higher than anywhere else. The share of employment in the inner ring also declined slightly, probably because the inner ring could not offer competitive land prices and lacked accessibility advantages of either the central city or the outer suburbs. Thus, most employment growth took place in the middle and outer suburbs.

Banking, insurance and financial institutions are the economic activity most concentrated in the city of Tel Aviv and in the Tel Aviv metropolis, but although concentration of this sector in the Tel Aviv metropolis even increased, the dominance of the central city eroded. An even more marked process was evident in business services. Despite substantial deconcentration, the city of Tel Aviv has retained its status as the dominant node of employment. The metropolitan CBD spills-over to adjacent Ramat Gan, but none of the suburban employment centres seems to be emerging as edge cities that rival Tel Aviv.

Figure 4.3. The Tel Aviv metropolitan area – percent population growth by local authority, 1972-2008.

Figure 4.4. The Tel Aviv metropolitan area – population growth (number of persons) by local authority, 1989-2008.



3.2.1.3 Small central city and medium level of fragmentation

The Tel Aviv metropolitan area included 65 local authorities in 2008: 30 cities, 23 local councils and 12 rural regional councils. The average population size of local authorities in the metropolis was 49,329 up from 41,628 only six years earlier, because of significant population increase and several imposed amalgamations (see latter in this chapter). Hence, the level of municipal fragmentation in the Tel Aviv metropolitan area is rather average from a cross-national comparative perspective. The central city – Tel Aviv – has a remarkably small share of the metropolitan population, although being economically dominant and fiscally sound. Suburban space is split among dozens of local authorities, but nearly half of them are cities of over 20,000 inhabitants, two have reached 200,000, and only five are tiny local authorities of less than 5,000 inhabitants.

Thus, although the discourse emphasizing the contribution of amalgamation reforms to enhanced efficiency and effectiveness prevails in Israel for quite a few years, the central city of the metropolis is in fact economically sound and suburban space is not extremely fragmented. It is the lack of upper-tier metropolitan, regional or sub-regional governments, and the apparently insufficient role of inter-municipal cooperation and coordination mechanisms, that amplifies the perceived negative impact of municipal fragmentation on the metropolis.

3.2.1.4 Land use planning at the sub-metropolitan and metropolitan levels

The Tel Aviv metropolis sprawls over the area of two planning districts: Tel Aviv and Central (Table 4.2), except for the city of Ashdod, which is at the Southern district. The 1965 Planning and Building Law does not acknowledge planning at the metropolitan level, but deals with planning at national, district, and local levels. National Outline Plan no. 31 was the first statutory document to acknowledge, in 1992-1993, the metropolitan scale as the appropriate scale for regional and national planning. The plan defined the metropolitan core of Israel as a triangle that includes the Tel Aviv and Jerusalem metropolitan areas. Shortly thereafter, in 1995, the Ministry of Interior initiated the preparation of a metropolitan development plan, as a first step in the preparation of the Tel Aviv district statutory outline plan.

Table 4.2. The Tel Aviv and Central Districts.

	Metropolitan Tel Aviv	
District	**Tel Aviv**	**Central**
Area (km²)	172	1,294
No. of local authorities	10 (all urban)	52 (40 urban and 12 regional councils)
Number of localities	18	236
Local planning committees	10 (1 is joint)	31 (6 are joint)
Population	1,216,500 (1,136,700 Jews)	1,730,500 (1,523,600 Jews)
Major Agendas	* High density and vertical development. * Urban preservation. * Mass-transit systems. * Sea Shore / coastal ribbon development. * Urban parks. * Metropolitan Parks.	* High density development and urban renewal. * Open spaces and parks. * Ben Gurion Airport (directly controlled by the district). * Arab localities local plans. * National infrastructures. * Out-of-town retail.

The Tel Aviv metropolitan development plan (Shachar and Lerman, 1998) has been the prime explicit initiative for metropolitan-wide planning in the Tel Aviv area, including both the Tel Aviv and Central districts. In formulating its housing development policy, it assessed growing deconcentration from the core of the metropolis to its different suburban rings (the inner ring, the middle ring and the outer ring), as well as the more modest countertrend of residents returning from the metropolitan periphery to the old core, which is undergoing renewal and change. The metropolitan approach also referred to the metropolitan Central Business District, along the Ayalon highway, between the old business centre of Tel Aviv and the new business center in Ramat Gan (which grew around the Diamond Exchange). A third aspect included in the metropolitan approach was transportation, especially public transportation. The metropolitan plan incorporated a combined system of public transportation, including light rail, suburban railway and a connecting bus system. Public transportation served as a major consideration in identifying secondary employment and business centres, and in defining housing densities. The plan was discussed at length and adopted in 1998 by the National Commission for Planning and Building, although not formally approved, because such development plans have no legal status. Nevertheless, it was expected to provide principles for the statutory Tel Aviv District Outline Plan.

It should be noted the Tel Aviv metropolitan development plan was essentially a top-down initiative, led by the Planning Administration of the Ministry of Interior. Whereas various agencies and interest groups, including local authorities, were consulted and represented in the steering committee, its metropolitan approach is a central state initiative, although it is an initiative that met little resistance. Local authorities had few objections, and the plan was not a cause for conflict, or for inter-municipal cooperation in either opposing particular elements in the plan, or working together in order to implement them. The weak, non-binding status of this plan apparently explains such indifference. Major controversial issues at stake, involving zoning, betterment and compensation costs associated with zoning, the delineation of major road and rail lines and the location of locally unwanted land uses were not determined by this plan, which mainly incorporated available plans of other agencies in these fields, or left the statutory decision to the district plans.

The subsequently prepared Tel Aviv district plan (District Outline Plan no. 5) include clear reference to the metropolitan component of the plan, and to the need for a broad approach that sees beyond the borders of the District. The planners stressed three fields in which cooperation between the local authorities of Tel Aviv district is required:

1. Planning, policy formulation, supervision and enforcement.
2. Regional infrastructure, such as waste management, sewage treatment plants, major highways, light rail and metropolitan parks.
3. Promotion of district-wide interests, such as a database for planners and development initiatives, representation of district-wide interests in the central state arena, and promotion of the global status of the metropolitan area.

Statutory district plans have become more effective then ever, in the early 2000s, in controlling urban development, particularly in the Tel Aviv metropolis. Deviations and formal changes have become rare, and the plans have become a major tool for gatekeepers from the planning establishment – the district planners and the planning administration – to control urban development in the name of planning principles and sustainable development. Nevertheless, these plans, as well as the district planning committees, are clear top-down metropolitan tools, imposed by the central state, with only modest formal participation of local actors.

3.3 Case study 2: Haifa

3.3.1 Geographical and historical overview

Haifa is an emerging secondary metropolitan area. Its boundaries were roughly delineated by planners to include a core urban area and three suburban/peripheral areas: the Arab-Jewish greater Nazareth area to the east, the Jewish-Arab Karmiel-Sakhnin area to the northeast, and the Northern coastal plain area of Akko-Nahariya The Haifa metropolitan area has no clear ring structure, and suburban nodes of business activities, beyond manufacturing, are weak. The suburban centers of Nazareth, Karmiel and Nahariya are locally oriented, their role as regional centres is modest, but their ties with the Haifa metropolitan areas and to the central city of Haifa are characterized by relatively weak ties to (overshadowed by the dominant metropolitan center of Tel Aviv). Despite feelings of belonging to the Haifa-Northern region, some of them argue that especially since the opening of the no. 6 toll road that links the Galilee directly with the Tel Aviv area, their ties with the Tel Aviv area have intensified.

Planners of the metropolitan Haifa master plan (Mazor and Tzamir, 1998; 1999) used a broader definition for the metropolitan area than that of the CBS – definition that does not divide sub-regional urban clusters between metropolitan and non-metropolitan space. They demonstrated that rather than having a ring structure the Haifa metro includes the core Haifa Bay area and three suburban sub-regions: the greater Nazareth area to the east, the Karmiel-Sakhnin area to the northeast, and the Northern coastal plain area of Akko-Nahariya. Although attracting some suburbanizing and exurbanizing middle class population, all three suburban sub-regions are rather weak economically, because of the large concentrations of poor Arab population and Jewish development towns, and the limited range of employment opportunities in these peripheral locations. Suburban nodes of business activities, beyond manufacturing, are rather weak in the North. The suburban centres of Nazareth, Karmiel and Nahariya are locally oriented, their role as regional centres is modest, but their ties with Haifa are not that strong either.

Addressing the Haifa and Northern districts as Israel's northern metropolitan region has the advantage of being in line with the administrative division used for planning purposes and avoiding the need to delineate a rather artificial boundary across the Galilee. The region is somewhat broader than what could be scientifically defined as the metropolitan area. Eastern areas of the Northern district are clearly not part of the Haifa metropolitan area, and their ties with Tel Aviv could even be stronger than those with Haifa. The southernmost part of the Haifa district also has rather weak ties with Haifa and is in fact increasingly within Tel Aviv's orbit of influence.

3.3.1.1 Growth and expansion of the metropolitan area

According to the statistical division of the Haifa metropolitan area into rings, the central city of Haifa had, at the end of 2008, a population of 268,000; the inner ring had 271,200 inhabitants; and the outer ring 484,900, bringing the total population of the metropolitan area to 1.02 million (table 4.3). The population of the city of Haifa (the core of the metropolis) grew significantly from 10,000 people in 1948 to 268,000 in 2008. The outer ring of the metropolis, including Qiryat Motzkin, Tirat Carmel, Qiryat Bialik, Qiryat Yam, Nesher, and Qiryat Atta grew from 14,200 citizens in 1948 to 200,000 in 2008. The Haifa district, similarly to the Tel Aviv district, is very urbanized and highly crowded.

The main reason for the growth in the population of Haifa and the urban ring surrounding it is the Russian immigration to Israel in the nineties, from which a large number moved to Haifa due to the cheap housing in an urban area and high accessibility to areas with employment - a crucial parameter in immigrant housing patterns. From the middle of the nineties the growth in the population was low and sometimes negative. In the last few years there is no growth in the city's population, which is moving to the suburbs.

Table 4.3. Population and employment in the Haifa and Northern districts' 1970-2008.[*]

	1970	1980	1990	1995	2000	2005	2008
	Number of employed persons[****] - place of work (% of the metro area[**])						
The city of Haifa	36.8	33.8	30.4	30.2	27.0	25.1	23.3
Haifa district[***]	16.4	21.0	21.8	21.4	22.8	23.9	22.6
Northern district	46.8	45.5	47.7	48.4	50.2	51.0	54.1
Total metro[**]	100	100	100	100	100	100	100
Total metro[**] (thousands)	298.5	342.2	396.7	522.2	579.8	627.3	690.3
	Number of employed persons[****] - place of work (% of Israel – total)						
Total metro[**]	31.9	28.8	27.7	27.0	26.6	25.7	25.5

	1970	1980	1990	1995	2000	2005	2008
	Number of inhabitants (% of the metro area[**])						
The city of Haifa	23.5	19.5	16.8	15.4	14.2	13.1	12.8
Haifa district***	26.7	28.5	28.1	28.6	28.8	28.9	28.7
Northern district	49.8	52.0	55.1	56.0	57.0	58.0	58.5
Total metro[**]	100	100	100	100	100	100	100
Total metro[**] (thousands)	923.4	1179.4	1461.3	1689.9	1901.8	2043.4	2122.1
	Number of inhabitants (% of Israel – total)						
Total metro[**]	30.6	30.1	30.3	30.1	29.5	29.1	28.8

	1970	1980	1990	1995	2000	2005	2008
	Number of inhabitants (% of the metro area[**])						
Jews'	69.4	66.2	62.4	61.3	58.2	55.5	54.4
Arabs'	30.6	33.8	37.6	38.7	41.8	45.5	45.6
Total metro[**]	100	100	100	100	100	100	100
Total metro[**] (thousands)	923.4	1179.4	1461.3	1689.9	1901.8	2043.4	2122.1

[*] Source: Based on data of the Central Bureau of Statistics, Labor Force Surveys.

[**] Haifa and Northern districts.

[***] Haifa District Excluding the city of Haifa.

[****] The labor force survey data includes only the civilian labor force, and does not include Palestinians residing in the Palestinian territories and working in Israel.

3.3.1.2 The weakness of the metropolitan core

The civilian labour force in the Haifa metropolis (as divided geographically by the C.B.S. – Central Bureau of Statistics) shows that 28% is concentrated in the centre of the metropolis, whereas in Tel Aviv 14.4% of the labour force is in the centre.

A study by Ran Haklai (2008) on the employment structure, as preparation for an outline scheme for Haifa, shows a high rate of employment in industry, electricity and water and a relatively low percentage in banking, finances and insurance. The importance of work in business and financial services relative to the total employment indicates the dominance of these branches in the Tel Aviv district compared to a low rate in Haifa.

The proportion of salaries paid in industry and the water domain is some 20% of the salaries. The ratio between the wages paid to the number of people in the area of finances is similar and shows a high salary per person in Haifa and the Qrayot (towns located in the inner metropolitan circle) and it is considerably higher than the salary in areas nearby. 44% of the salaries paid throughout the northern district are paid in Haifa and the Qrayot, while Haifa holds 27% of the salaries paid in the north (Haklay, 2008).

3.3.1.3 Land use planning: a metropolitan master plan and a quest for statutory district outline plan

A Haifa metropolitan area master plan was prepared for the Planning Administration at the Ministry of Interior in the years 1997-1999, as a first step in the preparation of a statutory District Outline Plan. The master plan defined four main objectives: demographic growth, equity and integration of Jewish and Arab populations, economic growth and environmental protection. It suggested strengthening the Haifa region's polycentric nature, rather than opting at a monocentric metropolis that suburbanizes in either radial of concentric forms. The city of Haifa and its vicinity, including the Haifa Bay cities, were defined as the metropolitan core, and four secondary urban concentrations were identified, three in the Northern District (Akko-Nahariya, Karmiel-Sakhnin, and Nazareth-Afula) and one in the Haifa District, at the southern end of the metro region and perhaps linked with Tel Aviv no less than with Haifa (Hadera-Umm Al-Fahm). Metropolitan development plans followed the concentrated deconcentration principle, with the metropolitan core and sub-centres separated by green belts and a green heart, although connected to each other by an efficient transportation network.

The Haifa metropolitan area extends in areas of two Ministry of Interior districts: Haifa and Northern (Table 4.4 and Figure 4.5), but a statutory district outline plan was approved only for one of them: the Northern district. A first district outline plan for the Northern district was

prepared in the 1970s, approved in 1984. A revised plan – Northern District Outline Plan 2/9 – was prepared during the 1990s, approved in 2007. Unlike the original plan from the 1980s, the new plan proved effective, mainly in distinguishing different sensitivity levels for open spaces in this region, characterized by high quality nature reserves, woodland, landscape reserves and agricultural land. Nevertheless, the Northern district plans were regional rather than metropolitan in their nature, partly being a compilation of local and sectoral plans (transportation, infrastructure, woodland, etc.) and partly serving a coordination function at the regional level. However, in these functions, the plans focused on particular planning agendas of Israel's north (Table 4.4), rather than on metropolitan dynamics cantered in the city of Haifa.

Figure 4.5. The Haifa metropolitan area; two Ministry of Interior districts: Haifa and Northern.

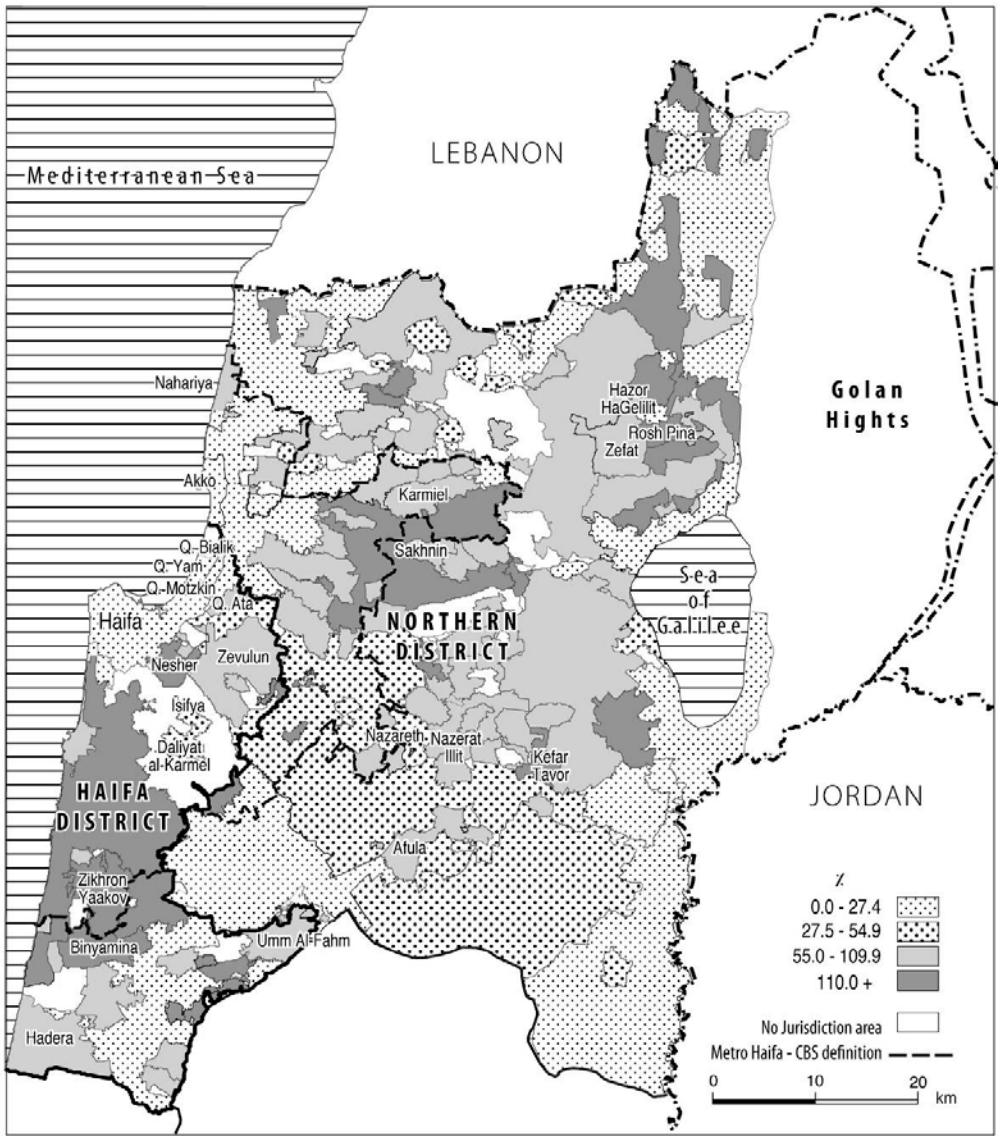


Table 4.4. The Haifa and Northern Districts, 2009.

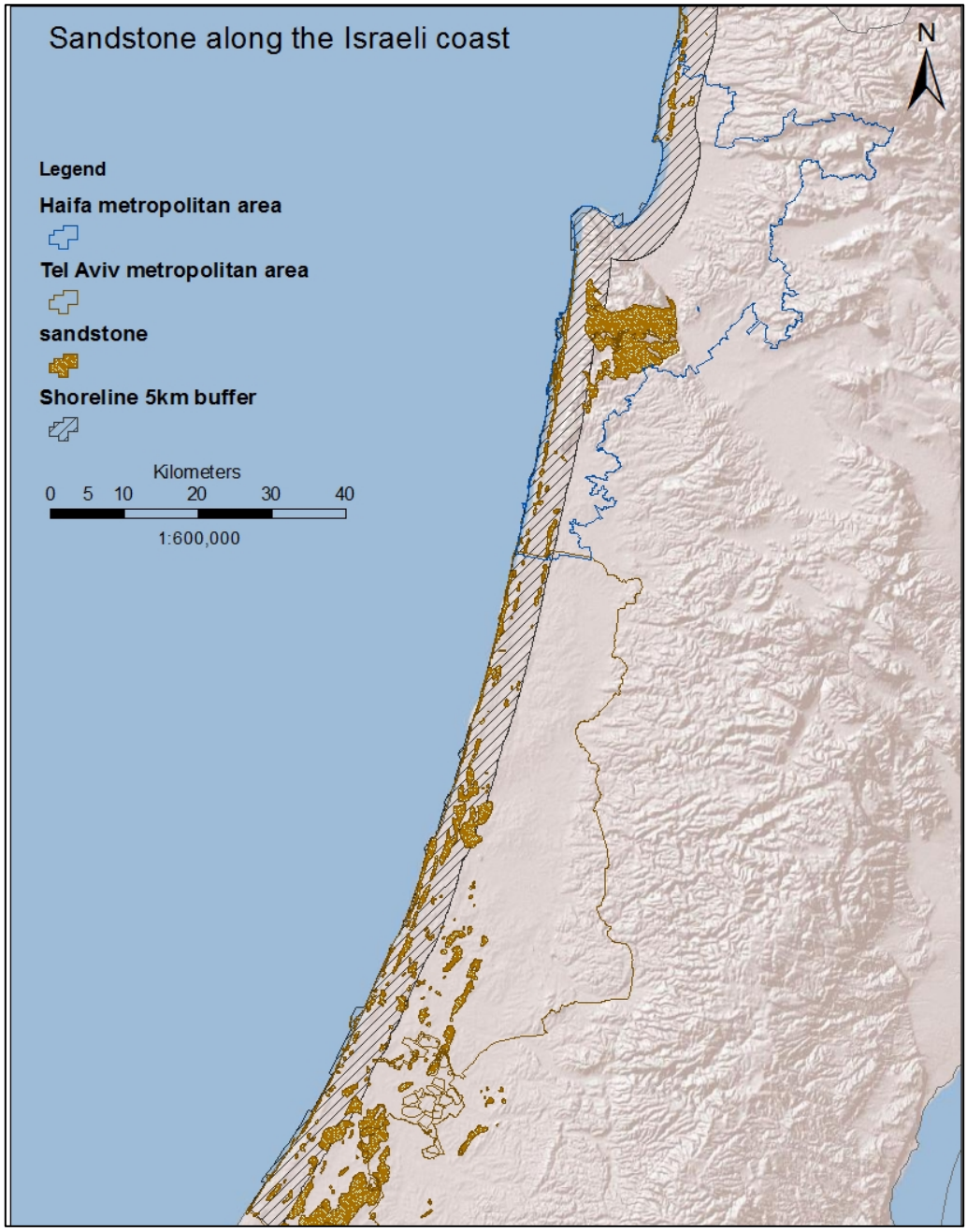
	Metropolitan Haifa	
District	**Haifa**	**Northern**
Area (km²)	866	4,473
No. of local authorities	28 (12 cities, 12 local councils, 4 regional councils)	91 (17 cities, 59 local councils, 15 regional councils)
Number of localities	89	422
Local planning committees	13 (6 are joint)	33 (14 are joint)
Population (12.2008)	888,300 (69.9% Jews)	1,239,800 (44.1% Jews)
Major Agendas	* Haifa Port – refineries – airport complex at the Haifa Bay * Railroads and road development * A metropolitan Park * The status of Haifa as a metropolitan core city	* Demographic and economic growth in the context of peripheriality * Protection of prime quality open spaces versus development * Planning of Arab cities and towns

3.4 Biophysical resources (for both case-studies) and Land-use

3.4.1 Coastal ecosystems

The Israeli coast is generally characterised by sandstone cliffs (Figure 4.6) that form a unique coastal ecosystem. Sandstone cliffs are characterised by their submission to natural and human processes; both processes and activities direct the scale of erosion and setback of the cliffs. Current discussions on the eroding cliffs involve two main agendas: the environmental agenda and the social agenda. The latter faces the dilemma of existing and future development along the cliffs both affecting the scale of erosion and subject to the scale of erosion weakening the foundations and putting sites at risk. The former copes with the dilemma of human meddling in natural processes and the protection of the cliffs from further erosion (of course human activities can be partially accountable to the magnitude of erosion due to activities along the coastline affecting sedimentation thus increasing wave energy).

Figure 4.6. Sandstone along the Israeli coast.[*]

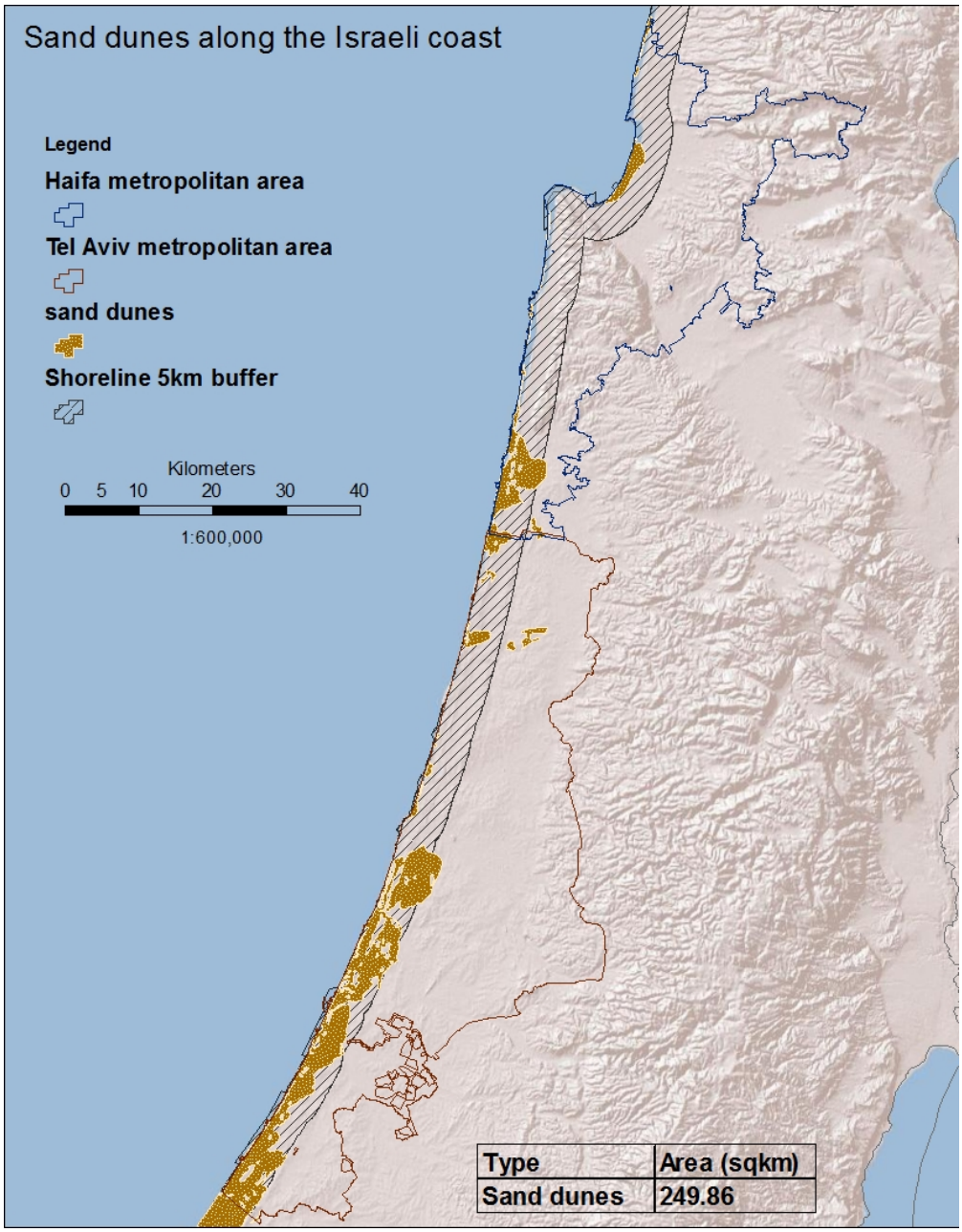


The other important geological feature along the Israeli coast is the formation of sand dunes, formed by air-born sedimentation from the Mediterranean Sea and the African continent (Figure 4.7). The southern part of the Israeli coast features such sand dunes in abundance providing unique habitats for other biological ecosystems unique to those areas. The other major sand-dune area is near the centre of the Israeli coast in currently an undeveloped area

[*] Source: data was received from WP.2 SECOA and the map produced by Gidon Jakar.

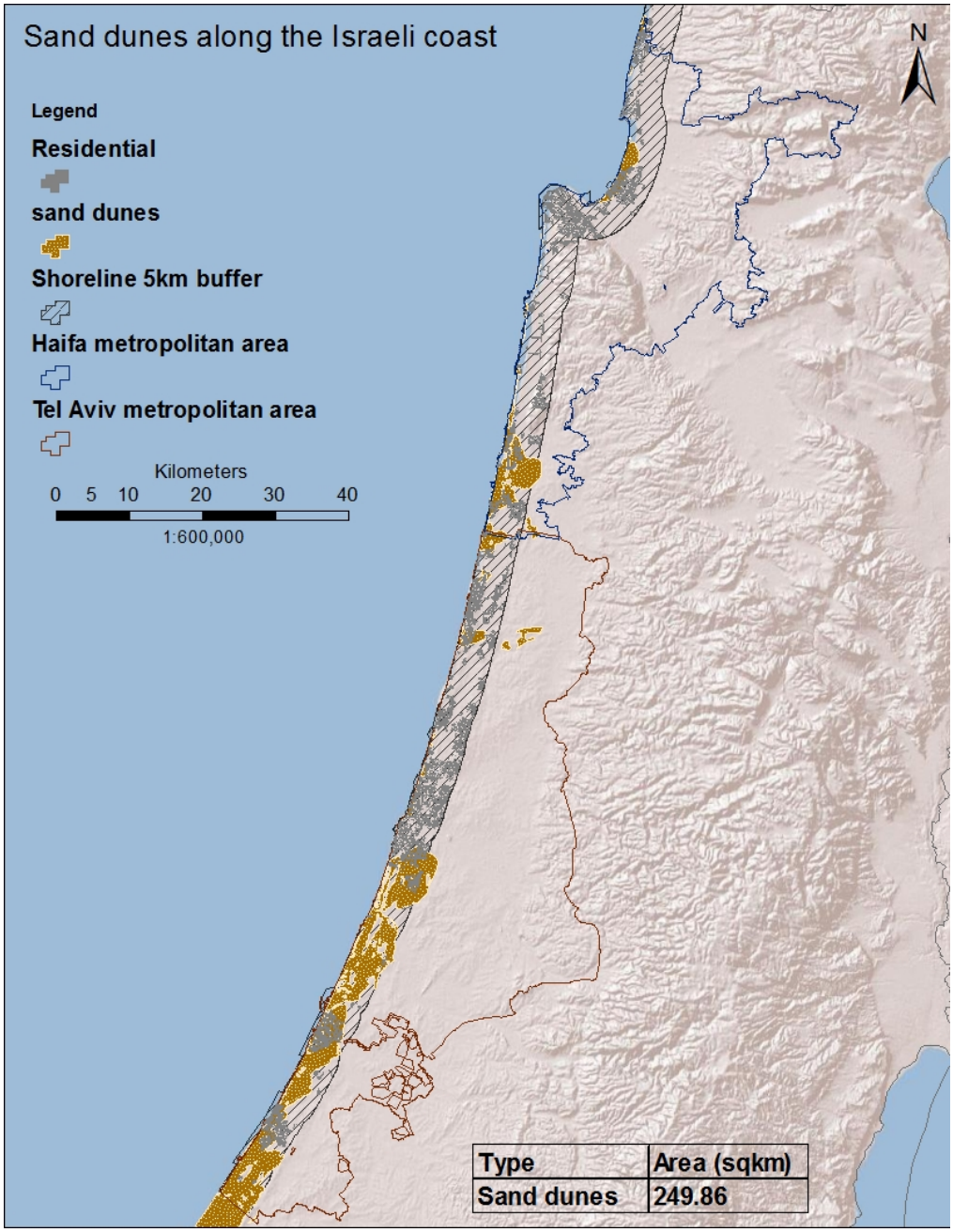
similar to that of the southern sand dune area. Some areas are protected by law or by military use preventing development however even the protected sites are subject to human meddling as activities such as sand buggies affect the ecosystem. Urban spread along those areas poses a threat to the sand dune ecosystems and all its adjoining attributes further increasing the pressure on conservation of sand dunes along the Israeli coast (Figure 4.8).

Figure 4.7. Sand dunes within 5km off the Israeli coast.[*]



[*] Source: data was received from WP.2 SECOA and the map produced by Gidon Jakar.

Figure 4.8. Sand-dunes and urban areas within 5km from the coast.[*]



[*] Source: data was received from WP.2 SECOA and the map produced by Gidon Jakar.

3.4.2 Land-use

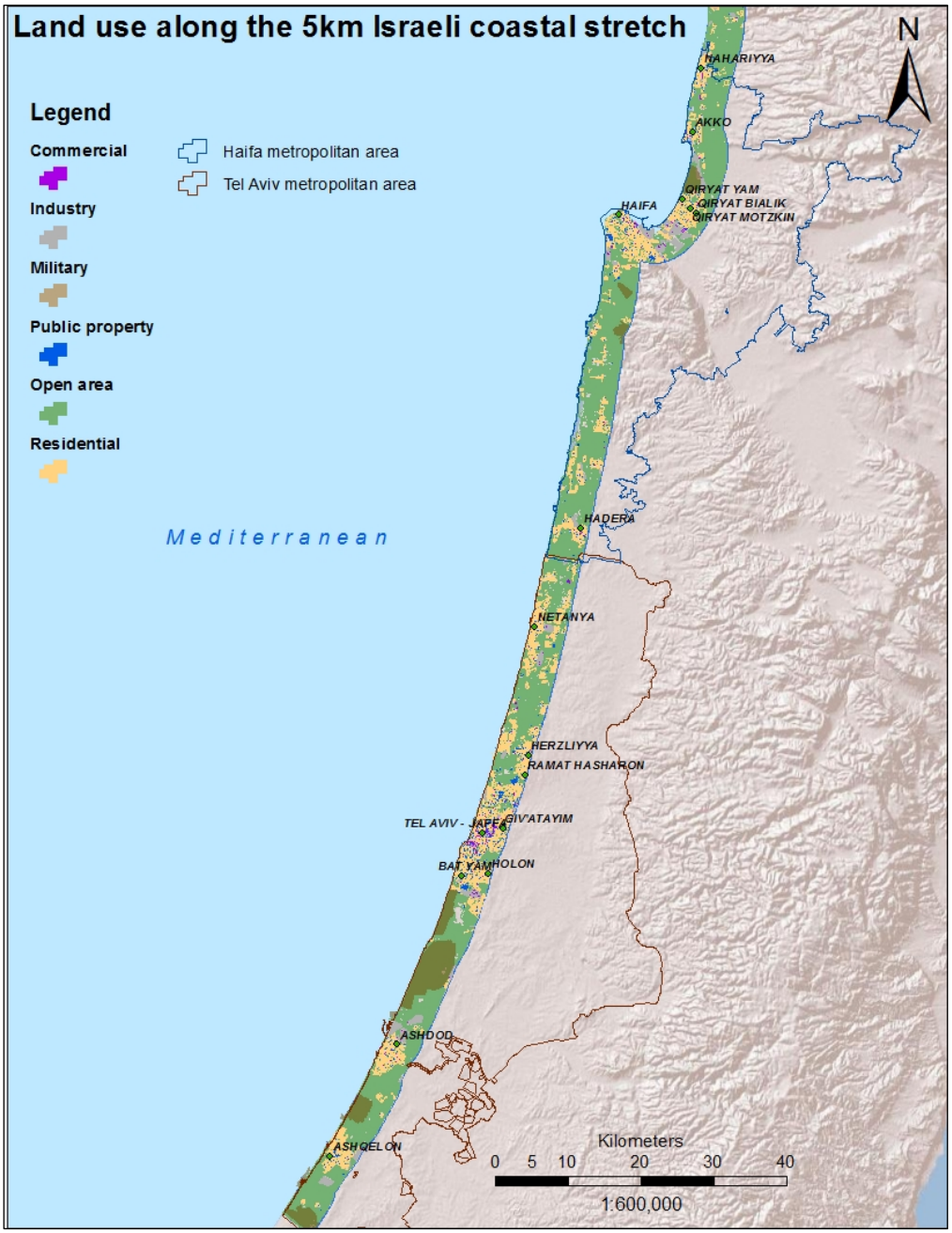
The maps of land use are presented in five different maps with each case-study shown in two maps north and south and a general land use map of the Israeli coast (maps 9-13). The current trend along the Israeli coast is divided between two contrasting trends: The first trend is the increased public and regulatory pressure concerning the preservation of open areas and sustainability, the second trend is the increasing pressure for further development of housing and tourism by private and public sectors.

Recently the agenda of maintaining open areas has received a number of boosts following battles won by environmentalists on different fronts against development along the coast. However, the coast remains in high demand for development of housing and tourism as it offers municipalities along the coast development and economic opportunities. Development along the coast of housing, tourism and recreation still pose a major threat to the coastal environmental agenda and preservation. An overview of land use along the Israeli coast depicts an image of large open areas with centralised urban development in a number of areas. But with the diminishing available property within the urbanised areas the only alternative is spreading outwards towards previously open areas. Protection of open areas faces an uphill battle against the development agenda though regulatory approaches are increasingly favouring the environmental approach.

In addition to open areas and urban development the other dominant land uses are military and industry. Although tourism features along the coastline but it generally meshes in with urban land-use; hotels districts are found along the Tel Aviv coast and other urban areas but tourism as a separate land use is less dominant along the Israeli coast, particularly with the modern environmental propaganda. Industrial areas are generally found near the ports of Haifa and Ashdod. Commercial land use features in the major urban areas of the Tel Aviv metropolitan area and near Haifa but is less dominant than other types of land use (when found along the coast it usually mixed with other uses such as housing).

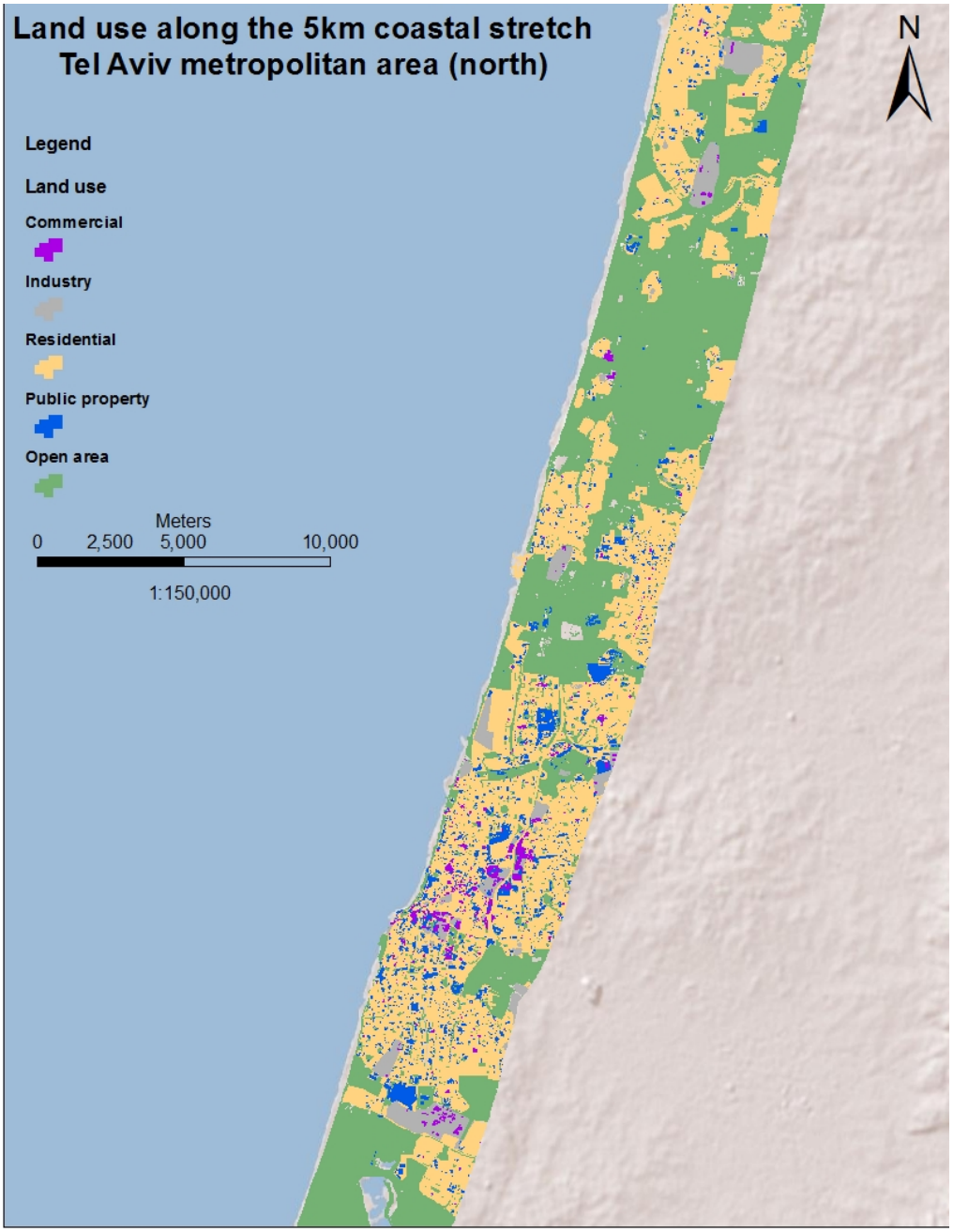
Whilst urban development and open area preservation compete for coastal resources the only land use which is somewhat inflexible is military land use. Military land-use is an important part of the coastal stretch located along the coast in various areas urban and rural. Due to the importance and necessity of the presence of naval bases along the coast and the use of the coast for other military bases the dominance of the military uses is present. Aspects related to this land use are the exclusion of the public from certain areas and the restrictions on development where the military is present.

Figure 4.9. Land use along the 5km Israeli coastal stretch.[*]



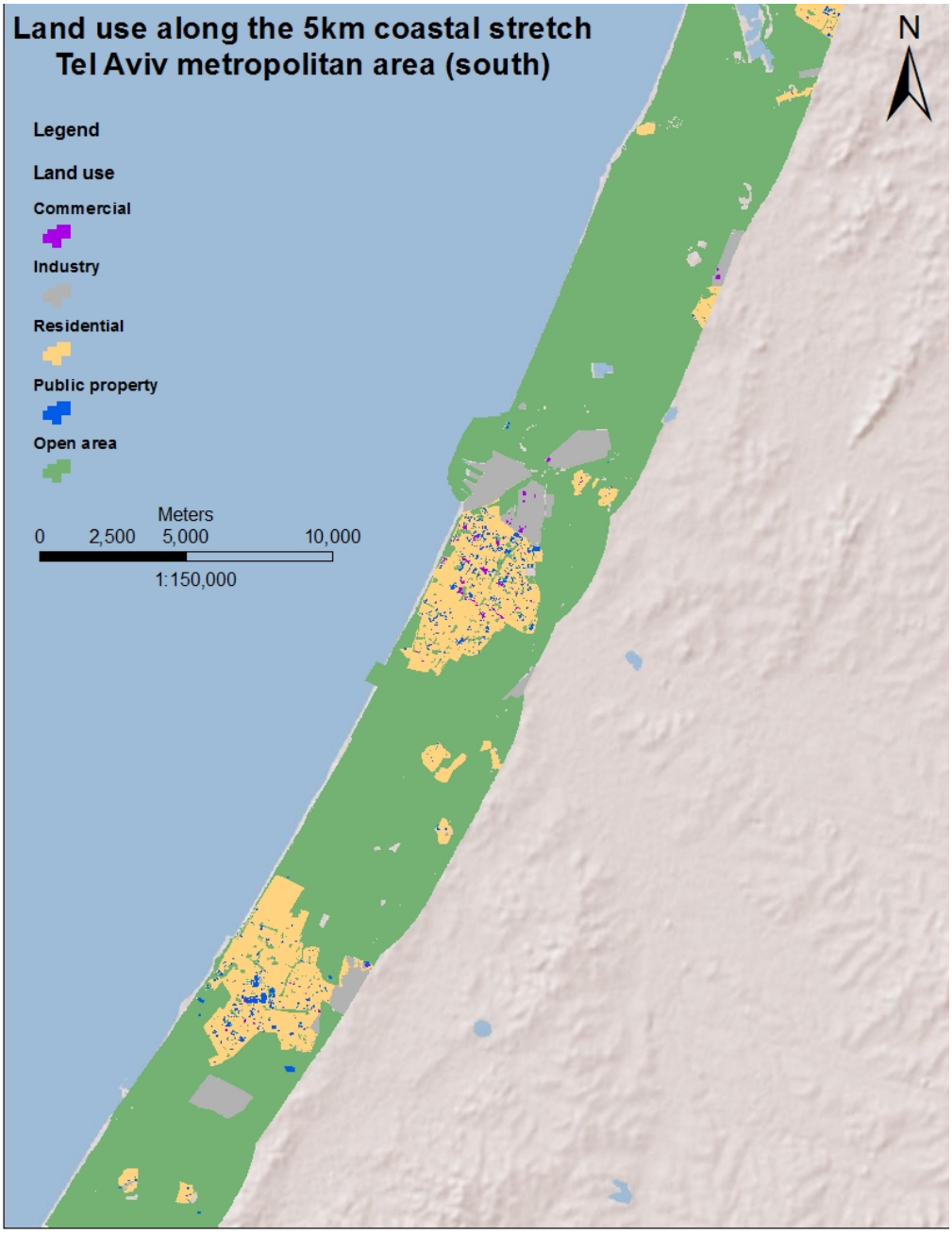
[*] Source: data was received from WP.3 SECOA and the map produced by Gidon Jakar.

Figure 4.10. Land-use along the Northern coastal Tel Aviv metropolitan area.[*]



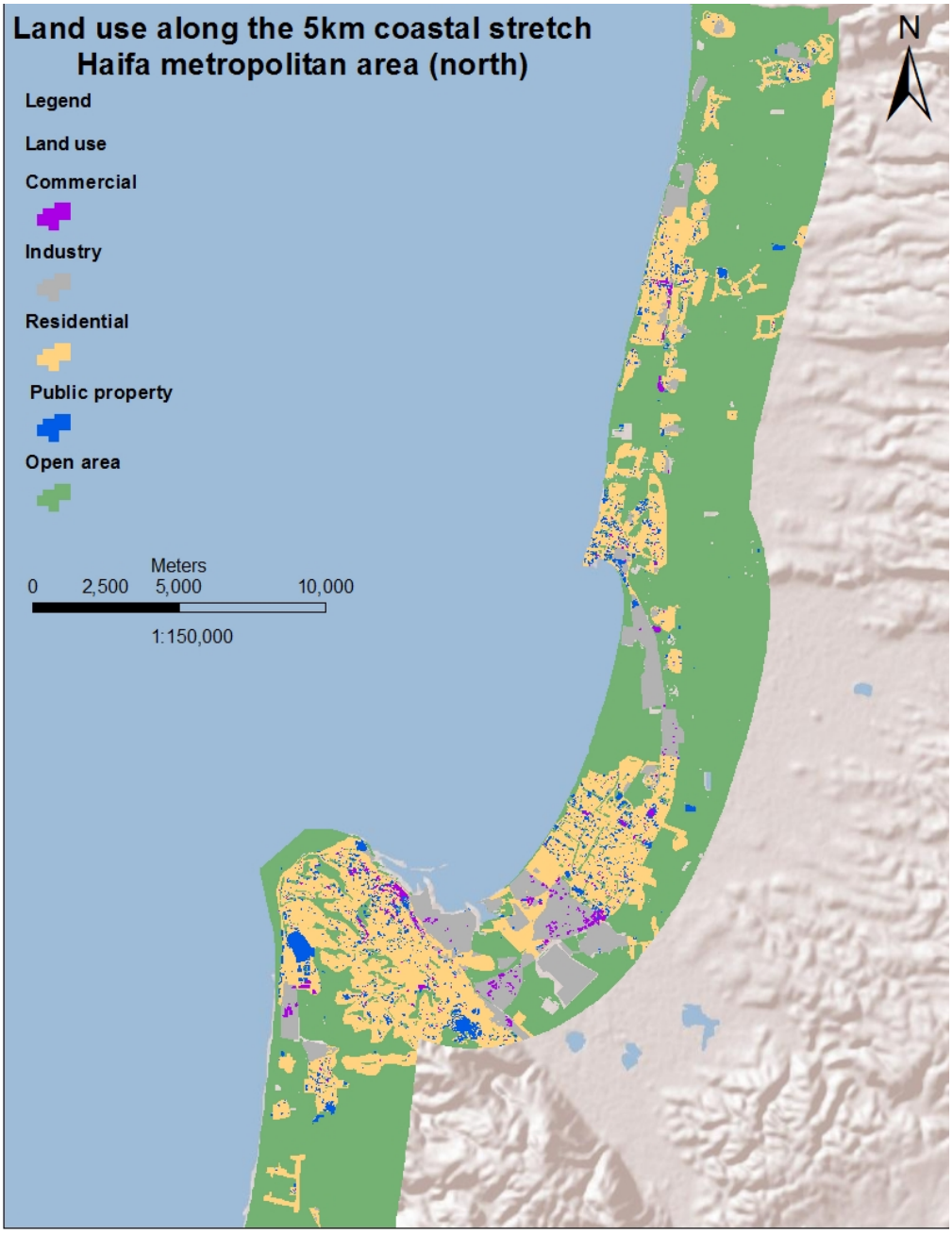
[*] Source: data was received from WP.3 SECOA and the map produced by Gidon Jakar.

Figure 4.11. Land-use along the southern Tel Aviv metropolitan area.[*]



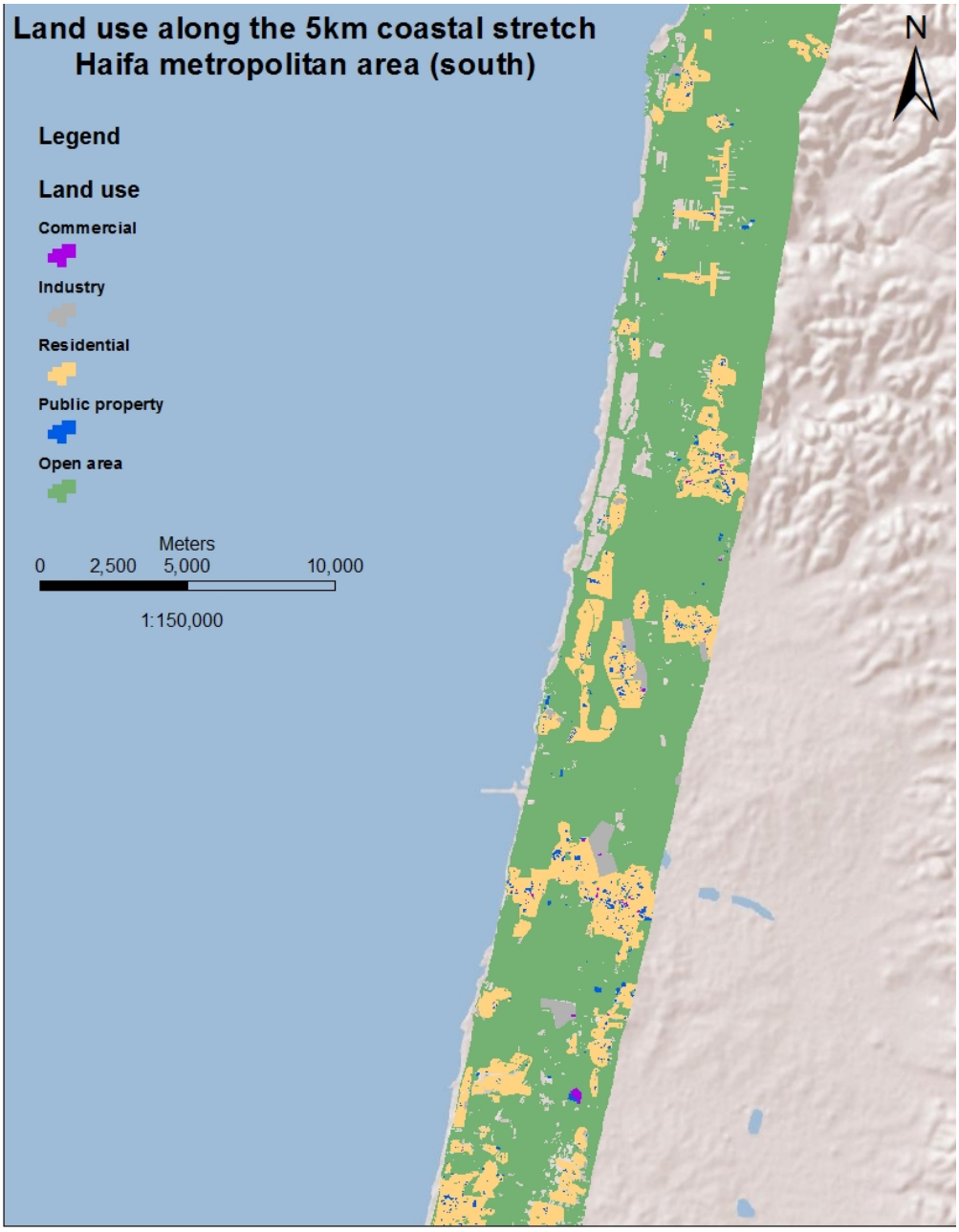
[*] Source: data was received from WP.3 SECOA and the map produced by Gidon Jakar

Figure 4.12. Land-use along the northern Haifa metropolitan area.[*]



[*] Source: data was received from WP.3 SECOA and the map produced by Gidon Jakar.

Figure 4.13. Land-use along the southern Haifa metropolitan area.[*]



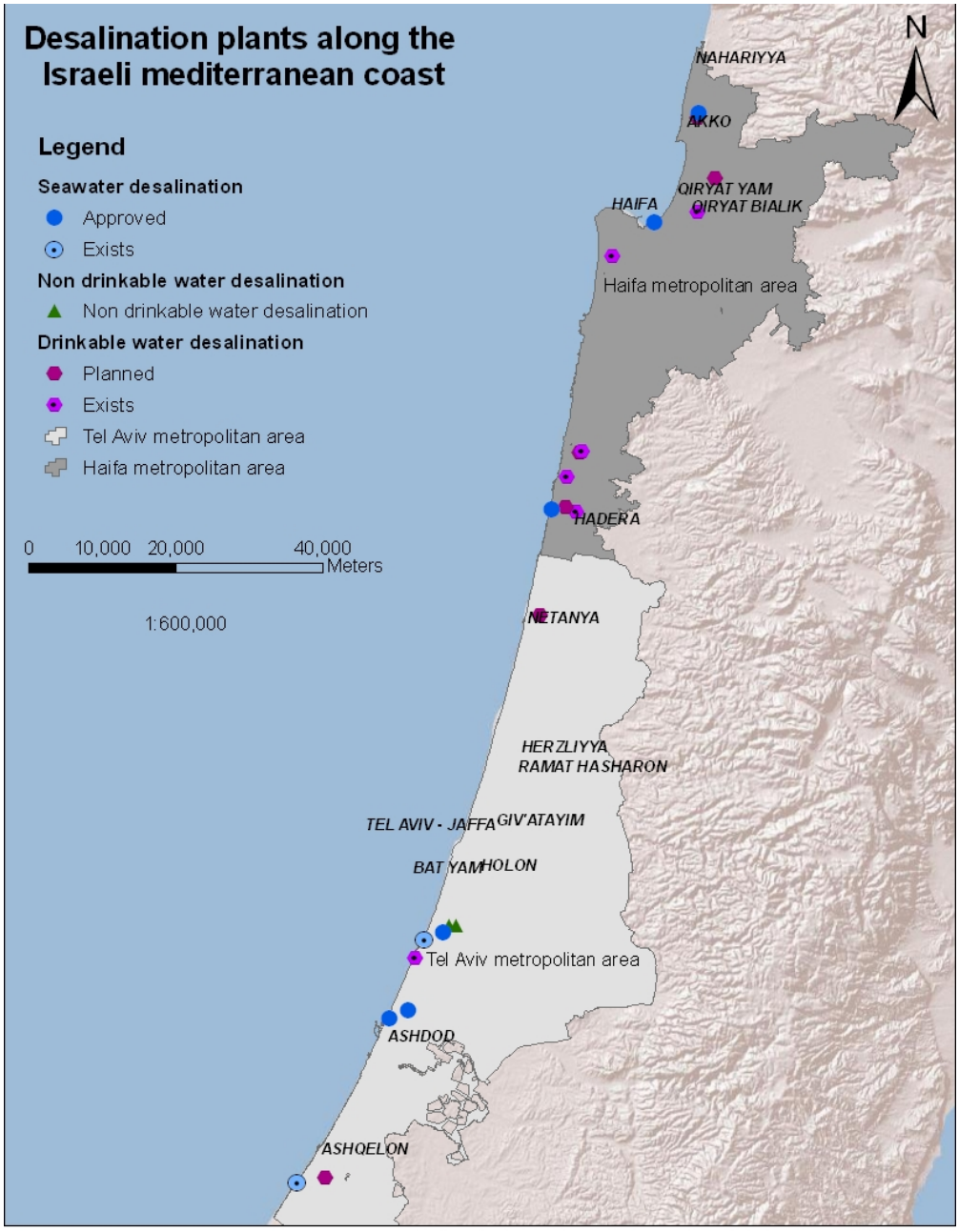
3.4.3 Freshwater and access to water

Freshwater exists in aquifers along the Israeli coast but is currently kept as a reserve; one process which has become common and being further developed in Israel due to the shortage of freshwater is desalination of seawater and water reserves along the coast for drinkable water and irrigation purposes (Figure 4.14). Desalination plants whilst guaranteeing water supplies

[*] Source: data was received from WP.3 SECOA and the map developed by Gidon Jakar

come at a cost and increase the pressures on the coastline. Pollution near these sites is anticipated with the waste produced by these sites with the addition of ecosystems affected by the presence of the plant. But the development of these plants requires proximity to the coast hence development along coastal areas is inevitable.

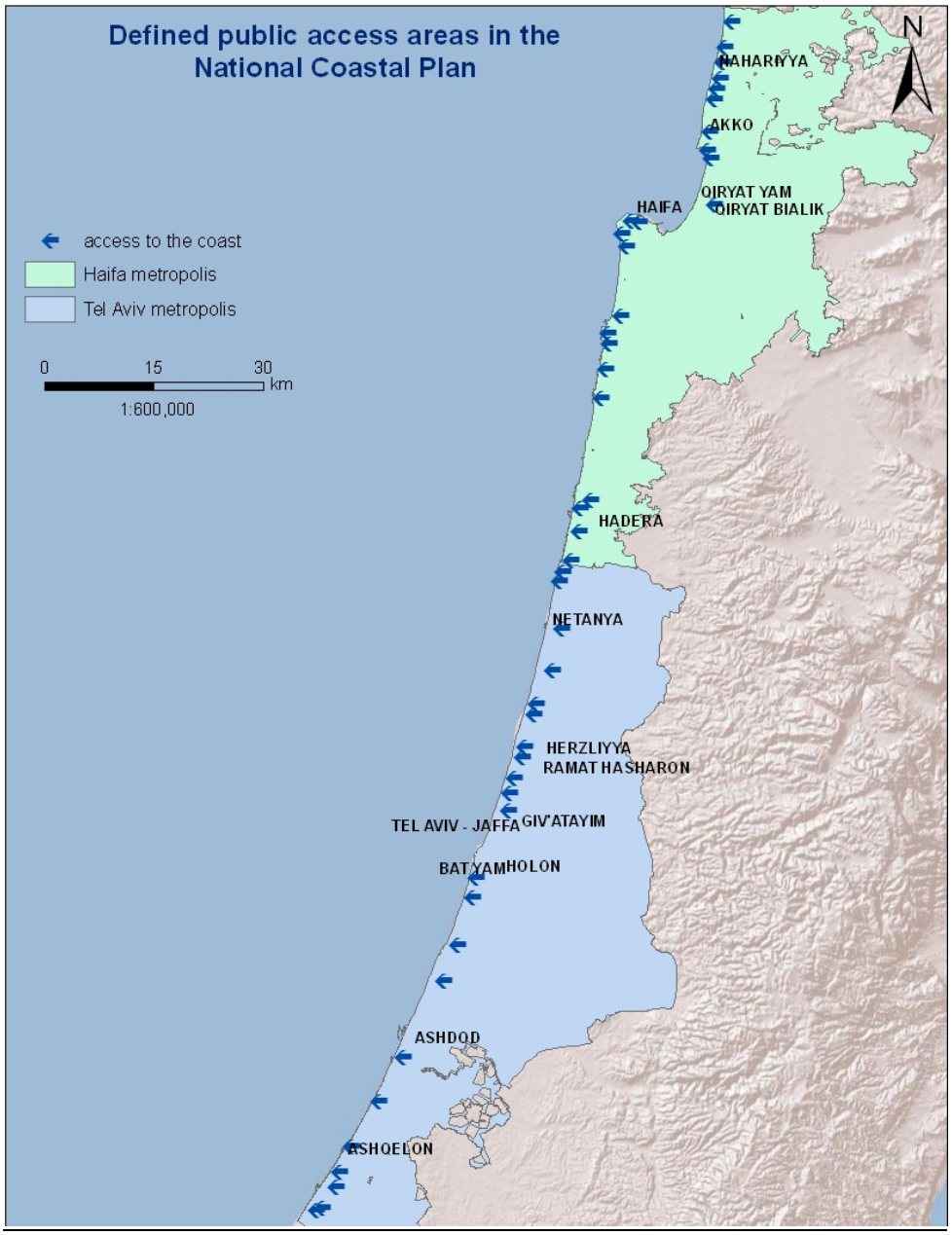
Figure 4.14: Desalination plants along the coast; seawater desalination.[*]



[*] Source: data was received from WP.3 SECOA and the map produced by Gidon Jakar

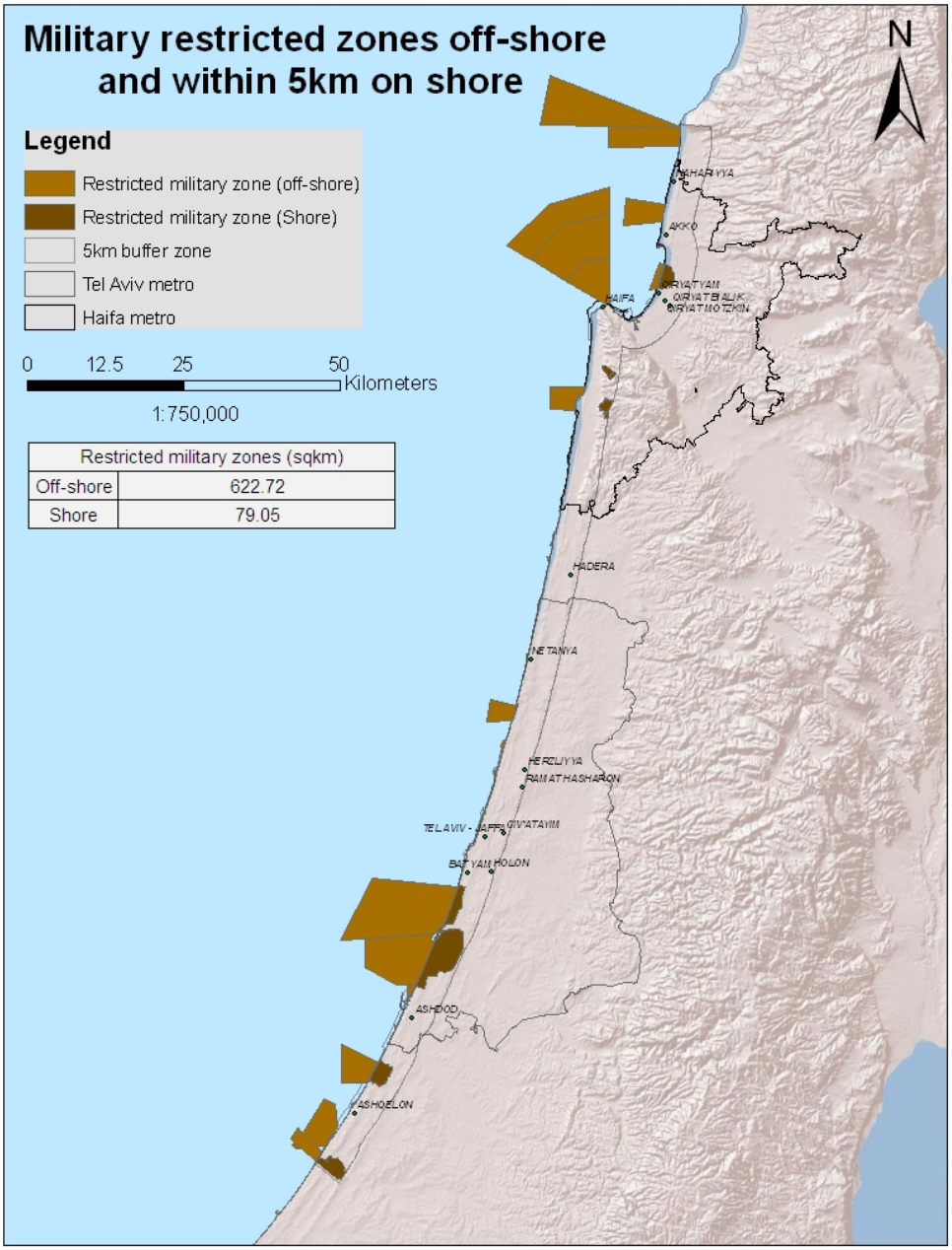
The national coastal plan outlines areas which according to the plan are designated as public access to the coast and emphasises the importance of public access to the coast (Figure 4.15). The majority of the areas are near urban regions and assume no structure or other type of development restricts access to these areas but this is not always the case. The military designated areas are the major restrictions on public access (Figure 4.16) along the coast with the addition of private properties and infrastructure.

Figure 4.15. Public access to the coast as outlined by the national coastal plan.[*]



[*] Source: the data is from the National Coastal Plan guidelines and the map produced by Gidon Jakar.

Figure 4.16: Military land use, shore and offshore along the Israeli coast.



4. Overview of Users in the Case Studies

4.1 Cultural and social resources

4.1.1 Cultural features

4.1.1.1 Religion

The Jewish population is the majority of the Tel Aviv Metropolitan area with a small minority of 4.8% Muslims living in the area. The Haifa metropolitan area presents slightly different ratios with 21.3% Muslims in the metropolitan area. In both areas Christians are a minority.

	Tel Aviv %	Haifa %
Jews	90.4	65.2
Muslims	4.8	21.3
Christians	0.6	5
Druze	0	3.7
Others	4.3	4.9

4.1.1.2 Higher education

Both Tel Aviv and Haifa have universities in the vicinity of the metropolitan area: the Tel Aviv University offering social sciences', humanitarian studies and a Medical department, and Haifa which has the Haifa University and the Israel Institute of Technology –'Technion'. In addition to the universities both areas have a number of private colleges.

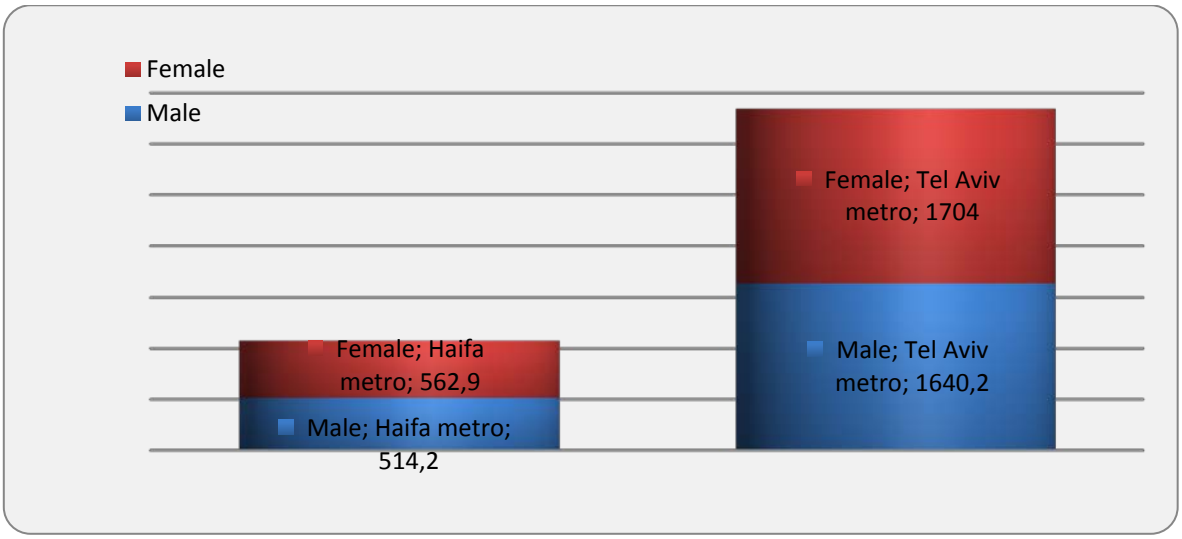
4.1.2 Social features

The Tel Aviv metropolitan area is the most populated metropolitan area in Israel with a total population of ~3,344,200 of those 1,640,200 male and 1,704,000 female. The Haifa metropolitan area has a total population of 1,077,100 similar to Tel Aviv metro and the global trend the female population (562,900) is slightly more than that of the male population (514,200) (Table 4.5 and Figure 4.17).

Table 4.5. Demographic data for 2008; male\female ratio.[*]

Demographical information for Tel Aviv and Haifa metropolitan areas by ring for 2008 (thousands)				
	Tel Aviv metro		Haifa metro	
	m	F	m	f
Core	195.7	206.9	126.2	138.1
Inner ring	415.2	441	134.6	141.1
Second ring	497.4	514.3	253.4	283.7
Outer ring	531.9	541.8	-	-
Total	1640.2	1704	514.2	562.9
Total population	3344.2		1077.1	

Figure 4.17. Gender ratio for Haifa and Tel Aviv metropolitan areas (thousands).



In both case studies the younger population is more dominant with more than 50% of the Tel Aviv and Haifa metropolitan areas population under the age of 35. In both case studies the highest percentage age group is that between 0-4 demonstrating the increasing population oriented pressures on the coast and future pressure on the coast (table 4.6).

- The total dependency ratio of Tel Aviv metropolitan area (population between 0-14 and 65+ in comparison to population between those ages):55.89% \ Youth dependency ratio: 37.83% \ Senior dependency ratio: 18.06%.

[*] Data source: Israel Central Bureau of Statistics; 2008 census.

- The total dependency ratio of Haifa metropolitan area (population between 0-14 and 65+ in comparison to population between those ages): 56.43% \ Youth dependency ratio: 37.87 \ Senior dependency ratio: 18.56.

Demographical trends in both metropolitan areas are similar with approximately the same dependency ratios (referring to the population which is usually unemployed and dependent on others for assistance). The age groups differ in size as expected due to the difference in population sizes in the case studies but the proportion of each age group is similar in comparison to the rest of the population. The high percentage of population in their fertile years explains the high percentage of younger populations; however, another main aspect in Tel Aviv's population growth is the inner migration from other regions in to the area seeking work and the social aspects Tel Aviv offers.

Table 4.6. Age distribution for Haifa and Tel Aviv metropolitan areas.[*]

	Tel Aviv metro	Haifa metro	Tel Aviv metro %	Haifa metro %
00-04	298.9	89.8	8.946691	8.188201
05-09	268.6	89.7	8.03975	8.179083
10-14	243.2	86	7.279476	7.841707
15-19	232	88	6.944237	8.024072
20-24	242.8	85.2	7.267503	7.768761
25-29	259.1	80.8	7.755395	7.367557
30-34	265	78.7	7.931994	7.176074
35-39	237.1	72	7.09689	6.56515
40-44	194.6	62.9	5.824778	5.735388
45-49	183.8	61.9	5.501512	5.644205
50-54	183.9	61.2	5.504505	5.580377
55-59	188.3	59.5	5.636206	5.425367
60-64	156.5	50.9	4.684366	4.641196
65-69	98.6	32.4	2.951301	2.954317
70-74	98.2	34.3	2.939328	3.127565
75-79	77.5	26	2.319734	2.370749
80-84	61	20.8	1.825855	1.896599
85+	51.8	16.6	1.55048	1.513632

[*] Source: Israel Central Bureau of Statistics; 2008 census.

4.2 Important economic features

This chapter focuses on three main features that provide a case study and comparative overview for Tel Aviv and Haifa metropolitan areas. The first feature in table 4.7 focuses on labour and employment rates, and the second focuses on the socioeconomic levels in both areas. The third feature is presented in table 8 focusing on main industries and sectors in 2008. It's important to note that the labour force in Tel Aviv is greater than that of Haifa so the important number in this aspect is the employment rate (the ratio between employed and labour force). In both years employment rate has been higher in Tel Aviv but more significantly is the slight increase in Tel Aviv between 1995 and 2008 as opposed to Haifa with decreasing trends. The socioeconomic ratio in each metropolitan area between the high class and middle class, high class and low class, and middle class and low class showed an increase in all but one instance where the ratio between high and middle class in Haifa showed a slight decrease (-0.02) hence it is possible to assume that socioeconomic levels have increased in both areas with a dominant middle class in both cases.

Table 4.7. Members of labour Force, employment and socioeconomic level for Haifa and Tel Aviv metropolitan areas (1996 & 2008).[*]

		YEAR		YEAR	
		1995		2008	
		Tel Aviv	Haifa	Tel Aviv	Haifa
Member of LF		829883	191964	1449712	422179
Non member of LF		606781	168381	866038	335404
Total employed		781776	178194	1377315	388462
Employment (employed\LF)		94.20311	92.82688	95.00611	92.0138
Socio-economic level[**]	High	262072.1	63836.9	543416.9	137322.2
	Middle	455641.6	98583.3	729610.4	217733
	Low	58979.8	14739.1	87358.4	30737.5
	Unknown	5082.6	1034.8	16928.7	2669.9

[*] Source: data was received from WP.3 SECOA

[**] The socio economic level includes only the metropolitan areas defined by the Central Bureau of statistics.

Table 4.8 provides data on the main industries and sectors in each Metropolitan area, the numbers depict the main differences between the two metropolitan areas. A clear distinction emerges between industrial\agricultural oriented Haifa and economic\commercial oriented Tel Aviv. Haifa's main sector is industry whereas in Tel Aviv real estate is the main sector, but more significantly is the gap in industry between the two areas (18.5% in Haifa compared to Tel Aviv's 12.5) and the gap in finance whereupon Tel Aviv may only 5.3% Haifa is a measly 2.5%. Consequentially, the differences between the main industries and sectors impact social and economic trends. The economic orientation of Tel Aviv attracts young employment seeking to work in such industries as opposed to industrial work.

Table 4.8. Main industries/sectors (%).[*]

	Tel Aviv	**Haifa**
Agriculture	0.8	1.2
Industry	12.5	18.5
Power and Water	0.5	1.3
Construction	3.2	4.4
Commerce	14.2	12.7
Hosting	4.5	3.9
Transportation	7.4	7.1
Finance	5.3	2.5
Real estate	16.7	12.1
Public admin	4.1	4.2
Education	10.2	12.3
Health services	9.4	10.8
Community work	5.4	4.3
Private	1.5	1.2
International bodies	0.1	0
Unknown	4.1	3.7

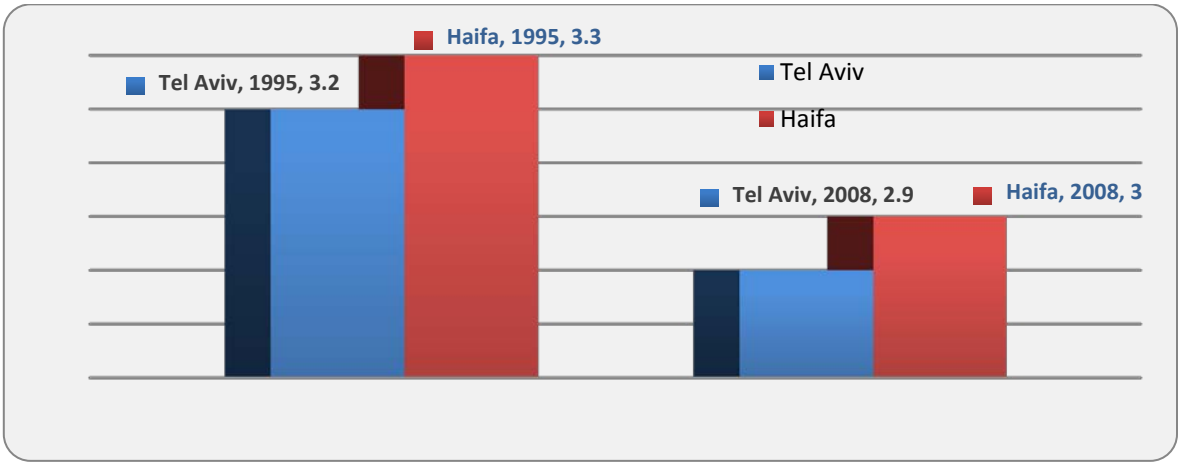
[*] Source: Israel Central Bureau of Statistics; 2008 census

4.3 Overview of the users in the case studies

4.3.1 Inhabitants\households

In 2008 the Tel Aviv metropolitan area numbered approximately 1,132,400 households with an average of 2.9 inhabitants per household whilst Haifa had an average of 3 inhabitants per household and slightly three times less households than that of Tel Aviv (~364,800). As seen in figure 4.18 the average household in Haifa was higher in 1995 and 2008 this supports the notion that the Tel Aviv metropolitan area attracts younger populations with smaller families than that of Haifa. The interesting trend though is the decreasing average in both areas over the years showing an inclination towards smaller households.

Figure 4.18. Average size of household



4.3.2 Tourism establishments:

This part covers information on tourist amenities for both case studies, including number of rooms within a short distance of the coast, room occupancy and bed occupancy. The data on number of rooms is updated as of October 2010 with the information on occupancy of rooms (%) and beds (thousands) taken from the Central Bureau of Statistics Israel (CBS) displaying data from the years 2000-2009.

The chosen case studies Tel Aviv and Haifa metropolitan areas hold more than a quarter of the hotel rooms in the entire state of Israel, out of those over 90% of the rooms in the Tel Aviv metropolitan area and 88% of the rooms in the Haifa metro area are within a short a distance from the coast (Table 4.9, Figure 4.19 & 4.20). The majority of the tourists who stay in the areas

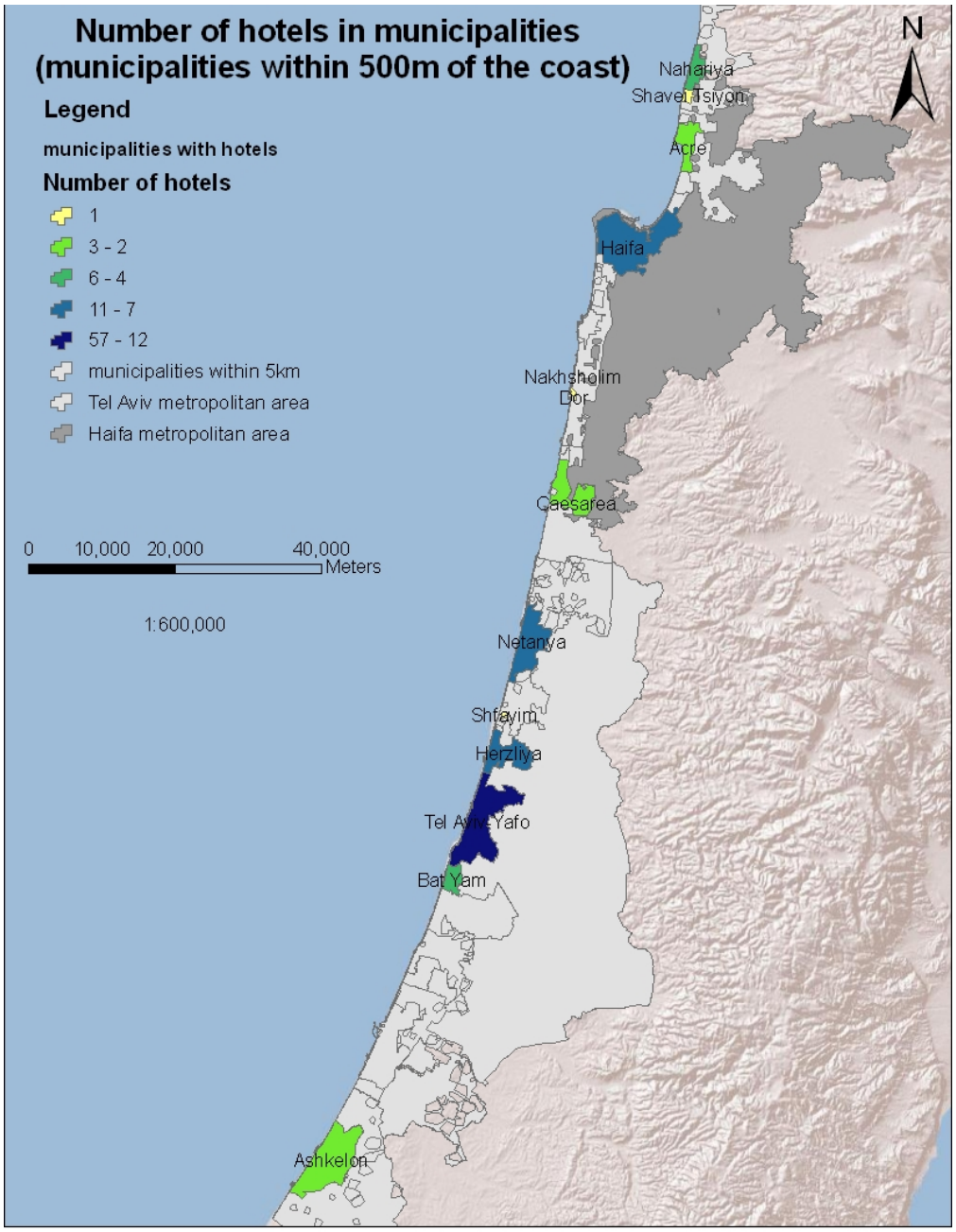
of the case-study are either local tourists or tourists from the US or Europe (the majority of tourists come from the US, UK and France). Many local tourists prefer these locations due to their proximity to the coast as do the foreign tourists who otherwise are likely to stay in Jerusalem. Being a relatively small country with short distances between locations, many tourists are able to stay near Tel Aviv and the city centre and embark on daily trips in order to visit sites such as Jerusalem or the sea of Galilee.

In addition to vocational tourists or visiting friends and family, Tel Aviv attracts a large number of business travellers who occupy the hotels during week days. Other business travellers visiting Israel often prefer staying in the Tel Aviv area due to its different social amenities even if the offices they are visiting are located outside the Tel Aviv metropolitan area. Tel Aviv in this case has a distinctive advantage over the other coastal areas.

Table 4.9. Hotel rooms in Tel Aviv and Haifa metropolitan areas.

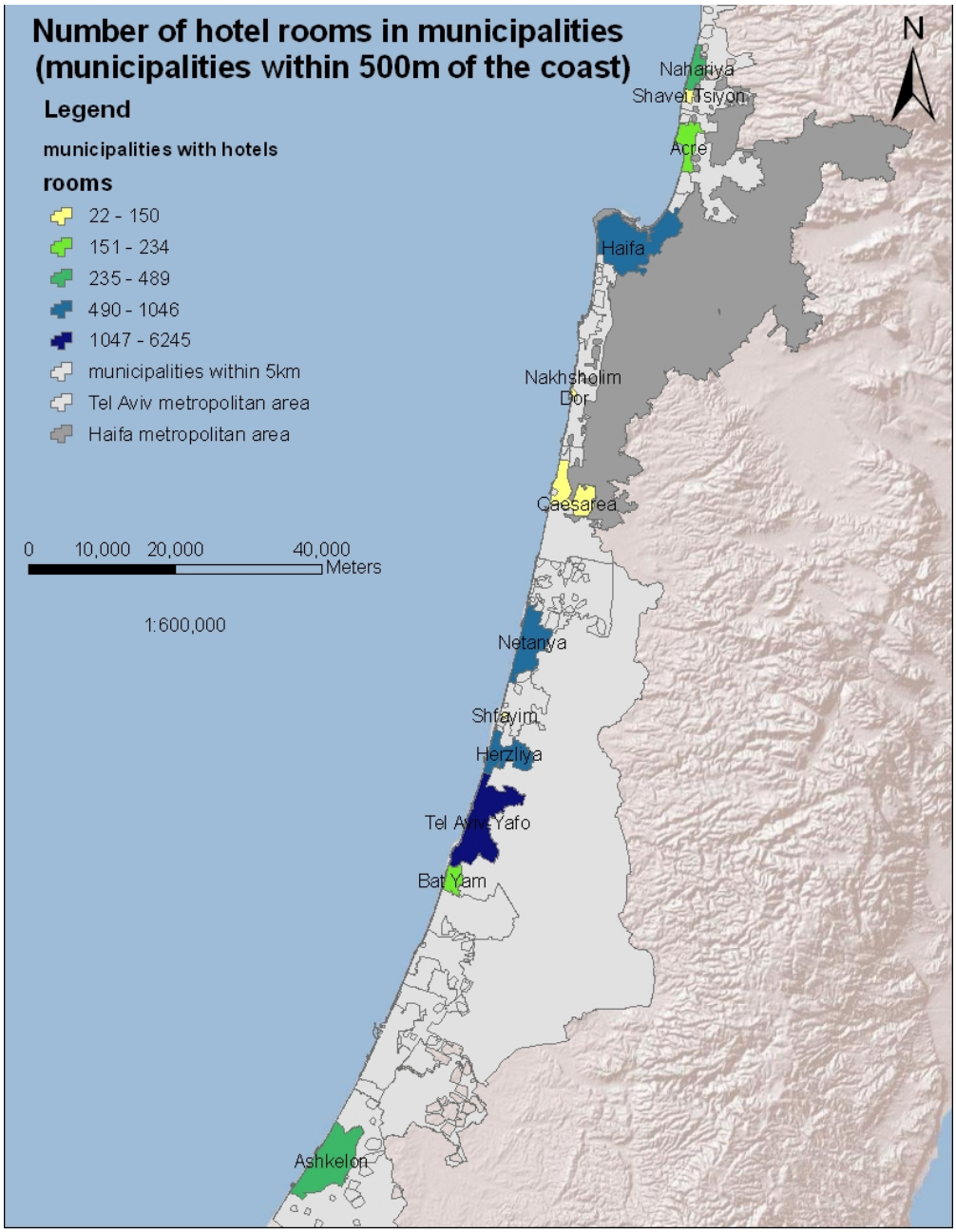
	Number of hotel rooms (running hotels)			
	National	Tel Aviv	Haifa	Other
Total (2009)	44,443	9,519	2,502	32,422
Tel Aviv and Haifa hotel rooms Within 3km of the coast (2010)	-	8,732	2,207	-
% of hotels rooms near the coast (Tel Aviv and Haifa)		91.73	88.21	
% of rooms within 3km from the coast (case studies)	24.61			

Figure 4.19. number hotels in coastal municipalities (municipalities that are within 500m from the coast).[*]



[*] Source: Gidon Jakar WP. 4.

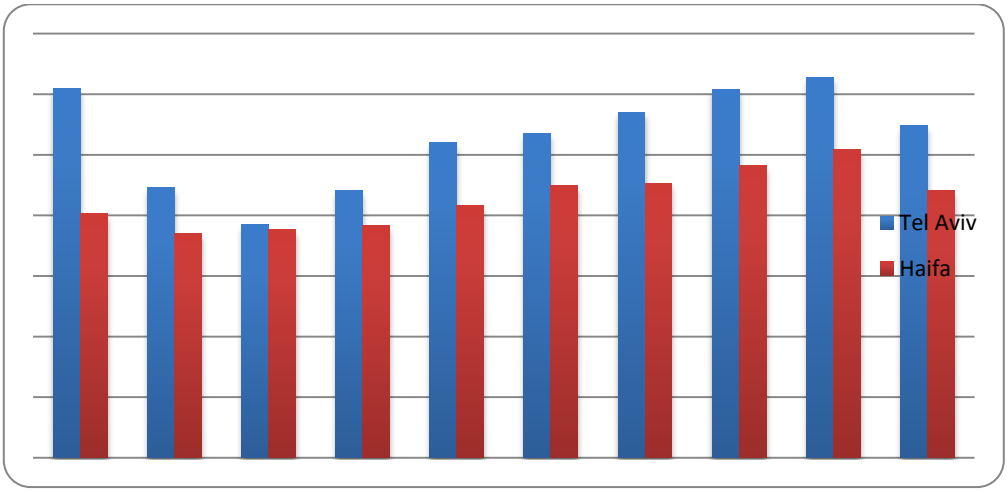
Figure 4.20. number hotel rooms in coastal municipalities (municipalities that are within 500m from the coast).[*]



The occupancy in Tel Aviv is constantly higher over the years than that of Haifa over and has been over 50% since the year 2004, on the other hand Haifa has been increasing over the years but has generally been below the 50% (figure 4.21).

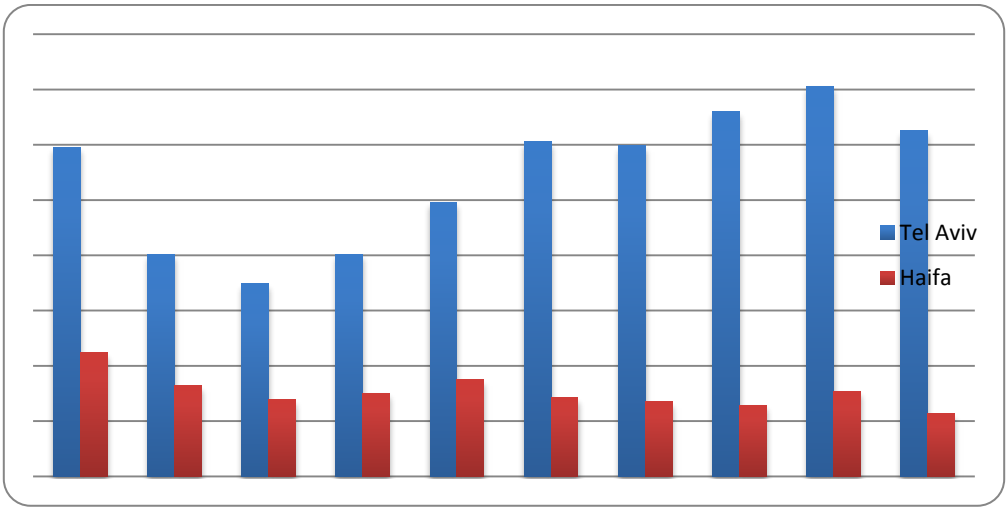
[*] Source: Gidon Jakar WP. 4.

Figure 4.21. Hotel occupancy in Tel Aviv and Haifa metropolitan areas (%) 2000-2009.[*]



In 2008 Tel Aviv metropolitan area had 3,529,600 occupied beds with Haifa metropolitan area having over 768,000 occupied beds, both cases showing a general increase over the years (figure 4.22).

Figure 4.22. Occupied hotel beds (thousands) 2000-2009.[**]



4.3.3 Other trading/commercial establishments

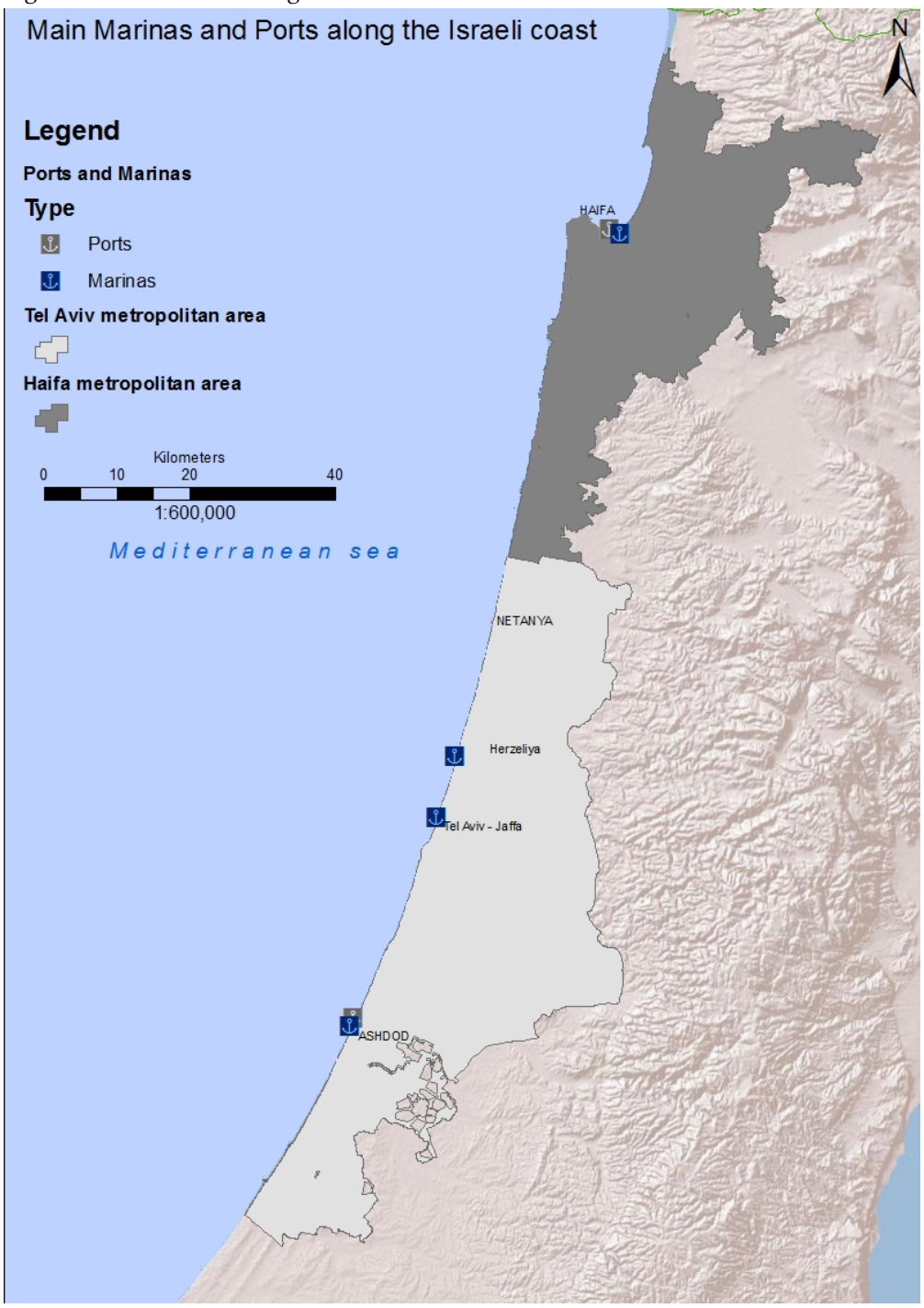
Marinas along the Israeli coast (Figure 4.23) are characterised both by marine activities and commercial activities which in some cases are more dominant than the marine activities. The Herzliyya Marina as an example includes a shopping mall and a number of commercial establishments along the Marina. Tel Aviv port as it's named no longer accommodates port activities but rather private boating and surrounding activities. The area of the current marina

[*] Source: The Central Bureau of Statistics (Israel).

[**] Source: The Central Bureau of Statistics (Israel).

has shown staggering social attributes attracting large number of social activities in the area. The majority of the boats in the marinas throughout the coast are locally owned rather than international boating activity.

Figure 4.23. Marinas along the Israeli coast.[*]

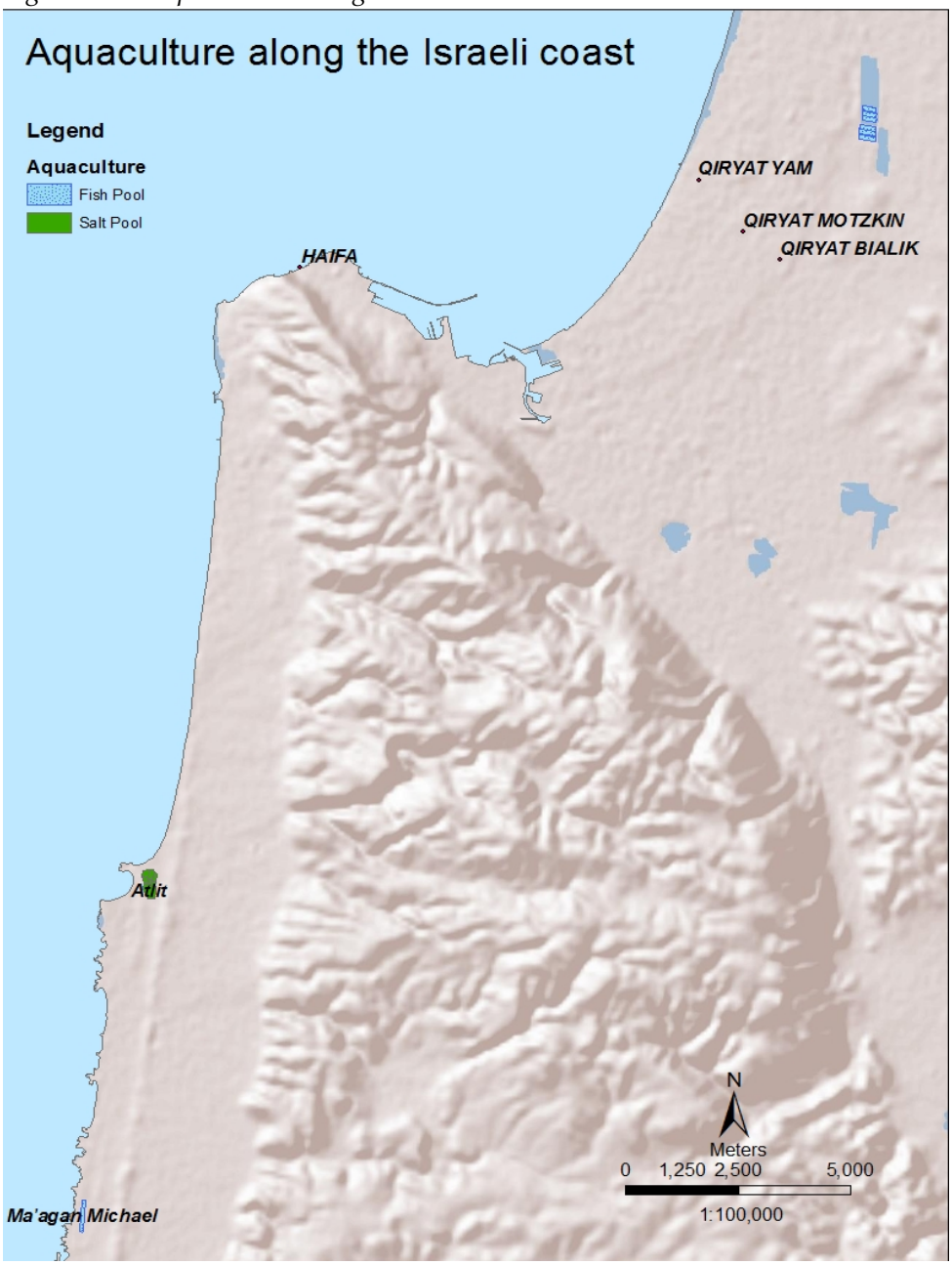


[*] Source: Israel's National Coastal plan 13, map produced by Gidon Jakar.

4.3.4 Agriculture

Farming in proximity to the Israeli coast is not a dominant land-use. Marine farming such as fish pools does exist, however, similarly to land farming only a small number of locations of marine farming are located along the coast and of those that do exist are located in the Haifa metropolitan area (Figure 4.24). The aquaculture includes *fish pools* and *salt extraction pools* within a short distance from the coast, on occasions using the coastal area as a site for waste disposal triggering environmental and pollution oriented conflicts.

Figure 4.24. Aquaculture along the Israeli coast.[*]



[*] Source: Israel's National Coastal plan 13, map produced by Gidon Jakar

4.3.5 Ports

Two dominant ports exist along the Israeli coast, one in the Haifa metropolitan area situated in the centre of Haifa city (Figure 4.20) and the other in Ashdod south of Tel Aviv (Figure 4.25 & 4.26).

Figure 4.25. Haifa ports.

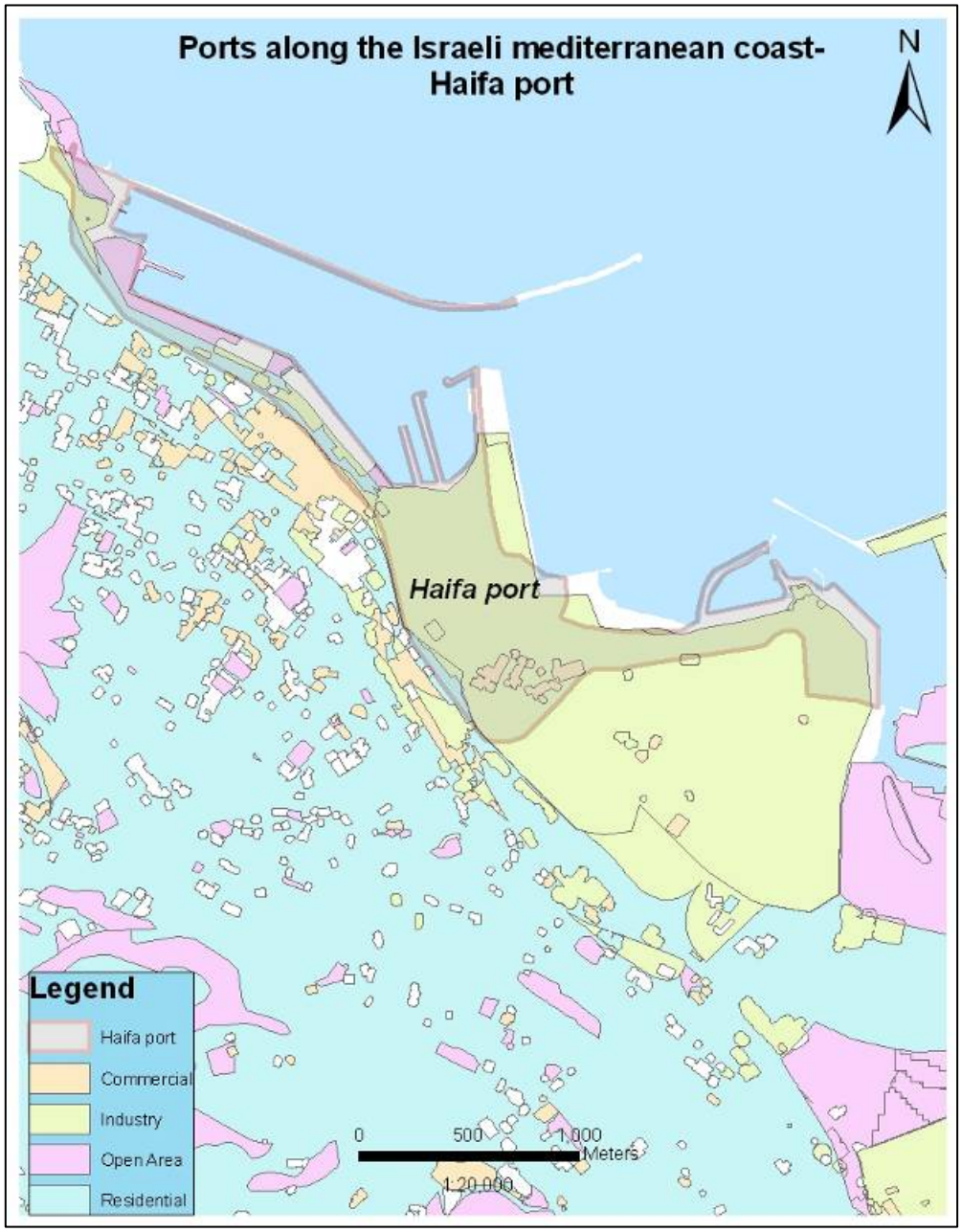
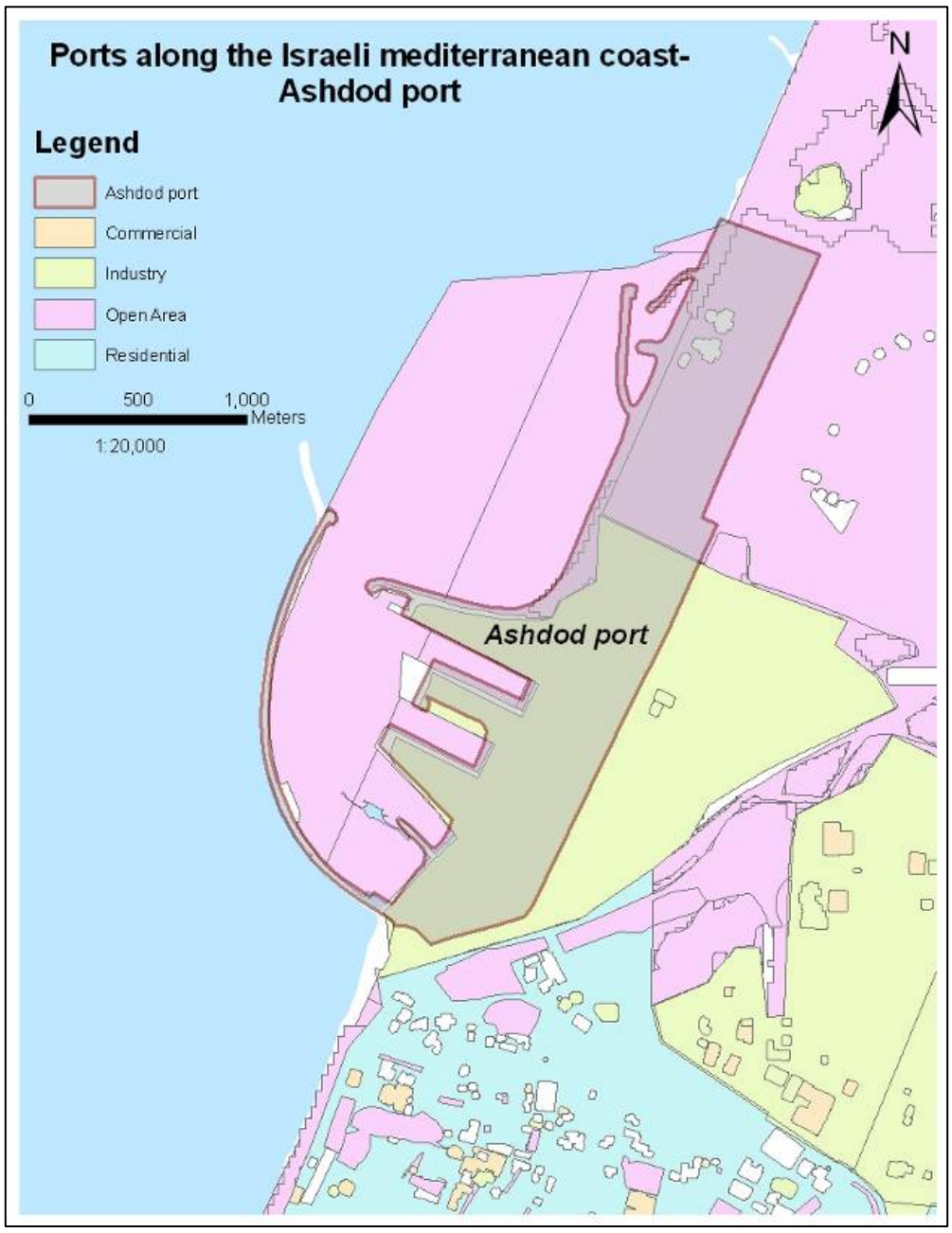


Figure 4.26. Ashdod ports.



Haifa port is the more active port between the two ports, but both port's freight activity has shown an increase in activity over the years. The increase is not a constant one with some drops in certain years but the general trend-line is a positive (table 4.10 & figure 4.27). Currently a debate exists amongst the policy makers regarding the expansion of one of the ports increasing capacity and attraction of super tankers and extensive port activity. The main dilemma is whether to further develop Ashdod port and the Tel Aviv metropolitan area or

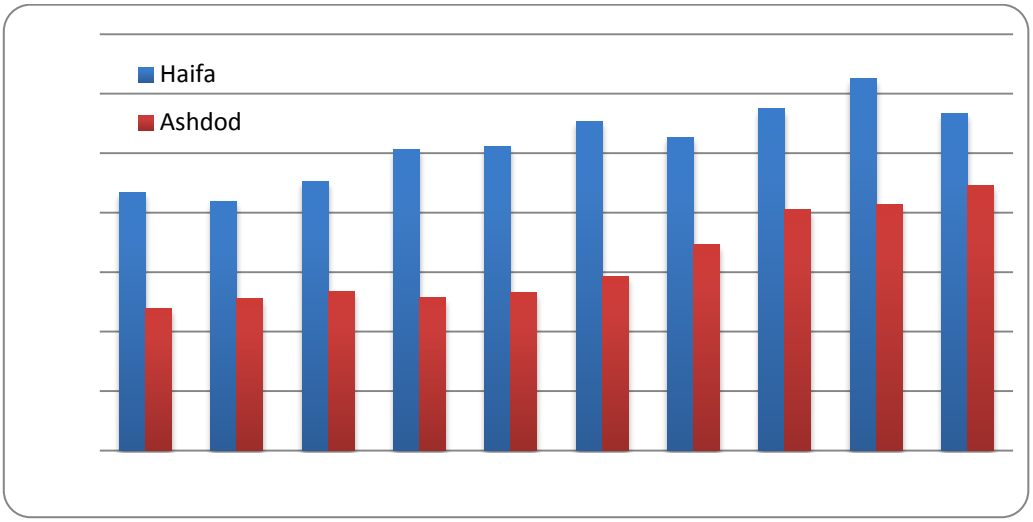
further developing the north of Israel and the periphery expanding Haifa port. In the case of the former it is likely that the Haifa port will suffer immensely adding to the already existing economic woes.

Table 4.10: freight activities in Haifa and Ashdod ports (2000-2009).[*]

Port	Year	Automated facilities	Bulk	General freight	Containers	Total
		Tons (thousands)				
Haifa	2000	7,699	1,088	1,121	8,626	18,534
	2001	6,741	772	893	8,314	16,720
	2002	6,118	907	720	9,327	17,072
	2003	6,538	889	747	10,632	18,806
	2004	7,606	906	870	11,152	20,534
	2005	7,107	1,121	606	12,156	20,990
	2006	6,214	922	626	11,448	19,210
	2007	7,079	999	752	12,627	21,457
	2008	6,813	1,185	580	14,215	22,793
	2009	6,150	1,177	441	12,507	20,275
Ashdod	2000	3,960	4,801	2,765	4,232	15,758
	2001	4,294	2,240	2,607	4,435	13,576
	2002	4,519	2,627	2,624	4,951	14,721
	2003	4,251	2,469	2,462	4,879	14,061
	2004	3,919	2,816	2,558	5,156	14,449
	2005	3,193	3,069	2,646	5,320	14,228
	2006	3,037	3,278	2,307	6,521	15,143
	2007	3,109	3,096	2,454	7,573	16,232
	2008	2,786	3,328	1,997	7,288	15,399
	2009	2,633	2,484	1,945	6,081	13,143

[*] Source: Israel Ports Developments and Assets Ltd.

Figure 4.27. Freight activity in TEUs (thousands) for Haifa and Ashdod ports.[*]

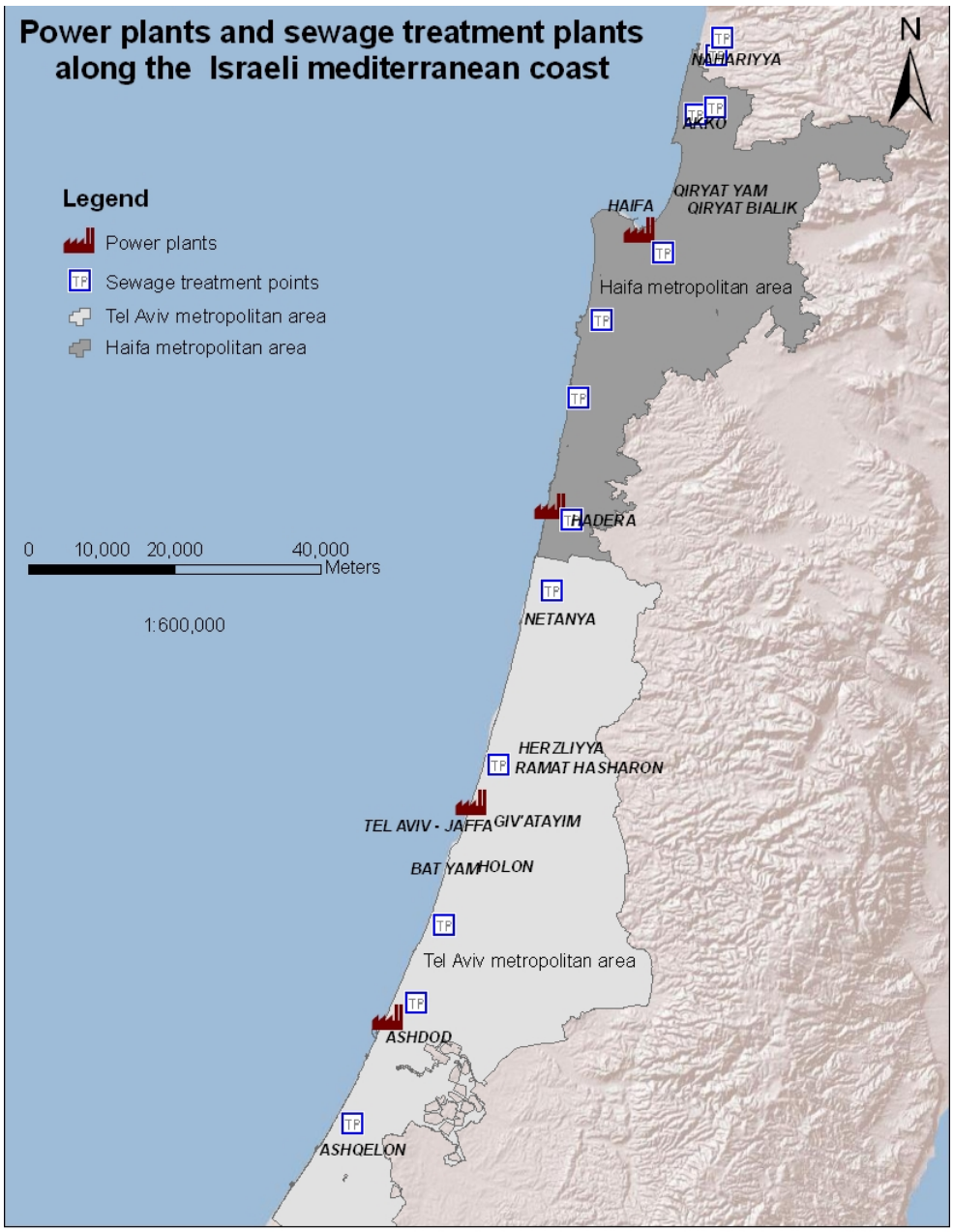


4.3.6 Energy production and sewage treatment.

The Israeli coast line houses a number of power plants and sewage treatment points which exploit the coast for waste disposal (Fig. 4.28). The power plants utilise the coastal area for cooling waters necessary for the plant's activity and hubs for coal import used in the plant. The waste disposal sites and power plants have been a source for environmental conflicts with the proximity to the coast and environmental damage however the different sites require this proximity. Sites like these are common throughout the world however as the coastal area in Israel is small the sites dominate large parts of the coast intensifying their effect.

[*] Source: Israel Ports Developments and Assets Ltd.

Figure 4.28. Power plants and sewage treatment plants along the Israeli coast.[*]



[*] Source: Israel's National Coastal plan 13, map produced by Gidon Jakar

5. Conclusions

5.1 Conflicts along the Israeli coast

In the above chapter we introduced the development pressures on the coastal metropolitan areas in Israel. This section introduces subsequent conflicts following the increasing pressure on the Israeli coastline and summarises conclusions on the major resources and users along the Israeli coastline. The list of conflicts consists of 28 cases of various types that have been identified since the year 2000 (Figure 4.30). Some cases are comprised of more than one conflict or can be associated with more than one type of conflict. Hence, the following tables present the 28 cases broken down by type of conflict covering the additional sub conflicts. The sub-categorisation of the conflicts is comprised then of 41 conflicts. The conflicts are divided into five conflict criteria: [1] Access conflicts (Table 4.11), [2] Conflicting land uses (Table 14.2), [3] The particular case of conflict between tourism development and environmental protection (Table 4.13), [4] Pollution (Table 14.4) and [5] Offshore development and coastal defences (Table 4.15). Figure 4.29 summarises the number of conflicts in each category; access conflicts that concern exclusion of the public are evidently the most dominant category, hence demonstrating the significance of maintaining the coast as a public domain whilst facing the increasing pressures of development. The 28 conflicts demonstrate the pressures along the coast, discussed in the above chapters, as sources of conflict along the Israeli coast.

Figure 4.29. Number of conflicts in each criterion.

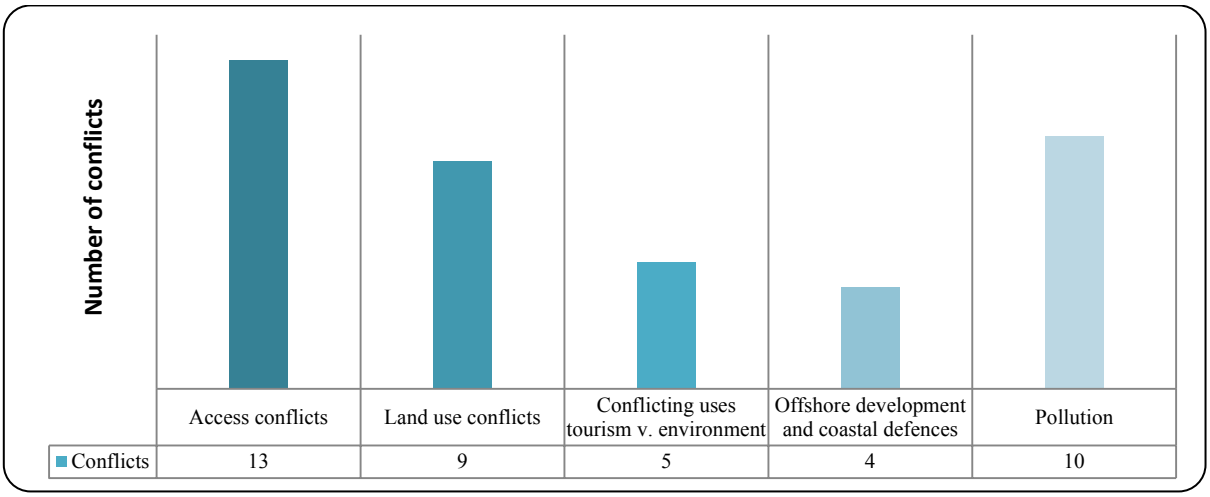
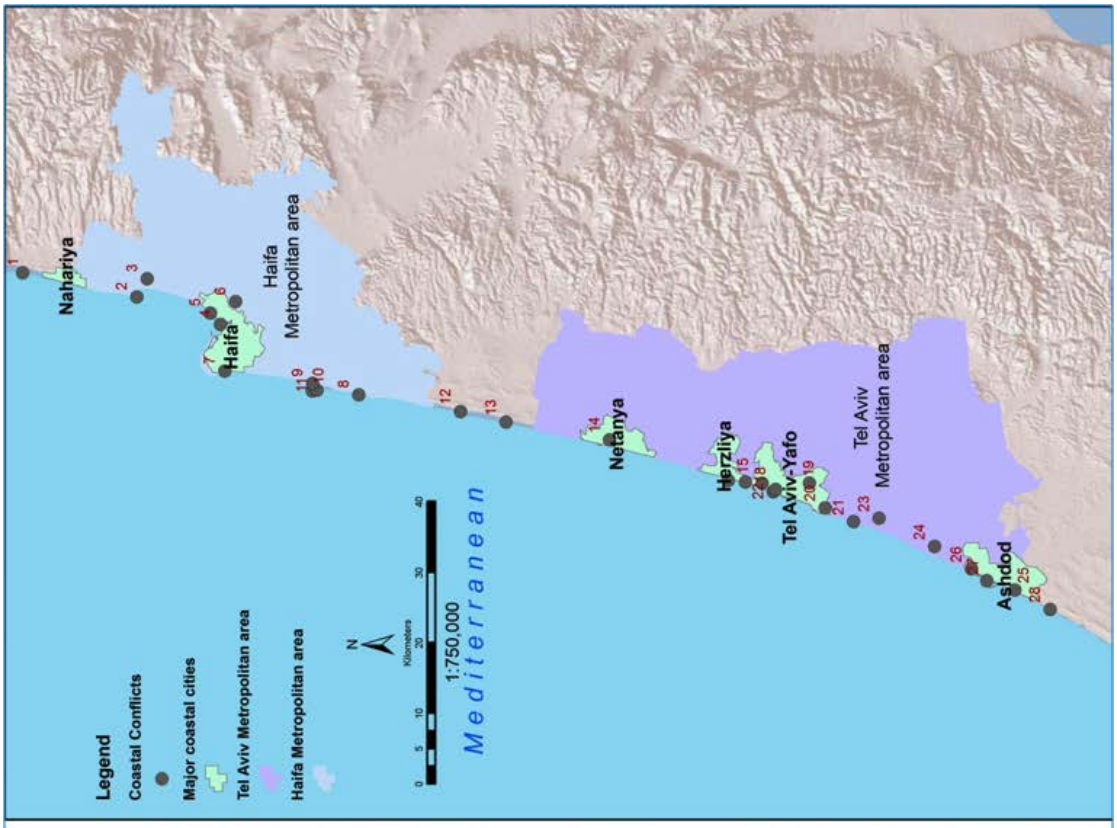


Figure 4.30. Conflicts along the Israeli coast.[*]



	Case study	Location	Main issues		Case study	Location	Main issues
1	Betzet beach	North of Nahariya	Access \ Land use	15	Herzliyya marina	Herzliyya	access
2	South beach marina Akko	Akko	access \ offshore development	16	Sea & Sun development	Tel Aviv-Jaffa	access
3	Akko factories	Akko	Pollution	17	Sde Dov airport	Tel Aviv-Jaffa	Land use
4	Kishon plants	Haifa region	Pollution	18	Redding power plant	Tel Aviv-Jaffa	Pollution
5	Haifa region factories	Haifa region	Pollution	19	Ajami development	Tel Aviv-Jaffa	access
6	Haifa port	Haifa	Access \ Landuse \ Offshore development	20	Bat Yam development	Bat Yam	Land use
7	Haifa "Carmel beach towers"	Haifa	Access	21	Rishon le Zion development	Rishon le Zion	access
8	Ha bonim beach	South of Haifa	Access	22	Gush Dan waste	South of Rishon le Zion	Pollution
9	Dor Beach	South of Haifa	Land use	23	Palmachim beach resort	North of Ashdod	Access \ Landuse
10	Atlit naval base	South of Haifa	Access	24	Palmachim waste disposal	North of Ashdod	Pollution
11	Atlit polluting plants	South of Haifa	Pollution	25	Ashdod marina	Ashdod	Land use
12	Sedot Yam housing development	North of Hadera	Land use	26	Ashdod harbour and sewage	Ashdod	Pollution
13	Hadera development	Hadera	Access	27	Ashdod power plant and refinery	Ashdod	Pollution
14	Netanya sandstone cliffs	Netanya	Land use \ Offshore development	28	Nitzanim development	South of Ashdod	Land use

[*] Source: Gidon Jakar.

Table 4.11. Access conflicts.

Case study	Location	Issue at stake	Resources	Case study	Location	Issue at stake	Resources
Betzet beach	North of Nahariya	Development of a new beach resort	Public beach \ Coastal ecosystem	Herzeliya Marina	Herzeliya	Further development of the marina and accompanying conflicting uses such as housing rather than tourism	Public access and use
South beach Marina Akko	Akko	drying up portions of the sea to develop housing, tourism and a Marina	Public access use \ Landscape \ conservation	Sea & sun	Tel Aviv	Development of housing and tourism within a short distance of the coast (distortion of original plans) denying access to the coast	Public access and use
Haifa Naval base	Haifa	development of a dominant structure on the premises of the naval base	Public access and use \ Landscape	Ajami	Jaffa	Development of expensive housing along the coast whilst demolishing existing housing.	Public access and use \ Housing
Haifa "Carmel beach towers"	Haifa	Construction of six towers for tourism and housing.	Public access use \ Landscape	Rishon Lezion development	Rishon Lezion	Development of housing (rather than tourism) within a short distance of the beach.	Habitat (human)
Ha bonim beach	South of Haifa	Development a public beach with adjoining facilities	Landscape \ Ecological \ Public access use	Palmachim	South of Rishon Lezion	Development of a beach resort and fencing the area	Public access and use \ Ecological
Atlit naval base	South of Haifa	The area which lays on an historical site hosts a naval base denying public access	Public access and use	Nitzanim	South of Ashdod	Housing development	Public access and use \ Ecological \ Housing
Hadera development	Hadera	Development of housing (rather than tourism) units within a short distance of the beach and denying access to the beach	Public access and use				

Table 4.12. Land use conflicts.

Case study	Location	Issue at stake	Resources	Case study	Location	Issue at stake	Resources
Haifa Port and Kishon park	Haifa	Extending and developing the port of Haifa versus competing uses and conservation	Estuary	Sde Dov Airport	Tel Aviv	Converting the airport (owned be several stakeholders), located along the coastal front of Tel Aviv, in to a residential and business area.	Public access and use \ Waterfront \ Potential land for development
Haifa water-front plan	Haifa	The preparation and execution of a waterfront plan replacing the western zone of the port	Public access and use \ Landscape	Ashdod Marina	Ashdod	Developing the marina in Ashdod with housing and other activities	Public access and use \ Ecological
Dor Beach	South of Haifa	Construction of a Gas plant along the beach within close proximity of populated areas	•Gas (energy) •Public beaches •Humanitarian	Sedot Yam housing develop ment	North of Hadera	Housing development and extension along the sandstone cliffs	
Atlit naval base	South of Haifa	The area which lays on an historical site hosts a naval base denying public access and development of the region	Public access and use	Nitzanim	South of Ashdod	Developing housing and communities rather tourism	Public access and use \ Ecological \ Housing
Sandston e Cliffs	Netanya	Development along the sandstone cliffs including a new marina	Ecological \ Landscape				

Table 4.13. Conflicting uses; tourism V. development.

Case study	Location	Issue at stake	Resources
Betzet beach	North of Nahariya	Development of a new beach resort	Public beach \ Coastal ecosystem
Sandstone Cliffs	Netanya	Development of a hotel along the sandstone cliffs	Ecological \ Landscape
Hotel development on the coast	Bat-yam	Development of hotels based on approved plans before the development of the national coastal plan (National Plan 13)	Public access and use
Palmachim	South of Rishon Lezion	Development of a beach resort	Public access and use \ Ecological
Nitzanim	South of Ashdod	Development as opposed to preservation	Public access and use \ Ecological

Table 4.14. Pollution conflicts.

Case study	Location	Issue at stake	Resources	Case study	Location	Issue at stake	Resources
Akko Factories	Akko	Pollution transported from factories to sea	Ecosystems	Redding power plant	Tel Aviv	cooling water from the power plant	Metals \ chemicals
Kishon plants	Haifa bay	Pollution dumped into the Kishon wiver	Mainly chemical pollutants	Gush Dan region - shafdan	Tel Aviv	Sewage dumped in to the sea by the authorities \ Precipitation carrying polluting bodies towards the sea	Sewage \ Human pollutants
Factories \ Energy infrastructure \ port	Haifa bay	Clustered factories and plants, mainly chemical. The pollution is dumped directly in to the sea, port or Kishon river	Mainly chemical pollutants	Sewage waste	(Palmachim) South of Tel Aviv	Mainly organic and oils, dumped into the sea via Sorek river and the Shafdan which dumps sewage 5k off palmachim beach	Sewage, human pollutants, metals and organic
Maritime farming	(Atlit) South of Haifa	Fish ponds waste dumped into the sea	Organic pollution	Ashdod harbour and sewage	Ashdod	Sewage dumped in to the sea by the authorities and from the harbour including spills	Industrial waste and Sewage
chemical plants	(Atlit) South of Haifa	Evaporation of water for cooling purposes	Chemical pollution	Power plant \ Refinery \ Chemicals	Ashdod	Pollution dumped into the sea from operating plants	Industrial waste and chemicals

Table 4.15. Offshore development and coastal defenses.

Case study	Location	Issue at stake	Resources
South beach Marina Akko	Akko	drying up portions of the sea to develop housing, tourism and a Marina	Public access use \ Landscape \ conservation
The extension of Haifa port	Haifa bay	the extension of the port at the expense of the sea	Ecosystems
Sandstone Cliffs	Netanya	Coastal defences development	Ecological \ Landscape
Herzeliya Marina	Herzeliya	Further development of the marina	Coastal erosion \ Public access and use

Acronyms:

GPC – Government Planning Commission.

NGO – Non Governmental Organization.

SPNI – Society for the Protection of Nature in Israel.

5.2 Conclusions on major/important resources and users

This chapter demonstrated the immense pressures along the Israeli coast and the two metropolitan areas of Haifa and Tel Aviv. Coastal systems are a unique stretch of land shaped by interactions of land and sea, the result of which is a stretch of land with unique resources and amenities but far from immune and highly sensitive to any changes, natural or human. This unique stretch of land is under increasing pressures from urban development and population changes and requirements. Thus the relatively small coastal stretch of the Israeli Mediterranean coastline exhibits the influence human activity has on the coast and the significance of recognising the potential pressures and the fragility of the coastline and resources. Supply is decreasingly fulfilling the demand as new areas are converted from previous uses in order to increase the supply. However, the coast and its resources are finite and eventually, unless measures are taken, these resources may well disappear and most likely highly affect ecosystems and human activity along the coast.

The two most dominant resources along the Israeli coast are the sandstone cliffs and sand dunes, both of which are under constant threat of erosion and exploitation whilst maintaining a significant role in unique ecosystems, environmental agendas and urban development. The sandstone cliffs play a double role in urban development as the continuous erosion shapes urban development whilst increasing the pressure for coastal defences to enable future development. Sand dunes maintain a significant role in the environmental agenda and the pressures of limiting urban development at the expense of ecosystems. Though it appears that large areas along the coast remain open the increasing pressure of urban development of housing and recreation along the coast pose a constant threat. Military areas do serve a double purpose as in addition to the military use (which excludes the public in many instances) they serve as a buffer between development and recreational use, and environmental protection thus promising continuous protection of those areas. But unlike military areas the only other tool currently guaranteeing protection of the remaining open areas are statutory open areas such as national parks.

Social aspects and awareness are increasing, particularly in the regulatory arena, as pressures increase on the demand for accessible public use along the coast threatened by development, particularly private development of housing and hotels. Perhaps the most significant existing barrier between the coast and public access are military enclosed areas however as mentioned above they do offer protective measures of open areas that otherwise may be exploited by the public.

Table 4.16. Case study summary and significant data.

	Tel Aviv	**Haifa**
Population	3344.2	1077.1
Main industries \ sectors (%)	Real Estate (16.7)	Industry (18.5)
	Commerce (14.2)	Commerce (12.7)
	Industry (12.5)	Education (12.3)
male\female (thousands)	m\f	m\f
	1640.2\1704	514.2\562.9
Main age groups (thousands)	00-04 (298.9)	00-04 (89.8)
	04-09 (268.6)	05-09 (89.7)
	30-34 (265)	15-19 (88)
Member of LF	1449712	422179
Non member of LF	866038	335404
Total employed	1377315	388462.5
Employment (employed\LF)	95.00611	92.0138

5.3. Conclusions on major/dominant users

Both Haifa and Tel Aviv metropolitan areas are dominated by urbanised population; the majority of which live within a few kilometres off the coast. Populations of both areas benefit from the proximity to the coast and the coastal environmental with its many offerings. In addition to the large population another two fairly dominant users exist, the military and tourism. The former in most cases is situated on non urbanised areas, the exception being the naval base in Haifa and smaller naval activities in urbanised areas. The latter however currently exhibits different patterns as the majority of coastal tourism remains in urbanised areas.

Economically, tourism is recognised as a major income potential along the entire coastal stretch and is evident in coastal urban waterfronts (the majority of the conflicts along the coastal stretch involve further development of tourist establishments). Tourism development is enhanced by the increasing influx of tourists and locals seeking vacations along the coastline. The Tel Aviv metropolitan area is widely developed as opposed to the Haifa metropolitan area in terms of tourist visits and establishments and this can be associated with the different amenities Tel Aviv has to offer.

The Israeli coast houses two major ports which due to their location on the Mediterranean coast count for the majority of freight activity in Israel with the Haifa port

currently the more dominant of ports. A number of power plants are located along the coast due the coastal attributes which enable transporting massive shipments to the plants and using the water for cooling purposes. Waste and sewage plans appear along the coast where once the waste has been processed it is dumped into the sea. Whilst the need for preserving the coast for some users is emphasised, others cannot be ignored and the location of power plants and infrastructure will most likely remain along the coast.

5.4. End notes

1. In this report Tel Aviv metropolitan area includes the area defined by the Israeli Central Statistics Bureau with the addition of the southern coastline including the city of Ashqelon. Haifa metropolitan area includes the area defined by the Israeli Central Statistics Bureau with the addition of the area south of the metropolitan area including the city of Hadera.
2. The data sources can be found in the datasets of WP. 2, project SECOA.
3. Unfortunately disasters have already occurred concerning human casualties, on the 30th of May 2009, a 26 year old man was killed when a minor land slide from the cliffs plunged directly on him while camping on the beach. (http://www.haaretz.com/print-edition/news/man-killed-when-cliff-collapses-on-netanya-beach-campout-1.276951).
4. Recently new pressures emerged on the Israeli coast with the discovery of a large gas reserve near the coast of Haifa, development of processing gas plants are currently planned along the coast on land.

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CHAPTER 5.

Sustainability in Coastal Urban Environment: Thematic Profiles of Resources and Their Users in Sweden Case Study Areas Gothenburg and Malmö

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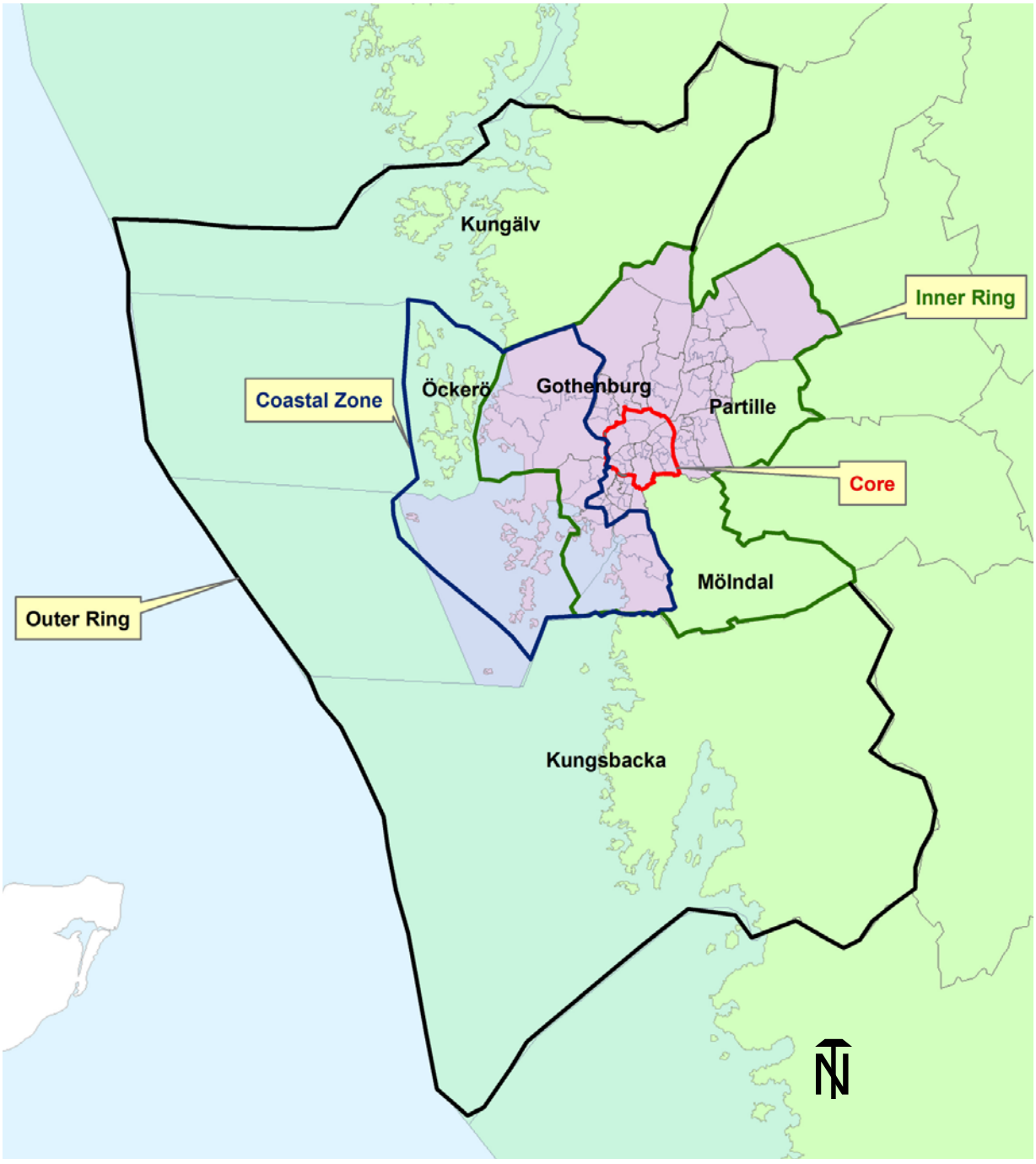
1. Introduction

This chapter aims at describing the important natural and other resources and resource user groups in both Swedish study areas of Gothenburg and Malmö to create a data and knowledge base for further studies of natural resource use conflicts in and around the metropolitan areas. The context of the case studies in the Secoa-project is one of multidisiciplinary research in metropolitan coastal areas where the social and environmental problems of human mobility and natural resource use by many human users create new, hitherto unknown conflicts. These conflicts need to be addressed for the adaptation to climate change and as parts of strategies for sustainable resource management.

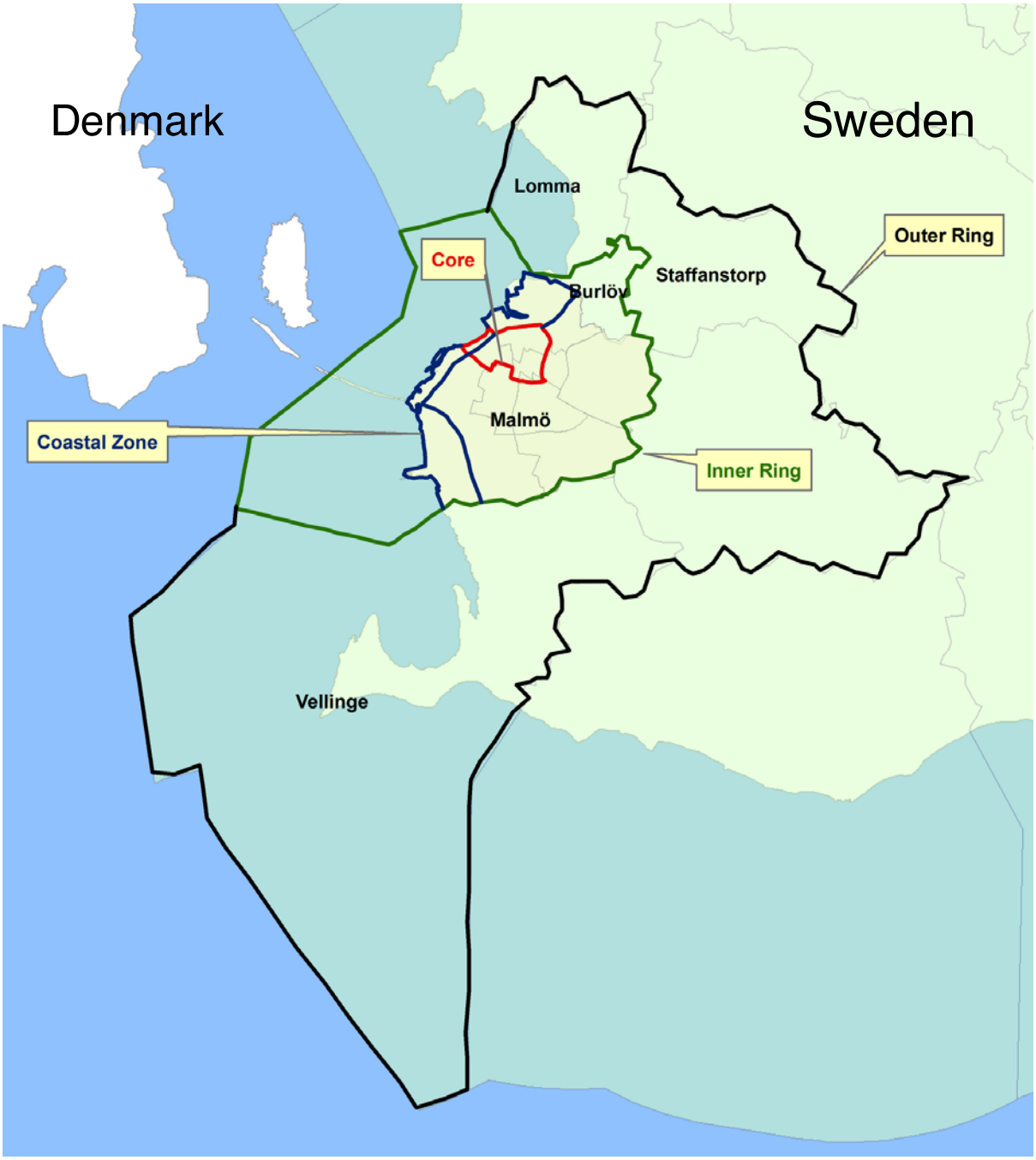
The chapter includes a description of the Swedish case study areas, the metropolitan areas of Gothenburg and Malmö an overview over relevant natural and social resources in the metropolitan areas of Gothenburg and Malmö that may be relevant for conflicts and could be identified by analysing of statistical data (from other work packages of the project). Furthermore, an overview of relevant resource user groups in both study areas is given and a preliminary mapping of potential and actual resource related conflicts in both areas as resulting from the data about resources and users including a pilot study for conflict identification based on document analysis, especially from public planning documents, and communication with some stakeholders. Detailed sources are given in the longer report from which this chapter is compiled.

Figure 5.1. Gothenburg metropolitan area (case study area) – municipal boundaries and delimitation of zones.[*]



[*] Source: SECOA-WP 3, CORINE.

Figure 5.2. Malmö metropolitan area (case study area) – municipal boundaries and delimitation of zones.[*]



2. Materials and Methods

This report includes an overview and comparison of presently relevant (1) resources and (2) resource user groups in the metropolitan areas of Gothenburg and Malmö that could be identified from statistical data (input from data from the four work packages in the first phase of the Secoa project), document analysis, and communication with some stakeholders. The chapter uses information from the environmental profile report (Morf & Olsson, 2011) and information from the conflict analysis (Böhler *et al.*, 2011), as well as data from the analysis of urban mobility. Potential resource use conflicts have been identified in further research not included here.

1) The larger part of the chapter describes and analyses the state of resources in detail to indicate problems and potential conflicts about resource use.

2) The users have been identified from statistical and other data about resource use and through a stakeholder analysis. The analysis is summaric because a standardized description of resource users has been applied to allow for comparison. At community level, and in specific conflicts, the user groups differ in their composition and structure. Some groups and organisations emerge in the context of specific conflicts.

3. Overview of Resources in the Case Studies

For the areas of Göteborg and Malmö the availability of resources is described. The inventory of natural resources includes raw materials such as minerals and biological resources. Not only air, water and soil, but also ecosystems and their services, and flow resources such as wind, tidal and solar energy, and space can be seen as natural resources. Cultural and social resources are described according to data on mobility and economic development.

With regard to the main objective of the project, conflict analysis, the data are analysed whether they indicate potential conflicts. Not all resources are of equal importance in creating conflict. For many resources, the degree of availability alone does not allow to judge conflict potential. The emergence of conflicts is affected by scarcity, but also the degree of environmental damage, how the problems are perceived, how a resource is valued by different stakeholders, and whether they are able to express their concerns.

Both urban centres lie within rural areas where primary production through forestry and agriculture (Västra Götaland) or agriculture (Scania) and landscape-related recreation form

the landscape and become important parts of the regional economy but also potential sources of conflict. The following comparative tables provide basic information on the territorial dimensions of natural resource use in both areas.

Table 5.1. Sweden's three large metropolitan areas (in km²).[*]

	Land	Inland waters (exc. 4 big lakes)	4 big lakes: Vänern, Vättern, Mälaren, Hjälmaren	Marine areas (territorial waters)
Sweden	397,504.28	30,422.5	8,546.03	67,051.05
Stockholm metropolitan area	6,519.31	269.89	379.58	9,470.86
Gothenburg metropolitan area	3,718.36	276.58	0	2,923.53
Malmö metropolitan area	2,535.76	60.84	0	2,051.02

Table 5.2. Total area of agricultural land and forest – comparison across the study regions.[*]

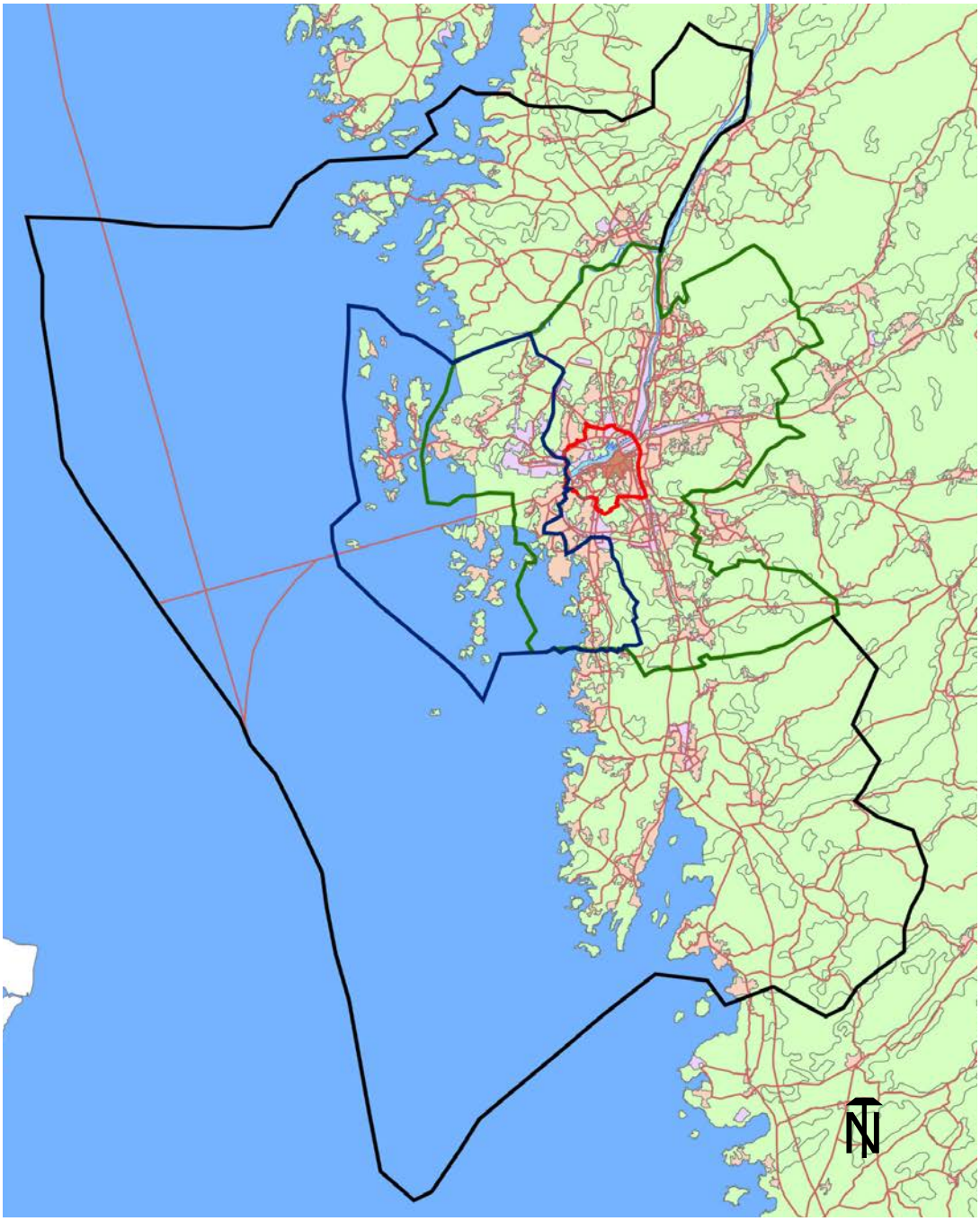
	Agricultural land	Forest
	% of total area	% of total area
Sweden	8	53
Västra Götaland County	23	51
Scania County	48	35

[*] Source: SCB, land statistics database.

3.1 Case study 1: Gothenburg metropolitan area

For the metropolitan area of Gothenburg detailed and standardized statistical data about resources and users are available from Gothenburgs´ statistical yearbook.

Figure 5.3. Gothenburg metropolitan area: urban land use.[*]



[*] Source: SECOA-WP3, CORINE.

3.1.1 Geographical and historical overview

The delimitation of the area includes the municipalities of Gothenburg and its neighbouring municipalities inland – Partille and Mölndal – which are part of the inner and outer ring of the urban centre. The outer ring of the urban centre includes the coastal municipalities of Öckerö and Kungälv in the North, and by Kungsbacka in the South. The focus of this report is on the municipality of Gothenburg, as it includes core, inner ring, and outer ring of the urban area.

Gothenburg, the second largest city in Sweden, with more than 500,000 inhabitants, is located at the Swedish West coast and at the boundary between the marine areas of Skagerrak and Kattegatt. The location at the mouth of the river Göta offers good possibilities of marine transport (harbor) and inland transport in the river valley. The topography is characterized by hilly bedrock plateaus transversed by narrow fissure valleys. The bedrock consists of archaic gneisses with slow weathering capacity. The whole area has been below glacial sea level implying thin soil layers on the plateaus and thick marine sediments of clay and sand in the valleys constituting fertile soils. The climate is of seasonal maritime character with relative mild winters and cool summers.

Gothenburg counted as Swedish town by Royal privilege since 1621. The city developed at the mouth of the river Göta around the fortress which dominated its development until 19th century. Between 1800 and 1900 the number of inhabitants grew from about 12,000 to about 120,000. Until the early 20th century sea transport and commerce were the main economic sectors. After the 1st World War industrialization contributed to strong in-migration and population growth (main industry: metal products); considerable decrease of industy and harbour based economy happened in the second half of 20th century. Throughout 20th century the city area grew through administrative consolidation with surrounding municipalities. The last big municipal territorial reform occurred in the 1970s. After 1970 until the late 1900s population decreased. Only in 2000 (466,990) it was again higher than in 1970 and since then population has been growing slowly (2009/10: 507 000).).

3.1.2 Bio-physical resources

Gothenburg's coastal features include an extensive archipelago. The natural shoreline consists of rocky parts intersected with shallow bays and smaller sandy beaches. This creates a high variety of coastal habitats and a spectacular landscape for recreation. Geological features include mainly acidic granite and gneis bedrock intersected with sand and silt sedimentary areas containing parts of shells and the riverine clay at the northern and the southern estuary of Göta river. Chemical composition and topography vary strongly over short distances. Most original oak forest has vanished through logging and continued grazing. Today, the archipelago is a cultural landscape of high biodiversity, with grass, heather and juniper formed by grazing and burning to keep away the shrubs.

The Gothenburg area features diverse landscapes and habitat types including marine and coastal ecosystems, archipelago, broadleaved and mixed deciduous forests and rocky outcrops and mires. Landscape diversity is increased by the inclusion of man-shaped ecosystems such as agricultural landscapes, urban parks, golf courses and peri-urban residential areas. Some non-managed waste areas close to exploited sites function as refuges for threatened and rare species of plants and animals, often insects. Landscape and habitat diversity result in high diversity of species which is higher in the Gothenburg area than in many other municipalities in the larger region.

3.1.2.1 Forests

Swedish forestry management has changed natural conditions for biodiversity by limiting habitats with old, wet and deciduous woods and by removing dead and decaying trees. Today there are approximately 15,000 ha forest land within the municipality of Gothenburg. Planted pine is the dominating species. Merely 819 ha is old deciduous forest. Approximately half of the forest is owned by the municipality and protected through nature reserves for outdoor recreation of city residents. A guiding principle in the management of such areas is to favor the wild oak at the expense of planted pine with the aspiration to re-establish the natural species composition.

3.1.2.2 Wetlands

Wetland habitats in the region include nutrient poor peatlands in the eastern mountainous parts and eutrophic marshes, reeds and salt shore grasslands along the coast and in the archipelago in the west. Along the riverine shores and in the estuaries ecologically valuable habitats with high biological diversity are found, e.g. alder marches.

3.1.2.3 Agricultural landscapes

During the 1960s and 1970s the municipality purchased agricultural land as reserve capacity for future urban expansion. Today the main part of the remaining agricultural land is located north of the centre. Much of the land is used for fodder production and as pastures for livestock, mainly horses. With reduction of commercial food production the use of agricultural chemicals has decreased. The whole landscape has high biodiversity values and cultural heritage values (including archeological remains form earlier agriculture and settlement).

3.1.2.4 Protected nature

Protection of landscapes, ecosystems and habitats has the purposes to maintain biodiversity maintenance and secure access to nature for human recreation. In Gothenburg municipality 14 nature reserves exist; some are included in the list of "Natura 2000"-areas. These areas include marine archipelago, river valleys with estuaria, forests and woodlands, salt meadows, traditional agricultural landscapes including moorland, inland as well as coastal, wetlands primarily as bird habitats.

3.1.2.5 Land use in the Gothenburg area

Development pressure on the shore is high, both for permanent residence and for recreational dwellings. This has been an important reason for protecting the shoreline. Table 5.3 with data from Malmö and Gothenburg metropolitan area gives an impression of the development pressure at the coast.

Table 5.3. Number of buildings and area occupied within 100 and 300 m from the shoreline.[*]

Year 2000	100 m		300 m	
	Are in ha	No of buildings	Area in ha	No of buildings
	100 m		300 m	
Burlöv	6	0	18	0
Vellinge	600	40	1556	959
Lomma	125	157	369	789
Malmö	474	259	1164	1519
Kungsbacka	1503	910	3803	4187
Göteborg	1010	1123	2396	3890
Kungälv	757	290	1871	972

In Gothenburg urban forms of use, such as built land and parks cover less than half of the area. More than half of the land shows more "rural" forms of use – forest (forested area larger than built area), agriculture and other forms (natural land). Land use patterns in West Sweden around Gothenburg are manifold and differentiated. This is not described further here but taken up in the conflict analysis as as competing forms of land use and resons for specific conflicts.

3.1.3 Freshwater and access to water

The main supply of drinking water for the city of Gothenburg is the river Göta with two lakes as reserve sources (Delsjöarna and Rådasjön). The water quality in the river has improved significantly during the last three decades so that the chemical parameters are good but the microbiological status not yet. Biological cleaning is performed before the water is distributed. Ground water resources for the city of Gothenburg are limited. Supplies of ground water for drinking water utilization are often gravel and sand deposits, many are polluted or damaged by exploitation. The supply of groundwater by infiltration of precipitation is generally lower in urban areas with main part of the ground covered by non-permeable surfaces. The ground water resource in the region is highly vulnerable due to risk of pollution from accidents with toxic chemicals in transports and ground water acidification.

[*] Source: SCB, environmental statistics.

Freshwater resources are used by many users for various purposes: drinking water, transport route for shipping, electricity generation from the flowing water, recipient of wastewater, industrial or production purposes, recreational fisheries. The manifold forms of resource use imply manifold risks and dangers to water quality. Non point source pollution, more difficult to manage, dominates today. Water quality maps show significant problems of surface water quality, eutrophication, but also because of toxic substances (quicksilver).

Water quality has also been strongly affected by airborne acidification. To fight this development, large-scale liming programs in both watercourses and on land have been going on since the 1970s run by the Swedish Environment Protection Agency and the country administrative board. The situation has improved considerably.

Potential sources of pollution include the following ones:

- wastewater discharge (risk of infectious diseases),
- animal husbandry and agricultural use of fertilizers (risk of infectious diseases),
- grazing at the river banks (risk of infectious diseases),
- harbour activities (emissions through transport),
- industrial activities (emissions through potential accidents and disasters),
- marine transport (emissions through potential accidents and disasters),
- road transport (emissions through potential accidents),
- railway transports (emissions through potential accidents),
- agriculture and forestry (leaching of nutrients and plant protection/agrochemicals).

The statistical picture of water use in Gothenburg municipality from the statistics is somewhat similar to that of most European cities:

- The highest percentage of water is consumed by private households, more than 50 %, the quantity not significantly changing over the reporting period; the average conumption per inhabitant seems rather moderate with a level of about 170-175 liter per day.
- Industry consumes much less water.

- Water use for local agriculture in this metropolitan area is insignificant, but globally seen agriculture is the largest user of freshwater, with more than 70% of global freshwater reosources.
- Water loss in the pipe system is significant, about 20% continually over the reporting period In spite of mdoern techn ology water loss is high in many public delivery systems. This phenomenon is well known for urban systems with long distance water procurement.

3.1.4 Marine geography and ecosystems

The Gothenburg area lies between Skagerrak and Kattegatt, at the entrance to the more brackish Baltic Sea with high salinity in Skagerrak, decreasing twards the South. The Baltic Current with low salinity water runs north along the West coast. Underneath the halocline, high salinity saltwater current runs south, driven by the Jutland current from the North Sea. Salinity in the Skagerrak varies from 3% and downward, especially in coastal areas due to high rainfall. This affects both types of species that thrive here and their diversity. The northern Skagerrak has the highest biodiversity in Swedish marine waters with more than 6,000 species (Bernes 2005). Tidal differences are small, only a few decimetres. Rain, air pressure and wind events play a much larger role for the water level than the lunar/solar tides and can lead to differences up to two metres. Twice per year the water column is blended, during spring and autumn, enhanced by storm events, twice also through the development of a thermocline: summer and winter stagnation, sometimes combined with ice.

The following important types of marine ecological communities can be found in the surroundings of Gothenburg:

- Shallow hard bottoms: macroalgae communities such as kelp forests – from green algae in the most shallow part to brown and red algae farther down .
- Shallow soft bottoms: eel grass meadows and mussel banks are important in the archipelagic areas.
- Deep hard bottoms: sea anemone, shellfish, lobster and a number of commercially interesting fish species.
- Deep soft bottoms: shrimp, crayfish as economically interesting species and a number of flatfish species and rays.

3.1.4.1 Fisheries

The main part of the Swedish large-scale fishing fleet is located on the West coast, mostly within the larger metropolitan area, in the harbour of Fiskebäck and the southern archipelago, and in the neighboring municipality of Öckerö. Besides professional large scale fisheries working mostly offshore with trawls and large nets (cod, mackerel, herring, sprat), there is a more artisanal multispecies coastal fisheries with boats smaller than 10 metres. Another commercial use are guided recreational fishing tours. There is competition between those two segments for some species. Moreover, there is extensive household- and individual recreational fishing after codfish and various types of groundfish and mackerel by hand gear and gill nets and after crabs and lobster, using pots. Lobster is popular and lucrative to sell, which has led to an unregulated private market with unreported landings. Mussels and oysters grow well in the area and are picked by private users. There are, however, seasons where mussels are toxic due to blooms of certain algal species. The native oyster may only be picked by the landowners. The invasive Japanese oyster has been spreading quickly during the last years competing with the blue mussel

Many of the consumption fish stocks in the Skagerrak and Kattegatt are threatened by overfishing (cod, eel, etc.). There has been a steady decline in landings of consumption fish and an increase in catches of shellfish and fodder fish. The Baltic Sea cod stock, also fished by fishers from the Gothenburg area seems to be in a slightly better shape. There is a strong competition between different countries' fishermen (Baltic: Poland, Germany, Denmark, Sweden, Skagerrak/Kattegatt: Norway, Denmark, Sweden). Professional fisheries and during the last years even marine leisure fisheries are increasingly regulated. Important instruments are the European Union´s Common Fishery Policy and the Swedish quota for specific fish stocks, but also different types of closures, vessel- and gear restrictions.

3.1.4.2 Aquaculture

Marine aquaculture is not as developed in West Sweden as it is in Norway. So far the focus is mostly on shellfish species: blue mussels and oysters. After some experimenting during the 1980s, aquaculture has so not developed much in the closer surroundings of Gothenburg. Its further development is, however, under way farther north in Bohuslän. It is presently being discussed whether some types of aquaculture may assist reducing environmental impacts and produce proteins in a more sustainable way than by fisheries. Mussel cultivation may both be used for production and for recycling of nutrients in order to reduce eutrophication.

Box 1: Gothenburg area: Water- and environmental quality in the aquatic environment

Present problems:

- Overfishing of many economically important species. Potential conflicts include competition with Danish, Polish, German, Norwegian fishers, between large scale and coastal fisheries and between professional and leisure or household fishers.

- Eutrophication from sources in forestry, agriculture, untreated waste water from buldings without septic tanks or attachment to public sewage system (coastal areas, summer houses), leisure boat sewage

- Pollution by marine traffic (risks) and leisure boating

- Competition for marine space: energy production, transport, recreation, fisheries, national defence, and conservation needs (planning conflicts when new activities are established)

- Pressure on the coast through development and recreational activities

- Sediment pollution in harbour areas (especially residues in sediment from marine antifouling paint and industrial activities: heavy metals, organochlorides) in connection with dredging and construction activities

- Some of these problems give rise to long-lasting conflicts between different user groups. However, there is no "one-to-one"-correspondence between resource use problems and conflicts. When, how and where problems existing result in conflicts between users is dependent on many factors.

Increasing problems:

The following problems may soon need action and better regulation:

- Invasive species, e.g. algae (e.g. Sargasso-tang) and animals (e.g. Japanese Oyster escaped from oyster plants crassostrea gigas, comb jellyfish), affect the food chain and the physical ecosystem structure.

- Medicines and hormones are found in the water and are affecting the fertility of aquatic species (sewage treatment is insufficient; working techniques exist, but are not normally used in public sewage treatment).

- Non-biodegradabe particles.

- Ocean acidification may in a few decades affect the reproduction of mussels and shellfish considerably.

- Marine bioprospecting without regulative legislation (medicines, food, cosmetics, etc.).

Source: Own compilation

3.1.5 Important cultural and social resources

3.1.5.1 Cultural resources

Cultural resources may be of different types, e.g. cultural knowledge, capabilities, experience and practices of certain socio-cultural or professional groups and the physical remains these activities have led to. With regard to the Secoa-topic of coastal resource use problems, cultural resources directly connected with natural resources are most relevant. The amenity value of landscapes in coastal areas is one of the important cultural resources - or ecosystem service. The quality of the landscapes is colosely connected to their nature as cultural landscapes influenced by human rersource use through agriculture, fisheries, forestry and settlement since thousands of years. Today, the cultural landscapes at the coast are less relevant for agricultural production than for recreational use by urban dwellers and tourists. However, agricultural uses are important ot keep their character and high biodiversity (Morf & Olsson, 2011). Another important cultural resource are historical buildings of national dignity in the city of Gothenburg and a number of archaeological sites both in the city centre and in the landscape outside. In the industrial history of the area 100-150 years back in time textile and paper industry have been important during the 19th century. A number of esthetically interesting industrial buildings (worker's villages and production plants) are found close to river Göta. Many of the older industrial areas are under transformation (Sävedalen, Partille/Jonsered, Mölndal) and become today cultural objects with museum quality or they are re-used for offices and flats by making use of their historical character.

3.1.5.2 Social resources

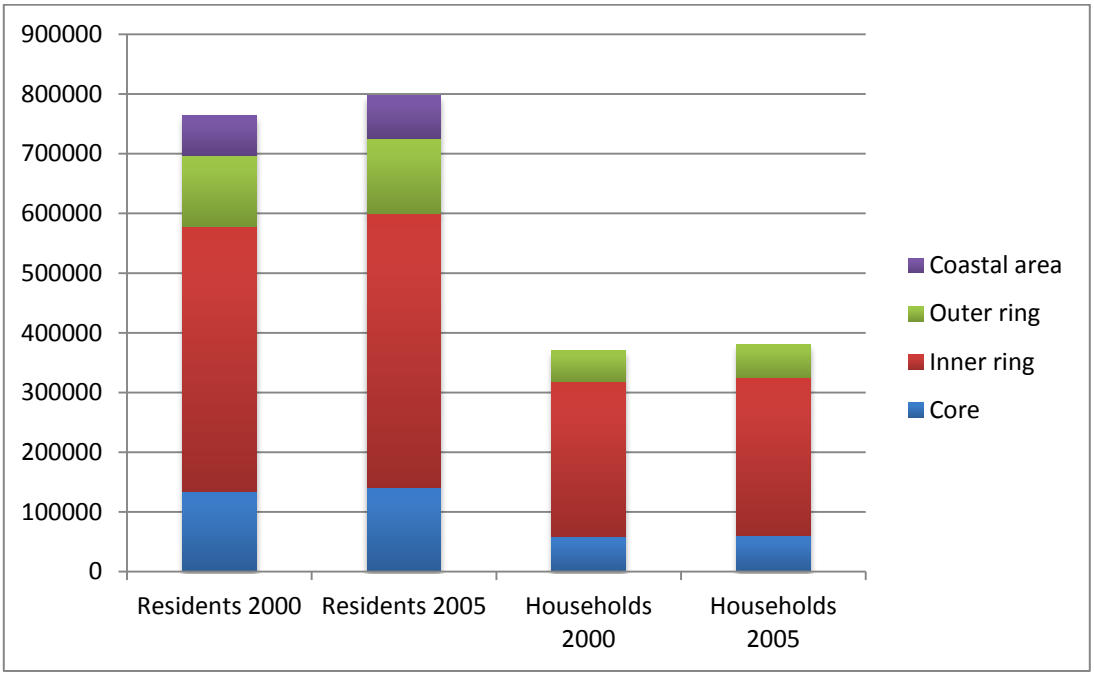
The demographic data (Statistisk årsbok Göteborg 2010) show:

- Population growth in Gothenburg was highest throughout the 19th century (from 12,500 to 130,000 inhabitants), that is: mainly before the late industrialisation in Sweden. In 20th century the growth rate has halved (growing from the level of about 130,000 to 500,000 inhabitants). It can be assumed throughout the reporting period since 1800 that the growth of the urban population happened more through migration (immigration from the countryside, later also from foreign countries) than through biological reproduction.
- The age structure of Gothenburgs´ inhabitants during 20th century has changed from the traditional „pyramid"-structure with the highest percentage of children and young

people of the pre-industrial epoch to the „oval" structure of the post-industrial epoch where the percentage of older age groups is growing.

- Gothenburg as well as Malmö metropolitan have higher percentages of higher education students among their population (about 7-8%, in all other countries with Secoa case studies 5% or less). This is not an exceptional situation to be explained by the metropolitan status only, and not a new development. It shows the situation given since long time in Sweden, where since many decades a larger percentage of the population has university education which is one of the factors explaining relatively high social and economic welfare levels.

Figure 5.4. Residents and households in the Gothenburg metropolitan area.[*]



[*] Source: Data from SECOA-WP 3.

3.1.5.3 Economic resources

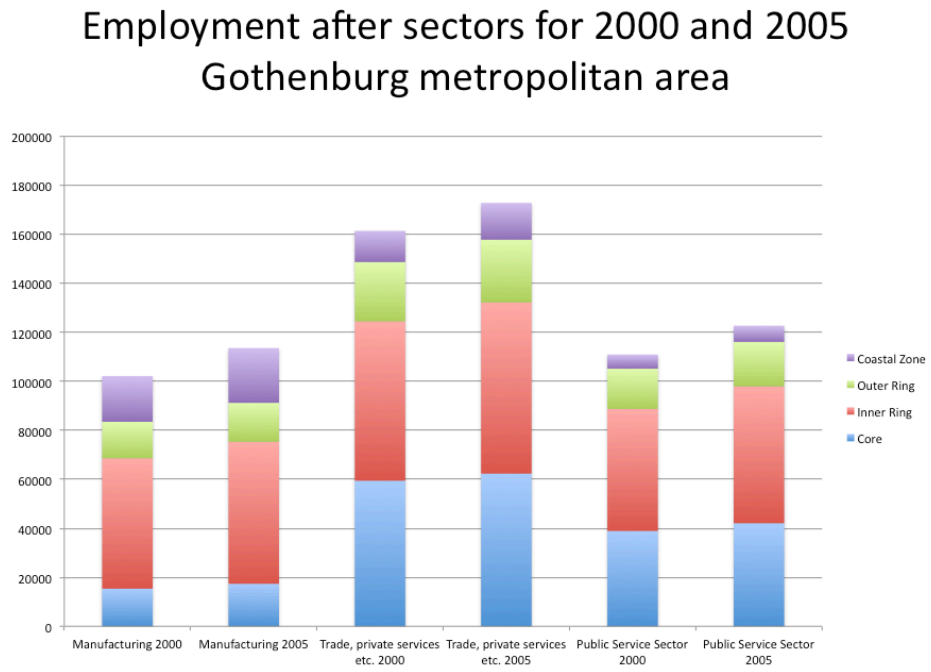
The economic statistics about branches and employment in Gothenburg show:

- Income levels vary in the different parts of the metropolitan area, in similar ways as in the Malmö case study: income is higher and unemployment lower among the inhabitants of the coastal zone and the fringe areas of the city, the other way round in the core.
- In the reporting period 1996 – 2007 in all branches a growth of work places could be observed, with slow growth in some sectors; higher growth in processing industry, commerce and communication, research and education, services, public administration; highest growth in financial and business service sector.
- The employment of men and women is balanced only in some sectors – sectors with dominant male occupation are shareholder companies, public and private enterprises; sectors with dominant female occupation are primary care and public institutions.

Unemployment statistics for Gothenburg from 1992-2009 show:

- From 1992 – 2005 the number of unemployed changed significantly in the short run, with rapid increase of unemployment in the year 1993 (that corresponds with strong rise of immigration figures, and significant reduction only since 1999); in the years 2000-2005 the unemployment remained relatively high at the level of 15,000-16,000 but decreased slowly, with a significant change in 2007 (where the definition has been changed, therefore no comparison possible with earlier years), and in the years 2008 and 2009 a significant increase (nearly doubling from the level of 10,000 to 20,000); unemployment of women was in all years below that of men.
- In the long trend unemployment decreased from 1993 to 2007, with sharp rise after 2007 (the latter change coincides with the global financial crisis).

Figure 5.5. Gothenburg metropolitan area, employment after sectors.*



3.1.5.4 Migration and commuting

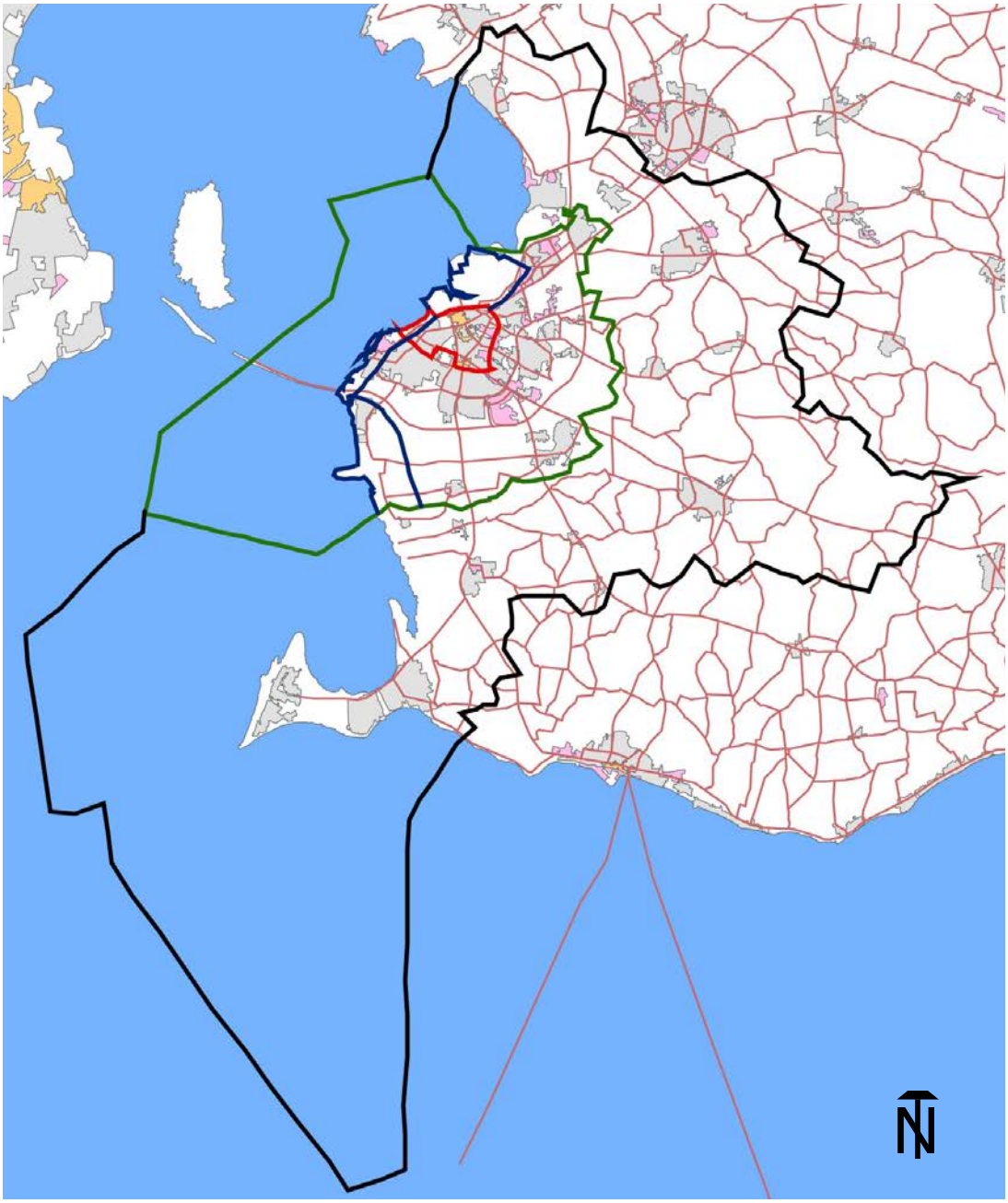
The long trend of in-and outmigration from Gothenburg shows since 1992 that the number of in-migration was continually higher than that of outmigration, but the figures of in- and outmigration remained rather close to each other since the mid 1970s. The number of commuters into Gothenburg has in the past two decades always been significantly higher (levels between 80,000 and 100,000 annually) than that of inhabitants of Gothenburg commuting to other places (levels between 20,000 and 40,000), but commuting in both directions is slowly and continually increasing. A general explanation for the high and increasing form of commuting to Gothenburg is that significant parts of the working population (families with children) live in the green urban fringe of Gothenburg, which is attractive for various reasons such as quality of life, contact with nature etc. An important form of combined resource use is linked to urban mobility for reasons of work- or leisure time-mobility. The dominant daily mobility patterns are that of transport to work and education inside the city and commuting between Gothenburg and surrounding municipalities.

The "Programme for Public Transport in the Gothenburg Region" adopted in 2009 by the municipalities in the region aims at improving collective transport in the region and shifting from private car use to collective transport or biking. The long-term goal is to double the

number of collective transport users from about half a million daily users in 2009 to about one million daily users in 2025.

3.2 Case study 2: Malmö metropolitan area

Figure 5.6. Malmö metropolitan area: urban land use.[*]



[*] Source: SECOA-WP 3, CORINE.

3.2.1 Geographical and historical overview

The Malmö region is situated at the Öresund strait in the region of Scania, Southern Sweden. The case study area includes the municipalities of Malmö, Bjurlöv, Lomma, Staffanstorp, Svedala and Vellinge. Focus here will be on the coastal municipalities of Malmö, Lomma, and Vellinge. Population numbers in the study area (January 1, 2010) are lower than for the Gothenburg area: Malmö municipality has 293,909, Malmö region 647,292 and the whole Scania about 1,200,000 inhabitants.

Malmö has been a Danish town for several hundred years, mainly developing through the rich fishing grounds in the Öresund, before it became Swedish in 1658 in the peace contract of Roskilde. After that Malmö lost for longer time economic dominance, only at the end of 18th century the port was developed and after that the city grew during 19th century. At the turn of 19-20th century the city was technically modernized (electricity etc.). Between the wars and after World War II the city grew until the 1970s when the economy (shipbuilding, textile industry) came into crisis and the number of in habitants was reducing until 1995, when the building of the new Öresund bridge started that was opened for traffic in 2000.

3.2.2 Bio-physical resources

A landscape analysis (Scania CAB 2007) of Scania region by the County Administrative Board classes the area into the following landscape types:

Coastal flats and dune landscape (uttermost peninsula of Skanör and Falsterbo including the coastal band in Vellinge and Malmö municipalities). For keeping their ecological value for the bird-population, these areas need to be managed by grazing and burning. They are under considerable pressure from recreation.

Southern lowlands within Vellinge municipality (agricultural lands inward from the coast)

Lund and Helsingborg lowlands (municipalities of Malmö, Burlöv, Lomma, Lund, Svedala, and Staffanstorp) – in this study mainly the southern, more urbanised part. The largest part of the agricultural area is a modern agricultural landscape. Valuable areas from a conservation perspective are mainly close to the sea shore and to rivers.

In contrast to the extensive archipelago with acidic cristalline bedrock and the riverine clay of the estuary in the Gothenburg area, the bedrock in the Malmö case study area consists of cretaceous sediments and is covered by highly productive and well buffered moraine soils. The natural shoreline consists mainly of sandy shores and flats. In the northern part of Sweden the land is rising out of the sea since the ice after the last ice age has melted away, whereas in Southern Sweden it is slightly sinking (Voipio, 1981), which enhances the need for shoreline protection and erosion management.

3.2.3 Soil and land use

Except for the specific urban land use, the land use in the area is similar to that in Southern Sweden in general, with less forested land and more agricultural land in comparison to the region where Gothenburg is located.

3.2.3.1 Agriculture and forestry

Scania is due to its climate and soil one of the most productive agricultural areas of Sweden. In comparison to the rest of Sweden and to the Gothenburg area, the agricultural land is a larger part, almost half of the total surface. Scania is a place for intensive production of crops and vegetables, and, in the less productive areas, of meat and dairy. Large parts of Swedish animal production, especially pig production, are located in Southern Sweden and the Scania region. The more forested areas are more inland, outside of the actual case study area.

3.2.3.2 Coastal and marine geography

The Öresund is a shallow strait connecting the Baltic Sea with the North Sea and running between Danish Själland and Scania, at its most only 30 metres deep. There are almost no tidal differences. Rain, air pressure and wind events play a much larger role for the water level than the lunar/solar tides and can lead to differences up to two metres. The largest differences can be experienced close to spring and autumn equinox.

The Baltic Sea is brackish, with a freshwater environment with 1% salinity in the Bothnian bay and increasing salinity towards the west with 3% in the Skagerrak. This is due to the freshwater runoff and the slow exchange and inflow of saltwater from the North Sea. The

exchange of water occurs through the narrow, shallow straits between Denmark and Sweden, the Great and the Small Belt, and the Öresund. The Baltic Current with low salinity water runs north along the Swedish West coast. Underneath the halocline, high salinity saltwater current runs south, driven by the Jutland current from the North Sea. In the shallow Danish straits this current is forced to the surface, blended with freshwater and usually diverged north again. The Öresund is relatively deep in its central and northern parts, but to the south there is a threshold with depths below 10 m. Thus, the exchange with the Baltic is mainly driven by differences in air pressure- and wind events and to some extent salinity. Salinity in the Öresund can vary between 1.5-3%. This affects both species composition and -diversity. Compared to the over 6000 species farther north, only around 1500 species thrive here, with declining diversity farther into the Baltic. A regular input of North Sea water with high salinity and oxygen is important for fish recruitment and the fauna and flora of the seabed in the rest of the Baltic (Bernes 2005). Two times every year the water column is blended (spring and autumn, enhanced by storm events) and two times stagnation and build-up of a thermocline occur (summer- /winter stagnation, at times with ice).

The habitats at the seabed can be classed into two main types of substrates hard and soft and further into shallow and deep for each kind of substrate. Even if the macroflora is most perceptible, the important primary producers on the seabed, both hard and shallow, are micro-algae, such as diatoms.

The following types of important ecological communities can be found in the case study area of Malmö:

- Shallow hard bottoms: macroalgae communities from green algae in the most shallow part to brown and red algae farther down. Species diversity tends to be considerably higher than on the soft bottoms.
- Shallow soft bottoms: eel grass meadows and mussel banks, mudflats and sand banks for seals and water fowl (not the least on the Falsterbo Peninsula in Vellinge).

Important pelagic groups of species include phyto- and zooplankton and a number of commercial fish species.

3.2.3.3 Fisheries

In the Malmö area, there are no large scale fishing vessels. About two dozen professional fishermen, mostly situated in Vellinge, operate smaller boats, fish e.g. eel, cod, and other seabed species. The area is increasingly exploited by commercial organisers of fishing tours. There is also private household- and popular recreational fishing after freshwater species and crabs. The Öresund is one of Sweden's most popular areas for marine and coastal recreational fisheries.

Many of the commercial fish stocks in the Skagerrak and Kattegatt area are declining, most likely due to overfishing (cod, eel, etc.). There has been a steady decline in landings of consumption fish and an increase in catches fodder fish. The Baltic Sea cod stock seems to be in a slightly better shape. Due to a trawling ban since the 1930s, the cod stocks are in a better shape than in other areas. Professional fisheries and during the last years even marine leisure fisheries are increasingly regulated through the European Union´s Common Fishery Policy and the Swedish quota for specific fish stocks and further measures such as various types of closures, vessel- and gear restrictions. There competition creates to some extent conflicts between fishermen from different countries (in the Baltic Sea mainly: Poland, Denmark, Germany, Sweden). Danish fishers have a much larger part of the quota in the Kattegatt/Skagerrak area than the Swedish.

3.2.3.4 Aquaculture

In South West Scania, the marine seabed topography and the relatively straight, mainly sandy coastline do not offer areas with good potential for marine aquaculture. There are, however, possibilities for small-scale net aquaculture of freshwater species and for crayfish in small lakes and rivers. Technology is developing, which means that larger plants may soon be possible whereas the environmental impact is reduced. Land based systems with recycling of water are most frequent and permits are relatively easy to obtain.

3.2.4 Cultural and social resources

3.2.4.1 Cultural resources

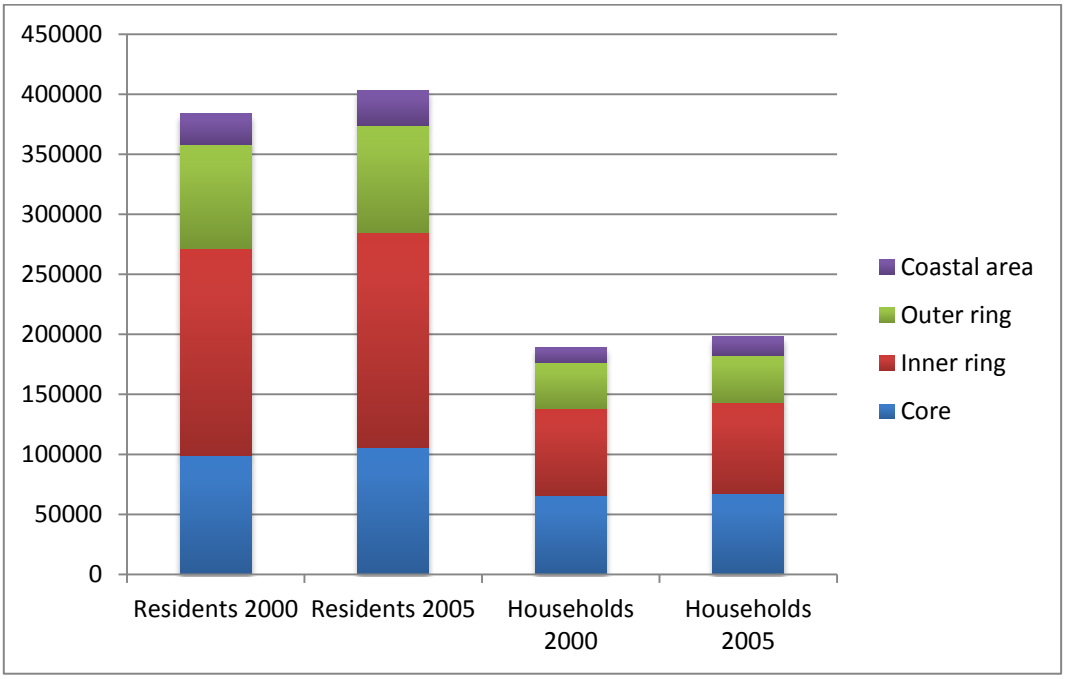
The amenity value of the coastyal landscapes is highly important for both residency and recreation. Values include the Scanian agricultural landscape and farming villages, but also the coastal meadows, forests and heaths requiring human use and tending in a more extensive way. In Malmö and surrounding municipalities, historical monuments and remnants are highly important as cultural resources. Cultural heritage from different epochs of human history is found both onshore and offshore. Malmö is interested in keeping high profile architecture combined with cultural heritage conservation for attracting new inhab itants and visitors. Archaeological sites of national interest exist in Burlöv and Staffanstorp. Cultural conservation of agricultural buildings and landscape features is significant in the area. A high number of cultural heritage sites exist, from the Stone Age, the Viking age, and forward to the recreational towns along the sandy shore of Scania.

The Baltic Sea contains many well conserved wrecks; due to the low salinity, wooden ships are not subjected to fouling to the same extent as in the Skagerrak. Moreover, 12000 years ago and until 8000, a large part of the Baltic and the North Sea were dry due to the ice shields after the last ice age. During this time people lived in today inundated areas. Trawling, dredging, and building activities threaten to destroy their cultural remnants. Often, there are synergies of cultural historical with nature conservation (protected areas) and to some extent with recreational aims (attracting attention, educational aims, enjoyment of natural and cultural landscapes from earlier times).

3.2.4.1 Social resources

The Malmö region is expansive and economically more dynamic than Gothenburg. Malmö had from 2009 to 2010 a higher number and rate of population growth than Gothenburg, which supports the impression of a rapidly developing area. The high and growing number of residents and households in the relatively small core area of Malmö indicates the concentration of the population and the density of building in the city.

Figure 5.7. Residents and hoseholds in Malmö metropolitan area.[*]

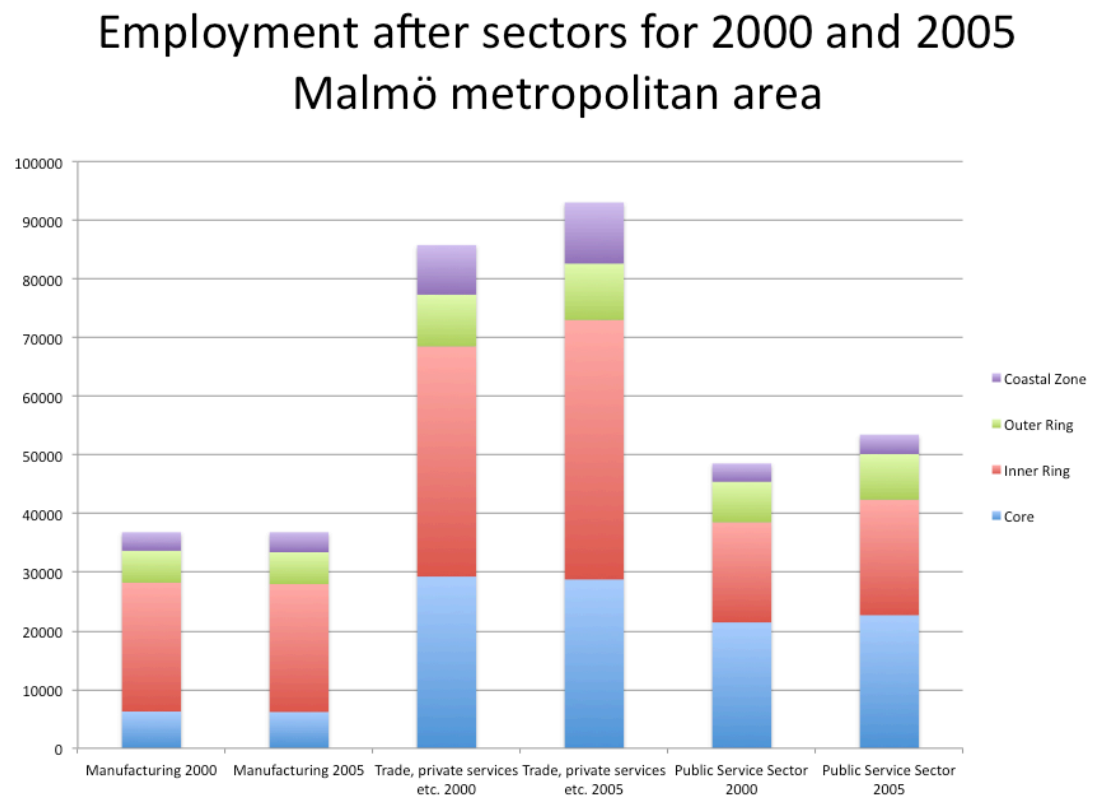


Since 2000 the Öresund bridge between Copenhagen and Malmö has been open, promoting an integration of the Malmö and Copenhagen areas to one big transboundary metropolitan area. There are high numbers of commuters between Malmö and Copenhagen and many Danes are living in the Malmö area. During the economic crisis 2007-2009, the area has experienced less of a decline than other areas of Sweden. Swedish side of the bridge. Malmö city is multicultural with about 175 nations among its residents. Development pressure is also high on the shore and the coastal zone (as in the Gothenburg area; see Table 5.3 above).

3.2.5 Economic resources

Growth in the Malmö region has exceeded growth in the Gothenburg area. Significant differences in average income are found in the differtent parts of core, inner and outer ring and coastal zone, with continually higher income levels in the outer areas. The inverse sequence is that of the number of unemployed that is highest in the city centre.

Figure 5.8. Employment after sectors for malmö metropolitan area.[*]



3.2.5.1 Migration and commuting

From 2005 onwards the number of commuters (incoming and outgoing) in the Malmö area are increasing faster, with the number of incoming commuters more than double that of outgoing. Growth of commuter numbers supports the impression of a rapidly growing and dynamic area. As stated above, the Öresund bridge has considerable effect on commuting. Presently the public transportation system is under expansion.

3.2.5.2 Commercial and service sectors

Increasing land use for commercial services creates conflicts about land use – agricultural land diminishes (Burlöv, and other areas in the urban fringe).

[*] Source: Data from SECOA-WP3.

Due to higher level education and research institutions – universities and technical uniebvrsities in Malmö and in Lund located close by – education and research makes an important employer and driver for urban processes and economic development as well. A number of research-related companies have established themselves in the surroundings of Lund and Malmö.

3.2.5.3 Transport and mobility

Malmö has several harbours and a logistics centre is in planning. Other harbour areas are being transformed into attractive dwelling and office areas. Towards south east, the municipality of Trelleborg has important ferry connections (train and passengers) to Northern Germany and Poland. Malmö has an airport (Sturup), however, the main airport is that of Copenhagen, located just across the Öresund bridge at the Danish coast.

The important infrastructure in the area includes, the Öresund-bridge, connecting Denmark and Sweden for cars and railway and Copenhagen airport just across the sound have led to increased traffic and economic development both in Malmö and the larger region of Scania.

An important form of combined resource use is the one linked to urban mobility for reasons of work- or leisure time-mobility. The dominant daily mobility patterns are that of transport to work (including education etc.) inside the city and commuting transport from surrounding municipalities (which is an important form of mobility in Gothenburg and Malmö metropolitan areas; both cities have significant higher number of ingoing than outgoing commuters).

With regard to the long-term development of the traffic system (until 2020) important measures to achieve more sustainable local transport are: to develop the possibilities for bicycle use and to develop a more efficient collective transport system.

3.2.5.4 Tourism and recreation

Tourism and recreational activities are an important uses and sources of income both in the urban centre and the more rural surroundings. Malmö and surroundings have experienced a steady growth of tourism in the last years. The urban area's growing population leads to an increase in recreational activities and need for infrastructure and space. Especially Malmö city and the long sandy beaches attract a considerable amount of tourism during summertime. Another attractive feature is the cultural landscape of Scania – with fields containing colourful

flowers, willow alleys, and agricultural villages and cultural heritage objects from various times. Due to the expansion of population and the increase in recreation and the need to get mobility to an ecologically more sustainable level, the urban "green areas" have much higher importance than in the Gothenburg case.

During the last years a transformation from mainly agriculture to horse keeping and other recreational activities (e.g. golf) has occurred in the rural areas outside the urban fringe of Malmö. Moreover, there are few forested areas for recreational activities, people seek themselves towards the coast and the shores of lakes and rivers. Most of the nature reserves along the coast so far have been established for biodiversity and conservation purposes, less for recreation.

3.2.5.5 Environmental quality and problems

Sinking land combined with a soft seashore create need for coastal protection. After the ice has melted away from the last ice age land level in Northern Scandinavia is still rising and in Southern Sweden tipping downward (Voipio, 1981). This makes coastal protection along the sandy shores of Scania even more important, not the least in connection with increasing storm events and inundation risk in connection with climatic change. The municipal and regional authorities are increasingly aware of eventual risks and problems and have been working with the issue through projects, plans and modeling during the last decade.

3.2.5.5.1 Water quality and environmental quality in the aquatic environment

From the national monitoring and reporting system, there is little information on the status in the Öresund close to Malmö. The following statements about trends in the marine environment appear to be relevant, however.

Microscopic plastic particles can be discovered in larger amounts than expected. These particles are not biodegradable but ground smaller and smaller. They can contain toxic chemicals themselves (such as particles from tyres) or due to their hydrophobic surface attract organic toxic substances. They have the same size as microplankton and can remain suspended and can be taken up by organisms feeding on microplankton or are deposited and eaten up by detritus feeders. Thus, toxic substances may more easily enter the food chain and accumulate.

Box 2: Malmö area - Environmental problems

The environmental problems of the South Baltic aquatic areas, seashore, shallow bays, and pelagic include the following presently found and increasing problems:

Present problems:

- Overfishing and decline of many economically important species (exception cod, due to trawling ban in Öresund). Conflict potential is generated through the competition with Danish, Polish, German fishermen. Fishery is regulated mainly at EU-level, mainly professional fishery.
- Eutrophication sources include forestry, agriculture, untreated waste water from buldings without septic tanks or attachment to public sewage system (coastal areas, summer houses), leisure boat sewage.
- Pollution by marine traffic (risks) and leisure boating.
- Competing for marine space are wind power, transport, recreation, fisheries, conservation needs.
- Pressure on the coast through development and recreational activities.
- Unclear effects of infrastructure, e.g. German authorities are still doubtful about the environmental effects of the Öresund-bridge.
- In harbour areas residues from marine antifouling paint and industrial activities (heavy metals, organochlorides) can be found in the sediment, which can be resuspended by dredging and construction activities.
- Increase of periodical inundations in low areas and erosion of sandy seashore due to climate change.

Increasing problems:

The following problems may soon need action and better regulation:

- Invasive species: both algae and animals.
- Medicines and hormones in the water affecting the fertility of aquatic species (see description of the Gothenburg area).
- Ocean acidification may in a few decades affect the reproduction of mussels and shellfish considerably.
- Non-biodegradabe, microscopic plastic particles can be discovered in larger quantities than expected. They can contain toxic chemicals themselves (such as particles from tyres) or attract, due to their hydrophobic surface, organic toxic substances. They have the same size as microplankton and can remain suspended and taken up by organisms feeding on microplankton (or are deposited and eaten up by detritus feeders). Thus, toxic substances may more easily enter the food chain and accumulate.

Source: Own compilation

3.3 Synopsis: state of coastal natural resources

Table 5.4 provides an overview over important presently exploited types of natural resources found in Gothenburg and Malmö and their surrounding municipalities, including both aquatic and terrestrial resources, based on municipal comprehensive plans and sector documents.

Table 5.4. Characterisation of coastal resources for the case studies.[*]

Resource type	Marine		Coast & on–shore		Comment	
Case site	G	M	G	M	Gothenburg	Malmö
Biological resources						
Fish	X	X	X	X	Small-scale marine fisheries Large-scale fisheries based in the Gbg-region, but mostly fishing outside the study area. Recreational fisheries both freshwater and coastal.	Professional small scale coastal fisheries. Freshwater aquaculture. Recreational fisheries both freshwater and coastal.
Mussels & shellfish (including crabs & crayfish)	X	X	X	X	Professional fisheries Freshwater aquaculture of crayfish Recreational fisheries	Professional fisheries Freshwater aquaculture of crayfish Recreational fisheries
Wood and timber			X	(X)	Low importance, mostly in inland parts of Kungsbacka, Kungälv, Partille	Not important in this area
Meat & milk			X	X	Kungsbacka: fodder production and large units for beef, pork, fowl. Meadow areas and archipelago with extensive, high quality production: cattle and sheep.	Important in Scania, cattle for meat and dairy, fodder production; sheep in coastal landscapes (low intensity meat production).
Crops & horticulture			X	X	Partille, Kungälv, Kungsbacka: grain, rapeseed, vegetables, fruit.	Agriculture and horticulture important in Scania: grain, beets, rapeseed, vegetables, fruit.
Biological diversity	X	X	X	X	Grasslands, woodlands, wetlands, estuaries, salt marshes, hard bottom habitats, artificial lobster reefs in harbour entrance, eelgrass meadows, mussel banks, large marine mammals and birds.	Salt meadows, remnants of grasslands & wetlands, estuaries, some small woodlands (Svedala, Staffanstorp), sandy heather moorland (Falsterbo), important bird trekking site, eelgrass meadows, musselbanks.
Non-biological resources						
Sand		X		X	-	Offshore: sand extraction for beach restoration. Onshore: sand for

[*] Sources: compilation from municipal plans and environmental audits 2008-2010.

Resource type	Marine		Coast & on–shore		Comment	
Case site	G	M	G	M	Gothenburg	Malmö
						construction
Gravel			X	X	Moraine and riverine material in Härryda and Mölndal: scarcity due to increasing needs.	Building, road construction.
Surface- and groundwater for drinking and production			X	X	Drinking water from Göta älv, reserve drinking water from small lakes (Härlanda tjärn, Delsjöarna)	Lake Vombsjön main drinking water source and Alnarp groundwater current
Productive arable soils for agriculture (& forestry)			X	X	Mainly Kungälv, Kungsbacka moslty agriculture, some productive forests inland.	The whole Malmö region: most fertile soils for agriculture in Scandinavia (bonity) 8-10!.
Landscape for outdoor recreation: beaches, green areas, forests	X		X	X	Coastal: Göteborg- and Öckerö archipelagos, coastal landscapes in Kungälv and Kungsbacka. Inland: forested landscapes in Partille, Delsjöarna in Gothenburg, Kungälv, Kungsbacka	Coastal: Malmö, Lomma, Burlöv, Vellinge (Falsterbo peninsula) Inland forested landscapes: Svedala, Staffanstorp
Space for industry & commerce			X	X	All municipalities, increasing demand	All municipalities, increasing demand
Space for transport	X	X	X	X	Traffic congestions with demands for more space for resolution Gothenburg Port	All municipalities, increasing demand Land reclaim in Malmö harbour
Space for housing & education			X	X	Urban space under re-disposition: from industrial and harbour use to attractive housing sites in central and riverine locations close to river Göta	Expanding. Urban space under re-disposition: from industrial and harbour use to attractive housing sites in Limhamn and Malmö harbour
Space for recreational infrastructure & indoor recreation	X		X	X	High pressure.	Increasing demand.
Space for deposit of waste/dredging material	X		X	X	Offshore: Dredging of harbour entrance. Artificial reef, to be protected as nature reserve. Old dump-sites	No offshore dumping, except clean material for harbour & beach defence. Spillepeng deposit area close to water (Staffanstorp, Malmö).
Space for military exercising	X		X	X	Känsö island and shooting range in southern archipelago	Staffanstorp, Vellinge
Flow resources						
Wind power	X	X	X	X	Wind power in harbour entrance	Malmö, Lomma, Vellinge, Lillgrund marine wind park since 2008 0.33TWh/a plus National interest area Kriegers' flak, just outside case boundaries
Air-, ground water and ground energy			X	X	Heat pumps increasingly popular in Sweden (especially air)	Ground water energy

4. Overview of Users in the Case Studies

Table 5.5 gives a first quantitative impression of the resource users, indicating significant differences between the two areas. These aggregated figures need to be broken down in specific user groups, private and institutional users, to show interrelations between resource use intensity and potential conflicts of resource use.

Table 5.5. Population development 2009-10 in Sweden, Swedish metropolitan municipalities.[*]

Recent population development	Residents 2010.01.01.	Netto change during 2009
Sweden	9,340,682	84,335
Stockholm	829,417	19,297
Gothenburg	507,330	7,133
Malmö	293,909	7,374

4.1 Case study 1 – Overview: users in the Gothenburg area

1) **Inhabitants/households:** Gothenburgs population has grown beyond 500,000. Residents and private households are among the dominant resource user groups, in the roles of "consumptive users". The social differences among residents in terms of social structure, economic situation and welfare that may influence conflicts between resource users are not sufficiently visible from the statistics for different parts of the metropolitan area. That income levels increase with distance from the centre, whereas the unemployment rates are highest in the centre, with highest population density does not allow for conclusions about resource related conflicts.

2) **Tourism establishments:** The statistics reveal that the larger part of tourists and visitors to Gothenburg are Swedish, less than one third are foreigners. Data about the whole range of tourism establishments (e.g. hotels, camping grounds) are not readily available.

3) **Restaurants and other gastronomic establishments:** The city of Gothenburg has a highly diverse gastronomic sector. With regard to spatial conflicts, there is competition about good locations in the inner city (leisure, evenings) and to some extent in areas

with larger daytime working- and student-population (lunch). The statistical yearbook does not provide detailed information.

4) **Industrial establishments.** Gothenburg has a more balanced structure, industrial production still significant among the three dominant sectors of industry, commerce and communication and financial business – in difference to the Malmö area, where the commercial and business sectors dominate.

5) **Other trading/commercial establishments:** The commerce and trade sector is with almost 100,000 jobs the largest of the three dominant ones of industry, trade and finance (the latter two between 70,000 and 80,000 work places).

6) **Fishing fleet:** A significant fishing fleet is located is located in the Gothenburg metropolitan area including the main part of Sweden's larger offshore commercial vessels (trawlers, gillnets). There is also a smaller scale coastal fishery, which is in decline in Gothenburg and even more so in Southern Sweden. Household- and recreational fishing compete for coastal fish and cod/mackerel, but also for space in the harbours.

7) **Farmers (land or aquaculture):** The primary production sectors of agriculture, forestry and fishery are small in Gothenburg, with altogether somewhat more than 2000 workplaces in 2008 – less than in the Malmö area (more than 3,000 work places, see below). Aquaculture is not yet developed although coastal mussel culture may develop due to good natural conditions and due to interest in using mussels as biofilters, for cleaning of coastal waters.

8) **Ports:** Except for the main port areas in the city along the river Göta Gothenburg has a number of smaller marinas and yacht harbours. There is pressure for increasing their capacity, as the number and size of leisure boats are growing.

9) **Energy production companies:** These include as main electricity producer one company in Gothenburg municipality ("Göteborg energi"). Energy production from renewable sources (solar energy and wind power) is not yet significant, although in development. Recently, a set large wind power aggregates have been established in the harbour entrance, which has led to conflicts. The sectors of electricity production, water supply and waste disposal are relatively small in terms of work places.

10) **Environmental groups:** Main Swedish environmental groups (NGOs) that are active nationwide and at municipal levels include the Swedish Asociation for Nature Protection (SNF) and the Swedish chapter of the World Wide Fund for Nature (WWF). These groups should less be seen as resource users, more as taking up resource use problems in policy and management contexst.

11) **Community groups:** This user category may include many different (cultural and other) groups. These cannot be identified in comparable forms from published sources. For Gothenburg metropolitan area this may include important ethnic and immigrant groups, but also local NGOs and political parties founded to lobby for a certain issue, as is frequent in conflictive situations.

12) **Second home-owners: M**ost of the second home owners come from the larger area or from Stockholm, few are foreigners. The majority of second homes are used seasonally only.

13) **Other, area specific, users:** (a) Leisure boat owners - Sweden's leisure boat fleet is about as big as the one of the entire Mediterranean. Boats are increasing in number and size, which increases competition for marine space for recreational boating, but also for mooring in summer and setting up boats during winter. (b) Recreation of inhabitants at the undeveloped coast accessible to the public and in public spaces in the forests and open landscape surrounding Gothenburg create high utilization pressure in these areas, not the least on parking lots close to such areas. (c) The Swedish Navy has a base in the Southern Archipelago. An application to expand the number of exercising days has led to conflicts both about noise and other environmental impacts.

4.2 Case study 2 – Overview: users in the Malmö metropolitan area

1) **Inhabitants/households.** The number of residents in Malmö has increased continually and faster than in Gothenburg during the past 50 years, from ca. 234,000 in 1961, to close to 300,000. Residents and private households are a dominant resource user group in Malmö, in the roles of "consumptive users" (see above). With regard to commuting the transboundary commuting between Copenhagen and Malmö across the Öresund bridge

is important. In 2009 every day 20,400 persons have been commuting by train or car across the bridge (88% for work, 12% for university studies).

2) **Tourism establishments.** The number of hotels and other places where tourists stay has developed with the expanding tourism. Malmö and surroundings have experienced a steady growth of tourism during the last years. Malmö city, the long sandy beaches, and the cultural landscape of Scania with cultural heritage objects from various times attract a considerable number of tourists during summertime.

3) **Restaurants and other gastronomic establishments:** The gastronomic sector is growing, especially in central Malmö. Also here, competition for best locations can be found. More specific data are not readily available.

4) **Industrial establishments:** In difference to Gothenburg the industriual production sector is less significant in Malmö than the commercial and financial sector; it provides significantly less work places.

5) **Other trading/commercial establishments:** In Malmö, commerce and trade and the financial sector are the dominant employment sectors.

6) **Fishing fleet.** Fishery is insignificant in the Swedish Öresund area; due to overfishing the formerly rich fishery (herring) is in decline. The small-scale professional coastal fishery does not count more than two dozen fishermen, with boats located mainly in Vellinge community. Decline of coastal fisheries is even stronger in Southern Sweden. However, leisure fisheries and fishing guides in the Öresund area are an increasing activity. Household fisheries can be found also here.

7) **Farmers (land or aquaculture):** Agriculture is significant in the region of Scania which shows also in the relative high number of employment in the primary production sectors compared to Gothenburg (see comparison of metropolitan areas below). Scania is one of Sweden's most important agricultural production areas.

8) **Ports:** Malmö's commercial port *Malmö Harbour* is part of a consortium with Copenhagen Harbour. Malmö has several harbour areas (Västra hamnen, Norra hamnen, Nyhamnen, Limhamn) close to the city centre, some of them are used for leisure purposes. Old harbour areas are being transformed, and new areas established, with the development of a new logistics centre coupled to road and railroad.

9) **Energy production companies:** Two dominant energy companies are SYSAV and Öresundsverket (electricity and long distance heat energy) that are both part of the energy strategy that aims to increase the energy from renewable sources.

10) **Environmental groups:** Also in the Malmö area, the two big environmental NGOs are the Swedish Association for Nature Protection (SNF) and the Swedish WWF. On the Falsterbo Peninsula in Vellinge, there are special groups for nature protection and bird watching.

11) **Community groups:** Conflicts often give rise to new community groups and formal NGOs (see above). No detailed information is available from statistical and planning material.

12) **Second home owners.** Especially Vellinge Municipality south of Malmö is attractive for second homes. Owners are both from the larger area, but also from Stockholm and Gothenburg. Main season is during summer.The number of foreign owners is limited.

13) **Other, area specific, users:** (a) Leisure boat owners - boats are increasing in number and size, which increases competition for marine space for recreational boating (situationa sin Gothenburg). (b) Recreation of inhabitants at the coast accessible to the public and in public spaces in the forests and open landscape surrounding Malmö create high utilization pressure in these areas, not the least on parking lots close to such areas (see Malmö). (c) The sandy beaches in South Sweden are attractive to surfers and kitesurfers. This sport has been growing in the 2000s and conflicts with other recreational activities and conservation have arisen (see Vellinge case in Böhler *et al.,* 2011).

5. Conclusions

5.1 Conclusions on Important Resources

In the Gothenburg area the following resources are important in terms of use, intensity and potential conflicts: coastal landscape and archipelago (tourism, recreation); freshwater, drinking water; space for urban development, building and traffic; air, air quality; fish and shellfish for professional and recreational fishing; marine, river and lake areas for marine transport; forests mainly for recreational purposes.

In the Malmö area the following resources are important in terms of use, intensity and potential conflicts: coastal landscape, sandy beaches; agricultural land for production; cultural landscape for recreation and tourism; air, air quality; freshwater, drinking water; space for urban development and traffic; climate regulation is important with regard to risks and to water exchange in the Baltic Sea.

5.1.1 Problems

The most pressing environmental problems in the Gothenburg area include:

- Air pollution from traffic (emissions of NOx, particles).
- Consumption of arable land for urban expansion.
- Polluted ground water from leakage of pollutants from waste deposits.
- Eutrophication of coastal waters.
- Pollution of coastal waters.

Hazards and risks include:

- Salinization of drinking water at the intake from river Göta in connection with sea level rise related to climate change.
- Mudslides in connection with heavy rains and extreme weather events due to climate change.

The most serious environmental problems in the Malmö area include (Morf & Olsson, 2011):

- Negative effects of increasing traffic (air pollution, noise, water pollution through runoff, fragmentation of space through growing infrastructure).
- Fragmentation of biotopes and loss of valuable agricultural land to urban development (traffic infrastructure, housing, industrial areas, recreational infrastructure).
- Eutrophication in freshwater and Southern Baltic affecting recreational activities, fish recruitment, and biodiversity.
- Combined effects of sinking land, sandy beaches, sealed urban and intensive agricultural landscape and climatic change (storm, rain): erosion along the seashore and inundations.
- Consumption of agricultural land by urbanisation; climate change enhances the dilemma, as most valuable agricultural land leies on higher elevations.
-

5.2 Conclusions on important resource users

In the Gothenburg area the major user groups in quantitative terms according to the classification above include the following ones:

- Private households/residents, recreational users with and without boats, tourists and tourism establishments, industry, commerce, the fishing fleet, farmers and energy producers. These groups are varying in size, structure, interests and power. A refined user typology is required to take into account the heterogenous forms and combinations of users as individuals/households or formal organisations, sectors of resource use, private and public organisations, large or small groups, productive or consumptive resource users, users with more or less influence and power.
- Resource users of minor quantitative significance are environmental groups, community groups and other area-specific users. Still these may be of importance in terms of influence on other users, for strategies of future resource use or changing resource use. Further refinement of the typology is required as well.
- A special seasonal user group of second home-owners are mostly from close by urban centres and other metropolitan areas (Stockholm), but include few foreigners.

- In the Malmö area major, the user groups in quantitative terms are similar:
- Private households/inhabitants, recreational users with and without boats, tourists and tourism establishments, industry, commerce, farmers and energy companies, leisure fishers both commercial and non-commercial. The coastal fishing fleet is also important as a cultural resource for tourism (maritime heritage).
- Less important user groups in quantitative terms are environmental groups, community groups and area specific users (these need to be specified in further research).

For both areas many connections exist between dominant users. Individuals act in many roles and often simultaneously as members of several groups, organizations and institutions – private households, firms, producers and consumers etc. Along the chain of resource use (extraction, production and processing, consumption, waste production and disposal) many contatcts are created between users. The combinations of natural and other resources in the processes of resource have as a consequence more overlapping groups.

5.3 Comparison between the two case studies in terms of resources and users

The following similarities and differences between the two study areas can be found:

- In both areas, the main resources evoking problems and providing conflict potential are coastal natural resources, including the functions and services of ecosystems. Other resources (economic and social) seem to be less conflictive. However, resource use implies mostly combinations of different resource types. Thus, resource related conflicts may be characterized by multidimensional, "cross domain"-aspects where, for example, economic use of resources for pruposes of production and development is in conflict with protection and maintenance of the natural resource base. Conflicts may also have multi-dimensional reasons where the use of natural resources may not be among the primary drivers.
- The users described here include rather heterogeneous groups of varying size and structure. Important users include urban residents and tourists as resource consumers, economic users from the primary sector (agriculture and fishery), industry, commerce and from energy production.

- The standardized categories of resource users for this report cannot be used to describe users involved in actual conflicts. In many cases authorities at various levels are involved in the conflicts and not only in mitigating roles. The general classification of resource uses needs to be complemented by a stakeholder analysis in the case study areas to obtain an appropriate picture of users involved in conflicts. These are often only smaller and blended groups, parts of the general user categories that are described in official statistics.
- Environmental and natural resource problems, described in detail in the Secoa-reports Morf & Olsson (2011, 2011a), are among the dominant drivers of resource related conflicts identified in municipal documents. However, further and more complex conflicts patterns can be found. The majority of conflicts identified so far in both case study areas is related to conflicting uses of land, landscape, water and other natural resources for differing social purposes and interests, e.g. conflicts between "urban and traffic development" and "maintenance and protection of natural and cultural heritage and landscapes".
- The analysis of potential resource use conflicts provided by general description of resource use and users in statistical terms needs to be complemented with a detailed picture of conflicts resulting from the mapping of conflicts, e.g. from resource management documents such as municipal and regional plans.
- In the study areas policies and resource management programs and strategies implemented (as part of national, regional or local/municipal policies to address problems) are part of or give rise to conflicts with their norms for action, limiting or directing resource use practices.
- Planning conflicts in Malmö include examples that did not emerge earlier, when land uses were separated, but when land is to be used more effectively for multiple uses. There is a dilemma of defending against climate change or consuming valuable agricultural land (see Morf & Olsson, 2011a).

5.4 End Notes

This text with an overview of the environmental status, resources, users and current challenges in the study areas Gothenburg and Malmö uses information from other work packages of the project and from municipal documents and stakeholder communication. We thank everyone from the Swedish team who has contributed, the end users from both study areas, especially in the regional administrations and municipal administrations of Gothenburg and Malmö, and the teams in the Secoa project commenting this report.

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CHAPTER 6.

Coastal Environmental Resources and Users in Mumbai and Chennai Metropolitan Regions, India

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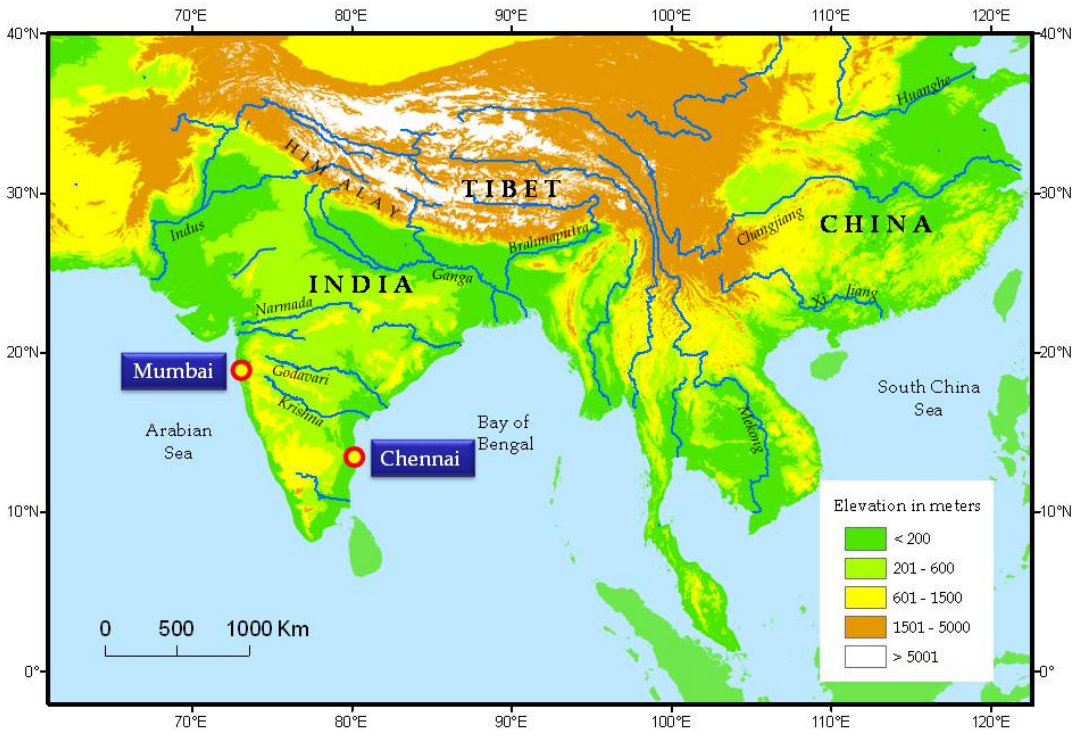
1. Introduction

With a population of over 1.2 billion, India is the second most populous country in the world. There are eight urban agglomerations in India, including three large coastal cities. Due to rapid urbanization and phenomenal growth of population, land, water and other resources are under enormous stress. One of the major reasons for the dramatic population increase has been the large-scale influx of skilled and unskilled workers from the rural countryside as well as other parts of the country. With growing demand for land and the consequent prohibitive housing prices, millions of urban poor are forced to occupy environmentally sensitive areas. This has given rise to the (in)famous slums of Indian megacities. Concomitant growth in the business and industrial activities as well as tourism and entertainment activities have induced further stress on the existing resources and consequent degradation of the land, water and forest resources.

Figure 6.1. The geographical location of Mumbai and Chennai Metropolitan Regions.



The focus of this chapter is specifically on two coastal metropolitan cities of India, namely, Mumbai and Chennai. The former is located on the west coast of India and the latter is situated on the eastern seaboard (Figure 6.1). Sprawling over an area of 4,355 km^2, the Mumbai Metropolitan Region (MMR) is home to more than 19 million inhabitants (Table 6.1). The port city has been described as the gateway of India and the economic and commercial nucleus of India. In terms of population size, it is the sixth largest city in the world (Munich Re, 2005). In comparison, the Chennai Metropolitan Region (CMR) is ranked as the fourth largest urban agglomeration in India (Table 6.1). CMR had about 7.18 million inhabitants in 2001 and an area of 1,189 km^2.

2. Material and Methods

Considering the nature and availability of demographic, occupational, land use and other types of data, only two spatial zones were identified for this study (Table 6.1). In the case of MMR, Greater Mumbai has been defined as the core. And in the case of CMR, the Chennai City District has been classified as the core. This is because a very high proportion of the total population and working population is confined to these parts of the metropolitan regions (Table 6.1). The 'ring' includes rest of the metropolitan region and is functionally linked to the core. Although quantitative data are not available, there is little doubt that over 15% of the workforce travels for work to the core.

The time period in this report for demographic data is 10 years and data used in this report are for 1991 and 2001. The smallest administrative unit used was based on the smallest unit defined by the Census of India. These are 'wards' in the urban areas and 'villages' in the rural areas.

Table 6.1. Details of the core area and ring in MMR and CMR (2001 Census).[*]

	Core	Ring
Mumbai Metropolitan Region		
Name	Greater Mumbai	Rest of MMR
Area in km^2	466 (10.7%)	3,889 (89.3%)
Population in million	11.9 (61.86%)	7.38 (38.14%)
Working population in the metro	62.05%	37.94%
Number of smaller administrative units	89 wards	1,021 villages & towns

Chennai Metropolitan Region		
Name	Chennai City District	Rest of CMR
Area in km²	174 (14.6%)	1,015 (85.4%)
Population in million	4.3 (59.6%)	2.9 (40.4%)
Working population in the metro	60.62%	39.38%
Number of smaller administrative units	155wards	220 villages & towns

The present study is entirely based on secondary data. The primary sources of data are the various reports of the central (federal) and state governments. The demographic and occupational data are from the Census of India reports and District Census Handbooks for 1991 and 2001.

In addition, the Regional Plan for MMR 1996-2011 prepared by Mumbai Metropolitan Development Authority (MMRDA) Mumbai, and the Second Master Plan for Chennai Metropolitan Areas, 2026**,** formulated by the Chennai Metropolitan Development Authority (CMDA), as well as various reports prepared by MMRDA, CMDA and other central and state government departments/agencies have been used.

The Indian Remote Sensing satellite data for 1997 and 2008 were used for various purposes, but primarily for land use/cover analysis.

3. Overview of Resources

Mumbai (formerly, *Bombay*), the largest metropolis in India, is the capital of the Maharashtra State in western India. It is a 'mega city' as per the definition of Census of India and the United Nations, because the population is more than 10 million. The boundaries of the MMR were originally defined in 1967. The region lies between 18° 33' and 19° 31' N latitude, and between 72° 45'and 73° 28' E longitude. The MMR comprises the Municipal Corporations of Greater Mumbai, Thane, Kalyan, Navi Mumbai, Ulhasnagar, etc., 15 municipal towns, 7 non-municipal urban centers and 995 villages (Table 6.2). Its administrative limits cover Mumbai City and Mumbai Suburban Districts, and parts of Thane and Raigarh District (Figure 6.2).

Table 6.2. Area and number of administrative bodies in MMR and CMR.[*]

1. Mumbai Metropolitan Region	Total Area	4,355 km^2
Mumbai Municipal Corporation	No. of wards	89
Mumbai Rural	No. of villages	995
Mumbai Urban	No. of Towns	26
Uninhabited	Villages	12
2. Chennai Metropolitan Region	Total Area	1,189 km^2
Chennai Municipal Corporation	No. of wards	155
Chennai Rural	No. of Villages	169
Chennai Urban	No. of Towns	51

The Chennai Metropolitan Region (CMR) extends from 12° 50' to 13° 17' N latitude and 80° 0' to 80° 20' E longitude. The CMR encompasses a total area of 1,189 km^2 and consists of Chennai City District (core) and parts of Kancheepuram and Tiruvallur Districts (Figure 6.3). The CMR comprises the Chennai Municipal Corporation, 16 municipalities, 20 town panchayats and 214 villages.

3.1 Historical Overview of the two metropolitan cities

3.1.1 History of Mumbai (Bombay)

The Kanheri Buddhist Caves in Mumbai suburban area are evidence of the introduction of Buddhism in the region during the reign of Ashoka the Great in the 3rd century BCE. The Konkan region, including Mumbai, was ruled by Satavahanas, Kalachuri, Mauryas, Chalukyas and the Rashtrakutas and Yadavas of Devgiri till the Muslim rule came in early 14th century.

Figure 6.2. Map of Mumbai Metropolitan Region (MMR), showing the three districts falling within the MMR. Major towns and cities are also shown.

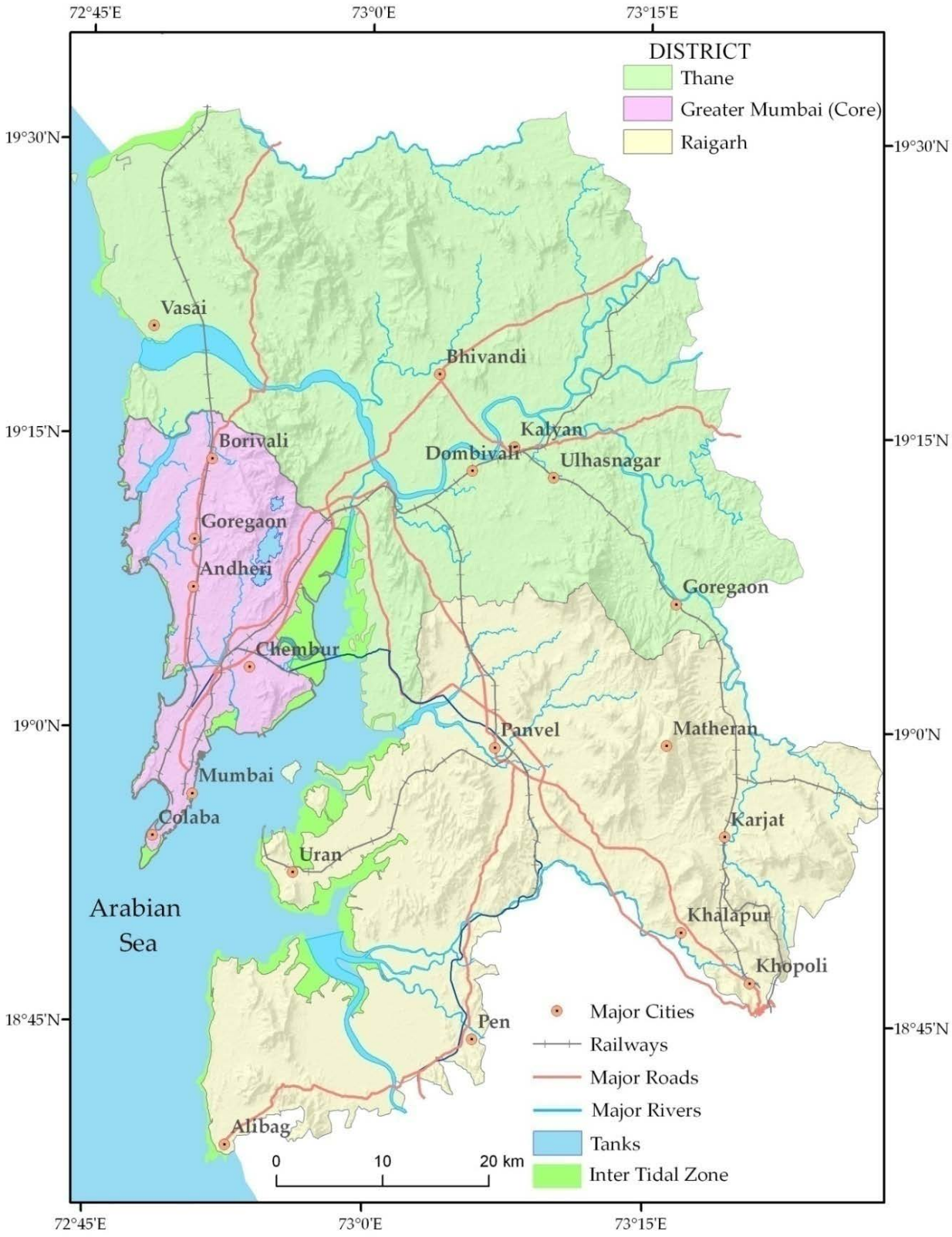


Figure 6.3. Map of Chennai Metropolitan Region (CMR), showing the three districts falling within the CMR. Major towns and cities are also shown.

In 1534, the Portuguese captured the Bombay islands. Within a few years, these islands were gifted to Charles II of England, in the dowry of Catherine de Braganza, the sister of the Portuguese king. The islands were then leased by Charles II to the East India Company in 1668. The company built the docks, trading posts and the fort realizing the strategic importance of these islands. As a result, Bombay soon emerged as an important trading post. In 1708, Bombay became the headquarters of the East India Company.

Bombay was initially a group of seven islands, occupied by *Kolis* (a fishermen community). By 1862, the seven islands were coupled together by reclamation. Due to the efforts of the then Governor of Bombay, many businessmen from different parts of the country came and settled in Bombay. The growing city particularly attracted business communities like the Parsis, Gujaratis and Marwaris from western India. These entrepreneurs and businessmen established trading companies and factories. Bombay thus developed into a major commercial centre in western India. In the following period, Bombay witnessed construction of various buildings, offices, railway stations, educational institutes, banks, hospitals, etc. During the British rule, Bombay was the capital of Bombay Presidency, encompassing much of the western India (including Karachi, Pakistan), and parts of central India.

Bombay emerged as the chief commercial and industrial center in India after the advent of the Great Indian Peninsular Railways in 1853 and the opening of the Suez Canal in 1869. The first textile mill was established in Mumbai in 1850. Until 1980s, the textile industry was the leading and biggest employer in the port city. In the early 20th century Bombay emerged as the main center of Indian film industry. Bombay was declared the capital of Bombay State, once India became independent in 1947. In 1961, the State of Maharashtra came into existence and Bombay was made its capital. In 1996, the Government of Maharashtra officially changed the name of Bombay to Mumbai.

3.1.2 History of Chennai (Madras)

It is believed that St. Thomas, an apostle of Jesus Christ, was martyred in Chennai (at Mylapore) in the first century CE. The growth of the city bears the influence of all the popular dynasties of South India, such as the Pallavas, the Cholas, the Pandyas and the Vijaynagar Empire. The 7th century Pallava Port, Kapalesvara and Parthasarathi Temples are evidence of the long history of the city. Like Mumbai, Chennai also has been – and continue to be – shaped by diverse human mobility flows.

The origin of the present city started in 1639, when the East India Company established a trading post here. A settlement was built in 1640 and was named as St George's Fort. In 1746, Chennai, along with Fort St George, came under the control of the French. Within three years, the British again got control over Chennai. By the late 18th century, they were able to annex most of the region around Tamil Nadu, Andhra Pradesh and Karnataka, and founded the Madras Presidency. When India became independent in 1947, Chennai City was declared as the capital of Madras State, which was later renamed as Tamil Nadu in 1968. In 1996, the Government of Tamil Nadu officially changed the name of Madras to Chennai.

3.2 Bio-Physical Resources

Geomorphologically, the MMR forms a part of the north Konkan lowland that extends from the Arabian Sea in the west to the Western Ghat (or *Sahyadri*) in the east. The MMR is a coastal lowland (Figure 6.4), with a series of north-south hill ridges in the central part, the great escarpment of Western Ghat in the east and vast low-lying areas in between. The region is divisible into three major bio-physical units, primarily on the basis of elevation (Table 6.3). Unit I is the low-lying area (< 50 m a.s.l) and covers nearly two-third of the geographical area of the MMR. Within Unit I, about half of the area is below 10 m a.s.l (Figure 6.5). This sub-unit is dominated by coastal features and ecosystems. The wetlands, including mangroves, fall in this unit.

Table 6.3. Major Bio-physical units of MMR and their geomorphic characteristics.[*]

Unit	Elevation in m a.s.l.	Area in %	Geomorphic characteristics	Major landforms	Vegetation cover/ Soil types
I-A	0 - 10	29.36	Area close to the coastline , creeks and estuaries Extensive rocky shoreline	Rocky shoreline Cliffs Islands Creeks Estuaries Beaches Tidal flats	Saline soils; Deep black to black soils; Coastal and river alluvium Mangrove forest and grasses. Large reclaimed area in Mumbai

[*] Source: Based on SRTM-DEM and satellite images; Classes based on natural breaks, except Unit I.

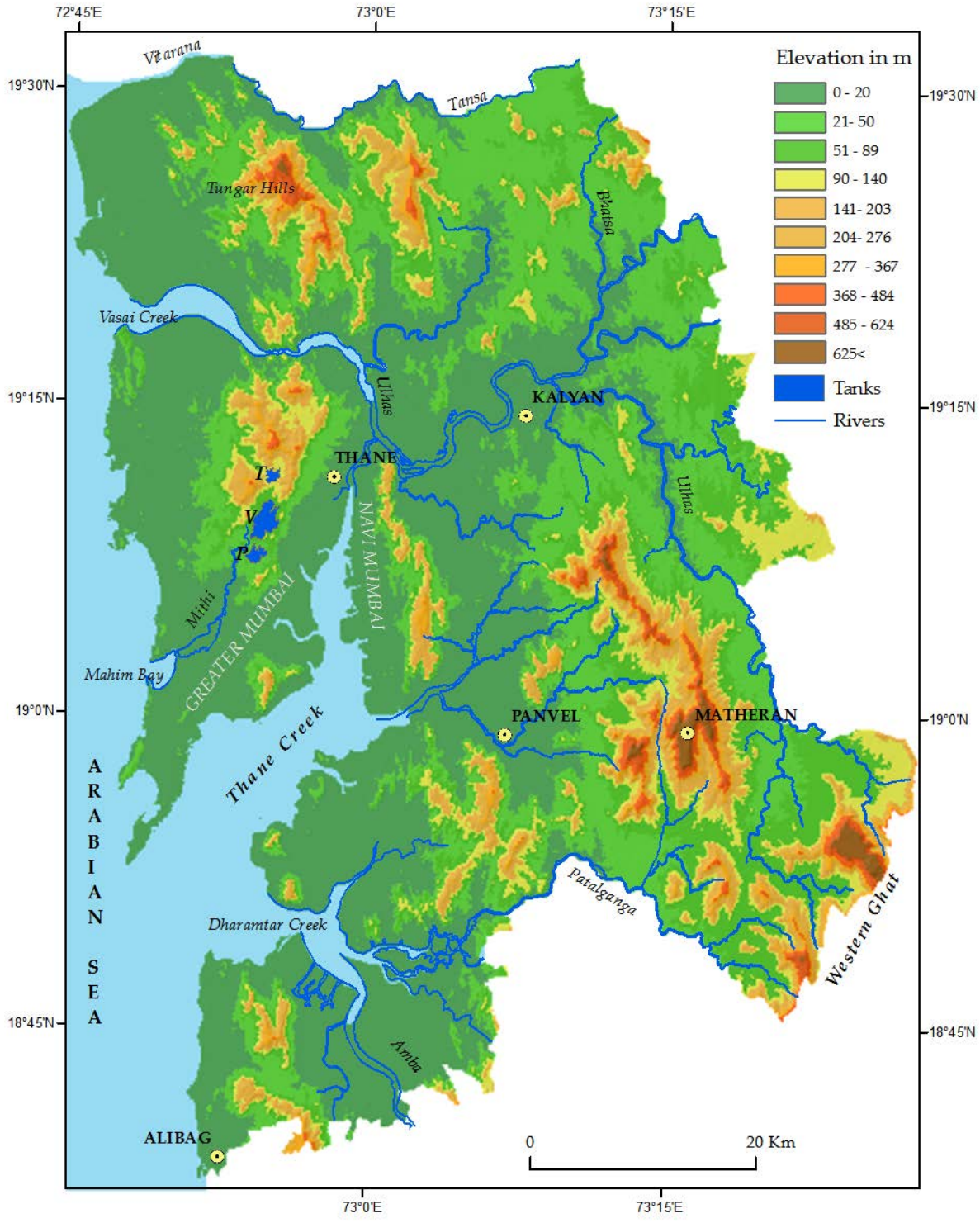
I-B	11-50	38.55	Gently sloping low-lying area along creeks, estuaries and rivers	Rocky pavements River terraces Wide valleys of higher order stream	Scrubland to open forest Shallow, yellow-brown soils
II	51 – 367	29.97	Moderate to steep hill slopes	Residual hills Ridges Cliffs	Moderate to dense forest cover Shallow yellow-brown to red soils
III-A	368 - 624	10.56	High hill ranges with steep slopes	Residual hills Ridges Cliffs	Dense forest Red soils
III-B	625 <	0.51	Hill summits and hill ridges	Flat-topped hills Escarpment	Dense forest Laterite and Lateritic soils

Unit III occupies ~11% of the area. The unit constitutes hills and offshoots of the Western Ghat and the elevation is > 367 m a.s.l. The rainfall is high (up to 5000 mm a^{-1}) due to orographic effect. This unit is covered by dense vegetation cover. The hills and ridges display a stepped landscape. Unit II is the transitional area, and is only covered by thick vegetation in places.

The MMR has over 380 km long, rocky coastline that is highly indented by estuaries, bays and creeks. The largest creek is the Thane Creek. Wetlands occupy vast area of land along the creeks. The coastal belt is marked by small beaches. Gorai, Juhu, Dadar and Chowpatty are the popular beaches. The islands of Karanja, Butcher and Gharapuri or Elephanta in the Harbour Bay are the major islands.

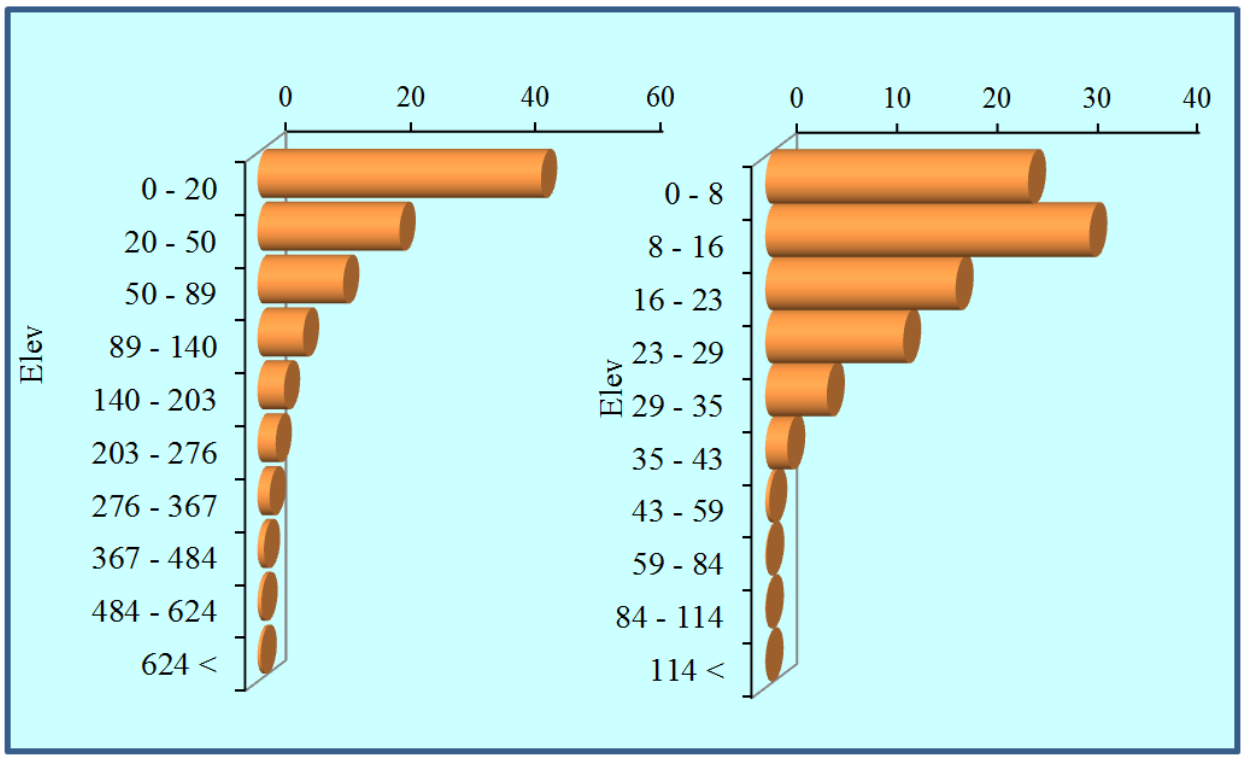
Geologically, the MMR is underlain by various types of basalts (compact, columnar and amygdaloidal), popularly known as the Deccan Traps, which were deposited during the Cretaceous-Eocene period (~ 65 Ma).

Figure 6.4. Map of Mumbai Metropolitan Region showing the relief and the location of major rivers, tanks and cities/towns within the MMR.[*]



[*] Map based on analysis of 90-m SRTM data. V = Vihar Lake, T = Tulsi Lake, P = Powai Lake.

Figure 6.5. Distribution of area under different elevation categories.[*]



The Ulhas River and its tributaries (Bhatsa and Kalu), the Panvel, Patalganga and Amba are the main rivers draining the MMR (Figure 6.4). The major river on the Mumbai Island is the Mitthi River (Figure 6.4). The major lakes that are the main sources of water supply to Greater Mumbai are Tulsi and Vihar. Tansa, Modak Sagar, Upper Vaitarna and Bhatsa are other reservoirs located outside the MMR. The Bhatsa reservoir is the major source of water supply to 12 million people living in Greater Mumbai.

As per Köppen's climatic classification, the Mumbai area belongs to Am or Aw type. The mean temperature is ~ 27° C. The annual rainfall in Mumbai is about 2422 mm and increases to more than 5000 mm at Matheran in the east (Figure 6.4). Over 95% of the rainfall is received in the southwest monsoon season (June to September). Thunderstorms are relatively frequent and are responsible for localized heavy rainfall. One of the most severe storms was recorded on 26th July 2005, when 945 mm of rain fell in less than 24 hours.

Geographically, Chennai is situated on the southeastern coast of the Indian Peninsula, known as 'Coromandel Coast'. Geomorphologically, the topography of the CMR is almost flat

[*] Categories based on natural breaks. Analysis based on SRTM data. A = MMR; B = CMR.

with gentle regional slope towards the Bay of Bengal with a few isolated residual hills (Figure 6.6). The CMR can be broadly divided into two major bio-physical units (Table 6.4). Unit I constitutes about 91% area, which is below 29 m a.s.l. (Figure 6.5). The sub-unit of this bio-physical unit is Unit IA, which is dominated by sandy coastal features (beaches and dunes) and coastal ecosystems. A small patch of marshy land exists south of the Adyar River, known as Pallikaranai Swamps (Figure 6.6). The straight, sandy coastline stretches nearly 50 km. The Marina Beach is the largest beach, with a length about 5.6 km.

Table 6.4. Major bio-physical units of CMR and their geomorphic characteristics.[*]

Unit	Elevation in m	Area in %	Geomorphic characteristics	Landforms	Soils/vegetation
I-A	0 - 8	26.2	Extensive sandy shoreline Low lying coastal area Estuaries of Adyar and Cooum Rivers, known as Pallikaranai Swamps	Beaches Sand dues Estuaries Lagoon Swamp	Riverine and coastal sandy soils. Estuarine soils No natural vegetation, except in the Pallikaranai Swamp area
I-B	9 - 29	65.0	Area along Adyar River and lower Cooum River	Coastal sandy plain Slightly incised rivers	Sandy soils, patches of clay soils
II	30<	8.8	Hills characterized by bedrock exposure and shallow soils. Rocky surfaces inland	Residual hills surrounded by rocky pediments Pavement	Elevated area inland including residual hills. Elevated area in the Red Hill catchment covered by laterite and lateritic sandy soils.

Unit II is highland area (> 30 m a.s.l.) with a few isolated hills in southeast and a wide laterite/laterite gravel covered pavement in northeast (Figure 6.6). The highest point in the CMR is ~172 m a.s.l.

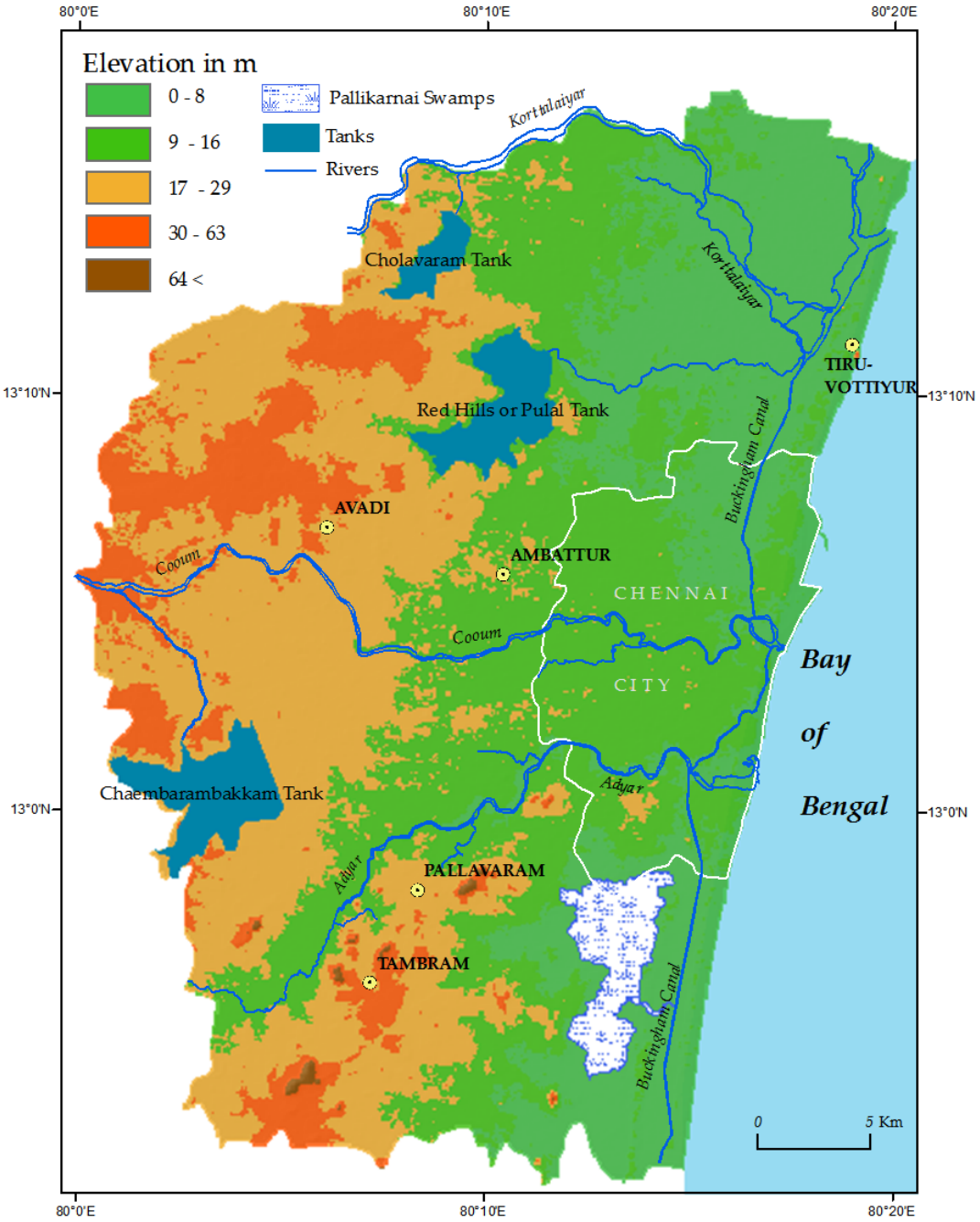
[*] Source: Based on SRTM-DEM and satellite images; Classes based on natural breaks.

Recent alluvium and marine deposits underlie the major part of the CMR (Achyuthan & Nagalakshmi, 2007). The basement rocks include various geological formations namely, Archaean crystalline rocks, consolidated Gondwana and Tertiary sediments and Quaternary alluvium (CGWB, 2008).

The three main rivers of the CMR are the Cooum, Adyar and Korattalaiyar (Figure 6.6). None of the rivers is perennial. They carry water only during the northeast monsoon. A man-made canal, known as "Buckingham Canal" runs almost parallel to the coast (Figure 6.6). In addition, there are number of tanks, such as Red Hills Tank, Sriperumpudur Tank, Cholavaram Tank and Chembarambakkam Tank (Figure 6.6). There are over 165 tanks in Chennai City area. Many of them are temple tanks.

The climate of Chennai is very hot and humid. The mean annual temperature ranges between 24.3° and 32.9° C. The average annual rainfall of the area is 1266 mm. Over 60% of the annual rainfall is received during the northeast monsoon (October to December). Tropical cyclones and depressions originating over the Bay of Bengal also significantly contribute to the annual rainfall totals.

Figure 6.6. Physical map of the CMR. The major rivers and tanks are shown.[*]



3.3 Coastal Ecosystems

The coastal and offshore environment of Konkan (Mumbai) and Coromandel (Chennai) coasts support rich biodiversity and have variety of natural ecosystems. Table 6.5 shows that

[*] Source: Based on SRTM-DEM and satellite images; Classes based on natural breaks.

placer deposits of economically valuable minerals are not present within the two metropolitan areas. Some phosphorite deposits have been reported on the coastal margin off Chennai, and hydrocarbons and gas occurs off the coast of Mumbai.

Table 6.5. Coastal and marine ecosystems and resources of MMR and CMR.

Coastal and Marine resources	MMR	CMR
• Rocks	◊	Δ
• Sand	□	◊
• Beaches	□	◊
• Sand dunes	□	◊
• Rocky cliffs	◊	Δ
• Mud cliffs	Δ	Δ
• Tidal flats	◊	□
• Tidal inlets and creeks	◊	Δ
• Off shore islands	◊	Δ
• Deltaic areas	Δ	Δ
• Barrier islands	Δ	Δ
• Fresh water lakes in coastal zone	Δ	Δ
• Placer and other mineral deposits	Δ	Δ
• Hydrocarbons (offshore)	◊	Δ
• Salt Pans	◊	Δ
• Mangrove forest	◊	Δ
• Estuaries	◊	□
• Lagoons	Δ	Δ
• Non-Saline groundwater	□	□
• Mangroves	◊	Δ
• Coral Reefs	Δ	Δ
• Fisheries (Marine and Inland)	◊	◊
• Marine biodiversity	◊	◊
• Sea grass/ weeds	Δ	Δ
• Renewable energy (wind, waves, tides)*	◊	◊
• Geothermal*	◊	Δ
• Heritage and archaeological sites	□	□

Potential and/or occurrence						
◊	High	□	Moderate	Δ	Low to Nil	* = Not utilized

3.3.1 Forest Ecosystem

In MMR, the total area under forest and scrubland is ~1310 km^2 or 31%. The major forest types are evergreen, semi-evergreen, deciduous and mixed. The MMR has five sanctuaries – Sanjay Gandhi National Park (SGNP), Tungareshwar, Phansad, Karnala and Tansa. Matheran is one of three ecological hotspots in India that has been designated as Eco-Sensitive Zone (ESC). The SGNP is the largest national park in MMR. The 103 km^2 Park has very good biodiversity and is famous for wildlife. In 2009, there were 22 panthers, 7 tigers and 4 lions in SGNP. In comparison, CMR does not have much of green cover (< 2%), except the Guindy National Park (270 ha), which is under reserve forest category.

3.3.2 Wetland ecosystems

Wetlands are a critical environmental resource that function as wild life habitat and provide various ecosystem services. Wetlands, including mangroves, tidal flats and salt pans cover about 8.3% (350 km^2) of MMR.

Mangroves have been an integral part of the landscape of Mumbai since its inception. The halophytic trees are mainly confined to areas around Thane Creek. NDVI analysis indicates that in 2008, ~71 km^2 area was occupied by thick mangroves (Table 6.6). In Greater Mumbai, the density of mangrove trees is highest in Thane Creek (30 trees/25 m^2) followed by other creeks (Vijay *et al.*, 2005; Patil, 2009).

Salt pans are areas where artificially hyper saline conditions are created to extract crude salt during the dry season. In MMR, salt-pans are associated with tidal flats and mangrove covered areas, and cover about 30 km^2 area. These pans are confined mostly along the Thane Creek and on the creeks on the western margin of the Mumbai city.

Apart from Guindy National Park, the only other hot spot in Chennai area is the Pallikaranai Swamp or marshland. The partly saline and largely freshwater marshland is characterized by a variety of aquatic grass species and waterlogged areas. No noteworthy mangrove forest occurs within CMR and the area under salt farming is significantly less (~ 5 km^2).

Table 6.6. Areas under mangroves in MMR in km².[*]

Year	Marginally stressed	Stressed	Highly stressed	Total area
1997	24.3	75.2	23.9	123.4
2008	11.9	46.4	12.5	70.8
Change	-12.4	-28,8	-11.4	-52.6

3.3.3 Marine Ecosystems

No coral reefs or flats are present off the coast of Chennai or Mumbai. Sea grasses are virtually absent from the MMR and CMR coasts. Seaweeds such as *Gracilaria verrucosa* have been reported from some parts of the Chennai coast. *Halophila stipulacea* has also been described from the Kalpakkam and other areas of CMR. Salt tolerant grasses are associated with the mangroves in the Thane Creek and some other areas of Mumbai.

3.3.4 Marine Fishery Resources

With a long coastline, the two port cities are major centers of marine fishing in India. Fisheries are an important allied activity, which provides employment and sustainable income to thousands of people. Chennai and Mumbai are also the two biggest seafood-exporting ports in India. The cities contribute about one-third of India's seafood export.

Resource potential in the marine zones of Mumbai and Chennai could be evaluated from the marine fish production. On an average, Pelagics formed 53.1%, Demersals 34.5%, Crustaceans 9% and Molluscs 3.3% of the total landings between 1986 and 2007 in Tamil Nadu State. The corresponding values for Maharashtra State are 37.5%, 25.5%, 31% and 5.6%. The share of Greater Mumbai is 45% in the total marine fish production in the Maharashtra State (Table 6.7).

Shrimps, Prawns, Ribbon fish, *Achoviolla, Harpodon Nehereuse, Otalithes sp. Upenaides sp.* Cuttle fish and Squids account for 2/3rd of the total seafood production in Greater Mumbai as well as rest of MMR. In comparison, seafoods like Lesser Sardines, Perches, Silver bellies, Mackerel, Sciaenids, Skates and Rays, Penaeld Prawns, Crabs and Cephalopods constitute a large proportion of the total fish landings in Chennai. The quantity exported from JNPT is highest and that from the Mumbai Port is negligible (Table 6.8).

[*] Classification based on NDVI values.

Table 6.7. Marine and inland fish projection in the districts of MMR and CMR.[*]

Metropolitan Region	Districts	Marine fish Production in tons
Mumbai	Greater Mumbai (2001)[a]	1,55,895
	Thane (2008)[b]	1,09,016
	Raigarh (2008)[b]	33,273
Chennai	Chennai (2008)	6,540
	Kancheepuram (2008)	31,850
	Tiruvallur (2008)	10,570

Table 6.8. Portwise marine product export.[**]

Ports		Share %[***]	2008-09
CHENNAI PORT	Quantity in tons	6.48	39043
	Value in million USD	12.62	240.80
MUMBAI PORT	Quantity in tons	0.38	2319
	Value in million USD	2.02	38.60
JAWAHARLAL NEHRU PORT, MUMBAI (JNPT)	Quantity in tons	21.04	126853
	Value in million USD	17.26	329.52

3.4 Soils and Land Use Structure

Basalt is the dominant rock type in the MMR region. Therefore, the soils of the region are essentially derived from Deccan Trap basalts. Depending upon the rainfall and geomorphic situation the soils range from deep black to reddish lateritic soils. There are four main types of soils in MMR — (a) black soils or vertisols, occur in the low-lying areas, along rivers and in intervening spaces between hills and ranges, (b) yellowish-brown or light coloured coarse soils occupying hillslopes, (c), lateritic soils occurring in areas of heavy rainfall and humid conditions, particularly at higher elevations, and (d) Saline soils or *khar*, found on flat, leveled land close to the sea and along estuaries.

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[*] Source: Statistical Handbook (2010); Department of Economics and Statistics, Gov. of Tamil Nadu; [a] = Statistical Abstract of Maharashtra State 2000-01, Directorate of Economics and Statistics, Government of Maharashtra, Mumbai; [b] = District Economic Survey of Thane and Raigarh (2010).

[**] Source: Marine Product Export Development Authority, Ministry of Commerce and Industry (http://www.mpeda.com).

[***] = of the total Indian export.

The CMR is underlain by a variety of rocks. As a result, there is spatial variation in the type of soils. However, except in the hilly area, most of the coastal lowlands are covered by coastal or riverine alluvium. The three main types of soils in CMR are — (a) sandy soils, which occur along the coast and the lower reaches of the Adyar and Cooum Rivers, (b) clay and clay-shale occupy the interfluves between Adyar and Cooum Rivers, as well as to the north of the Adyar River, and (c) laterite and gravelly lateritic soils occur in the northeastern part of the CMR.

The discussion on land use structure is primarily based on our interpretation of 5.8 m-resolution Indian Remote Sensing images (IRS) of 1997 and 2008. Figure 6.7 and 8 respectively show the land use pattern in 2008 and Tables 9 and 10 give the percentage area under different land use categories. In MMR, the built-up area covers about 10.2% of the total geographical area, but within Greater Mumbai, this category covers five times more area (48.2%). In CMR, the built-up area is ~37%. Within the Chennai, the figure increases to 71%.

Table 6.9. Land use distribution in MMR in 1997 and 2008.[*]

Land use type	1997 Area in %		2008 Area in %	
	MMR	Greater Mumbai	MMR	Greater Mumbai
Built-up	8.06	45.05	10.19	48.05
Agriculture	31.79	2.27	28.50	2.00
Dense Forest	15.34	12.38	11.32	7.95
Sparse Forest and Scrubland	13.95	2.26	19.17	7.83
Mangroves	3.95	12.13	3.68	11.74
Salt Pans	0.52	0.77	0.69	1.83
Water bodies	1.91	2.17	2.72	2.73
Others (open, barren, tidal, etc.)	24.32	22.96	23.41	17.31
Masked area	1.17	0.00	0.32	0.58

[*] Based on interpretation of 5.8 m-resolution IRS images for this study.

Table 6.10. Land use distribution in CMR in 1997 and 2008.[*]

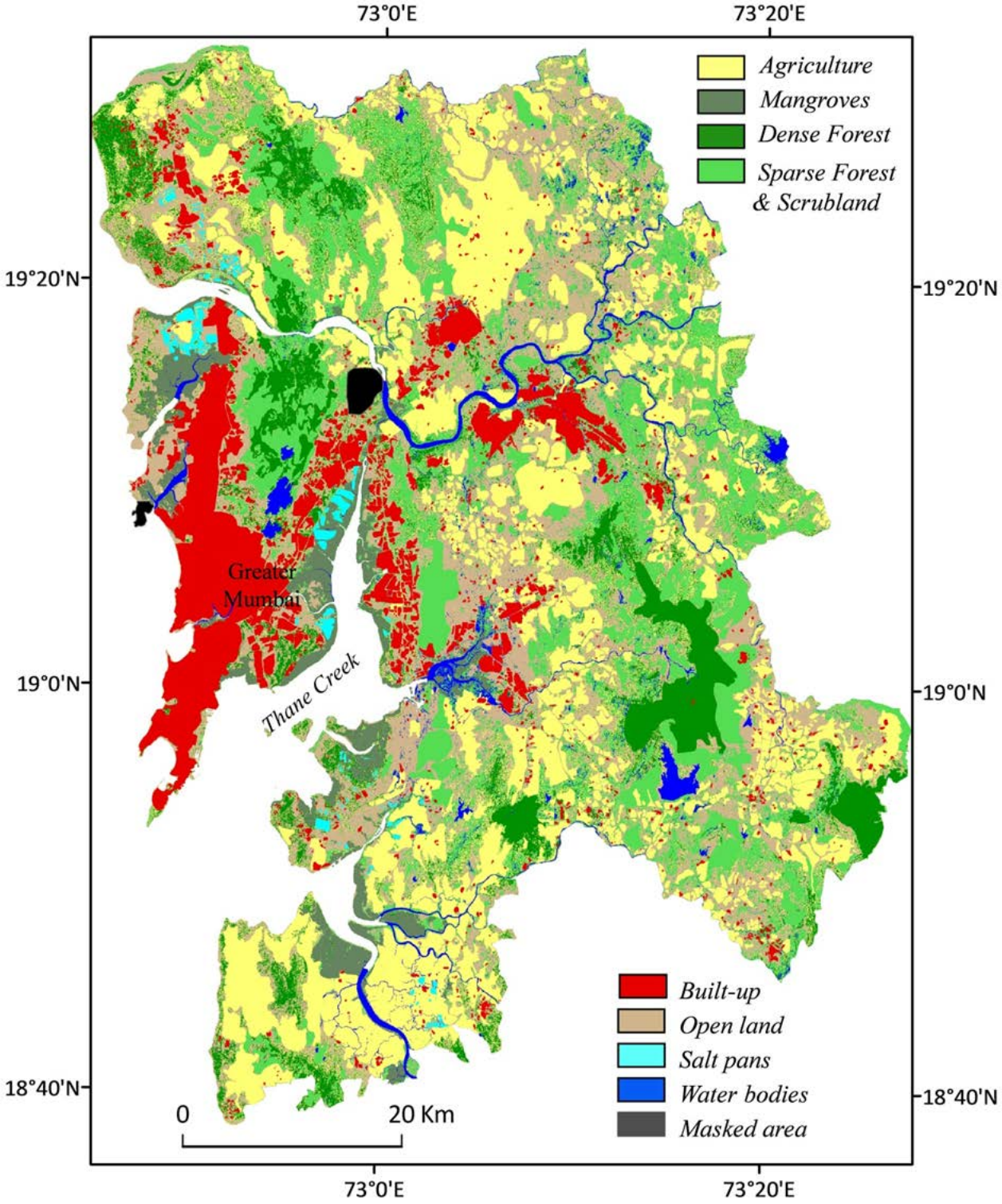
Land use type	1997 (area in %)		2008 (area in %)	
	CMR	Chennai City	CMR	Chennai City
Built-up	28.38	65.60	37.00	71.12
Agriculture	17.06	0.88	11.96	0.00
Water bodies	10.07	2.93	10.61	2.96
Forest	1.35	1.45	1.29	1.41
Salt Pan	0.46	0.00	0.42	0.00
Others (including open space, barren area, hills, beaches, dunes, etc.)	33.99	29.15	36.83	24.51
Masked area	8.68	--	1.89	--

The area under agriculture in MMR is about 29%, but only about 12% of the CMR was under agriculture in 2008. In Chennai City, there is practically no area under agriculture. However, in Greater Mumbai there seems to be at least 2% area under agriculture.

Forest and wetlands cover a sizable area of the MMR. About one-third area is under dense or sparse forest and scrubland. Nearly 8.3% area is under wetlands. Water bodies constitute only about 2.7% of the areas. Within CMR, the area under water bodies is at least 10.6% and forest cover is negligible (< 2%).

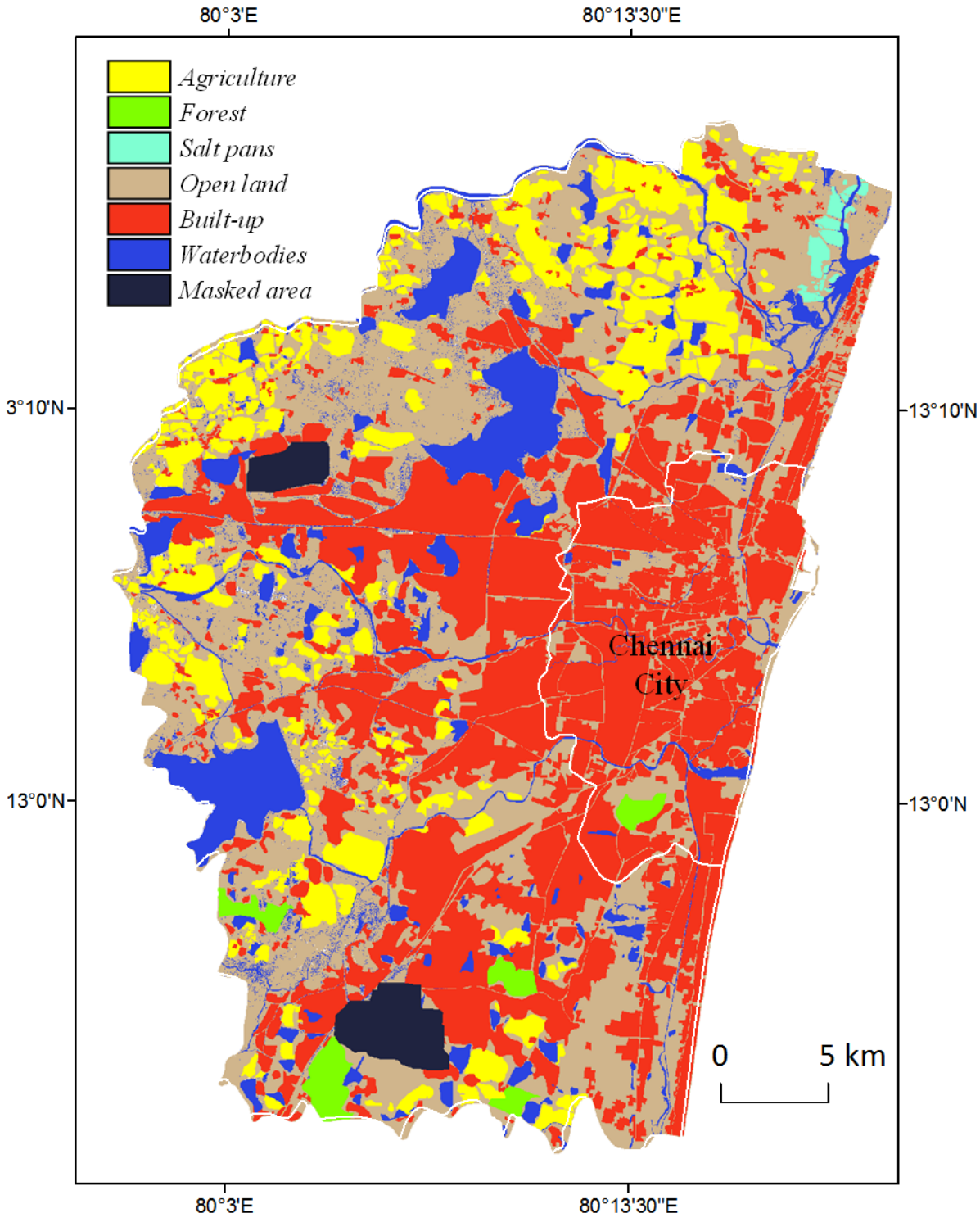
[*] Based on interpretation of 5.8 m-resolution IRS images for this study.

Figure 6.7. Mumbai metropolitan land use map (2008).[*]



[*] Source: Based on IRS image interpretation.

Figure 6.8. Chennai Metropolitan Region land use map (2008).[*]



[*] Source: Based on image interpretation.

3.5 Freshwater and Access to Water

Inadequate water supply and sanitation are the major problems faced by all the urban agglomerations in India, including Mumbai and Chennai. Highly seasonal rainfall, seasonal rivers, inadequate water storage capacity and depleting groundwater reserves have combined to increase the gap between freshwater demand and water supply. Data given in the District Handbooks indicate that in 2001, 95% of the population in Greater Mumbai and 82% of the population in the ring had access to water in MMR. In CMR, it is claimed that 100% population had access to water in 2001. However, these data are not reliable, because today there is acute shortage of water in CMR.

There are three major sources of drinking water in the two metropolitan cities: - rivers, tanks and groundwater. The rivers of the two metros do not have enough discharge to meet the enormous demand of water of the two cities, unless dammed. Greater Mumbai has three man-made lakes, namely Tulsi, Vihar and Powai. All these lakes (excluding Powai), however, provided only 17% of the total water supply to the city. The remaining 83% come from reservoirs located >100 km away from the city.

Till recently, apart from groundwater, Chennai was dependent for its water supply to a large extent (2/3rd) on surface storage in the reservoirs of Poondi (located outside CMR), Red Hills and Cholavaram. Two anicuts (bunds) constructed downstream of Poondi Reservoir provide water to some residential and industrial areas in CMR.

3.6 Cultural and Social Features

The culture of the two metropolitan cities has been shaped by their unique geography and long history. Although both the cities are overwhelmingly dominated by Hindus (60 to 90%), the people of Tamil Nadu (Chennai) and Maharashtra (Mumbai) belong to two different ethnic groups. As a result, there are striking differences in their culture due to differences in language, script and ancient history.

Mumbai is the capital of Maharashtra. The Maharashtrians belong to the Indo-Aryan ethnic group of western India. The Marathi language is an Indo-Aryan language of the larger Indo-European language family. Maharashtra is the territory of Maratha rulers. The founder of the Maratha Empire, Shivaji, is considered a folk hero in Maharashtra and across India. *Deepawali* (the Festival of lights) and *Ganeshotsav*, are the main festivals in Mumbai and whole of

Maharashtra. Being hometown of people of all diversified communities, Muslim, Christian, Parsis and Jain festivals are also celebrated with great enthusiasm.

Chennai is located in Tamil Nadu, which is the home of Tamil people for more than two millennia. Tamilians belong to the Dravidian ethnic group, who natively speak languages belonging to the Dravidian language family. *Pongal* is the 'State Festival'. It is a harvest festival. *Deepawali*, the most important Hindu festival, is also celebrated. Being multi-cultural city, all other major festivals like Eid and Christmas are also celebrated.

3.7 Archeology, Heritage and Historical Places

Both, Mumbai and Chennai display a rich cultural and historical heritage and are British creations. The British legacy is evident in architectural style of many buildings in the two cities.

The list of the outstanding and prominent heritage structures in Mumbai includes World Hertiage sites such as Elephanta Caves and CST Building as well as Gateway of India, Central Library, Sailor's Home, Crawford Market, Churchgate Station, Mumbai High Court, KEM Hospital, General Post Office, etc. The protected monuments include the ca. 2000 year old Kanheri and Mahakali Caves.

Mumbai also has many medieval forts such as Mahim, Worli, Shiv and Shivdi Forts and the Hirakot Old Fort near Alibag. There are many famous places of worship. The Mahalakshmi Temple and the Siddhivinayak Temple are visited by millions of Hindus every year. Mount Mary Church, St. Thomas' Cathedral and St. Michael's Church are important churches in Mumbai and Haji Ali is a venerated tomb (dargah) by the Muslims.

There are a large number of other tourist spots in Mumbai. These include Sanjay Gandhi National Park, Essel World, Film City, Gorai, Manori, Juhu and Chowpatty beaches, Marine lines, Taraporwala Aquarium, etc.

Chennai is a city of temples, churches, mosques and dargahs. There are over 250 heritage structures in Chennai. Some of the prominent ones are - Fort St. George (17^{th} century), Public Works Department building, Bharathiyar Illam, Rippon Building, Madras War I Cemetery, Queen Mary's College, Museum Theatre and Connemara Library complex, Madras Club, Empress Victoria Memorial Hall, Memorial Hall, Egmore Railway Station, Mercantile Bank of India, Central Railway Station, Presidency College, Senate House of the Madras University and the Madras High Court buildings.

Major religious places in Chennai include Kapaleeshwarar, Parthasarathy, Kailasanatha, and Vaikuntha Perumal Temples, Anderson, St George's Cathedral, Christ and Chinnamalai Churches, Andrew's Kink, Santhome Cathedral Basilica. The famous mosques and dargahs include the Makka Masjid, Grand Mosque, Thousand Lights Mosque, Anna Salai Dargah, Hazrat Baba Dargah, Mohammad Ismail Sahib and Qadri Baba Dargah. However, the most visited tourist places in and around Chennai are Mahabalipuram and Kanchipuram. The former has 7th century temple complex and is a world heritage site and the latter has many ancient temples and is aptly known as 'the city of 1000 temples'.

3.8 Demographic Profile

The two coastal cities have registered a dramatic increase in population during the last four decades. Between 1971 and 2001, the population of MMR has increased by a factor of 2.5 and during the same time period, the population of CMR has almost doubled (Figure 6.9). Apart from natural growth, large-scale migration has been primarily responsible for this phenomenal increase in population. While the population in the core and outer ring has increased significantly between 1991 and 2001, the relative proportion of male and female has remained constant (Table 6.11). The percentage of children below the age of 6 years has, however, declined.

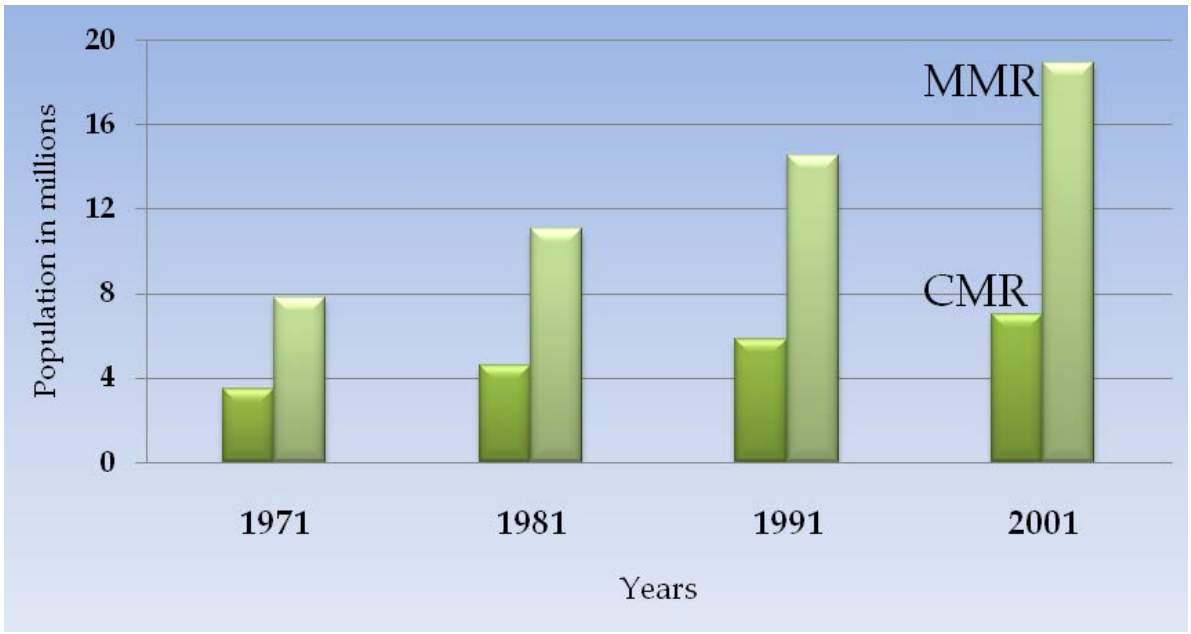
The average population density in MMR is about 4445 persons/km^2 and in CMR, it is nearly 6042 persons/km^2. These values are respectively 14 and 19 times higher than the national average (324 persons/km^2). Figure 6.10 illustrates that some wards in the core have density exceeding 100,000 persons/km^2, implying very high population pressure on land.

Sex ratio, which is denoted by number of females per 1000 males, is significantly higher for CMR (957) than MMR (822). The national average (933/1000) is higher than MMR but lower than CMR. The low ratio in case of Mumbai is primarily due to migration of male population into the city from different parts of the state and India for jobs and education. About 2/3rd to 3/4th of the population is literate in the two cities (Table 6.11).

Table 6.11. Demographic features of the two metropolitan regions – 1991 and 2001.[*]

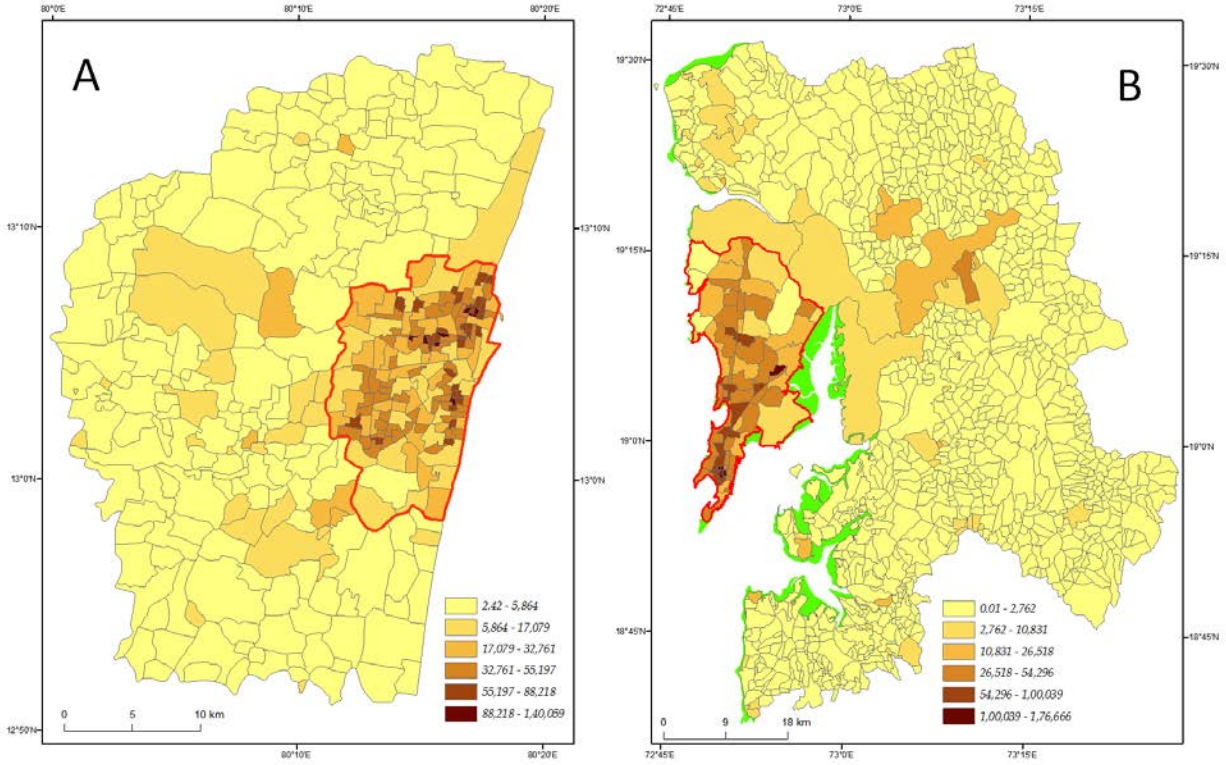
Demographic and Socio-Economic Parameters	Mumbai Metropolitan Region				Chennai Metropolitan Region			
	1991		2001		1991		2001	
	Core	Outer Ring	Core	Outer Ring	Core	Outer Ring	Core	Outer Ring
Total Population in million	9.93	4.55	11.98	7.38	3.84	1.59	4.34	2.84
Total Male population %	55.01	53.66	55.27	54.23	51.71	51.70	51.10	51.14
Total Female population %	44.99	46.34	44.73	45.77	48.29	48.30	48.90	48.86
Sex Ratio	818	864	809	844	934	934	957	955
Total Population below 6 years %	13.51	16.06	11.39	13.41	12.20	13.91	9.98	11.42
Total Literate %	71.67	63.65	76.87	73.32	71.65	65.97	76.82	69.21
Male Literate %	77.15	70.12	81.40	78.41	77.30	73.49	81.10	69.11
Female Literate %	64.98	56.17	71.28	67.32	65.60	57.91	72.35	69.31

Figure 6.9. Population growth of Mumbai (MMR) and Chennai (CMR) metropolitan regions, between 1971 and 2001. (MMRDA, 1999 and CMDA, 2008).



[*] Source: Based on 1991 and 2001 Census data.

Figure 6.10. Population density (persons/km²) map of Chennai (A) and Mumbai (B) Metropolitan Regions – 2001. Classification based on natural breaks.



3.8.1 Migrant Population

Mumbai is a highly cosmopolitan city, primarily due to migrants from all over India in general and the north Indian states in particular. In comparison, most of the migrants in Chennai are from within the state or adjoining states. Primarily, the migrants are from rural areas. As per census definition, the ratio of total migrants to the total population multiplied by 1000 is migration rate, and is synonymous to term population mobility.

Table 6.12. Migrant population in Greater Mumbai and Chennai City** from 1961 to 2001.*

Metro Region	Unit	1961	1971	1981	1991	2001
Greater Mumbai	in million	2.66	3.37	4.23	3.69	5.18
	Migration rate	641	564	512	372	433
Chennai	in million	0.64	0.78	1.01	0.92	0.94
	Migration rate	372	316	307	239	216

* = Greater Mumbai Municipal Corporation (mcgm.gov.in).

** = CMDA (2008).

In 2001, a little less than half of the total population of Greater Mumbai was classified as migrants, i.e. the migration rate was 433. This proportion was almost two-third in 1961 (Table 6.12). Within MMR, the maximum total migrants are found in the ring (Table 6.13), perhaps because there was no scope for new migrants in the core. Hence, many of them have settled in the neighbouring districts. Similar picture is seen for the ring of CMR. Of the total migrants in Greater Mumbai nearly 2/3rd are from other Indian states such as Gujarat, Uttar Pradesh, Karnatak and Bihar. In rest of MMR, the proportion of migrants from other states is lower.

Table 6.13. Total migrants in the core and the outer ring of the MMR and CMR (2001 census).[*]

Type of Migrants	Mumbai Metropolitan Region				Chennai Metropolitan Region		
	Greater Mumbai		Rest of MMR		Chennai	Rest of CMR	
	Mumbai	Mumbai suburban	Thane[**]	Raigarh[**]	Chennai	Thiru-vallur[**]	Kanchee-puram[**]
Total Migrants %	39.32	44.82	56.63	55.17	21.57	42.66	36.09
Migrants born within the state of enumeration	40.5	36.3	61.1	83.9	74.5	92.1	96.5
Migrants born in other states of India	58.1	62.2	37.9	15.8	23.8	7.9	3.5
Migrants born in other countries	1.4	1.4	1.0	0.3	1.6	0.8	0.3

In Chennai City, about 22% were migrants in 2001. In the CMR, the percentage is 22% and in the ring the proportion is about 36-40%. About 75% of the migrants were from within the state of Tamil Nadu, 24% from other parts of India (primarily neighbouring states) and <2% from other countries. In both the coastal cities, the prominent reasons for other-state and within-state migration are - work and employment, business, education, marriage etc.

[*] Source: DCOM (2001a,b,c,d) DCOTN (2001a,b,c).

[**] Includes some area outside metro region.

3.9 Important Economic Features

The first textile mill was established in Mumbai in 1850. Until 1980s, the textile industry was the leading and biggest employer in the mega city. There are large number of working factories within the core and ring of the two cities (Table 6.14).

In Greater Mumbai, the number of industries dealing with fabricated metals, garments and hosiery, wood and furniture works, printing, rubber and plastic, chemicals and motor vehicles, etc. is higher and they provide large-scale employment opportunities. The textile industry was the largest employer with nearly 19% of the work force in 2001. Next is the motor and transport industry that employs about 16% of the workers in Greater Mumbai. There are four major industrial clusters in MMR (Murthy *et al.,* 2001) — (a) Thane–Belapur belt, (b) Kalyan–Ulhasnagar–Ambernath belt, (c) Western shore of Thane Creek and (d) Around Patalganga River. These industries primarily deal with the production of dyes, pharmaceuticals, chemicals, plastics, petro and agrochemical, fertilizers, and refined petroleum products. Film Industry is an exceedingly important industry in Mumbai that employs a very large number of people.

Temporal changes in the workers' occupation have undergone a clear shift from manufacturing industry to trade and commerce between 1961 and 2001. The construction industry workers increased nearly two times from 1961 to 2001 (Singh, 2010).

Table 6.14. Number of working factories and employees in MMR and CMR.

Metropolitan Region	Districts	Number of Working Factories	Number of employees
Mumbai (2001)*	Greater Mumbai	6,910	341,450
	Thane	3,868	137,108
	Raigarh	874	54,817
Chennai (2005-06)**	Chennai	2,706	33,256
	Tiruvallur	2,170	194,872
	Kancheepuram	1,628	84,785

In CMR, many of the heavy industries are clustered in the Manali and Ennore areas. These industries include petrochemicals, paint, sugar, fertilizers, thermal power, etc. Chennai is

* Source: Directorate of Economics and Statistics, Gov. of Maharashtra, Mumbai (2001).

** Online District Handbooks of Chennai, Tiruvallur and Kancheepuram (2005-06).

nicknamed as the 'Detroit of Asia' because of the large number of major automobile industries and auto parts manufacturers located there. Auto giants include Ashok Leyland, Ford, BMW, Hindustan Motors, Hyundai, Mitsubishi, etc. India's heavy vehicle factory is also located within CMR (at Avadi).

3.9.1 Occupational Structure

In 2001, 37.2% of the population in MMR and 34.2% population in CMR participated in some or the other economically productive activity.

The total percentage of workers engaged in the agricultural activity in the two coastal cites is only 3% (Table 6.15). Workers engaged in activities, other than agriculture and household industry, have been classified in the 2001 census as 'Other Workers'. Nearly 95% of the work force in MMR and CMR is engaged in such activities (Table 6.15). The involvement of women in these activities is only on a limited scale.

Table 6.15. Salient features of the working population of MMR and CMR – 2001 Census.[*]

Worker population	Mumbai Metropolitan Region			Chennai Metropolitan Region		
	Total	Male	Female	Total	Male	Female
Total workers %	37.2	83.3	16.8	34.1	80.6	19.3
Total non-workers %	62.8	38.0	61.9	65.8	35.7	64.2
Total marginal workers %	7.3	83.3	16.6	9.3	68.7	31.2
Total workers engaged in Agriculture %	2.4	62.3	30.9	3.0	66.2	33.7
Total workers engaged in Household industry%	2.4	69.0	30.9	1.9	60.2	39.7
Total workers engaged in other activities %	95.1	86.1	13.8	95.0	82.8	18.0

Greater Mumbai and Chennai City are the major employment hubs. The core areas respectively employ about 63% of the total working population in the metropolitan region. Other major urban centers of employment in MMR are Navi Mumbai, Kalyan, Bhiwandi and Thane. About 7.4% of work force in MMR and 9.3% workers in CMR were unemployed for a major part of the reference period. Nearly 1/4th to 1/5th of the population in the working age group was unemployed in Greater Mumbai and Chennai (core areas) in 2001.

[*] Source: Based on 2001 Census data.

3.9.2 Economy

Mumbai is the financial and commercial capital of India and thus the powerhouse of the country. Mumbai contributes about 33% of the country's income tax, 60% of customs duty, and 40% of the foreign trade. The share of Chennai City and CMR in the state's economy is respectively 10.9% and 16.2%.

Table 6.16. Economic and social indictors of development of the four metropolitan cities.[*]

Sector	Indicator	Mumbai	Delhi	Chennai	Kolkata
Economy	Total GDP at current prices, 2006-07 (in billion INR)	2.01	1.61	0.32	1.00
	GDP Growth Rate (2001-02 to 2006-07) in %	8.5	8.4	6.2	6.3
	Gross District Product Per Capita (in INR)	43000 USD 860	39000 USD 780	34,000 USD 680	33,000 USD 660
	Population below poverty line (2001) in %	27	8	20	6
	Economic disparity (% of low and lower middle Income households, 2002) in %**	27	18	42	32
Work force	Total workers (2001) in %	37	32	34	--
Slums	Slum population (2001) in %	54	35	19	31

The economic base of the two cities has traditionally been industry, trade, commerce and services. However, in the last decade or so the contribution of Information Technology (IT) sector to their economy has increased phenomenally. The total GDP and GDP growth rate of Mumbai is much higher than other Indian metropolitan cities (Table 6.16). The share of Chennai to the nation's economy is comparatively small.

Gross District Product Per Capita is highest for Mumbai, and Chennai ranks third amongst the major urban agglomerations. However, about one-fourth of the population in Mumbai is below poverty line and the proportion of lower and lower-middle income households is nearly 27%. In Chennai, one-fifth of the population is below-poverty line and nearly 42% of the city's households belong to the lower and lower-middle income group. This indicates that the economic disparity is considerably higher in Chennai than in Mumbai.

[*] Source: City Development Plan: CPO'S Office, Collectorate, Greater Visakhapatnam Municipal Corporation.

4. Overview of Users

4.1 Inhabitants/Households

Table 6.17 gives the salient features of the two metro cities with respect to inhabitants and households. About 70% of the inhabitants live in the core of the metropolitan region. In Greater Mumbai, about 68.7% of the total inhabitants live in the core area, which is only 10.7% of the geographical area of the total metropolitan region. In CMR, ~71% inhabitants are cramped in 15% of the core area. This gives a density of 21,404 inhabitants/km^2 in Greater Mumbai and 22,077 inhabitants/km^2 in Chennai.

Table 6.17. Salient features of the inhabitants and households in MMR and CMR in 1991 and 2001.[*]

Region	Mumbai Metropolitan Region				Chennai Metropolitan Region			
	1991		2001		1991		2001	
	Core	Ring	Core	Ring	Core	Ring	Core	Ring
Area in km^2	466	3,889	466	3,889	174	1,015	174	1,015
Area in %	10.7	89.3	10.7	89.3	14.7	85.3	14.7	85.3
Total Inhabitants	9,974,436	4,552,055	11,978,450	7,384,713	3,841,396	1,585,887	4,343,645	2,839,909
Total number of Households	2,062,219	970,583	2,515,589	1,620,367	798,279	342,846	962,213	651,301
% of Total Households	68.0	32.0	60.8	39.2	70.0	30.0	59.6	40.4
Average household size	4.84	4.69	4.77	4.56	4.81	4.63	4.51	4.36

As expected, the number of inhabitants and the density is lower in the ring. However, the ring zones have witnessed a noteworthy rise in the number of inhabitants as well as density between 1991 and 2001.

The core-ring ratio of inhabitants is also maintained for the households. Two-third of the households are confined to the core areas. The average family size in both the metros is close to 4.5 persons. The size is highest in Greater Mumbai (the core).

[*] Source: Census of India 1991 and 2001.

4.2 Tourism

Tourism is an important economic activity as it directly contributes to the economy of the city, the state and the nation.

Mumbai, known as the city that never sleeps, is the financial and commercial capital of the country, centre of world's largest film industry (aka Bollywood) and shopper's paradise. This business-cum-tourist center has many other attractions, such as the Kanheri and Elephanta Caves, Gateway of India, Juhu Beach etc. as well as performances in music, dance and theater. The Sanjay Gandhi National Park is yet another most visited place in the city. Mumbai is also emerging as an important IT center. As a result, Mumbai attracts professionals as well as non-professionals, from all over the country as well as world.

Numerous temples and churches, rice based cuisine, as well as shopping for silks and handicrafts and handlooms attract domestic and international tourists to Chennai. Other attractions are theater, art galleries and the Theosophical Society. Mamallapuram temple town, located about 60 km from Chennai, is one of the most visited tourist places via Chennai. Chennai is also popular for the glamour of Tamil Film Industry (aka Kollywood).

Table 6.18. Number of visitors to the protected and ticketed monuments in and around Mumbai and Chennai.[*]

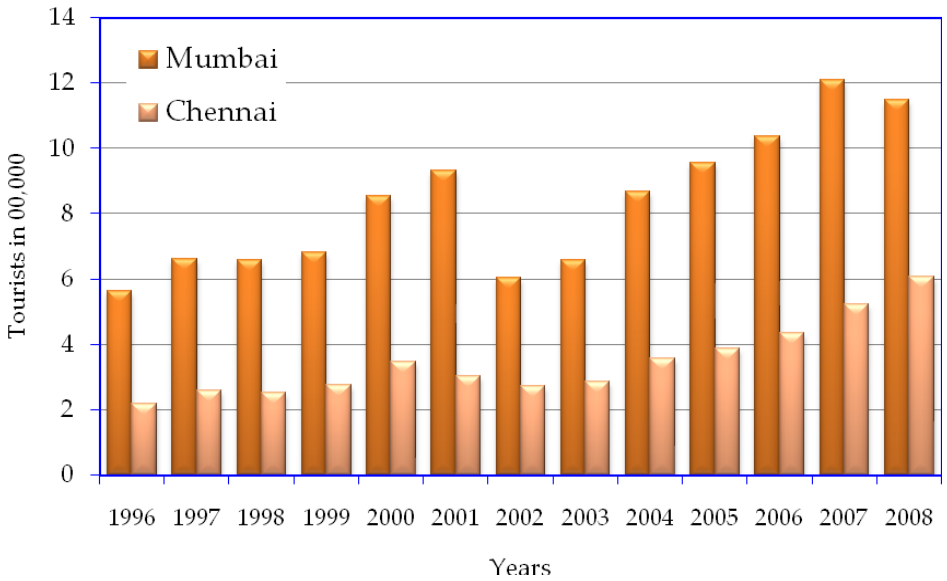
	2006		2007		2008	
	Domestic	International	Domestic	International	Domestic	International
Mumbai						
Elephanta Caves	278,517	20,202	234,225	20,332	240,042	16,924
Kanheri Caves	49,094	1663	79,557	2644	103,844	3,252
Karla Caves	95,482	838	94,073	790	77,134	692
Chennai						
Mamalla-puram	721,593	58,922	802,000	71,055	241,520	36,163
St.George Fort	24,374	5,678	23,217	7,110	--	--

[*] Source: India Tourism Statistics (2008). Ministry of Tourism, New Delhi (http://www.incredibleindia.org/Tourism_Stastics2008.pdf).

A survey of domestic tourists by the Ministry of Tourism (MoT) in 2002-03 reveals that both the cities were visited by about 1.66% of the total domestic Indian tourists. Domestic tourists overwhelmingly dominate the tourist population. The number of tourists visiting ticketed monuments gives some idea about the tourist population in Mumbai (Table 6.18). Needless to say the figures are under-estimation of the total number tourists visiting Mumbai.

Mumbai and Chennai are major entry points for foreign tourists. According to Ministry of Tourism, (MoT) Government of India, Mumbai is the destination of about 21% and Chennai receives about 12% of the international tourists. Mumbai is the "Gateway to India" and the financial and commercial capital of India. Therefore, it is the most preferred destination in India. In 2008, the city received 1.1 million international visitors (Figure 6.11), out of which nearly 1/3rd were from UK and US. In 2000, of the total foreign tourists disembarking at Mumbai, 37% were from Europe and 23% from North America. Of the total international tourists arriving in India in 2008, 27% of the foreign tourists from North America, 28% tourists from South America and 25% tourists from Western Europe arrived in Mumbai.

Figure 6.11. International tourist arrivals in Mumbai and Chennai.[*]



[*] Source: India Tourism Statistics (2008). Ministry of Tourism, New Delhi (http://www.incredibleindia.org/Tourism_Stastics2008.pdf).

Chennai and its surrounding areas have a number of places to attract domestic and foreign tourists. Apart from this, it is growing as a hub of automobile industry. While the number of domestic tourists visiting Chennai increased from 5.5 million in 2004 to 7.31 million in 2006 (CMDA, 2008), the number of foreign tourists increased from 0.21 million in 1996 to 0.61 million in 2008 (Figure 6.11). Of the total international tourists arriving in India in 2008, 31% of the foreign tourists from South East Asia, 17% tourists from South Asia and 9% tourists each from Western Europe and East Asia arrived in Chennai.

4.3 Hotels and Restaurants

Over the last few decades the increasing number of tourists, businessmen and traders has made the hotel industry very lucrative in Mumbai and Chennai as well as other cities of India. One of the main reasons is that travel has become affordable, particularly air travel. As a result, there has been a proliferation of hotels (budget hotels to 5-star deluxe hotels). Same is the case with restaurants. Some data for the hotels approved by the Government of India are available for Mumbai, Thane, Matheran and Chennai (Table 6.19).

Table 6.19. Number of approved hotels and hotel rooms during 2007-2008.[*]

Metro	Hotel type	5 Star Deluxe	5 Star	4 Star	3 Star	2 Star	1 star	Apartment Hotel	Unclassified	Total
MMR	Mumbai	16	8	14	30	29	2	3	11	113
		5434	1488	1046	1898	1151	79	312	1450	12858
	Thane	-	-	-	4	3	-	-	-	7
		-	-	-	202	78	-	-	-	280
	Matheran	-	-	-	2	2	-	-	-	4
		-	-	-	102	86	-	-	-	188
CMR	Chennai	5	6	5	30	15	9	-	6	75
		1034	763	745	2244	533	249		629	6197

[*] Source: India Tourism Statistics (2008). Ministry of Tourism, New Delhi (http://www.incredibleindia.org/Tourism_Stastics2008.pdf)

4.4 Industry, Trade and Commerce

According to 1991 and 2001 census, the work force in the two metropolitan regions is about one-third of the total population of which, maximum proportion of workers is found to be in secondary and tertiary sectors. The tertiary sector includes, trade and commerce and other services. The trade and commerce sector is the largest sector, contributing over one-third of the workforce in Greater Mumbai and one-fourth of the workforce in Chennai, followed by manufacturing, transport and construction sectors (Table 6.20).

Greater Mumbai is one of the greatest industrial centers of the country, dominated by private sector industrial units. Private industries such as textiles, petroleum, chemicals, clothes, readymade garments, edible oil, gold ornaments, plastic, medicines, etc. are the main items manufactured in Greater Mumbai and other industrial areas of MMR. Presently, unlike rest of the MMR, Greater Mumbai is dominated by tertiary sector (trade, transport, IT, real estate, etc.).

Table 6.20. Sectorwise distribution of industrial workers in Greater Mumbai and Chennai City.

Industrial activity	Greater Mumbai – 2001*	Chennai City – 1991**
Agricultural	1.12	0.10
Manufacturing	28.79	23.55
Construction	6.41	6.39
Trade and Commerce	32.9	25.68
Transport and storage	12.11	10.74
Other services	18.65	33.54

The manufacturing sector of Chennai comprises large industries such as petrochemicals and chemical industry, electrical and automobile and related ancillary industries. Many chemical industries are clustered in Manali area. Chennai has now emerged as the automobile capital of India. Chennai has a large base of leather industry. Most of the footwear industries are located within CMR. Some of the largest industrial estates include Ambattur and Manali and small industrial estates include Guindy, Thirumazhisai and Thirumudivakkam in CMR. There are large-scale public sector industries, such as Integral Coach Factory, Heavy Vehicles

* Singh (2010).

** CMDA (2008).

Factory, the Manali Refinery and Fertilizers. Unlike MMR, the public sector units have a substantial workforce in CMR.

4.5 Fishing Fleet

Fishing is an important economic activity and plays a pivotal role in the socio-economic development of the two metropolitan cities. This activity has been important traditionally also. Every region in India has some important castes, whose main and only profession is fishing. In Chennai region the fishing community is know as *Pattinavars* and in Mumbai region the fishing community is known as *Kolis.*

The demand for fresh marine fish has been growing steadily. There is great demand for prawns and pomfret from restaurants and star hotels. Mumbai and Chennai ports are also the two main ports for export of seafood. Increasing demand has also accelerated the growth of aquaculture.

In Mumbai there are about 22 fish landing centers, 23 fishermen villages, 11 important fish markets, 30 fisheries cooperative societies. There are 61 fishermen village and 37 landing sites in Thane District and 159 fishermen villages and 40 landing sites in Raigarh District.

According to CMDA (2008), there are 146 fishing villages, one fishing harbour and 64 fish landing centers within the CMR.

Aquaculture and particularly coastal aquaculture is gaining importance as one of the important economic activities. Unfortunately, information regarding the area under shrimp farms, total production, etc. for the farms located within CMR and MMR is just not available.

4.6 Agriculture

India is dominantly an agricultural country with over three-fourth of the population dependent on agriculture. As per 2001 Census of India, about 58% of the worker population in India was engaged in agriculture as cultivators and agricultural labourers. However, in MMR 2.5% and in CMR 3.1% of the main workers were engaged in this activity in 2001.

In Greater Mumbai and Chennai City there is not much scope for agriculture, due to the severe demographic pressure on open land. Therefore, in the peri-urban areas agricultural workers constitute a noteworthy proportion of the population. Within the core area, the percentage of agricultural workers is negligible (Table 6.21).

The percentage has also decreased significantly between 1991 and 2001. This is to say that more and more cultivators and agricultural laborers are moving to other professions or to other areas for jobs. The CMR's ring, particularly has witnessed a remarkable decline in the agricultural labourers. There is no apparent explanation of the increase in the core.

Table 6.21. Percentage of population engaged in agricultural activity.[*]

	Mumbai Metropolitan Region				Chennai Metropolitan Region			
	1991		2001		1991		2001	
	Core	Outer Ring	Core	Outer Ring	Core	Outer Ring	Core	Outer Ring
Total Cultivators %	0.10	11.20	0.10	4.17	0.08	5.07	1.10	2.23
Total Agriculture Labourers %	0.07	2.46	0.07	2.22	0.02	15.44	0.42	3.37
Total Agricultural workers %	0.17	13.66	0.17	6.39	0.10	20.51	1.52	5.60
Area under agriculture %[**]			2.00	28.29			0.0	11.90

4.7 Port and Harbour

Both the cities have strategic location in South Asia and, hence, important from the standpoint of international sea trade. Mumbai has a natural harbour whereas Chennai has an artificial harbour. The two major ports in Mumbai are – the Mumbai Port Trust (MbPT) and the Jawaharlal Nehru Port Trust (JNPT). The latter is the youngest and the largest container traffic port in India. MbPT is one of the oldest ports in India and has been in operation for 135 years. It handles 1/10th of India's sea traffic. The JNPT port was established in 1989 as a satellite port to MbPT. The ports can handle >50 million tons of cargo traffic annually (Table 6.22). Cargoes such as crude oil, iron steel and automobiles are primarily handled by these ports. In recent years, the shipment of Indian made cars has increased significantly.

[*] Source: Census of India, 2001.

[**] Based on remote sensing for 2008.

Table 6.22. Descriptive statistics of the Mumbai (MbPt) and Jawaharlal Nehru (JNPT) ports.[*]

Items	MbPT		JNPT	
	2007-08	2008-09	2007-08	2008-09
Total cargo capacity in million tons	50.70	47.40	54.3	57.2
Number of employees	14,481	14,296	1,763	1,746
Imports in million tons	32.4	29.5	27.6	27.1
Exports in million tons	24.6	22.3	28.2	27.8
Total in million tons	57.0	51.8	55.8	54.9
Passenger traffic in thousands	59.2	30.9	--	--

The Chennai's man-made harbour was completed in 1896. In terms of the volume of cargo handled, the Chennai Port (ChPT) is the third largest port in India. The major cargo commodities being handled are containers, automobiles, petroleum, oil and lubricants (POL), iron ore, coal, fertilizer and other products. The cargo volume in 2000-2001 was 34.7 million tons and it increased to 47.3 million tons in 2005-2006. Thermal coal, iron ore and POL constitute the bulk of the products handled by ChPT. In 2006, over 10,000 cars were exported.

The Ennore Port (EPT) is the second port in Chennai, located 24 km north of the ChPT. It was commissioned in 2001 to primarily handle thermal coal and POL shipment. EPT is the first corporate port in India and is considered as the 12th major port in India and presently handles ~10 million tons of thermal coal per annum.

4.8 Energy Production Companies

Electric power is one of the key drivers of the economy of the city, state and nation. Presently, Mumbai is one of the few fortunate metropolitan cities in India, that have uninterrupted power supply 24 x 7. This has been one of the major factors that has attracted and sustained the industrial sector, as well as trade and commerce. In CMR, power shutdown or 'holiday' is a major constraint to the industrial sector.

The power demand in Greater Mumbai is more than 2 gigawatts. This is almost equivalent to the demand of the entire CMR. The enormous demand is largely met by hydro-power generated outside the city area. Mumbai has one nuclear power based plant and one

[*] Source: Economic Survey of Maharashtra, 2009-10, Gov. of Maharashtra, Mumbai.

major private thermal power plant. The third plant (DTPS) is located just outside the MMR boundary (Table 6.23).

The Bombay Electric Supply and Transport (BEST) supplies power to the Mumbai city and the Reliance Power serves the western suburban area. Rest of MMR is provided by the Maharashtra State Electricity Distribution Company Limited (MSEDCL). Some of the power is provided by Tata Electric Companies (TEC).

Table 6.23. The main power plants in MMR and CMR.[*]

Metropolitan Region	Name of the Power Station	Type/ base	Installed /Total capacity (MW)
Mumbai	Trombay Thermal Power Plant (TTPP)	Coal + Oil + Gas	1600
	Tarapur Atomic Power Plant (TAPS)	Nuclear	1400
	Dahanu Thermal Power Station (DTPS)	Coal	500
Chennai	Ennore Thermal Power station (ETPS)	Coal	450
	North Chennai Thermal Power Station (NCTPS)	Coal	630
	Madras Atomic Power Station (MAPS)	Nuclear	440
	Gas Turbine -Basin Bridge	Gas	120
	IPP	Diesel	196

The Tamil Nadu Electricity Board (TNEB) caters to the power needs of Chennai and rest of CMR. Chennai has two coal based thermal power plants and one nuclear based power plant.

Since power is a basic infrastructure determining the economic development, efforts are underway to use non-conventional energy resources; such as solar, wind and tides. However, the contribution of these to the total power supply is negligible (Table 6.23). The TNEB and MSEDCL get a noteworthy proportion of their total power from wind mills located in different parts of the state**.**

4.9 Environmental Groups

Environmental groups and non-government organizations (NGOs) play an important role in environmental education, taking up civic and environmental issues, and in promoting greater accountability and transparency in government actions. Since the 1980s a number of

[*] Sources: Various, including Economic Survey of Maharashtra, 2009-10, Government of Maharashtra, Online Statistical Handbooks of Chennai, Kancheepuram and Tiruvallur Districts 2005-2006.

groups have formed in India to protect the environment. Mumbai and Chennai also have such groups.

In Mumbai, the important NOGs are: The Bombay Natural History Society (BNHS); Bombay Environmental Action Group (BEAG); Hariyali; Foundation of Environmental Medicine (FEM); The Society for Clean Environment, Mumbai (SOCLEEN). The Mangrove Society of India (Mumbai Chapter), the Reefwatch, the National Societies For Clean Cities – India, the Indian Heritage Society, the Indian National Trust for Art, Cultural Heritage (INTACH), SOCLEAN, Chapters of WWF and TERI, etc. are other NGOs actively involved in the protection of mangrove forest, aquatic life and Mumbai's cultural heritage.

In Chennai, there are over 50 non-government organizations (ORG, 1999). Most of them are involved in the activity of environment education and protection. The Environmental Society of Madras (ESM), World Wide Fund for Nature– India, Madras Crocodile Bank Trust (MCBT), Chennai Snake Park Trust, Greenpeace Chennai Volunteers, Care Earth, etc. are some of the NGOs engaged in the protection, conservation of environment in and around Chennai.

4.10 Community Groups

Religious, linguistic and ethnic plurality characterizes the two metropolitan cities, particularly Greater Mumbai. Various religious and ethnic groups co-exist giving rise to the highly cosmopolitan nature of the cities, particularly in the case of Greater Mumbai.

4.11 Religious Communities

Hindus constitute the dominant religious group in both the metropolitan cities. Nearly 63 to 69% percent of the population belongs to Hindu faith in Mumbai. Islam is the second largest religious community in Greater Mumbai as well as in MMR. Buddhists, Jains and Christians are the other major religious communities in Greater Mumbai. In CMR, majority of the people (82 to 89%) are followers of Hinduism, followed by Muslim, Christian, Sikh, Buddhist and Jain communities.

4.12 Linguistic communities

The multi-lingual nature of Greater Mumbai is primarily because of migrants coming from the Hindi speaking belt of north India and Gujarat State in western India. Partition of India in 1947 also brought many Hindus from Pakistan's Sindh Province. In comparison, the migrants to Chennai mainly came from the nearby states. Therefore, there is less diversity in spoken languages in the Tamil Nadu's capital city.

Marathi is the main language of the Maharashtra State and hence the official language of Greater Mumbai and MMR. Slightly more than one-third of Mumbai's population speaks Marathi. However, in MMR the percentage of Marathi speakers is 50 to 80%. Hindi is spoken by 16-18% of the population in Greater Mumbai. Other important languages spoken in Mumbai are Urdu and Gujarati. In comparison, Tamil, the official language of Tamil Nadu State and Chennai City, is spoken by overwhelmingly large number of people in CMR.

4.13 Schedule Caste and Schedule Tribe Communities

Scheduled Castes (SC) and Scheduled Tribes (ST) are socially and economically underprivileged communities listed in the Schedule of the Indian Constitution. The SCs and STs respectively constitute about 4.7% and 2.3% of the total population of the MMR. The corresponding values for CMR are 15.2% and 0.3%. The number of SCs and STs has declined to some extent between 1991 and 2001(Table 6.24). Since independence (1947), the state and central governments have taken many steps for the social, educational and economic improvement of these communities.

Table 6.24. Percent of Schedule Caste and Tribe population in Mumbai and Chennai.[*]

Metropolitan Region	Schedule Caste and Tribe population	1991		2001	
		Core	Outer Ring	Core	Outer Ring
Mumbai	Total SC %	6.52	5.62	4.88	4.39
	Total ST %	1.05	6.05	0.76	4.91
Chennai	Total SC %	13.79	21.04	13.77	17.35
	Total ST %	0.21	0.68	0.15	0.54

[*] Source: 1991 and 2001 Census.

4.14 Slum Inhabitants

Slums are major living sites of the urban poor. In 2002, the United Nations defined slums as communities characterized by insecure residential status, poor structural quality of housing, overcrowding, and inadequate access to safe water, sanitation, and other infrastructure (UNHSP, 2003).

A very large proportion of the slum population is concentrated in the city proper rather than the peri-urban areas. This is partly due to the fact that the slum dwellers cannot afford the high travel cost. Between 1981 and 1991, the percentage of slum population in Mumbai increased significantly, but the rate declined slightly between 1991 and 2001 (Table 6.25). In comparison, the increase in slum population of Chennai has been only by a few percent during the same period.

Table 6.25. Percentage of slum population in urban areas of Mumbai and Chennai.[*]

Metro cities	1981	1991	2001
Mumbai City	30.8	43.2	48.9
Chennai	13.8	15.3	17.7

As per 2001 census, the total slum population in MMR is about 6.72 million (38%). In Greater Mumbai, there were nearly 1959 slum settlements with a population of 6.47 million, which constitutes about 54% of the total population of the city as per 2001 census. *Dharavi* Slum is the biggest slum of Asia (BMC, 2008-09). Migrants overwhelmingly dominate the slums. Other municipalities having sizeable slum population are Thane, Kalyan, Ulhasnagar, Mira-Bhayandar, Bhiwandi, Ambarnath, Navi Mumbai and Panvel.

As per 2001 census, the total number of slum inhabitants in CMR were about 0.95 million or 13.2% of the total population. In the same year, the Chennai City had a slum population of 819,872, or ~19% of the city's population. Outside the city limit, sizeable slum population (2 to 13%) is observed in the other municipalities in CMR. There are 1431 slums in CMR. Most of the slums are located along the banks of the Adyar and the Cooum Rivers, the Buckingham Canal and the Otteri Nullah and along the roadside.

The percentage of slum dwellers in the outer ring is significantly lower than the core zone of the MMR and CMR. About 14% slum population lives in the ring in MMR and only slightly less than 5% inhabitants in the outer zone of CMR occupy slum areas.

[*] Source: Maiti & Agarwal (2005).

5. Conclusions

In the Indian context, land, water, forests and livestock as well as coastal and marine resources are means of livelihood and primary sources of income for a good part of the inhabitants. Many natural resources are considered common property and are utilized by multiple users. When the number of users increases and the natural resources are limited and non-renewable, conflicts (sometimes violent) are inevitable.

5.1 Land Resources and Total Inhabitants

Land is a limited resource, especially in densely populated cities such as Greater Mumbai and Chennai. The growth of Greater Mumbai has been phenomenal in the last three decades. The rise in the population has continued unabated at the annual compound growth rate of 2.35% and 1.67% respectively during the last three decades (1971 to 2001).

Table 6.26. Measures of increased pressure on the land resource in Greater Mumbai and Chennai City.

Metropolitan core	Measures of pressure on land	1981	1991	2001
Greater Mumbai	Total Population in million	8.24	9.92	11.97
	Percent population change*	--	20.4	20.7
	Change in population density (in km^2)**	--	3605	4399
Chennai City	Total Population in million	3.28	3.84	4.33
	Percent population change*	--	17.1	12.8
	Change in population density (in km^2)**	--	3218	2816

The change in the population density and percentage change in population provides a measure of increased pressure on the land resource. Table 6.26 shows that between 1991 and 2001 nearly 4400 additional inhabitants were added to every square km in Greater Mumbai. In Chennai City nearly 2800 additional inhabitants were added per square km. The main reason was – large-scale flux of migrants.

* Equal to the difference in population between a census year and pervious census year over the population in previous census year.

** Equal to the difference in population density between census year and preceding census year.

5.2 Arable Land Resource and Agriculture

One of the important and primary uses of land resources includes agriculture. Nearly 29% of the land was under agriculture in 2008 in MMR. In CMR only 12% area was under this primary activity. The percentage of agricultural workers has declined significantly between 1991 and 2001. This implies that the cultivators and agricultural labourers are sifting to other professions or are migrating to other areas for assured employment.

5.3 Water Resources and Users

Water resource is one of the vital assets of regions like India, where the rainy season is limited to just four months of a year. The major sources of potable water are rivers, lakes, tanks and groundwater. There are multiple users of this resource such as – municipal, industrial, fisheries and agricultural sectors. There were nearly 4.13 million households in MMR and about 1.61 million households in CMR in 2001. Considering the standard norms, the total water requirement would be at least 3000 and 1200 million liters/day for domestic use respectively. Further, hundreds of manufacturing units and major thermal power plants also utilize the available water.

Livestock and poultry also are other users of water in the two metro cities. The livestock population in the three districts falling within MMR was about 2 million and in the case of CMR districts the number was close to 0.7 million in 2001.

Agriculture sector is yet another water resource user in the two metros. In the last few decades, the groundwater resource is being exploited on a large-scale for growing irrigated crops and vegetables.

In order to augment the available water resource, a number of dams and tanks have been constructed within or outside the metropolitan limits. The supply-demand gap has, however, continued to widen because of uncontrolled growth in population and the over use of this resource. The shortage of this resource is boon to the groundwater explorers, the water-tanker businessmen and the bottled water companies.

5.4 Forest Resource Users

Scheduled Tribes (ST) constitute about 2.34% of the total population of the MMR and 0.3% of the population of CMR. Most of the tribal communities (or *adivasis*, the original inhabitants), especially the hunter-gatherers and pastoralists, for generations have lived in forest and have depended on the biodiversity of forests for their livelihood. However, the forest laws since the colonial period, construction of large dams and highways in the tribal areas and declaration of important forested lands as national parks have created a situation where the tribals are finding it more and more difficult to subsist on forest products alone. As a result, the forest users have started migrating to towns and cities in search of employment (in salt pan works, brick kilns, fishing boats, etc.).

Other users of forest resource include people involved in lumbering and wood and furniture industry. In both the cities a large number of people are engaged in wood and wood product industry. In 2001, there were nearly 1000 units in the Mumbai region employing about 30,000 persons.

The sanctuaries and national parks are visited by large number of tourists every year. For example, 2 million visitors visit the SGNP in Mumbai, and 0.7 million visitors visit Guindy National Park in Chennai annually.

5.5 Fisheries Resources and Fishermen

One of the primary uses of marine and coastal resources includes fishing and aquaculture. Fishing is an important resource-based activity. There is sizable population of fishermen in both the regions (Table 6.27). The fishermen community in Mumbai region is the *Kolis*. Along the Chennai coast, the majority of the coastline population belongs to the *Pattinavar* fishing caste. Both these communities have their own fishing villages, where everyone is involved in fishing industry.

The fishing community along the Chennai (Tamil Nadu) coast was badly hit by the December 2004 tsunami. Apart from damage to boats and crafts, many fishing villages were completely or partially destroyed and many fishermen lost their lives.

Table 6.27. Fisheries statistics for MMR and CMR districts 2005-2006.

Mumbai Metropolitan Region			Chennai Metropolitan Region		
MMR Districts*	Fishermen population	Number of fishermen households	CMR Districts**	Fishermen Population***a	Number of households/ families
Greater Mumbai	37,695	7,145	Chennai	87,131	16,414
Thane	85,332	15,510	Kancheepuram	31,833	8,985
Raigarh	69,304	13,381	Tiruvallur	19,653	35,328
Total	192,331	36,036	Total	1,38,617	60,727

5.6 Wetlands and Salt Farming

A part of the wetlands in the Mumbai region is being used for salt farming. The total area under salt pans within MMR is ~29.5 km^2. In view of the city's staggering housing problem, wetlands and salt pan lands are being viewed as areas for future townships. However, most of the salt farming areas fall within the CRZ 1 of the Coastal Regulatory Zone Notification of India (1991 and 2011) and so any kind of development is prohibited by law.

The small area under salt farming in Chennai is found southeast of Ennore. With increasing pressure on land, the area under salt pans is also slowly declining.

5.7 Forest-Wetland and Slum Encroachment

In 2001 39% of the population in MMR lived in slums and the slum population of CMR was 13%. In the same year, the slum population constituted about 54% of the total population of Greater Mumbai and 19% in Chennai City. There is little doubt that most of the migrants were forced to settle in slums or illegally occupy new lands along the margins of forest or wetlands in Greater Mumbai and along rivers, canals and pipelines in the Chennai City. The slums illegally occupy private or government owned lands (forest, wetlands or others). In both the situations there are potential risks for land conflicts.

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* http://fisheries.maharashtra.gov.in/.

** Statistical Handbooks of Chennai, Kancheepuram and Tiruvallur Districts for 2001 and 2006.

*** Fisheries Department, Chennai.

5.8 Cultural Resources and Tourists

With respect to cultural resources, tourists are considered as primary users. The cultural resources of the two cities include a number of exquisite ancient temples and churches and magnificent historical buildings. National parks, beaches, ethnic cuisine, markets and modern shopping malls, all attract the tourists. Regional festivals are also important events for Indian and foreign tourists.

Both cities are preferred by Indian tourists in spite of the absence of any world-famous monument(s). The Elephanta Caves in Mumbai and Mamallapuram near Chennai are the most popular tourist destinations. Mumbai and Chennai are the main entry points in India, after New Delhi. In 2008, nearly 1.1 million foreign tourists visited Mumbai and in Chennai the figure was close to 0.6 million.

Tourists bring much needed revenue to the cities and provide employment to a large number of persons. Tourist industry supports many other industries such as hotel and catering industry, travel and transport industry, handicraft industry, etc. But at the same time they are the cause of degradation of the environment.

5.9 Concluding remarks

Both the cities are facing challenges due to phenomenal population growth, rapid urbanization, large-scale migration and environmental degradation. It is apparent from the above discussion that there are marked differences in the natural resources of the two cities. Whereas the MMR is dominated by rocky and hilly landscape, with sizable area under wetlands, the CMR is characterized by wide, sandy alluvial and coastal plains. In terms of forest as well as marine and coastal resources, MMR is far better endowed than CMR. Like MMR, Chennai does not have a natural harbour. The area under forest, mangroves and agriculture is strikingly more in MMR. Further, while both the cities are impacted by monsoon rains, the problem of water scarcity is much more acute in Chennai than in Mumbai.

Both the cities display a rich cultural and historical heritage and tourism is an important economic activity. When it comes to demographic and socio-economic features, Mumbai has much higher population density, is more ethnically diverse and is economically far more prosperous than CMR. However, the proportion of urban poor and slum dwellers is also significantly higher in Mumbai.

The main users in both cities include the inhabitants belong to different ethnic, religious, social and economic groups. Cultivators, agricultural labourers, saltpan workers, fishermen and tribals are other users that are dependent on land, soil, water, forest, coastal resources. With respect to cultural resources, tourists are the primary users. Many natural resources are common property and are utilized by multiple users. Because the natural resources are limited and not always renewable, and because the number of users is increasing at an alarming rate, conflicts (sometimes violent) occur, inevitably.

Conversion of wetland, forest land and open land into built-up area, occupation of slums in private and government lands, disparity in access to freshwater and sanitation, disparity in economic condition and large-scale misuse of water and land resources are some of the important reasons for conflicts between different groups in the two metropolitan cities.

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CHAPTER 7.
Sustainability in Coastal Urban Environment: Thematic Profiles of Resources and Their Users. Case Studies of Hai Phong and Nha Trang City - Vietnam

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1. Introduction

Hai Phong and Nha Trang are big coastal cities of Vietnam. These areas have many favourable conditions for social and economic development such as: rich resource base, high biodiversity and a strategic location in the country. In recent years, there is a significant change in the economy of both cities: economic growth is increasing rapidly and living standard has improved. However, many environmental issues are emerging, especially environmental pollution and the unsustainable use of natural resources. This chapter aims to inventory the existing natural resources and their users in order to identify environmental conflicts that can be studied to understand the patterns and formulate a suitable scheme for conflict analysis and management.

2. Materials and Methods

The main method employed is literature review based on the collection and assessment of available reports and documents related to natural resources, socio- economic and cultural features of the two case studies: Hai Phong and Nha Nrang cities of Vietnam. The review took into account a 10-year time frame and considered a wide range of topics. For some topics, longer time-frame is used, such as a 20-year frame for mangrove forest evolution assessment. Where possible, official data sources are used (such as for demographic data, economic growth data, natural resources inventory reports, etc.).

3. Overview of Resources in the Case Studies

3.1 Hai Phong – Vietnam: a port city

3.1.1 Geographical and Historical Overview

Hai Phong is situated on the northeastern coast of Vietnam, about 100 km east of Hanoi Capital. It is the third largest city in Vietnam and has the largest seaport in the northern part of the country. It covers an area of 1,519 km^2, including two island districts (Cat Hai and Bach Long Vi). In the mainland, Hai Phong shares administrative borders to 3 provinces of East of Tonkin and Hong River Delta, including Quang Ninh in the North, Hai Duong in the North-west and Thai Binh in the South-west. The east of the city, there is 125 km of coastlines from Lach Huyen mouth to Thai Binh River mouth. This is lower section area of 5 main rivers of Thai Binh River System (Nam Trieu mouth, Cam River, Lach Tray River, Van Uc River and Thai

Binh River) flowing from high mountains of East of Tonkin. Hai Phong has a large coastal and sea area, favourable for marine economic development. Hai Phong is the most important commercial and transportation hub in northern Vietnam, connecting the Northern provinces with the world market through its seaport. Hai Phong is connected to other parts of the country via roads, rails, inland waterways, short-sea and air links.

The formation and development of Hai Phong is traced back to prehistoric times: associated with the evidence of prehistoric caveman at Cai Beo archaeological site (Cat Ba), Ha Long culture, dated about 4000 to 6000 years ago; and with the formation of the Red River civilization of the Dong Son culture with the evidence of humans at Trang Kenh (Thuy Nguyen), Nui Voi (An Lao) about 2000 to over 3000 years ago; with legend about the Heroine Le Chan – who founded Trang An in early 1st century AD – the cradle of Hai Phong city today. With the importance of geographic position, several Royal Dynasties of Viet Nam have been founded in this region. Hai Phong region became part of the Hai Duong Province during 19th century. In this period, under the governance of Nguyen Dynasty and the French, Hai Phong became an important area for commercial port and coastal defendence activities. In 1887, some coastal districts of Hai Duong province were separated to form Hai Phong province. In 1888, the French President Sadi Carnot formally gave name of Hai Phong city. From the end of nineteenth century to the beginning of twentieth century, Hai Phong was ranked equally to Ha Noi, Sai Gon (Ho Chi Minh City today), became the biggest seaport of North Viet Nam and an important traffic point of the international maritime route and an industrial centre. After unification of the country in 1975, Hai Phong is one of the three cities under government of Socialist Republic of Viet Nam.

Climate: Hai Phong has a tropical climate with high humidity and high temperatures. The average annual rainfall is around 1760 mm (over 76 years of observation). The rainy season covers the months from May to October, which produces 75% to 85% of the total annual rainfall. The dry season is from November to March, in which the precipitation contributes to about 15% to 25% the total of annual rainfall. The months from October to December are particularly foggy. Around twenty days of the year the visibility is less than one km, mostly during this October to December.

Wind: The climate in Hai Phong is mainly influenced by the monsoons of East Asia, the northeast monsoon lasts from November till April, and the southeast monsoon lasts during the rest of the year. The 10-year data of wind records in Hon Dau Observatory shows the dominant directions are East, Southeast, North and South.

Wave: Hai Phong coastal area is dominated by varying wave regime, depending on the season. The northeast wave direction dominates on annual records. In summer, when typhoons occur, the south and southwest waves are in control. The highest waves have not been measured in the stormy season (June-July), but in the autumn and winter months.

Tide: Hai Phong has the diurnal tidal regime with a spring tide / neap tide cycle of 14 days and a range of 3.6-3.8m. It has a one high tide and one low tide every day. The tidal wave propagates from south to north with mean velocities between 0.2-0.3 m/s. The maximum ebb-tidal current is 0.6 m/s and the maximum flood-tidal current is 0.5 m/s.

Current: In Hai Phong, the diurnal tide plays an important role; the semi-diurnal tide current is only noticeable in low tide days. The currents are changed in accordance with the change of wind and wave, which are seasonal (South direction in winter, and north one in summer). In summer, the currents become stronger during flood tide, and decrease during the ebb tide.

River flow: In Hai Phong coastal area, there are five rivers: Bach Dang, Cam, Lach Tray, Van Uc and Thai Binh. These rivers supply most of fresh water and bring nutrients and other materials from upstream inland areas to the coastal zone of Hai Phong. The river discharge in this area has a strong variation by the season. Discharge during the wet season is much larger than during the dry season.

3.1.2 Bio-physical resources

3.1.2.1 Non biological resources

According to the results of geological expeditions, Hai Phong has some natural resources in small reserve such as iron in Duong Quan (Thuy Nguyen District); zinc in Cat Ba. Coastal mineral sand can be found in Cat Hai and Tien Lang. In terms of non-metal resources, Hai Phong has reserves of kaolin (Thuy Nguyen), clay (Tien Lang, Kien Thuy, and An Hai). Limestone can be found in Cat Ba, Trang Kenh, Phi Liet, Dun ferry; quartzite and tectonics can be found in Do Son, phosphate at Bach Long Vi, mineral water is available in Tien Lang. Salt and sand are the two important resources of Hai Phong, which are exploited extensively on river islets and on the seaside of Cat Hai, Tieng Lang, Vinh Bao, Kien Thuy and Do Son districts. In Bach Long Vi Island, there is asphalt stone, a product of oiled oxidation showing some prospects of oil and natural gas availability because the continental shelf of Hai Phong

occupies one forth of sediment of Third Epoch of the Gulf of Tonkin with the thickness of up to 3,000m.

Hai Phong has more than 57,000 hectares of arable land. This is mainly alluvial land formed by the Thai Binh River system. Due to its location next to the sea, most of the soil is of alum and saline alum nature and the terrain is a mixture of low and high land alternated with many low-lying paddies. The variation of climate negatively affects the soil, land and plants causing additional difficulties for agriculture production, especially plantation.

3.1.2.2 Other resources

Hai Phong is located in a convenient position for transportation to domestic provinces and international networks via roads, rails, sea routes, inland waterways and air links. The sea territories of Hai Phong are part of north-eastern water area of the Gulf of Tonkin. The seabed compositions and the oceanographic characteristics of Hai Phong are closely connected to the common characteristics of the Gulf of Tonkin and Eastern Sea.

Hai Phong Sea is not very deep. A depth curve of 2m goes around Do Son Cape and then descends down to 5m far from the coast. The trenches created by the rivers flowing into the sea are deeper and are currently used as navigation channels for vessels. Further offshore, the seabed descends to the depth of the Gulf of Tonkin to about 30 - 40m.

The length of the Hai Phong coast is 125 km including the length of the coastlines of offshore islands. The coast has a form of a concave curve as the common seaside of the Gulf of Tonkin. It is low and quite flat with the structure created mainly by muddy sand coming from the 5 major estuaries. At the center of the coast, Do Son cape stretches out into the sea like a peninsula. This cape is also the end of the range of mountains of Devonian sandstone running from the mainland. The peak is 125m, and it stretched out 5km into the sea in the direction of North West - South East. This natural structure has given Do Son an advantage as a strategic important location in the sea and also as a famous scenic spot. At the foot of the sandstone hills, there are beaches making this place a romantic resort and a valuable convalescent area. In the offshore territory of Hai Phong there are many islands that are distributed over the sea with Cat Ba Island as the largest and Bach Long Vi Island as the farthest.

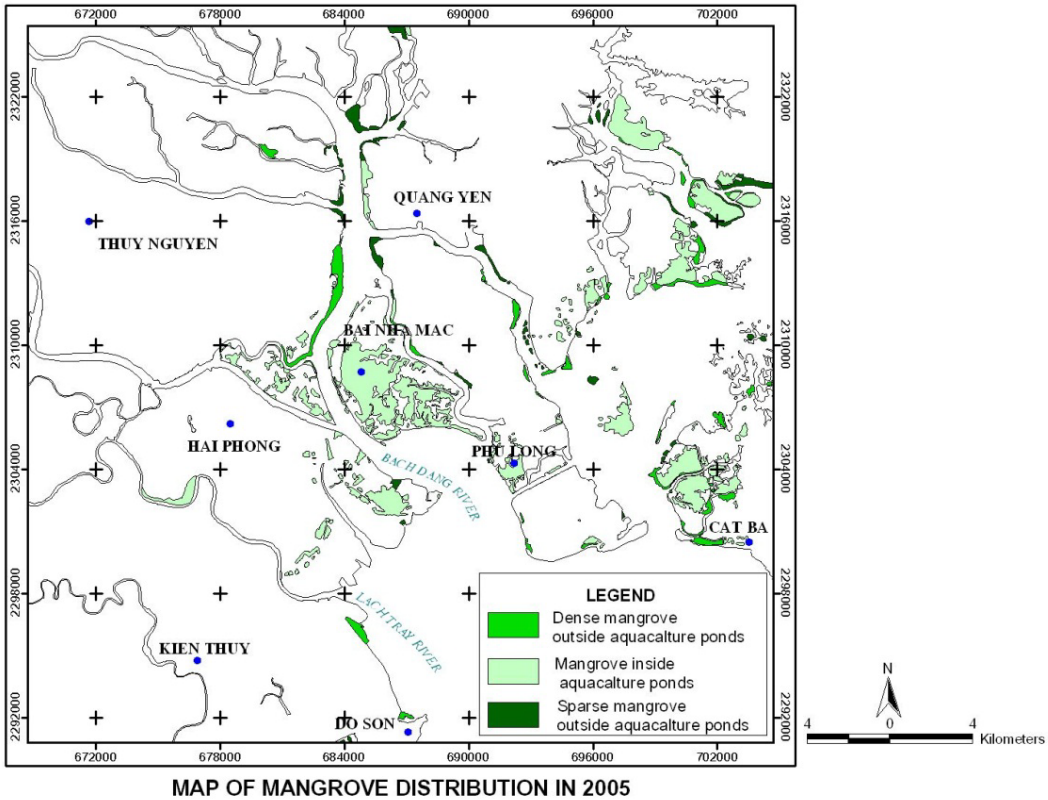
Sea, coast and islands have created special natural landscapes to this coastal city. It is also a special potential advantage of the economy of Hai Phong.

3.1.2.3 Mangrove ecosystem

In 1970, Hai Phong had nearly 30,000 ha of mangrove forests. Among them, Bach Dang estuary zone had 20,037 ha and the rest belonged to Phu Long, Cat Hai and Do Son (Phan Nguyen Hong, 1970). Until the 1990s, the total areas of mangrove forests in Hai Phong were still very large. However, due to a large reformation of local people and military force, more than 1000 ha of mangrove forests had been destroyed to make agriculture fields in Dinh Vu area alone (Vu Doan Thai, 2007). At the moment, total area of mangrove forest is only a little over 600ha, among them, Cat Hai district have more than 200ha (Le Thi Thanh, 2007) (Figure 7.1).

Mangrove forests in the area have a high biodiversity value at the species level. A total of 494 species have been identified, including 36 mangrove species, 16 marine algae species, 4 species of seagrasses, 306 species of zoobenthos, 90 species of fishes, 5 species of reptiles and 37 species of birds (waterfowl). Among them, 2 species of algae, 3 species of gastropods, one species of fish, 3 species of reptiles and 3 species of birds are listed in Vietnam Red Book (Pham Dinh Trong, 1991; 1996).

Figure 7.1. Distribution of mangrove forests in Hai Phong area in 2005.



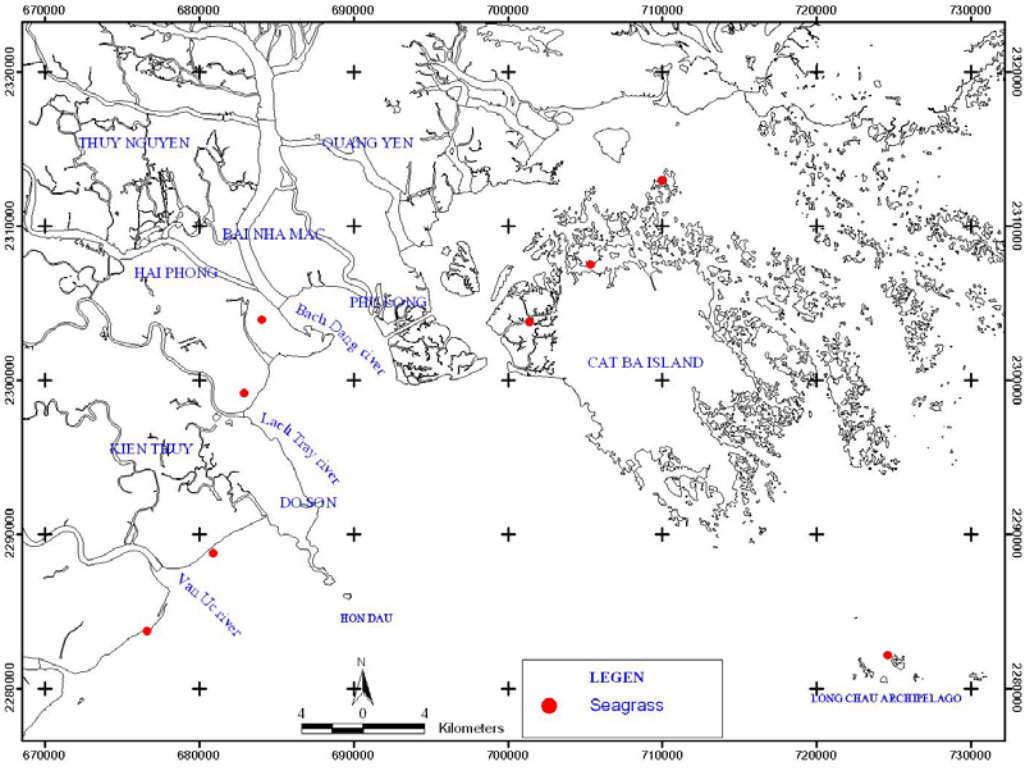
MAP OF MANGROVE DISTRIBUTION IN 2005

3.1.2.4 Seagrass ecosystem

There are 4 species of seagrass in the area. They are concentrated in a large area in Nha Mac ponds (Quang Ninh), Cat Hai, Dinh Vu and Trang Cat (Hai Phong) with total area of 780 ha (Nguyen Van Tien, 2002). In the natural environment, one of the most important functions of seagrass ecosystem is buffering. They play important role in stabilizing the coastal zone and preventing erosion. The other important function of seagrass ecosystem is supplying of larvae sources for aquaculture and fisheries. They are also the habitats, breeding and foraging areas for many rare and important species of marine animals such as Dugong (Dugong dugon) and Green sea turtle (Chenonia mydas).

The information on the evolution of seagrass beds is very limited. At the moment, most seagrass beds at Dinh Vu lagoon have been destroyed by infrastructure development activities.

Figure 7.2. Distribution of seagrass beds in Hai Phong area in 2005.



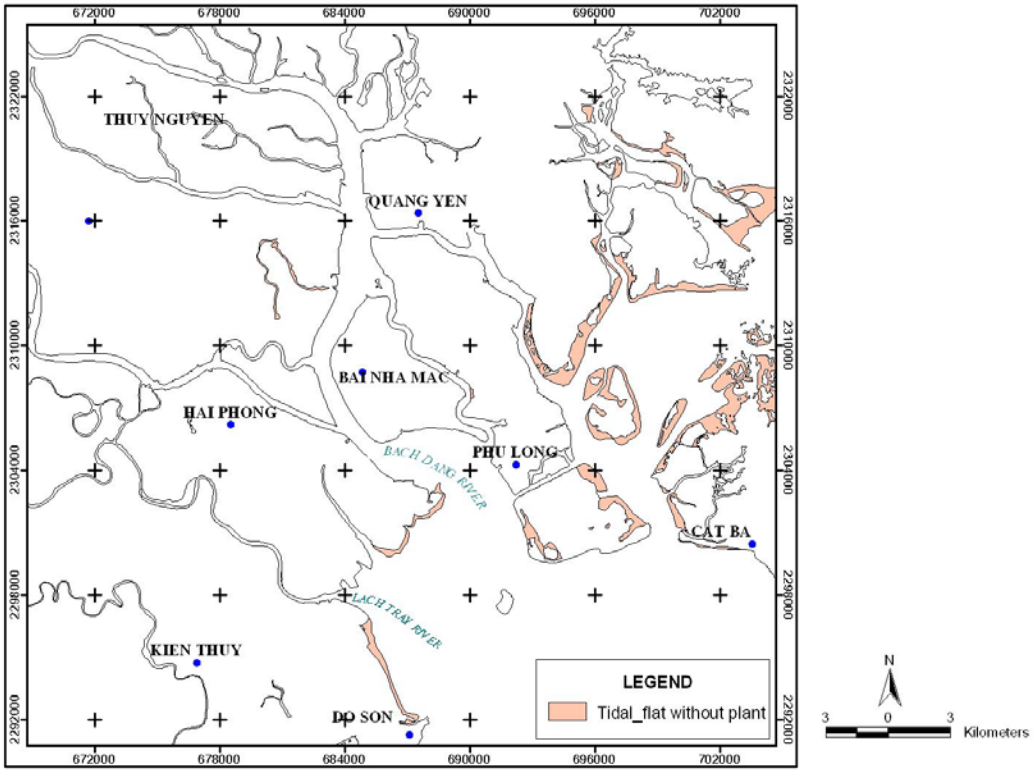
MAP OF SEAGRASS DISTRIBUTION

3.1.2.5 Soft bottom ecosystem

The area of the sub-littoral muddy sand sediment and the intertidal without mangroves is very large, about 73,320 ha. Among them, the submerged area (down to 6 meters depth) is 38,285 ha, the intertidal area without mangrove is 11,634 ha, and aquaculture ponds occupy 23,420 ha (Nguyen Duc Cu, 1996). There are 340 species of benthic fauna in the sub-littoral soft bottom in Cat Ba. The intertidal flats can be divided into two types: soft bottom and rocky bottom. The soft bottom tidal flats are further divided into the inside and outside of the river mouth. In the inside tidal flat (Vu Yen, Dinh Vu), 77 species of zoo benthos had been found; and 234 species of those in the outside river mouth tidal flat. In the rocky tidal flat (at Cat Ba Island), 114 species of zoo benthos are recorded.

Although the species diversity index is lower than those of the coral reef or mangrove, the soft bottom area is important fisheries ground for local people. The intertidal areas provide fishing ground for hundreds of people, who harvest mud crabs, fibber crabs, seashells and other kinds of sea products every day. Low tide areas are fishing grounds for shrimps, prawns, swimming crabs and many kinds of marine fishes.

Figure 7.3. Distribution of tidal flats in Hai Phong area in 2005.



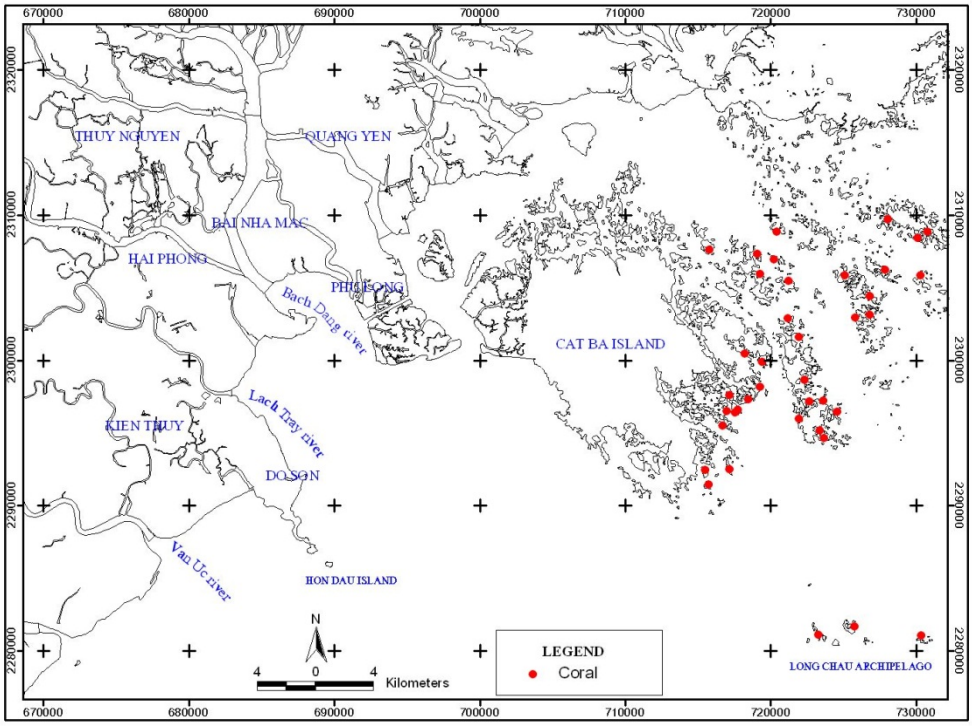
MAP OF TIDAL FLAT WITHOUT PLANT DISTRIBUTION IN 2005

3.1.2.6 Coral reef ecosystem

In Hai Phong, coral reefs are distributed at the southwestern part of the Cat Ba island, Long Chau island and the southern part of Ha Long Bay, from the intertidal area down to 6 meters deep (Figure 7.4). Reef building corals populate mostly at the depth from one to three meters. Based on the UNESCO's evaluation table, many coral reefs in Cat Ba and Long Chau could be listed at average level (living coverage from 25% to 50%) and fine level (living coverage from 50% to 75%) (WWF, 1993). However, recently, the living coverage of corals in Cat Ba and Long Chau Island has been significantly reduced. According to studies conducted by Institute of Marine Environment and Resources, the coverage percentage of some reefs at Cat Ba such as Tung Gio, Tung Ngon is only ranging from 10 to 40%, Ang Du 23.7%, some other places have even lower or completely zero. At Long Chau Island, the mean of living coverage decreased to 25.6% (Nguyen Huy Yet, 1999; Nguyen Van Quan, 2007).

The fauna of coral reefs in the area is also an indication of abundance of the species level. According to previous studies, a list of 1,109 species has been identified; among them are 211 species of coral. Coral reef in Hai Phong is also home of many other species. Some endangered species, which were listed in the Vietnam Red Book, such as trochids, green mussel, green turtle, hawksbill turtle, sea horses, also present in the coral reef ecosystem (Nguyen Huy Yet, 1999, Mark Hamann *et al.*, 2006).

Figure 7.4. Distribution of coral reefs in Hai Phong area in 2005.



MAP OF CORAL DISTRIBUTION

3.1.3 Cultural and social resources

3.1.3.1 Important cultural features

Religion: Many religions are in practice in Hai Phong, including Buddhism, Christianity [Catholicism and Protestantism] and Islam. Buddhism is the most widespread religion. Worships and offerings for ancestor, burning votive objects, releasing animals, etc. are customs linked closely with Buddhism. Many activities are taking place around New Year occasion, such as visiting pagodas, temples and participation in the traditional ceremonies. In addition, Hai Phong also has its own festivals such as the Do Son buffalo-fighting festival and swing festival (Thuy Nguyen). In total, there are 38 festivals in Hai Phong every year (sum up from website of Department of Culture, Sport and Tourism of Hai Phong).

There are 14 officially recognized national historical monuments in Hai Phong. Hai Phong also has 30 traditional villages in the suurounding area. Today, with the industrialization and modernization of the city, the traditional features of these villages are being lost.

Income and living condition: As a result of economic development, the living conditions of the Hai Phong people have changed in recent years towards higher income and better welfare. The average GDP per capita exceeds 1,500 USD per year and is higher than Vietnam's average (in 2006). The population is stable, and the birth rate is maintained at less than 1%. Telephone lines averages 19 per 100 people, excluding mobile telephones. The number of households that has access to clean water (up to 2005) in urban and rural areas is 80% and 10%, respectively. Most urban households (over 90%) have modern equipments, such as TV, video, motorbike, etc. In rural areas, 60% of households have TVs and video, 35% have a motorbike and 1.5% has a fridge (Tran Dinh Lan *et al*, 2007).

Education: Education is of special concern because it is fundamental for supplying a high quality labor source to economic sectors. In Hai Phong city, by 2001, secondary schooling had been universalized. So far (2010), the city has 239 kindergartens, 479 schools (218 primary schools, 194 secondary schools and 55 upper secondary schools, 10 basic general, 2 lower and upper secondary schools). It is in the process of universalizing high-school education.

Hai Phong city has many universities, colleges and vocation schools which have trained a large amount of cadres and skilled workers. They include three colleges and four state and local universities, and five research institutes with several branches in Hai Phong City

(Yearbook 2010). There are also more than 700 people with professor, PhD and Master's qualifications; more than 47,800 people have an undergraduate qualification and the number of university students is more than 100 thousand. Compared to other provinces in Vietnam, Hai Phong has one of the highest levels of education and training.

Health care: In Hai Phong, there are 24 hospitals under city management (15 dictricts hospitals, 7 city hospitals and two private hospitals), 2 clinics, 218 medical service unit, one sanatorium and 10 other various medical care units. The total number of hospital beds in the whole city is 5,630, among them 4,310 are in hospitals, 120 are in the sanatorium, 20 in the clinics, 1,120 are owned by medical service units and the rest belongs to the other medical units. According to statistical data up to 2009, there were 4,907 employees working in the field of health care, among which were 1,347 doctors, 726 physicians, 2,284 nurses, 550 midwives, 83 high degree pharmacists, 257 middle degree pharmacists and 329 assistant pharmacists (Tran Dinh Lan *et al*, 2007).

3.1.3.2 Important social features

Demography: There were 529,548 households in Hai Phong in 2009 (Table 7.1). Based on the national poverty line, there were 62.707 poor housheols, or around 4.5% of the city population (Kim Oanh, 2009).

Table 7.1. Number of households in Hai Phong in 2009 and 1999.

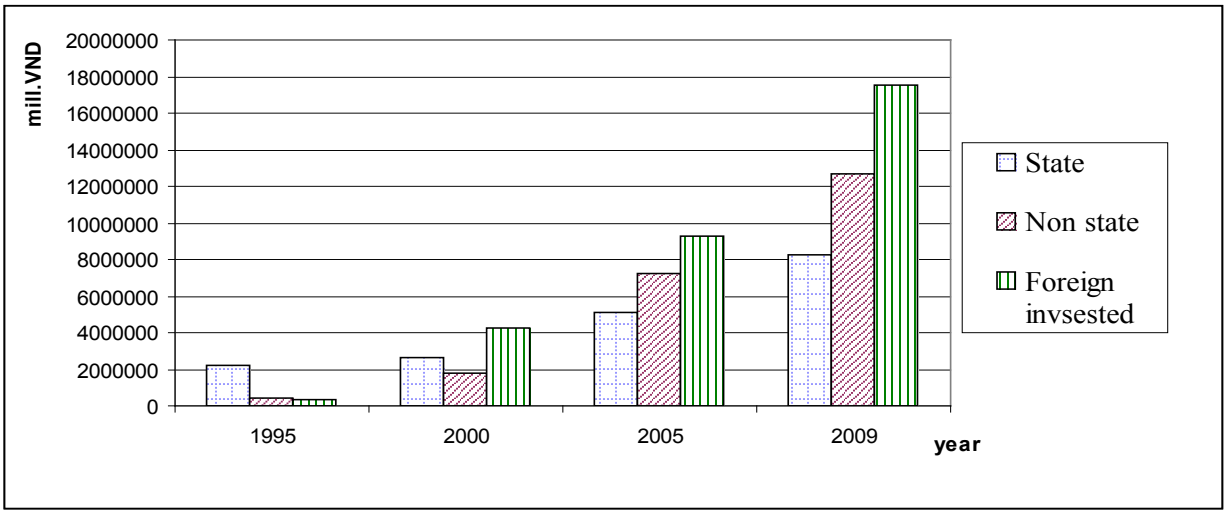
Year	2009	1999
Core	223,703	131,457
Coastal	167,547	151,187
Ring	138,298	130,967
Total	529,548	413,611

Age groups: According to Year Book of Hai Phong, in 2010, the number of people older than 15 years increased from 70.39 % in 2000 to 78.92% in 2009.

3.1.3.3 Important economic features (main industries/sectors)

Industry: Gross output of industry of Hai Phong city has a high development rate. During 1996 to 2000 period, the average rate of increase was 23.65%, and from 2001 to 2005 a slower rate increase occurred (19.91%). Of the industries that had the highest production rate, the highest was manufacturing with 27.65%.

Figure 7.5. The trend of constituent economic parts to industrial output value.



All industrial fields have an increasing trend of output value. The gross output of industry in 2005 was increased by 2.48 times in comparison to the figure in 2000. Industries with foreign investment made the highest contribution to the whole output of the city (Figure 7.5). The gross output of Hai Phong's industry in 2006 was 15,799.3 billion dong [approximately 897 million USD, based on exchange rates in 2006], increasing 12.5% from that of 2005 (Hai Phong Year book).

Table 7.2. Structure of gross output of industry (Unit: %).

Years / Field (unit:%)	1995	2000	2005	2008
Exploiting industry	1.5	0.55	0.84	0.5
Manufacturing	97.7	98.63	98.71	95.9
Production and distribution of electricity	0.8	0.82	0.45	3.6

Table 7.2 shows that the output value of the manufacturing sector makes up nearly all output value of all industrial activities (as much as 98%). Nearly all are footwear and metal products.

By 2009, Hai Phong has 12,912 industrial establishments, most of which are concentrated in the urban areas and Thuy Nguyen rural district. In Hai Phong, there exist three big industrial zones: Nomura (153 ha), Dinh Vu (164 ha) and Do Son (150 ha), which were established by the Central Government decision. There are other small industrial zones with which were established by the city. In Hai Phong, the industry has developed mainly in the southern part of the city. Many districts offer good investing conditions to attract many various businesses, such as Hong Bang, with machinery and shipping, and steel construction; Ngo Quyen with frozen fishery products; and Kien An concentrated on small machinery, motors, footwear and clothes, etc., An Duong rural district focuses on chemicals and machinery in Nomura industrial zone; Thuy Nguyen with cements, colored metals, shipping and shiprepair, and Cat Hai and Do Son with fish sauce and tourism.

Agriculture: The gross output of agriculture for the city was 8,011.9 billion VND [741.3 million USD, based on exchange rates in 2009] in 2009 increased by a 2.4 fold from that of 2005. The largest increase came from cultivation (Table 7.3). This index is quite high in an industrial city like Hai Phong, and in the future, this trend might decrease.

Table 7.3. The output value of agriculture in the period from 1995 to 2009.[*]

Years / Field	1995	2000	2005	2009
Total (billion VND)	1,576.1	2,310.4	3,323.1	8,011.9
Cultivation (billion VND)	1,118.0	1,616.0	2,091.3	4,459.7
Breeding (billion VND)	434.6	648.9	1,159.5	3,374.2
Agriculture service (billion VND)	23.5	45.5	72.3	178.0

The total agricultural area of Hai Phong is about 54,239 ha that is decreasing over time. Comparing with the year 2000, agricultural area has decreased by 7,888 ha. Many areas have changed into other land uses, such as, industrial, urban, transportation areas, etc. Of these changes the foremost change occurred to industrial areas.

Aquaculture: Aquaculture and fishing are strong points for economic development of coastal provinces. Aquaculture activities of Hai Phong are concentrated in Hai An, Do Son, Thuy Nguyen and Tien Lang district. In 2009, the total area of water surface for aquaculture is 13,983 ha in with fishery production of 86,843.5 tons.

The total value of aquaculture of Hai Phong in the period from 2000 to 2005 has increased at an average rate of about 7.5% per year. The output value from the aquaculture in 2005 was 669.4 billion VND. Of which, breeding and catching productions composed of the highest percentage (99.43% of total value). Contribution of the service value was low with only 0.57%.

Aquatic cultivation in Hai Phong includes marine, brackish and freshwater. Marine and brackish aquaculture occupies most of the area (61.51%) with nearly 8,259 ha in 2005, and other types of aquatic cultivation in freshwater occurred in smaller areas (with 38.49% that contained 5.168 ha). According to the investigation of Institute of Aquaculture Economy and Planning, in 2005, most of these areas were in Tien Lang (2,500ha), Kien Thuy (2,449 ha), Thuy Nguyen (2,136.7ha), Cat Hai (1,872.7 ha) and Hai An (2,140 ha). Near the Hai Phong ports most aquaculture areas belong to Hai An, Thuy Nguyen, Kien Thuy, Do Son and Cat Hai districts. Those areas account for 65% of the total area and 66% of the total production of the city (Table 7.4). The major marine and brackish aquaculture products are shrimp, seaweed, crab, brackish fish and other small shells such as oysters and mollusks. As for freshwater aquaculture, the main products are freshwater fish and shrimp.

Table 7.4. Some indexes of aquaculture of Hai Phong.[*]

Index	Unit	1995	2000	2005	2009
Total value	Bil dong	191.9	326.0	699.4	946.3
- Aquatic cultivation		82.4	155.5	383.1	541.9
- Fishing		108.8	169.2	312.3	397
- Fishery Service		0.7	1.3	4.0	7.4
Total areas for aquatic cultivation	Ha	12,458	13,077.0	13,486	13,983
Production of fishing	Ton	15,000	23,163	35,279.1	43,102
Production of aquatic cultivation	Ton	15,589	19,425.0	34,953.8	43,441.5

Commercial and services: Commercial and services has a decisive role in cargo circulation, service provisions and connecting production to the market. For many years, commercial and services activities of Hai Phong have developed comprehensively, both in foreign and domestic

trade. They have contributed to active trade activities, amount of cargo circulation is large with better quality, structural changes in the economy and improvement of living standards.

Commercial activities attract many employees and increase much of the output value. They contribute to solving unemployment problems and improving the living conditions of the people and the community. The total export value of the city in 2005 was 839.029 thousand USD, twice as much as than that of 2000. Of which, the local economy consists of main value with 52.6% total. The elaborate value of Hai Phong trade is shown in Table 7.5.

Table 7.5. The output value of trade of Hai Phong from 2000 to 2005 (Unit: bil. Dongs).[*]

Year	2000	2003	2004	2005
Total	3,934.9	7,707.2	9,467.1	11,362.4
Commerce		6,749.10	7,884.5	8,824.0
Restaurant		470.1	816.3	1,630.5
Tourism		40.4	35.9	32.0
Service		447.6	731.4	875.9

The products for export are mainly wool carpets, footwear, paper, frozen pork, frozen shrimp, fish, ground nuts, peanuts, coffee, rubber products, coconut and rice. The main import products are urea, chemicals, steel and iron, primary plastics, textile fabrics, cigarette materials, automobiles, material for sewing, motorbikes, fridges, white sugar and wheat flour.

The service sector of Hai Phong has developed steadily in recent years. During the period from 1996 to 2000, there is an annual average increase of 5.5% in the sector's GDP contribution, slightly lower than the national average (5.7%). During the period from 2001 to 2005, Hai Phong's service sector witnessed a rapid increase in its GDP contribution with an average of 10.3%, more than 3% higher than the national average for the same period (7%) (Hai Phong PC, 2006). The sector's contribution to the total GDP of the province has decreased from 52.3% in 1995 to 48.1% in 2000 then recovered to 50.4% in 2005 (Hai Phong PC, 2006). The services sector of Hai Phong is dominated by transport, storage service and communications, which accounts for 34.69% of the GDP of the services sector in 2005.

Port and Harbor: Hai Phong has a seaport and some small ports, which are fishing port and port for construction materials. In addition, there are many ports along the rivers that serve local residents. Thanks to the favourable conditions for port activities, there are nearly 30 ports and wharfs operating along the Cam – Bach Dang River to serve factories. Port operation is one

of the main industrial activities of Hai Phong city. Hai Phong Port has been built and developed for more than a century and it has always been playing an important role as the gateway to the Northern part of the country. Cargoes of 17 northern provinces and transit cargoes to and from North of Laos and south of China etc. have been transferred via the port of Hai phong to the markets of many countries and vice versa. Amount of cargo at ports of Hai phong is shown in table 7.6:

Table 7.6. Some main indicators of Hai Phong Port.[*]

	1995	2000	2005	2009
Total Cargo volume (thous. tonnes)	4,515	12,465	14,857	32,825
Of which volume of goods at the main port	4,515	7,645	10,512	14,370
- Export goods	493	1,234	2,349	2,376
- Import goods	2,362	3,586	5,197	8,226
- Domestic goods	1,660	2,825	2,966	3,768
Number of ship entering the port	1,386	1,559	2,011	2,410
- Domestic ship	360	542	1,149	1,011
- Foreign ship	1,026	1017	862	1,399
Total staff in the list (person)		5,350	5,022	3,611
In which: Porter		2,037	1,572	1,576
Area of cargo storage (1000 m^2)		377.6	258.6	694

According the Development Plan of the economic belt in the Tonkin Gulf coastal area till 2020, Hai Phong port will be upgraded and extended (Decision No. 34/2009/QĐ-TTg). Lach Huyen Port will be constructed to serve as the first international gateway of the North, in respond to the demand of cargo transportation of the North and cargo transit in Southeast China. Port capacity in 2015 will reach 6 million tones dry cargo and 1 million tone liquid cargo, further increase to 24-26 million tones of the former and 9-11 million tones of the latter in 2020. It will receive ship of 50,000 – 80,000 DWT. Port of Do Son south will be built for economic and defense purpose.

3.1.3.4 (Un)Employment

Labor source is an important factor in economic development of the city. Hai Phong has rich source of labor. Total number of labor is 1,453,433 people – 79% of population (as of July 1st 2009). Enterprises accommodate 67% of the total labor force and the unemployment rate is 17%.

Statistical data in 2009 shows high labor concentration sectors are fishery, agriculture and forestry (38.54%), next are manufacturing (20%), trade and repair of motor vehicles (12.8%), construction (7%) and finally education (7.6%).

3.1.3.5 Migration

The data related to migration in Hai Phong are presented in following table. In the period of 2004 - 2006, the decreasing trend of immigration was observed in all the core, coastal and ring areas. There was an increase in migration in the coastal area and decrease in core and ring areas.

Table 7.7. Migration in Hai Phong (unit: people).

	In migration			Out migration		
Zone	2004	2005	2006	2004	2005	2006
Core	5,289	4,029	530	1,364	13	812
Coastal		4,976	1,211	4,517	6,610	
Ring		1,435	775	5,049	844	
Total		10,440	2,516	10,930	7,467	

3.2 Nha Trang – Vietnam

3.2.1 Geographical and historical overview

Nha Trang is a small city of Khanh Hoa province. This is a coastal province in Southern Central Vietnam. The province is bordered by Phu Yen Province to the North; Ninh Thuan Province to the South; Dak Lak Province to the West; and the South China Sea (locally known as East Sea) to the East. Nha Trang City is 1,280km from Hanoi, 535km from Danang, and 448km from Ho Chi Minh City. Nha Trang is home to many famous scenic spots and landscapes and is a major tourist attraction in the country.

Nha Trang City is situated in a valley surrounded by mountains on three sides, except the East, which is bordered by the sea. Cai river and Cua Be river divide Nha Trang into 3 sections: the North of Cai River, the South of Cua Be River and the inner part of Nha Trang City located between the two rivers. Nha Trang has 19 islands with more than 2,500 households. The largest of these is Tre Island with an area of some 30km², sheltering Nha Trang bay from strong winds and waves.

From 1653 to the middle of the nineteenth century, Nha Trang was still a largely unknown land belonging to Ha Bac, Vinh Xuong district, Dien Khanh palace. Only during the two first decades of the twentieth century, Nha Trang had a rapid change. With the decree of the Governor - General of Indochina dated on 30th August 1924, Nha Trang became a town, which combined the ancient villages of Xuan Huong, Phuong Cau, Van Thanh, Phuong Sai, and Phuoc Hai. Today, Nha Trang is the cultural, economic, administrative center of Khanh Hoa province.

3.2.1.1 Hydraulic features

Wind: The climate in Nha Trang area is mainly influenced by the monsoon winds of East Asia, the northeast monsoon prevails from November to April, and the southeast monsoon prevails during the rest of the year. In the winter, northeast and north monsoons are major events, with about 30% each. Winds with velocity from 6 to 10m/s take up about 20% for the northeast and north winds. West and northwest winds in the winter are about 30% of the total. The calm winds account for about 14%. In the summer, the prevalent wind direction in Nha Trang is southwest and west, with the velocity lies mostly between 11-15m/s. However, mean winter wind velocity is higher than in the summer. The calm winds in this season could reach up to 37%.

Tide: The tidal regime of Nha Trang coastal area is irregular diurnal with a spring tide/neap tide cycle of 14 days and a range of 1.5-2.0m. Monthly, there are around 18-22 days of diurnal tide and the rest of mix-semidiurnal. During neap tide, it has an additional small high tide in these days. The tidal amplitude between spring tide and neap tide varies. During neap tide, the amplitude is about 0.5m.

Current: The current in Nha Trang is the combination of wave-induced and tide-induced currents and river flow. The current has seasonal features, affected by the monsoon regime. Tidal current is the regular current and has a small magnitude in the range from 0.1 to 0.15 m/s, approximately. The remaining part of the current is an irregular current with seasonal changes. In the winter monsoon, the current which is dominated by the Northwest, South and Southeast direction, is driven by the Northern wave and high river flow. In the summer monsoon, the current is only affected by the Southern wave because of the negligibility of river flow and dominated by South and Southeast direction.

Wave: In Nha Trang, the dominant wave direction varies depending on the season. The main directions are southeast, east and northeast. Nha Trang is one of few coastal areas where the wave is higher than that in its adjacent places. The mean wave height annually is about 2.0m. In winter months, the main wave direction is northeast (occupies about 60%) and north (20%) while the dominate wave direction in the summer is southeast (occupies about 50-60%).

River flow: Cai River is the source of fresh water for the Nha Trang coastal area. Driven by the precipitation, the river flow has two seasons: rainy and dry season. The rainy season lasts from October to December. In these three months, the amount of river discharge is 75-78% of the total river discharge in a year. The dry season lasts from January to September and the total discharge (mainly supplied from ground water) in dry season only equal one third of the discharge in three months of the flood season. The unequal distribution of monthly river discharge in a year is described clearer by the data analysis and the extreme event. The annual average Cai river discharge is 56.5m^3/s. The total discharge of Cai River is about 1.78 billion m^3/year.

3.2.2 Bio-physical resources

3.2.2.1 Non-biological resources

Khanh Hoa has abundant resources and minerals such as peat, molybdenum, kaolin, clay, mineral gold, mineral water, heat-resistant clay, silica sand, corals, granite, etc. Among these, the most important minerals are silica sand from Cam Ranh with a reserve of 55.2 million m^3, which meets the technical requirements for manufacturing optical glass, crystal, etc.; construction sand at Hon Gom peninsula of Van Ninh district with a reserve of about 55.5 million m^3; limonite (260,000 tons); and granite (2 billion tons). In addition, mineral water with a reserve of around 40 l/s can be exploited at the rate of 3,400-3,500 m^3/day. One of the successful industrial exploit of mineral water is Danh Thanh Company with an output of 57 million litters per year.

There are many types of land resources in Khanh Hoa. In these, the yellow red soil is biggest area (about 84,4%), which is suitable for the cultivation of both vegetable and industrial plantation. Next one is alluviums (about 7,5%) - the best soil for rice farming. The grey soil (4,6%) is fallow. The sandy soil and sandy dune (2%) is used for settlement and orchards. The alum and saline alum soil (1.5%) is suitable for salt farming and aquaculture.

3.2.2.2 Other resources

Khanh Hoa Province lies on the coast of Southern Central Vietnam, with the mainland part protruding farthest into the East Sea. Apart from the territory on the mainland, Khanh Hoa also has its territorial waters, continental shelf, inshore islands and the island district of Truong Sa. Nha Trang city belongs to the Khanh Hoa Province and is 1280km from Hanoi, 535km from Danang, 448km from Ho Chi Minh City.

Lagoons, bays and beaches of Khanh Hoa are famous: Van Phong Bay, Nha Trang Bay, Cam Ranh Bay, Nha Phu Lagoon; the beaches of Dai Lanh, Doc Lech, Dam Mon, Bai Tien, Bai San, Bai Dai of Cam Ranh. In addition, Khanh Hoa has 8 estuaries and 200 islands in many kinds of size and shape. A number of these islands have been sustainably exploited and turned into tourist attractions that attract more and more visitors to the province. Khanh Hoa has a lot of beautiful beaches suitable for swimming, especially Nha Trang beach located right at the city center. Other remarkable beaches are: Tien beach to the North of the City; the 4km-long Doc Lech beach in Ninh Hoa district; and Dai Lanh beach with a length of 3 km located in Van Ninh district. Moreover, the large number of in-shore islands with various sizes provides favourable conditions for the development of touristic activities such as diving, sea entertainment, etc. Among these, Tre Island is widely known for its nice beaches (such as Tru, Tre, Bich Dam, etc). With landscapes and seascapes endowed by nature together with other scenic spots and an ideal climate with only 2 rainy months emphasized by many historical and cultural relics, Nha Trang has virtually found itself in the list of 10 major tourist centers nationwide, especially known for sea tourism.

With a relatively high salt concentration in seawater, salt production is also important sector, especially for the production of industrial salt.

Nha Trang lies close to multiple international maritime routes, equidistant from such other transshipment ports in the regions as Singapore, Manila, and Hong Kong. In the future, the site will become an international container transshipment port with all the supportive sectors in service and tourism.

3.2.2.3 Seagrass ecosystem

In 2002, there were 32 ha of seagrass beds in Nha Trang bay, distributed near the coast. Seven species of seagrasses in 5 genera from 2 families were recorded in NhaTrang Bay. The largest seagrass beds occur at Dam Tre, Dam Gia, Vung Me (Tre island) and Lang Chai (Mieu island). Seagrasses are most diverse at Dam Gia where 6 species in 5 genera were recorded. The

Spoon grass (Halophila ovalis) is commonly found in Nha Trang Bay. This species is widely distributed, from the intertidal zone to 10 m deep. The highest density of Halophila ovalis was recorded at Dam Tre and Vung Me (Vo Si Tuan *et al*, 2002b).

However, in 2005, there were the big reduce in their coverage of *Enhalus acoroides* in Dam Gia and in the North of Hon Tre. The area of seagrass nearby VinaPearl resort was destroyed for development (Vo Si Tuan *et al.*, 2005).

3.2.2.4 Coral reef ecosystem

Nha Trang Bay has 14 islands with about 15km of coastline, which is an ideal condition for coral distribution. The recent data show that, coral reefs distribute at almost all of islands in Nha Trang Bay, with the structure is semi-fringing and depending on the structure of sea bottom, maximum depth is 15m. The total area of coral reefs in Nha Trang Bay is about 200ha.

There are 350 coral species belong to 64 genera, including 24 species and 5 genera of soft coral. In comparing to other places, Nha Trang Bay is one of the most abundant locations in term of number of coral species and genera in Vietnam (Vo Si Tuan *et al.*, 2002a).

The species composition of coral fishes in Nha Trang Bay is also abundant with 348 species belonging to 146 genera and 58 families. Among them, 77 species are unique to Nha Trang Bay. Mollusks group is also a big group in coral reefs with 106 species, 52 genera and 33 families. Among them, the families, which are highest in number of species, are Conidae, Muricidae, Cypraeidae. Crustacean group has 69 species belong to 39 genera; Echinoderms group has 27 species, 20 genera and more than 252 species of seaweeds living on coral reefs have been found in Nha Trang Bay.

The results of surveys conducted at 12 places in Nha Trang Bay show that the average living coverage of hard coral is 22% (level 2 on the UNESCO's evaluation table). Among them, the western part of Hon Mun has the highest living coverage, reach 54% and the lowest is Bai Ran where average living percentage is 2.2%. In Hon Cau, soft corals cover up to 17% while this number is ranged between 0 to 3.3% in other locations (Vo Si Tuan *et al.*, 2005).

3.2.2.5 Mangrove forest

There used to be 500 ha of mangrove forest surrounded by islands and swamps in Nha Trang Bay. However, most of the mangrove forest in Nha Trang has been destroyed in spite of local authorities' efforts to save salt-marsh forest in Dam Bay, Dam Gia, Song Lo, etc. At the moment, mangrove forest in Dam Bay is in good condition but it is almost destroyed in Dam Gia (Vo Si Tuan *et al*, 2005).

3.2.3 Cultural and social resources

3.2.3.1 Important cultural features

Religions and Beliefs: Khanh Hoa is a province with many religions. The ones with the most followers are Buddhism and Christianity [including Catholicism and Protestantism]. Before Vietnamese people came to this land, Chams native had other specific religious beliefs. Buddhism had been brought in Khanh Hoa from the second half of the seventeenth century, by the Vietnamese. After 1653, Lord Nguyen Phuc Tan set up two palaces of Thai Khanh and Dien Ninh. It quickly affected to the spirit and life of people there. The devotion of Nguyen Lords to Buddhism was the main reason for the spread of Buddhism to the south of Vietnam in the early stages. Traditional belief of King peoples in Khanh Hoa reserves the following faiths: worship agriculture and fishery gods; worship for ancestors, grandparents, parents and relations; worship for national heroes; worship for the Hung Kings, Tran Hung Dao, etc.

3.2.3.2 Important monuments and sites

Thap Ba - Nha Trang (also known as Thap Po Nagar) in Nha Trang is one of the largest towers of the Chams that still remains in the central part of Vietnam. Nowadays, there are only five sites, including one mandapa and 4 temples that serves religious activities and belief of Hinduism. Thap Ba is one of few places where many types of towers of the Champa architecture are retained. Thap Ba - Nha Trang Festival is the biggest traditional festival of the year in Khanh Hoa. It is held from 20th to 23th March annually (Lunar calendar), attracting not only the Vietnamese but also many pilgrims, including the Cham, Hoa, Khmer people from the central, Highlands and south. With the unique and important value in many aspects, Thap Ba - Nha Trang was recognized as national historical monument since l979.

Dam market, central market of Nha Trang city has a unique architecture. This is the largest market as well as the trade symbol of the city. This is a commercial shopping center and also a visit point for tourists. Called the Dam market because the market was located on a swamp, connect to Nha Trang River.

Long Son_Pagoda also known as Phat Trang pagoda or Dang Long Tu, is located on the 23rd October street, Thuy Son Ward, under Trai Thuy hill. This temple was built over a hundred years ago, which has been restored and now is the most famous temple in Khanh Hoa. On top of the hill is the Great Buddha, the height of statue is 21m, the height of the lotus shaped lamp

support is 7m. The statue is easily seen from a wide area around the temple. The statue was built in 1963 by the contribution of the Buddhists. Around the lotus is a portrait of the seven self-burning monks to protest the repression of Buddhism from Ngo Dinh Diem in the period from April to September 1963.

Nui church is a Catholic church in Nha Trang city, Khanh Hoa province. This church also has many popular names such as Nha Trang church; Stone church (because it was built of stone); and Nui Church (as it is built on a small mountain). This church was built in the style of the Western architecture. Overall, the church has strong frame with small blocks from low to high. The highest point is where the bell tower is located - 38 meters high, from the road.

Whale skeleton at the Institute of Nha Trang Oceanography: The Institute of Nha Trang Oceanography is also one of the attraction in Nha Trang. The Oceanographic Institute established by the French in 1922, is considered one of the earliest research facilities in Vietnam. This is a place having the largest collection on marine life in Southeast Asia. Nowadays, the institute is not only a research office but also attracts many tourists.

Cau Da Villas (Bao Dai Building), located at the top Chut mountain (Canh Long mountain), is a historical – cultural monument, at a distance of about 6 km from Nha Trang city. This is a unique structure that combines western architectural styles with eastern art. Bao Dai Building was built by the French in 1923, originally as a cluster of five villas on the Chut Mountain as accommodation for oceanographic research. The French named these villas according to the name of trees and flowers around.

Hon Chong - Hon Do landscape belongs to Vanh Phuoc and Vinh Tho wards, Nha Trang city. Here is a relic formed by the natural tectonic. They are created by a complex of large and small natural rocks, arranged in multiple layers. Hon Chong area is classified as national monument in 1999 by the Ministry of Culture – Information.

3.2.3.3 Income and living condition

Nha Trang often keeps the development at high level and affirms its significant role with high economic development: annual GDP increases 13.13% in average (period of 2003-2007), living condition is better every passing year.

3.2.3.4 Education

In Nha Trang city, education infrastructure is rather complete with numerous facilities at all educational levels. In 2009, there were 75 schools in Nha Trang city. Among them, there were 10 high schools, 23 secondary schools, 41 primary schools and 1 lower and upper secondary school. Total number of pupils was 63,673 and total number of teachers was 2,932 for the school year 2008 – 2010 (Nha Trang yearbook 2010). In recent years, illiteracy elimination and education universalization programmes have yielded encouraging results. The enrollment in the school - year 2008-2009 increased by 2.5 times in comparison with the school-year 2007 - 2008. In 2009, the programmes resulted in 180 trainees obtained literacy, 354 people completed compulsory primary; 498 people completed secondary level and 376 people at high school level (Management Board of Sanitation and Environment project of Nha Trang, 2010). Nha Trang city has 1 university, 2 colleges, 4 primary colleges and 4 vocational schools. They have a significant role in creating a high quality labour force for Nha Trang city, Khanh Hoa and contiguous provinces.

3.2.3.5 Health care

Till December 2008, Nha Trang city has 4 hospitals, 6 clinics and medical service units. Medicine infrastructure is rather good with a large number of medical staff and hospital beds. Following table shows the state of medical infrastructure:

Table 7.8. State of medical infrastructure of Nha Trang city from 2004 to 2008.[*]

Content	unit	2004	2005	2006	2007	2008
Hospital bed						
In hospitals	bed	866	955	1,057	1,050	1,299
Clinic units	bed	43	55	75	130	130
Medical service units	bed	27	27	27	27	27
Medical staffs	person	822	957	1,116	1,191	1,195
Doctors	person	314	334	330	352	356
Physicians	person	253	263	244	247	243
Nurses	person	255	360	435	483	486
Pharmacists	person	340	375	392	400	404
High degree pharmacists	person	41	51	57	59	54
Middle degree pharmacists	person	158	177	187	190	200
Assistant pharmacists	person	138	147	148	151	148

Nha Trang city has also carried out compaigns for epidemic prevention and control with infectious diseases such as influenza A (H1N1), petechial fever, promotion of food safety and hygiene program.

3.2.3.6 Important social features

Demography: The number of households in Nha Trang was 67,312 in 2000 and 99,144 in 2009 (table 7.9). The increase occurs evenly in both the core and the ring.

Table 7.9. Number of households in Nha Trang divided by zones.[*]

Area	2000	2003	2006	2009
Coastal zone	24,321	23,215	24,972	32,926
outer ring	42,991	45,195	47,519	66,218
Total	67,312	68,410	72,491	99,144

The population of Nha Trang was 384,529 people in 2008, in which 49.50% was male. The rate of male/female in Nha Trang was rather stable (table 7.10).

Table 7.10. Population of Nha Trang divided by sex.

Year	Total (person)	Male (%)	Female (%)	Density (people/km^2)
2000	337803	49.15	50.85	
2001	343362	49.12	50.88	1380
2002	347923	49.24	50.76	1396
2003	351990	48.75	51.25	1412
2004	354920	49.28	50.72	1419
2005	358175	49.31	50.69	1438
2006	361955	49.27	50.73	1450
2008	384529	49.50	50.50	1522

3.2.3.7 Important economic features (main industries/sectors)

Industry: Small and medium enterprises are the major components of the industrial sector in Nha Trang. There are three industrial clusters:

1) The North city industrial zone (south of Hon Kho – Vinh Thai commune) consists of 6 factories: Stone processing, factory 2757, Rattan Export production, 10/5 Wood factory, automobile repairing, and Dong An Cotton Packing.
2) The South-West industrial zone (Vinh Phuong commune) includes 3 weave fabric factories, CEVCO dyeing factory.
3) Tan Binh industrial zone (Vinh Nguyen commune) with a tobacco production company, 202 factory, 510 factory, and a seafood processing factory.

In 2009, the gross output of industry is 10,480.143 billion VND (according current price), of which state enterprises contribute 4,943.538 billion VND and non-state ones contribute 4,948.948 billion VND.

Agriculture: The gross output of agriculture of Nha Trang is 65,542 million VND in 2009 (at standard price in 1994). In contrast to Hai Phong city, this sector has a reduction trend from 1996 until now (as shown in table 7.11).

Table 7.11. The output value of agriculture of Nha Trang, 1996 – 2009.

Years / Field	1996	2000	2005	2009
Total (million dong)	69,295.5	78,640	66,379	65,542
Cultivation (million dong)	42,066.5	42,860	55,514	34545
Breeding (million dong)	27,230	35,780	13,865	28,627
Agriculture service (million dong)	-	-	-	2,370

Agricultural area is about 4,206 ha; consist of 2,552 ha for annual crops and 1,654 ha for perennial crops. Main industrial crops are sugar cane and peanut. Sedge is planted in small production. For the grain, paddy is the main crop with production of around 8,600 tons per year.

Aquaculture: In Nha Trang, aquaculture has a relatively small part in the economic structure. Fishing production in 2009 was 288,627 tones and aquatic cultivation produced 24,692 tones of produce. Aquaculture, especially lobster farming, was perceived as the most profitable economic activity; hence, there was a dramatic increase in the number of cages as well as in the total area devoted to aquaculture. Data collected by the Hon Mun MPA pilot project and the

Vinh Nguyen Commune showed that there were 1,675 cages in Nha Trang Bay in June 2001, which increased to 2,438 cages in Jan. 2003 (31% increment) and further went up to 5,096 cages by May 2004. The number of lobster cages thus increased by 204% in three years (Truong Kinh, 2004).

The dramatic growth of aquaculture caused a number of problems such as inadequate disposal of aquaculture waste, aesthetic degradation of the bay, marginalized water use rights of local people, conflicts between aquaculture and tourism, amongst other. Recently, some outsiders' cages located in Vung Me had been removed out of the bay, and islanders' cages were moved to farther areas. Some environmental issues have been mitigated, but other social issues still need to be addressed by the provincial government and other stakeholders (Ho Van Trung Thu, 2005).

Table 7.12. Some indexes of aquaculture of Nha Trang.

Index	Unit	1996	2000	2005	2009
Total value					
- Aquatic cultivation	Bil. dong	710	59,632	45,053	24,692
- Fishing		122,404	116,664	165,664	288,699
- Fishery Service		-		6,000	2,006
Total areas for aquatic cultivation	Ha	242	640	600	200
Production of fishing	Tone	20,070	20,080	27,936	36,434
Production of aquatic cultivation	Tone	257	738	350	410

Commercial and service: Commercial and service activities of Nha Trang city mainly focus on hotel, restaurant and other service accompanies. The total number of household that participated in this sector is 6,881 and these activities create jobs for 10,016 people (Nha Trang year book, 2000).

Port and harbor: Nha Trang Port is used as a multi-functional port for transport of passengers and cargo. Established in 1976, its activities observed a major increase during 1992-1995: cargo volume and turnover are increasing (cargo volume in 1986 is 250,000 tones and in 1996: 426,091 tones and 2009: 1,333,446 tones). Nha Trang Port has been approved in the detailed plan for development of seaport group of South Center of Vietnam.

Table 7.13. Some indicators of Nha Trang Port.

	2007	2008	2009
1) Cargo vulume (tonnes)	1,227,844	1,172,144	1,333,446
a- Export	253,307	218,949	394,994
b- Import	5,028	7,110	29,526
c-Domestic	969,509	946,085	908,926
- Import	848,310	842,868	811,665
- Export	121,199	103,217	97,261
2) Total number of cargo ship	681	629	667
- Domestic	518	526	559
- Foreign	163	103	108
3) Container			
- number of trip	43	47	47
- number of container (TEUs)	4,556	4,322	3,942
4) Passenger ship			
- number of trip	23	19	21
- number of passenger (person)	17,057	17,417	26,313

3.2.3.8 (Un)Employment

According to the Report on Socio – Economic State of the first 6 months of 2009 and the Plan of last 6 months of 2009, Nha Trang city has given jobs for 4,275/8700 employee.

Table 7.14. Employees in economic sector in n Nha Trang (Unit: person).[*]

Employees in	1991	1996	2000	2003	2006
Agriculture Sector	na	na	na	na	na
Industrial Sector		18,549	29,892	33,407	30,869
Service Sector	na	na	10,016	na	na

3.2.3.9 Migration

In the past ten years the net migration in Nha Trang city has reached +40,898. The rate of migration varies according to the sub-period. From 2000 to 2003, the number of people in the coastal area who left home and went to other areas for work or study purposes was quite high (- 8,459 people), but the ring area also received significant in-migration (+17,635 people). In the 2003-2006 periods, the net migration of people to Nha Trang was + 5,531 of whom about 30% came to the ring while the remaining 70% moved to the coastal area. From 2006 – 2009, the level

of migration increased with a total net migration of 26,191, 76% of which was concentrated in the ring. This may be related to the event of Nha Trang city achieving urban grade I status. Migration and shifts in the labor force are resulting in major changes in Nha Trang city in particular and Khanh Hoa province in general.

Table 7.15. In - out migration in Nha Trang from 2000 to 2009.*

	2000-2003	2003-2006	2006-2009
Coastal area/core	-8,459	3,650	6,297
In migration	6,251	4,114	12,374
Out migration	-14,710	-464	-6,076
Ring	17,635	1,880	19,893
In migration	19,650	4,839	29,580
Out migration	-2,015	-2,959	-9,687

4. Overview of Users in the Case Studies

4.1 Inhabitants/Households

The population of Hai Phong in last ten years is given in table 7.16. The population of Hai Phong is distributed in 14 administrative units, in which Le Chan district has the highest population density, followed by Ngo Quyen and Hong Bang districts. In 2009, Hai Phong had 529,548 households.

Table 7.16. Population changes of Hai Phong in last ten years.

Item	2000	2001	2003	2005	2007	2009
Population (Thous. person)	1700.5	1723.5	1754.2	1792.7	1826.9	1841.6
Density (People/km^2)	1119	1135	1155	1180	1203	1212
Rate of natural growth (%)	1.37	1.35	0.62	1.24	0.78	

The number of inhabitants and households in Nha Trang is presented in following tables:

Table 7.17. The characteristics of population in Nha Trang.

Items	2000		2009	
	Coastal zone	Outer ring	Coastal zone	Outer ring
Population (people)	126,691	234,317	132,273	261,260
Number of households	24,294	43,018	32,926	66,218
Density (people/km^2)	9,505	16,895	8,486	15,252

4.2 Tourism establishments

Hai Phong has its own potential for tourism development in both ecological and cultural tourism due to the advantage of a long coastline with lots of marine landscapes such as Do Son beach, Cat Ba archipelago. With a long-standing culture, Hai Phong's tourism has more capacity to develop. At present, the state of Hai Phong tourism does not correspond to its potential.

Statistics data show that the total number of tourists is increasing over time. In 2009, the number of tourists exceeded 4 million visitors, an increase of close to 2 times from 2005. Most of the tourists visiting Hai Phong are domestic. In 2008, Hai Phong had 122 hotels with 4758 rooms. The data related to tourist activities in Hai Phong in last ten year is presented in table 7.18.

Table 7.18. Tourist and hotel activities in Hai Phong.

Tourist and Hotel activities	Unit	2000	2001	2005	2007	2009
Number of hotels	Hotels	77		90	117	110
Number of rooms	Room	3,075	3,184	3,545	4509	4466
Number of beds	Bed	5,689	6137	6,381	8,028	7850
Utilized times						
Number of rooms	Day	496,089	550,539	557,699	795,387	803,590
Number of beds	Day	903,408	998,454	941,835	1,427,699	1,330,000
Number of tourist serviced by resident units	person	714,495	1,160,418	2,356,647	3,527,159	3,944,400
Foreign tourists	person	198,409	308,891	540,031	610,759	623,902
Domestic tourists		516,086	851,527	1,816,616	2,916,400	3,320,498
Number of tourist serviced by travel agencies	person	71,432	73,641	36,521	80,678	56,774
Foreign tourists	person	57,968	64,677	18,765	5,237	6,996
Domestic tourists		11,596	7,406	15,494	60,544	37,961
Vietnamese tourists traveling foreign countries		1,868	1,558	2,262	14,897	11,915

Tourism takes the most important role in the economic structure of Nha Trang (40% of economic structure). It is one of famous touristic destinations in the country with landscapes such as: Nha Trang beach, Nha Trang Bay, Thap Ba Ponagar, Vinpearl land, Hon Mun MPA, etc. Recently, Nha Trang has become an important center of tourism development, contributing to the expansion of tourism in Vietnam.

According to the Report on Socio – Economic state of the first 6 months and Plan of the last 6 months of 2009 of Nha Trang (Department of Investment and Planning of Khanh Hoa, 2005), the total gross output of tourism and service activities reached 773.704 billion dongs (increasing of 9.75% in comparison with the same period last year) with 776,000 turn of passenger (equivalent 95.86% compared with the same period last year). Of which, the number of foreign tourist visiting Nha Trang was 162,000.

In 2008, Nha Trang city had 342 hotels with 8235 rooms and served 1.4 million tourists. The number of tourists is increasing with number of tourist in 2008 is 3 times higher than that in 2001.

Table 7.19. Tourist and hotel activities in Nha Trang.

Tourist and Hotel activities	Unit	2001	2003	2005	2006	2007	2008
Number of hotels	Hotels	162	217	272	281	342	342
Number of rooms	Room	3,548	4,260	5,663	6,319	7,246	8,235
Number of beds	Bed	7,668	8,628	10,781	12,203	13,429	15,894
Number of visitors	Person	494,804	584,127	900,289	1,086,598	1,363,544	1,446,894
Vietnamese		353,156	400,656	651,234	831,277	1,081,489	1,025,593
Foreigner		141,648	183,471	249,055	255,321	282,055	421,301
Tourists stay days	Day	983,450	1,115,857	1,810,365	2,664,292	2,845,405	3,268,286
Vietnamese		641,627	714,969	1,216,208	2,054,072	2,181,064	2,431,043
Foreigner		341,823	400,888	594,157	610,220	664,341	837,243

4.3 Restaurant/café/snack establishments

The number of café/snack establishments in Hai Phong is numerous but no inventory data is available. In 2008, Hai Phong had 164 hotels and restaurants (table 7.19). In Nha Trang, in 2008, there were 18,965 establishments working on trade, hotel and restaurant activities.

4.4 Industrial establishments

At the moment (2009), there are 45 state-owned industrial establishments in Hai Phong. The state industrial establishments in Hai Phong reduced quickly from 2000 (81 establishments) to 2009 due to privatization. The main industries in Hai Phong are manufacturing that include foodstuffs and beverage, textiles, wearing apparel, footwear, chemicals and chemical products,

rubber and plastic products, non-metallic mineral products, and machinery and equipment. The number of enterprises in Hai Phong increased quickly from 2000 to 2009. At present, there are 4,497 enterprises in Hai Phong, with manufacturing (947 enterprises), trade (1814 enterprises), transport, storage and communication (726 enterprises), and construction (473 enterprises) (table 7.20).

Table 7.20. Number of enterprises operating devided by type of economic activities in Hai Phong.[*]

Economic activities	2000	2003	2004	2005	2006	2007	2008
Agriculture and forestry	10	11	10	16	38	19	18
Fishery	8	25	29	17	10	15	13
Mining	18	25	27	24	24	27	26
Manufacturing	337	541	684	768	816	947	947
Production and distribution of electricity and water	3	5	6	5	13	20	21
Construction	69	179	253	314	391	476	473
Trade	396	669	957	1176	1533	1796	1814
Hotels, restaurants	38	65	88	107	129	161	164
Transport, storage and communication	131	278	398	444	562	715	726
Finance, credit	37	28	31	29	35	41	40
Scientist activities and technology				1	6	6	6
Real estate, renting and business activities	34	56	78	109	132	184	196
Education and training	1	4	13	10	17	13	13
Health and social work	1	2	4	4	6	7	7
Culture and sport	1	3	3	5	6	6	6
Private household with employed persons	5	11	13	19	22	27	27
Total	1089	1902	2594	3048	3730	4460	4497

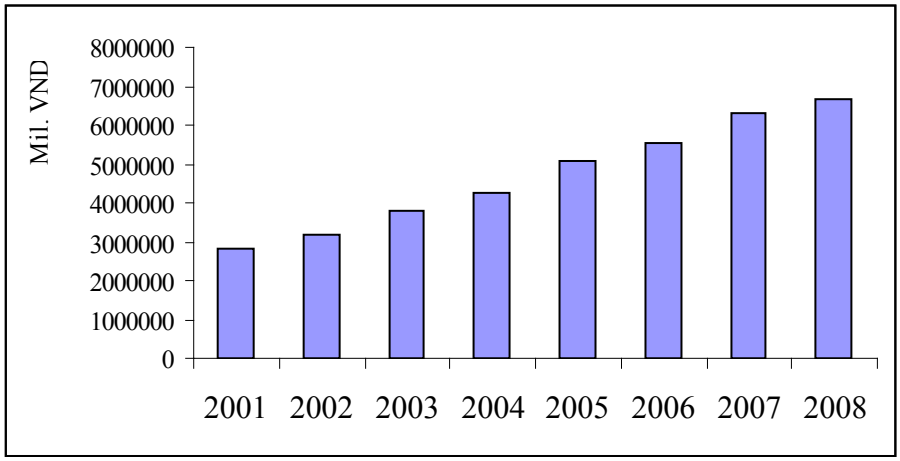
Enterprises that concentrate in 5 urban districts (3,253 enterprises), account for around 72% of the number of enterprises in whole city. In some of rural districts, the number of enterprises is also quite high such as Duong Kinh, Thuy Nguyen, An Duong, and An Lao.

In Nha Trang, the number of industrial enterprises is 1896 (in 2008), in which there are 12 state enterprises. The main type of enterprises in Nha Trang is household numbering 1528. Like Hai Phong, the number of state establishments has reduced from 2000 to 2008 because of privatization in Nha Trang.

Table 7.21. Number of industrial enterprises in Nha Trang.[*]

Economic activities	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	1,928	2,010	2,029	2,037	1,936	1,643	1,872	1,847	1,896
State	25	25	22	21	18	16	14	12	12
Collective	4	5	6	6	5	5	5	5	7
Household	1,823	1,879	1,865	1,845	1,713	1,398	1,601	1,527	1,528
Private	39	47	64	72	79	89	101	114	125
Mixed	31	47	63	84	114	128	144	181	216
Foreign invested economic sectors	6	7	9	9	7	7	7	8	8

Figure 7.6. Gross output of industry in Nha Trang (at standard 1994 prices).



The gross output of industry in Nha Trang is increasing (Figure 7.6). The main industries in Nha Trang are mining of stone and salt, and manufacturing (includes foodstuffs and beverage, textiles, wearing apparel, tanning and dressing of leather, leather product, wood manufacturing, fabricated metal products, furniture…).

4.5 Other trading/commercial establishments

In Hai Phong, the number of enterprises that work on trade is 1814 (Table 7.20), which accounts for 40% of the number of enterprises in the whole city. The number of enterprises working in hotel and restaurant sector is 164, which accounts for around 3.6%. In Nha Trang, there are 18965 establishments in trade, tourism, restaurant and hotel sectors in 2008. This number has increased 2.62 times compared to 2000.

4.6 Fishing fleet

In Hai phong, there are about 2800 fishing boats with the average capacity 22 – 22,5CV/boat (vasep.com.vn). In Nha Trang, there are 2880 mechanical fishing means with the total capacity of 86800 CV. The development of economy in Nha Trang has led to the replacement of manual fishing means by mechanical ones. In 2006, there were 297 manual fishing means, but in 2008, this number is 34.

Table 7.22. Sea fishing capacity in Nha Trang.[*]

Mechanical fishing	Amount (unit)	Capacity (CV)
2000	2050	53800
2002	1995	57900
2003	1985	58400
2004	1990	60281
2005	2105	60281
2006	2105	60281
2008	2880	86800
Manual fishing		
2006	297	
2008	34	

4.7 Farmers (land or aquaculture)

In 2009, Hai Phong has 2,011 farms, in which there are 699 livestock farms, and 797 fishing farms. The farms are mostly found in the rural areas such as Kien Thuy, Thuy Nguyen, An Duong, Tien Lang, An Lao (table 7.23).

Table 7.23. Number of farms in Hai Phong by kind of activity and by zone (2009).[*]

Area	Total	Annual crop farm	Perennial crop farm	Livestock farm	Fishing farm	General business farm and others
Total	2,011	23	11	699	797	481
Core	173	0	0	18	105	50
Coastal zone	1,477	3	3	496	601	374
Ring	361	20	8	185	91	57

[*] Sources: Year Book of Hai Phong, 2009.

In 2009, Hai Phong has 9.4 thousand heads of buffalos, 17400 head of beefs. The general trend of livestock in Hai Phong is the reduction of buffalos, the increasing of cattle and poultry. The change in the number of pigs is not so clear.

Table 7.24. Number of livestock in Hai Phong.[*]

Kind of livestock	2000	2003	2004	2005	2006	2007	2008	2009
Buffaloes (thous. Head)	17.2	12.2	10.9	10.5	10	9.5	9	9.4
Beef (Head)	10,294	11,106	12,045	13,803	16,404	17,927	16,539	17,400
Pig (thous. Head)	483	588	589.2	612.8	611.9	537.5	512.9	533.6
Poultry (thous. Head)	4,246.6	5,051.9	4,396.7	4,591.2	4,284.6	4,817.3	5,531.5	5,808.9

The area of agricultural land in Hai Phong has decreased from 2000 to 2009 due to urbanization. In 2009, there are 52,755 ha of agricultural land in Hai Phong, concentrating mainly in rural districts. The change in agricultural area took place strongly in Hai An and An Duong districts (table 7.25).

Table 7.25. Total utilized agricultural area (ha) in Hai Phong.[*]

Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	62,127	61,596	60,830	59,437	59,109	57,038	56,618	55,705	53,600	52,755
Core	2,205	1,958	1,875	2,839	2,945	2,693	2,740	2,333	2,935	2,850
Coastal zone	32,201	31,960	31,535	31,045	30,840	29,479	29,144	28,868	26,659	26,229
Ring	27,721	27,678	27,420	25,553	25,324	24,866	24,734	24,504	24,006	23,676

In 2009, Hai Phong had 13,983 ha of aquatic cultivation, mainly concentrated in coastal districts such as Thuy Nguyen, Hai An, An Lao, Kien Thuy, Vinh Bao, Cat Hai. The area of aquatic cultivation strongly increases during the period from 2002 – 2005 (table 7.26).

Table 7.26. Area of aquatic cultivation by zones in Hai Phong (ha).[*]

Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Core	1,698	1,901	2,219.5	4,186.1	3,543.1	3,220.6	3,426.9	2,930	3,605	3,702
Coastal zone	7,392	7,678.2	8,114.3	8,571	8,708.2	8,326.7	8,491	8,664	8,142	8,046
Ring	4,087	4,030	4,084.1	1,866.8	1,959.1	1,939	2,050	2,116	2,188	2,235
Total	13,177	13,609.2	14,417.9	14,623.9	14,210.4	13,486.3	13,967.9	13,710	13,935	13,983

Although the area for aquaculture slightly decreased, the aquaculture product in Hai Phong is increasing continuously from 2000 to 2009. In 2009 the aquaculture product in the whole city is 43,442 tons with the main products such as shrimp, fish, shellfish, crabs, etc.

*Table 7.27. Aquaculture production in Hai Phong (ton).**

Area	2000	2003	2004	2005	2006	2007	2008	2009
Core	3,271	10,842.7	11,199.9	11,044.3	10,286	8,779	11,677	8,358
Coastal zone	9,198	16,882	17,277.8	17,188.7	21,264	23,085	21,568	25,130
Ring	6,956	5,713.2	6,069.3	6,720.8	6,960	8,045	8,942	9,954
Total	19,425	33,437.9	34,547	34,953.8	38,510	39,909	42,187	43,442

In Nha Trang city, the number of livestock is low in comparison to Hai Phong city. In 2008, the city had 192 heads of buffalos, 2008 heads of cattle, and 11764 heads of pigs. Like Hai Phong, the general trend in livestock in Nha Trang is the reduction of buffalos, the increase of cattle, and a slight reduction of pigs (table 7.28).

*Table 7.28. Number of livestock in Nha Trang.**

Kind of livestock	2000	2001	2003	2005	2007	2008
Buffaloes (head)	437	369	375	395	234	192
Cattle (head)	1679	774	1303	2027	3107	2008
Pig (head)	13317	14444	15567	19594	10583	11764
Gross output of livestock and Poultry (ton)	1030	1000	1387	1339	1042	572

The agricultural area in Nha Trang includes both land and water surface areas, such as agricultural fields area (crop and plant), forestry, aquaculture, and salt production. In 2008, Nha Trang has 7310 ha for agriculture in which 670 ha is for aquaculture (table 7.29).

Table 7.29. Total utilized agricultural area (ha) in Nha Trang.[*]

	2000	2006	2008
Annual crops land	4801	2123	2247
Perennial crops land		1543	1651
Forestry land	2696	2208	2686
Water surface land for fishing		667	670
Salt productive land		43	43
Other agricultural land		13	13
Total	7497	6464	7310

The aquatic product in Nha Trang increased slightly from 2000 to 2008. The main aquatic product is from marine exploitation (table 7.30). Aquaculture contributed little to the overall production.

Table 7.30. Gross output of aquatic products in Nha Trang (ton).[*]

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Total	20827	25722	28095	29723	29898	31393	32018	33200	33630
Sea fish exploited	16989	17316	17917	21546	24289	26794	27320	28883	33205
Breeding aquatic product	757	1003	1034	1116	1168	483	580	372	425
Breeding fishes	19	24	31	34	26	25	16	20	11
Breeding shrimps	738	975	994	1076	1042	458	548	339	391

4.8 Ports

Port industry is one of the key economies in Hai Phong. The port of Hai phong is the biggest port in the north of Vietnam and the second largest in the whole country (just after Sai Gon port). The amount of cargo handled thought the ports of Hai Phong increased sharply from 12 million tons in 2000 to near 33 million tons in 2008, many times higher than the plan. Until now, the ports of Hai Phong attract about 3611 workers, in which 43.6% is porter. In 2009, there was 2410 ships call in and out the port (table 7.6).

In Nha Trang, the water ways are not very developed. The volume of freight transported by waterway is shown in the table below (mainly seaborne). However, the number of passengers carried by waterway is high (table 7.31).

Table 7.31. Port activities in Nha Trang.[*]

Year	2003	2004	2005	2006	2007	2008
Volume of freight (thousand tons)	166	185	264	273	546	226
Passengers (thousand persons)	514	406	828	857	975	1095

4.9 Energy production companies

In Hai Phong, there are 3 state establishments working on production and distribution of electricity and water supply. They employ 6,680 people, about 0.7% of the labour force of the whole city.

In Nha Trang, in 2006, there are 53 establishments operating in production and distribution of electricity and water, in which 4 establishments are collectives. The number of people working in this kind of production is 2,367 people.

4.10 Environmental groups

In Hai Phong and Nha Trang, the number of people who work in the environmental groups or organizations is not high. This group consists of governmental and non-governmental organizations. The governmental organizations include research institutes and universities on environment, marine environment, and fishery; management agencies on environment, Environmental Protection Associations of Hai Phong and Nha Trang, Urban Environment and Sanitation Companies of Hai Phong and Nha Trang, Environment Monitoring Centers of Hai Phong and Nha Trang, ect. The non–governmental organizations includes FFI, WWF, IUCN, WB and others.

4.11 Community groups

In Hai Phong, in 2009, there were 6 community [political] units working on scientific and technology related activities, 13 units working on education and training, 7 units working on health and social work, and 6 units working on cultural and sporting activities. There are about 53,723 people in these community groups. Related to activities of party and membership organizations, there are 13,561 people who participated, occupying about 1.4% labor force of the city (Hai Phong Statistics Office, 2010).

5. Conclusions

In Hai Phong, major resources can be distinguished in non-biological and biological categories. The non-biological resources consist of mines of iron, zinc, kaolin, clay, limestone and quartzite. The sand, mineral water, oil and natural gas are also available in Hai Phong. Hai Phong is located in northeastern coast of Vietnam, therefore, coastal area is also a special resource form. With 125 km long coastline and 5 estuaries, Hai Phong has many biological resources such as mangrove forest, seagrass, coral reef, soft bottom, and rocky tidal ecosystems. The water resources in Hai Phong are abundant including fresh water and ground water. In short, natural resource base in Hai Phong is abundant and diversified. The main users in Hai Phong are inhabitants (1.8 million people) distributed in 15 districts. Each year, Hai Phong receives 3.8 million tourists, mainly concentrated in Do Son and Cat Ba Island. There are 4497 enterprises and 2010 farms in Hai Phong.

Due to non-availability of data related to non-biological resources in Nha Trang, data for Khanh Hoa province in general is used. In Khanh Hoa, the main non – biological resources are peat, molybdenum, kaolin, clay, mineral gold, mineral water, heat-resistant, clay, silica sand, corals, granite and limonite. Especially, Nha Trang bay is a landscape and an invaluable resource of the Nha Trang city. The biological resources include seagrass, coral reef ecosystems with much kind of fauna and flora. Nha Trang is home for 393 thousand people, each year Nha Trang receives 1.4 million tourists. There are 1896 enterprises working mainly in industry, construction, services and tourism sectors in Nha Trang. Nha Trang also has 2880 mechanical fishing means.

In Hai Phong, the increase in exploitation of natural resources is related to the industries such as construction, building and construction materials (cement, iron, steel, sand, brick…). The number of enterprises working on construction industry has quickly increased from 2003 to 2008, which shows that the natural resources in Hai Phong are being exploited immoderately with less control.

Over fishing and extinct activities have caused serious affect on fauna and flora in both case study areas [Hai Phong and Nha Trang]. Many areas of seagrass and coral reef are affected by these activities. The loss of major areas of mangrove forest is a consequence of mainly the development of port and port logistics related activities. Widening of aquaculture area also causes water pollution, water turbidity and sediment pollution. The increase in tourism and hotels also lead to the increasing of tourist boats that influence water quality (oil and grease). Specially, diving activities of tourists in Nha Trang are affecting remarkably the coral reefs and

seagrass beds. These different uses and their effects in both case study areas of Hai Phong and Nha Trang indicates that there is a close relation between users and natural resources. It is the understanding of this close relationship that is crucial for understanding the present as well as future conflicts.

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CHAPTER 8.

Coastal Environmental Resources and Users – Portugal

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1. Introduction

The purpose of this chapter is to give an overview of the Portuguese case studies: Lisbon Metropolitan Area (LMA), Eastern Algarve (EA) and Funchal Metropolitan Area (FMA). Hence, the aim is to make an assessement of the main natural resources and users in each case study in order to identify the most important pressures and conflicts of uses that threaten coastal areas.

A broad analysis of the physical resources and environmental conditions will be first provided for each case study. Coastal morphology, climate and atmospheric conditions, littoral and marine habitats and biodiversity, as well as fresh water, soil and mineral resources, when available, were the main biophysical resources assessed. Additionally, cultural heritage resources were also taken into account.

The second part of this chapter encompasses a characterization of the main land users in the three Portuguese study areas. The approach for studying the case studies was mainly quantitative because the purpose is to identify the users on coastal areas and to weigh up the intensity of their presence. Therefore, the analysis of the magnitude and intensity of the impact of the users in coastal urban areas may aid the identification of potential sources of conflict/stresses with regards to environment and resources.

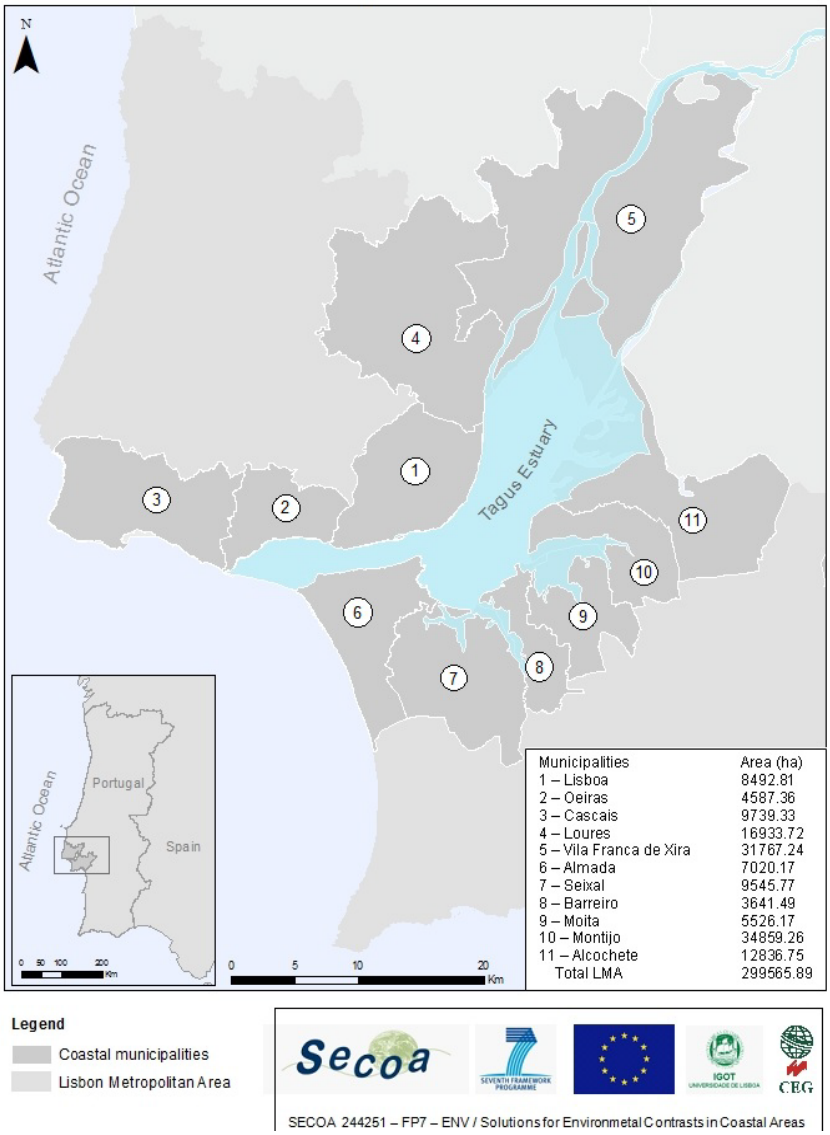
2. Overview Of Resources In The Case Studies

2.1. Lisbon Metropolitan Area – Tagus Estuary

2.1.1 Geographical overview

The Lisbon Metropolitan Area with 299,566 ha is the westernmost European capital, encompassing 18 municipalities. LMA is divided by the large Tagus river estuary, leading thus to two spatial units such as the Great Lisbon (9 municipalities) and the Setubal Peninsula (9 municipalities). The focus of this analysis will be on the 11 municipalities surrounding the Tagus Estuary, which comprise in total 144,949 ha.

Figure 8.1. Lisbon Metropolitan Area: coastal municipalities of Tagus Estuary.



Lisbon Metropolitan Area is highly populated holding 27% of the Portugal's population. As will be explored later, there is an increased pressure in the coastal municipalities such as Seixal (14.4%) and Cascais (8.4%) with the increase in population density from 2001-2008. Linked to the population density increase, in the municipalities on the outskirts of Lisbon, is the intense urban pressure and lack of spatial planning, which triggers a number of environmental conflicts. This metropolitan area also encompasses a significant number of industries and commercial activities, notably in the municipalities of Vila Franca de Xira, Loures, Lisbon and Seixal, as explained later. The critical issues that emerge here are linked with the location of those industrial and commercial areas bordering or overlapping protected areas such as the

Tagus River Natural Reserve and the Protected Landscape of Costa da Caparica's Fossil Cliff, which are ecologically very sensitive. A fourth issue that can be highlighted is Tourism, notably the pressures linked to resources consumption that touristic activities require. However, if well planned, leisure and tourism can become an opportunity for the enhancement of obsolete and currently vacant industrial sites (e.g. located in Almada, Seixal and Barreiro municipalities).

2.1.2 Bio-physical resources

2.1.2.1 Area and coastal morphology

The Tagus Estuary case study includes a coastline of 312 km (Table 8.1). The two banks, although both intensely urbanized, are asymmetrical. While the north bank is fairly regular, the south bank is sinuous, cutted out by numerous recesses, estuaries and river branches. On the other hand, while the hills and sand beaches dominate the west sector of the coastline (municipalities of Oeiras, Cascais and Almada), the east area is mainly constituted of flat lands and marshes.

Table 8.1. Topography of the Lisbon Metropolitan Area – Tagus Estuary study area[*]

	LMA	Tagus Estuary municipalities	500 m buffer
Total area (ha)	2,996,566	144,949	14,823
Coast line (Km)	210	145	145
Mean declive (degrees)	5.38	4.67	3.01
Highest point (m)	400	300	100

The western coastline is very well suited to beach and marine sports. In the municipalities of Cascais, Almada, and Oeiras, the coast comprises sandy beaches facing the Atlantic Ocean, which provide excellent conditions for the development of tourism and leisure. The water quality is also good for bathing. The water quality for bathing was assessed with regard to legal requirements under the DL nº 236/98, 1st August, which implements the 76/160/CEE Directive in Portugal, and criteria established by the Despacho nº 7845/2002, 16th April. The sampling plan is designed by the Portuguese Environmental Agency, and takes place during the bathing season (between March and September). The water quality is then classified as either "Good", "Fair" or "Bad" quality regarding to the following criteria: "Good" if at least 95% of the parameters are below the maximum recommended value; "Fair" if at least 80% of

the parameters are below the maximum recommended value; and "Bad" if at least 5% of the parameters are above the maximum admissible value. The three above mentioned municipalities have designated areas for bathing: Almada has 17 designated areas, Cascais has 12 and Oeiras has one. Overall, the beaches included in the study do not have water quality problems with regards to bathing. Cascais had consistently good water quality for bathing in 2006 and 2009. Oeiras had an increase in water quality in 2009, compared to 2006, whereas the Almada municipality had good water quality for bathing, except for 2 beaches in 2009 which were assessed as "Fair".

2.1.2.2 Climate conditions

The mean annual sunshine duration in Lisbon area is relatively high, around 2800 h/year. Lisbon's thermal rhythm is characterised by a moderately warm summer and a mild cold season. The winter amenity is demonstrated by the CmTm values, varying between 7.8ºC and 8.2º C. August was the hottest month with WmTm values around 29ºC in all the selected stations.

Precipitation time in Lisbon Metropolitan Area is characterized by a typical Mediterranean rainfall regime. At the regional scale, the spatial contrasts of mean annual precipitation are controlled by the orographic effects, namely those related to the presence of hills and mountains (e.g. Serra de Sintra, Serra de Arrábida) at the western and northern limits of the study area. In general, the values of mean annual precipitation (Ry) decrease from the most elevated areas of northern sectors to the lowest and southern areas of LMA. The Ry on the reference period was 753 mm. December was the rainiest month, reaching 100-120 mm of mean precipitation, and July was the driest one with an amount below 10 mm. The predominance of dry weather conditions (except for the cold season) is clearly indicated by the low value of NRDy, which did not reach 100 days in the selected stations.

Wind regime in LMA is dominated by a prevalence of westerly winds, but also by strong seasonal contrasts regarding not only its direction, but also its intensity. The mean annual wind speed is moderate, and Wsy values are below 2.5 m/s in all stations selected for this summary. In Summer North and Northwest winds prevail, while in winter the most frequent winds blow from the NE and the SW. Southwesterly winds' speed is the highest and they may cause material damages and occasional storm surges.

Wind power is an important renewable resource in Portugal (approximately 50% of the renewable sources). According to the European Wind Atlas, the LMA is located in a high wind potential resource area, ranging from 5.5 to 6.5 m/s, with an annual wind power of about 200 to 300 W/m^2 in open plain to 8.5-10 m/s (700 to 1200 w/m^2) in hills and ridges at 50 meters above ground level. Depending on the height of wind towers, estimated offshore production can range from 250 (20 m towers) to 900 W/m^2 (200 m towers). LMA has an installed capacity of about 320 MW (2010). Recent studies were carried out in the municipality of Cascais to assess the wind power at 10 m high (useful for small wind turbines); they demonstrated that wind turbines can easily be used to supply local neighbourhoods with electric power, for example to pump water or recharge electric vehicles' batteries.

2.1.2.3 Coastal and marine ecosystems

The Lisbon Metropolitan Area has important natural values related to the coastal and marine ecosystems, mostly in the riverside municipalities of the Tagus Estuary.

The Tagus Estuary, around which the Lisbon Metropolitan Area has developed, is the largest gulf in the Portuguese cost. It covers a total area of 32,500 ha and approximately 13,600 ha of intertidal areas, which are mainly occupied by salt marsh vegetation and by mudflats. The estuary has an internal delta including small lagoons, and a central area occupied by an internal sea comprising of a fresh and salt-water mix. This provides exceptional conditions for hosting over 100,000 species of birds.

The Portuguese law protects part of the Tagus Estuary. Due to its value as a semi-natural landscape and its importance as a habitat for migratory birds, 9,168 ha were designated Natural Reserve (RCM nº 177/2008, 24th November). The Tagus Estuary is also protected by European legislation, since it integrates the Natura 2000 network both as a Special Protection Area (SPA) (under the Directive 79/409/CEE, known as Birds Directive) and as a Site of Community Importance (SCI) (under the Directive 92/43/CEE, known as Habitats Directive).

The SCI Tagus Estuary (PTCON0009) occupies a wider area than the Tagus Estuary Natural Reserve. It covers a total of 26,795 ha of terrestrial area and 17,814 ha of marine area (the largest in Portugal and one of most important in Europe), distributed by the municipalities of Alcochete, Loures, Montijo and Vila Franca de Xira.

Table 8.2. Natural areas with conservation status by the Portuguese law in the Lisbon Metropolitan Area – Tagus Estuary.[*]

	Natural Park	Natural Reserve	Protected Landscape
Municipality	(ha)	(ha)	(ha)
Cascais	3,266	-	-
Vila Franca de Xira	-	7,440	-
Alcochete	-	1,728	-
Almada	-	-	1,062

The main land-uses in these SCI (Table 8.3) are wetlands (42%) and arable crops (30%); it also includes 5 priority habitats at European level, namely coastal lagoons (1150), Mediterranean salt steppes (Limonietalia) (1510), 'grey dunes' (2139), wooded dunes with *Pinus pinea* and/or *Pinus pinaster* (2270) and Mediterranean temporary ponds (3170). Salt marshes and salina are also very important in this ecosystem, providing nursery areas for fish species and contributing for the maintenance of fish stocks.

Table 8.3. Area occupied by Natura 2000 network in the Lisbon Metropolitan Area – Tagus Estuary.[*]

	SPA Tagus Estuary (PTZPE0010)	SCI Tagus Estuary (PTCON0009)	SCI Sintra-Cascais (PTCON0008)	SCI Fernão Ferro/Albufeira Lagoon (PTCON0054)
Municipality	(ha)	(ha)	(ha)	(ha)
Alcochete	**367**	**8,380**	**-**	**-**
Cascais	**-**	**-**	**2,641**	**-**
Loures	209	**111**	**-**	**-**
Moita	417	**-**	**-**	**-**
Montijo	25	**87**	**-**	**-**
Seixal	**-**	**-**	**-**	1,167
Vila Franca de Xira	7,542	**12,703**	**-**	**-**

The SPA Tagus Estuary (PTZPE0010) covers 41,725 ha in the municipalities of Alcochete, Loures, Moita, Montijo and Vila Franca de Xira. It is considered one of the most important places in Portugal for migratory birds. It holds a total number of 90 habitats or species protected and 36 target species included in the Annex I, Birds Directive.

There are other protected areas in the metropolitan municipalities around the Tagus Estuary. Another site with a significant ecological value is the western sector of Cascais municipality, along the coastline. This area is also protected by the Portuguese law, having been integrated in the Sintra-Cascais Natural Park (RCM nº 1A/2004, 8th January). It provides excellent ecological conditions for flora and fauna. Because of its floristic value, this area was also designated as a SCI in the Natura 2000 network (PTCON0008). SCI Sintra-Cascais does not confine to the study area. It has 8,110 ha of terrestrial area and 8,522 ha of marine area, but only 2,641 ha are situated in the municipality of Cascais. In the whole, SCI Sintra-Cascais is considered as a significant ecological spot in the Mediterranean Biogeographic Region. It has 12 species included in the Annex II, Habitats Directive, notably the priority specie *Jonopsidium acaule,* which is protected at the European level. Other spot of ecological relevance in the study area is the Costa da Caparica´s Fossil Cliff Protected Landscape (RCM nº 177/2008, 24th November), situated in the southern bank of Tagus Estuary, alongside the west coast.

In the southern part of the Seixal municipality there is another place that is included in the Natura 2000 network, under the Habitats Directive: SCI Fernão Ferro/Albufeira Lagoon (PTCON0054). It belongs to the Mediterranean Biogeographic Region and includes a wetland of international importance for avifauna and for fish and bivalves' reproduction.

2.1.2.4 Soil and mineral resources

In Portugal, the soil with agriculture aptitude is relatively rare, not exceeding 12% of the national surface. It is classified under the National Agricultural Reserve designation (NAR) and it is compulsorily considered as a *non aedificandi* zone in all the Portuguese spatial plans. In the Tagus Estuary, the NAR soil occupies a higher percentage of area than in Portugal as a whole. In fact, 19.3% of the Tagus Estuary study area falls in NAR classification. The presence of alluviums explains the comparatively superior richness of the Tagus Estuary soil. It also explains why the soil with a better aptitude for agriculture is concentrated in the eastern municipalities of Tagus Estuary, such as Vila Franca de Xira (51.5% of the municipality classified as NAR), Montijo (35.9%), Moita (31.4%) and Alcochete (26.6%).

The percentage of NAR soil in the 500 m coastal ribbon is lower than in the region as a whole, due to the salinization provoked by the sea water. Yet, NAR soil reaches to 25.1% in the 500 m coastal strip of Vila Franca de Xira municipality, and to 16.2% in Moita.

With regards to mineral resources, limestone and sand are those more economically relevant in this study area. Sand is present along the seashore and in the riverside of Tagus estuary, particularly in the south bank. As the sand is used as a raw material for building industry, its extraction remains an active business in the LMA, particularly in the southern rim of Tagus estuary. In 2007, 1 607,396 tons of sand where extracted in this area, which represented an increase of 26.7% in relation to the year 2000.

In the north bank, sand extraction has no expression. Here, limestone is the most important mineral resource; it is mainly explored in the municipalities of Vila Franca de Xira and Loures. Basalt, which is used for pavement, it is also extracted in these municipalities, however in a fairly minor quantity. In the past, the exploration of ornamental stones was a relevant industry in Cascais (blue limestone) but this mining activity has practically cessed in the last few years. Neither limestone nor basalt is extracted in the range of 500 m along the coastline.

2.1.2.5 Freshwater: quantity, quality and access to water

With regards to the quality of drinking water from public supply, there are no problems to be reported in the Tagus Estuary study area. In Portugal, drinking water quality is assessed as a percentage of samples non-compliant with the parameters defined in the law (DL 243/01, 5th September, and Portaria n. 1216/2003, 16 September, prior to 2007; DL 306/2007, 27th August, from 2007 to present). For the studied years (2005 and 2010), the percentage of non-compliance was found to be lower than 0.5% in all the municipalities.

2.1.3 Cultural and social resources

The Lisbon Metropolitan Area is one of the regions with a higher concentration of cultural heritage in Portugal. The 11 municipalities of the Tagus Estuary hold a total of 370 classified sites (historic urban quarters) and classified buildings (monuments), and 1213 archaeological sites. The monuments and archaeological sites are strongly concentrated in the core of the metropolitan area, i.e. Lisbon-city 60.2% of the classified buildings of this entire study area are located in the Lisbon municipality.

Table 8.4. Cultural heritage goods in the Lisbon Metropolitan Area – Tagus Estuary.[*]

Cultural features data	Classified Sites and buildings	Archaeological sites	Archaeological heritage in the riverside parishes
Lisbon Metropolipolitan Area	515	1,863	-
Tagus Estuary	370	1,213	565
Lisboa	223	320	165
Cascais	42	237	163
Oeiras	12	137	46
Loures	19	167	7
Vila Franca de Xira	20	107	20
Almada	13	67	40
Seixal	14	31	20
Barreiro	6	21	20
Moita	3	18	18
Montijo	14	53	15
Alcochete	4	55	51

The existence of all these monuments is related to the historical significance of Lisbon as a capital city and as an old commercial port. The coastline has a great significance with regards to cultural heritage, notably because old human settlements were generally placed on these areas; it was here also that urban areas were first developed. In this study area, the presence of cultural heritage is, thus, an important issue to be considered when the tensions and conflicts of land uses generated in coastal areas are analyzed.

The LMA is also the most important focus of culture and creativity in the all country. This area has the biggest concentration of museums, art galleries, music halls and theatres, and movie theatres in Portugal (Table 8.5). The majority of these facilities are located in the Lisbon municipality, which contains c. 50% of the movie screens and museums of the entire study area, as well as two thirds of the halls' seats and four fifths of the plays. A substantial part of this cultural offer is concentrated in the riverside neighbourhoods, which matches the most high-status urban quarters in the city.

[*] Source: IGESPAR, http://www.igespar.pt/pt/, [acessed September 2010].

Table 8.5. Cultural facilities and plays in the Lisbon Metropolitan Area – Tagus Estuary, 2008.[*]

Cultural features data	Art galleries and other temporary exhibition spaces (nº)	Museums (nº)	Life performences (nº)	Halls (nº)	Halls capacity (nº)	Cinema screen (nº)	Cinema capacity (nº)
Lisbon Metropolitan Area	245	-	11,611	145	115,666	203	39,798
Tagus Estuary	207	84	9,229	107	90,251	156	30,411
Lisboa	185	42	7,549	77	64,771	84	15,906
Cascais	12	3	151	8	2,406	13	2,596
Oeiras	4	2	482	7	1711	21	3,110
Loures	3	5	135	2	…	7	1,310
Vila Franca de Xira	5	12	503	3	5,548	1	115
Almada	6	8	560	8	2,017	14	3,217
Seixal	2	7	0	...	...	8	1,449
Barreiro	0	2	0	2	…	4	552
Moita	1	0	0	4	6,817	0	0
Montijo	1	2	0	1	…	6	1,369
Alcochete	0	4	0	3	9,387	11	3,383

The municipalities surrounding the Tagus Estuary, due to their integration in a metropolitan area, have an important function as service providers and Lisbon-city above all. Hospitals and health centres, courts, schools and universities are numerous and fairly disseminated in the region, although a patent prominence of Lisbon municipality can be detected regarding this issue.

The coastal area has no pronounced specialization in the provision of that kind of facilities. Conversely, a certain specialization on leisure and sport facilities can be pointed out in the range of 500 m alongside the coastline. In fact, 14.5% of the urban green areas that exist in all the Tagus Estuary are situated in this coastal strip, as well as 17.9% of the sport and leisure areas (figures were calculated from the Corine Land Cover 2006). In the Lisbon municipality, for instance, the coastal ribbon contains 50.2% of the sport and leisure areas, and the percentage reaches up to 62% in the Seixal municipality; Almada has 61.3% of its urban green areas located in the coastal ribbon and Cascais has 70.9%.

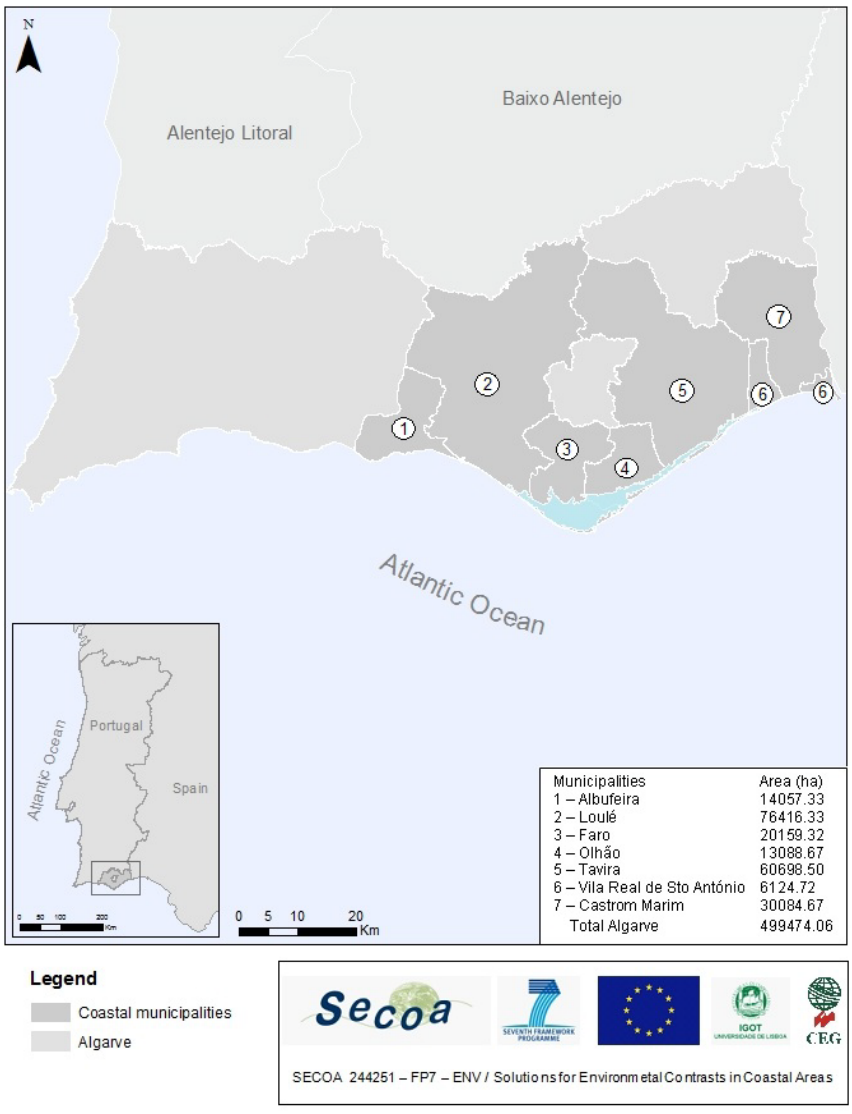
[*] Source: INE, www.ine.pt, [acessed September 2010].

2.2. Eastern Algarve

2.2.1 Geographical overview

The Algarve, with 499,474 ha, is the southernmost region of Portugal and is bordered by the Alentejo region (North), the Atlantic Ocean (South and West) and the Guadiana river (East) which marks the border with Spain. The highest point is situated in the hills of Monchique, with a maximum altitude of 902 m (Peak of the Foia). Internally, the region is subdivided into two zones, one to West (Barlavento) and another to the East (Sotavento).

Figure 8.2. Eastern Algarve - Coastal Municipalities.



The Algarve's coastal municipalities are represented in Figure 8.2. These municipalities were chosen because of their touristic importance and relationship with the protected area of Ria Formosa. The largest municipality is Loulé with 76,416.33 ha, followed by Faro with 20,159.32 ha and Castro Marim with 30,084.67 ha.

The Algarve is the most popular touristic "sun and sea" holiday destination and is responsible for 35.46% of night stays in accommodation facilities in all of mainland Portugal. The main pressures on the environment, and especially on Ria Formosa Natural Park, are driven by the touristic activities that are mainly located on the coastline. The critical issues emerged with tourism are linked with the seasonality of the "sun and sea" tourism, urban pressure triggered by the need to provide accommodation facilities, accessibilities and recreational activities, which are often located in areas of coastal erosion risk. The conflicts printed by tourism in the coastline of Algarve are well known. However, a critical change in the unsustainable *modus operandi* that has so far driven tourism in this region, and that could contribute to solve some of those issues, has not yet emerged. Hence, the Algarve is a paradigmatic case study of unsustainable tourism development, based on "sun and sea" holidays, in coastal areas.

2.2.2 Bio-physical resources

2.2.2.1 Area and coastal topography

The Eastern Algarve study area covers in total 220,630 ha in the 7 coastal municipalities, and 8,769 ha in the 500 m coastal ribbon alongside the seashore – 500 m buffer. The coastline has a length of 257 km, mainly constituted of low cliffs and sandy beaches. Few kilometres off shore there is a discontinuous row of islands, which form a natural barrier from the ocean. This natural barrier, which consists of a dozen of thin and flat sandy islands, encompasses a wide salt lagoon with marshes in its interior – Ria Formosa.

Table 8.6. Topography of the Eastern Algarve study area[*].

Indicators	Algarve	Eastern Algarve Coastal municipalities	500 m buffer
Total area (ha)	499,474	220,629	8,769
Coastline (km)	310	115	115
Mean declive (degrees)	9.73	8.85	2.36
Highest point (m)	900	500	0

[*] Source: SECOA GIS.

The Eastern Algarve coast is outstandingly suited to beach and other marine leisure activities because of the coastal morphology and the pleasant sea water temperature, particularly in the summer. Thus, all the municipalities have designated areas for bathing. The number of designated bathing areas ranges from 3 in Castro Marim municipality to 24 in Albufeira municipality. Overall, the quality of water during the bathing season is good. Considering the period between 2006 and 2009, only 1 designated bathing area was reported as "Bad" and 2 as "Fair" (all them in 2006); the other were classified as "Good" in both years. Thus, there was either maintenance or an increase in water quality for bathing from 2006 and 2009.

2.2.2.2 Climate and atmospheric conditions

The mean annual sunshine duration in Eastern Algarve sector (here indicated by the mean climate conditions in Faro Airport) is considerably high with circa 3038 h/year, as a consequence of predominantly reduced cloudiness conditions, especially from May to September, when the mean cloudiness remains below 3/8.

As in Lisbon Metropolitan Area, the thermal rhythm is characterised by a moderately warm summer and a mild cold season. The thermal amenity of the winter is demonstrated by the CmTm value – 7,8 ºC at Faro Airport. August was the hottest month in the reference period, with WmTm close to 30 ºC (29,9 ºC, more precisely).

Precipitation rhythm in Eastern Algarve is also characterized by a typical Mediterranean rainfall regime, but with lower mean annual rainfall than in Lisbon Metropolitan Area. At the regional scale, the spatial contrasts of mean annual precipitation are controlled by the orographic effects, namely those related by the presence of hills and mountains (e.g. Serra de Caldeirão) at the northern borders of the study area. The mean annual precipitation (Ry) on the reference period was 467 mm. December was the rainiest month, averaging circa 100 mm of mean precipitation, and July the driest with just 3mm of mean precipitation. The predominance of dry weather conditions is clearly indicated by the low value of NRDy – 73 days in Faro Airport.

Wind regime in Eastern Algarve is dominated by a prevalence of westerly winds, but also by strong seasonal contrasts regarding its directional frequency as also its intensity. From November to February, the NE winds are dominant. The mean annual wind speed is moderate, and Wsy value is 3,2 m/s. The potential wind power productivity in Eastern Algarve is similar to LMA.

In summary, the general year-round amenity of the climate of the area, the high levels of sunshine and relatively moderated temperatures, as also the limited number of days with

cloudiness and rain, creates excellent conditions to the practice of tourism, including a great diversity of outdoor activities (including beach recreation, city tours and others). But like in LMA the wind generates conflicts between leisure activities and economic activities.

2.2.2.3 Coastal and marine ecosystems

Eastern Algarve presents important natural values, in part related with coastal and marine ecosystems. There are 4 areas of ecological importance designated and protected under the Portuguese law in this study area. Two of these areas are situated at the seashore – Ria Formosa Natural Park and Castro Marim/Vila Real de Sto. António Salt Marshes´ Natural Reserve. In addition, 3 Special Protected Areas (SPA) and 6 Sites of Community Interest (SCI) included in the Natura 2000 Network can also be found in this study area, part of them overlapping the above mentioned areas with conservation status under the Portuguese law.

The most important of the protected areas in the seashore is Ria Formosa. Ria Formosa consists of a wide and complex lagoon system separated from the ocean by a barrier of islands, which spread over 60 km from Ancão to Manta Rota. Ria Formosa is the most important wetland in the south of Portugal and, due to its dimension, structural complexity, variety of habitats and importance for migratory birds, is protected by the Portuguese law (RCM n.º 78/2009, 2nd September). The Ria Formosa's ecological significance also explains why it is recognized by the Ramsar Convention, Berna Convention and Corine Biotope (CORINE/85/338/CEE).

Table 8.7. Natural areas with conservation status by the Portuguese law in the Eastern Algarve[*]

Municipality	Natural park	Natural reserve	Classified Site
	(ha)	(ha)	(ha)
Albufeira	-	-	-
Castro Marim	-	1,932	-
Faro	7,109	-	-
Loulé	2,527	-	1,078
Olhão	3,798	-	-
Tavira	3,518	-	-
Vila Real de Santo António	889	374	-

[*] Source: INE, www.ine.pt [Accessed 1st September 2010]. Reference year: 2007.

Due to its geographical location and natural features, Ria Formosa's wetlands are the main biotope for palearctic birds in their migration between Northern Europe and Africa. Ria Formosa is also very important as a nesting site, being used by a large number of aquatic birds and a number of rare and threatened species such as *Porphirio porphyrio, Emys orbiscularis and Chamaleo chamaleo*. The lagoon is also important as a feeding, breeding and nursery site for fish, molluscs and crustaceans of high commercial value. The ecological relevance of Ria Formosa explains its inclusion in the Natura 2000 Network, where it is classified at the same time in the category of SCI (SCI Ria Formosa/Castro Marim, PTCON0013) and of SPA (SPA Ria Formosa, PTZPE0017). It covers part of the municipalities of Vila Real de Santo António, Castro Marim, Tavira, Olhão, Faro and Loulé. This SCI occupies 16,489 ha and the municipality with the largest classified area is Faro (36%), followed by Olhão (18%) and Tavira (12%). The ecological importance of the SPA Ria Formosa is further proofed by the large number of protected species found here (104), of which 21 species are included in the target species group, Directive 79/409/CEE. Castro Marim/Vila Real de Santo António Salt Marshes, which are partially joined to Ria Formosa in the SCI Ria Formosa/Castro Marim, were the first Natural Reserve to be protected by law in Portugal (DL. 162/75, 27th March; Ministry Counsil Resolution n. 181/2008, 24th November). This Natural Reserve comprises of wetlands, chiefly consisting of salt marshes and areas converted for salt production (salina). It also includes dry areas formed as a result of the salt marshes degradation, which are now used for agriculture.

2.2.2.4 Soil and mineral resources

The mineral resources of Eastern Algarve are essentially constituted of sedimentary rocks, which are in part explored for building, chemical industry and the manufactory of nonmetallic mineral products (ceramics, etc.). Limestone, sandstone, sand and clay are the most frequent rocks found in this area. The limestone extraction is the principal mining activity in the Eastern Algarve. In 2007, 4.435,206 tons of limestones were extracted in this area. Loulé is the municipality were the mining activity is more expressive. Faro and Albufeira, on the other hand, registered the most pronounced increases in terms of mineral extraction during the last decade (a growth rate of about 50% between 2000 and 2007).

In addition to these mineral resources, some indicators of the presence of petroleum and natural gas in the off shore Algarve have been found in the last years. Although the size and

quality of these reserves remain unknown, they are apparently modest, thus they have not justified a commercial exploration up to date.

2.2.2.5 Freshwater: quantity, quality and access to water

By the analysis of the quality of drinking water from public supply in Eastern Algarve, it can be shown that the percentage of non-compliance was found to be very low during 2007 and 2009, indicating that the drinking water quality is very good in this study area.

2.2.3 Cultural and social resources

The density of cultural heritage in the Eastern Algarve is considerably lower than in Tagus Estuary. Nevertheless, there are 50 sites and buildings classified (historical urban quarters and monuments) and 842 archaeological sites in the entire study area (Table 8.8). Approximately 50% of the sites and buildings classified are found in the historical towns of Faro and Tavira, which constitute the two most important heritage centres in the region.

Table 8.8. Cultural heritage goods in the Eastern Algarve, 2010.[*]

Cultural features data	Sites and buildings classified	Archaeological sites	Archaeological heritage by riverside parishes
Algarve	118	2,259	-
Eastern Algarve	50	842	295
Albufeira	3	72	35
Loulé	8	134	38
Faro	22	100	52
Olhão	1	83	54
Tavira	13	244	46
Castro Marim	2	136	5
Vila Real de Santo António	1	73	65

[*] Source: IGESPAR, http://www.igespar.pt/pt/, [acessed September 2010]

The Eastern Algarve has substantially less cultural facilities than Lisbon, although the life shows audience and art galleries visitors per inhabitant are hardly comparable. The entire study area has 21 museums, 16 art galleries, 34 cinema screens, and 17 music halls and theatres, where 1529 life shows took place in 2008. These various cultural facilities are broadly distributed in the study area, despite a higher concentration of life performances and movie shows in Faro and Olhão (Table 8.9). The sport and leisure facilities occupy an important position amongst the land uses in the 500 m coastal buffer. About 17.4% of the all sport and leisure areas in the Eastern Algarve are concentrated in the strip of 500 m alongside the seashore (figures were calculated from the Corine Land Cover 2006). On the other hand, this land use occupies 21.9% of the whole coastal buffer in the Albufeira municipality, and 28.1% in the Loulé municipality.

Table 8.9. Cultural facilities and plays in the Eastern Algarve, 2008.[*]

Cultural features data	Art galleries and other temporary exhibition spaces	Museums (nº)	Life performences (nº)	Halls (nº)	Cinema screen (nº)	Cinema capacity
Algarve	28		1,529	17	34	5,954
Eastern Algarve	16	21	540	6	26	4,560
Albufeira	4	1	0	2	9	1,111
Loulé	3	9	181	1	2	646
Faro	3	3	359	1	13	2,033
Olhão	2	3	0	0	1	272
Tavira	2	2	0	1	1	472
Castro Marim	1	2	0	0	0	0
Vila Real de Santo António	1	1	0	1	0	0

[*] Source: INE, www.ine.pt/, [acessed September 2010].

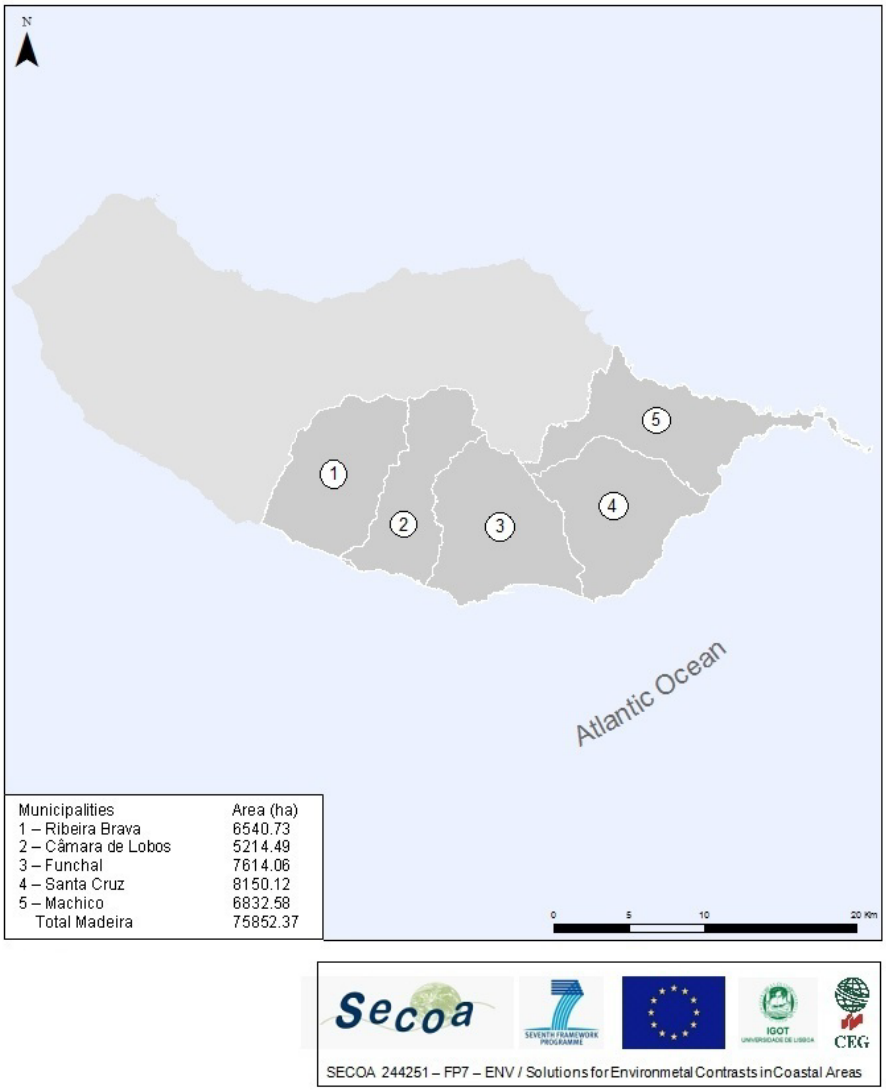
2.3. Funchal Metropolitan Area

2.3.1 Geographical overview

Madeira Island has an area of 75,852 ha, and is divided into 10 municipalities: three facing the North (Porto Moniz, Santana and São Vicente) and 7 in the South (Calheta Câmara de Lobos, Funchal, Machico, Ponta do Sol, Ribeira Brava and São Vicente). The Funchal Metropolitan Area encompasses the municipalities of Ribeira Brava, Câmara de Lobos, Funchal, Santa Cruz and Machico (Figure 8.3).

The Madeira case study is unique as it explores the environmental issues that emerge in an island. Here, controlling nature is probably even more critical and necessary for developing economic activities and creating accessibilities around the island. This leads to a number of pressures in the environment. The main environmental conflicts emerged from the population density, where 92.9% of the population leave in the southern municipalities of Madeira. The municipality of Funchal, the capital of the Autonomous Region covers an area of 761,406 ha (10.3% of the island) and in 2008 had 98,583 inhabitants (40.6% of the population of the island). Funchal is the dominant city, polarizing mainly economic, cultural, political an educational services, as well as the employment. The surrounding municipalities had been experiencing some urban growth, related to the need to accommodate people commuting to work to Funchal. The five municipalities of the metropolitan area of Funchal represent 45.3% of the territory and in 2008 it gathered 84.6% (205,455 inhabitants) of the island population. Additionally, Madeira is also a remarkable touristic destination. The location of the main touristic activities in the South of Madeira intensify environmental pressures on protected areas such as Partial Reserve of São Lourenço, located in Machico municipality, and Partial Natural Reserve of Garajau, located in the municipalaties of Funchal and Santa Cruz.

Figure 8.3. Funchal Metropolitan Area.



2.3.2 Bio-physical resources

2.3.2.1 Area and coastal topography

The metropolitan study area in Madeira Island covers 34,353 ha in 5 municipalities. This is much less than the surface involved in the other two Portuguese study areas. Yet, the Funchal Metropolitan Area's coastline has a length of 330 km (Table 8.10).

Table 8.10. Topography of the Funchal Metropolitan Area.[*]

Indicators	Madeira	Coastal municipalities	500 m buffer
Total area (ha)	75,852	34,352	5,162
Coast line (km)	200	109	109
Mean declive (m)	22.03	20.58	19.96
Highest point (m)	1,850	1,850	600

Unlike the other Portuguese SECOA study areas, the Funchal Metropolitan Areas' coastline is pronouncedly steep. The mean declive in the 500 m ribbon along the seashore is 19.96 degrees, which means that the altitudes range from 0 to 600 m in a few hundred meters from the shoreline. Moreover, the coast is nearly rocky in its total extension.

Despite the virtual absence of sandy beaches in Madeira, the Funchal Metropolitan Area has 26 designated areas for bathing along the coast. Only the data on the water quality for bathing in Funchal municipality are available. Overall, the beaches of the Funchal city do not have problems. In 2006, only 1 beach in 13 was classified as Fair; all the others were assessed as Good. Compared to 2006, Funchal municipality had a decrease in water quality in 2009.

2.3.2.2 Climate conditions

The oceanic context, in a subtropical domain, is responsible for the general amenity of climate of Madeira, which is probably the main reason for being so well-known to tourists. The mean annual sunshine duration on the southern coast of Madeira (here suggested by the mean climate conditions in Funchal's Airport) is relatively high, with around 2447 h/year. As in the previous case studies, the thermal rhythm is characterised by a moderately warm summer and a mild cold season. The thermal amenity of winter is demonstrated by the pleasant CmTm value – 14,4 ºC at Funchal's Airport. July was the hottest month of the reference period, with WmTm close to 27 ºC.

Precipitation rhythm in Funchal is also characterized by a typical Mediterranean rainfall regime. Being a very mountainous island, divided by a central crest, Madeira exhibits strong contrasts on rainfall distribution, with lower amounts in the southern coast comparing to the

[*] Source: SECOA GIS

northern flanks. In Funchal's Airport the Ry value was 593 mm, while the NRDy was 91, therefore, dry weather conditions are clearly dominant all year round.

Wind regime in southern Madeira is also dominated by a prevalence of westerly winds. The mean annual wind speed is moderate, as it is indicated by the Wsy value at Funchal's Airport - 4 m/s. Madeira is also a good region for wind power production. Nowadays 61 turbines are installed in Madeira with a total power of 37800 kW. Due to the relief of Madeira wind farms are apart from tourism activities near Funchal, but they can collide with natural environment, because the highest mountains where wind turbines can be installed are largely occupied by Laurissilva Forest bringing aesthetic and environmental issues to the discussion.

2.3.2.3 Coastal and marine ecosystems

Although c. 75% of the Madeira Island is designated as a Natural Park, the most of this conservation area is located in the central highlands, where the indigenous Laurissilva forest remains better represented. At the shore, concerning coastal and marine ecosystems, there are 5 conservation areas designated, some of them under the Portuguese law and others under the EU directives on biodiversity. The Partial Natural Reserve of Garajau is one of the largest and the oldest in Madeira (created in 1986 by the RDL nº 23/86/M of 4th October). It was the first exclusively marine reserve designated in Portugal. It extends along 7 km of shoreline, covering an area of 376 ha between the bathymetric of 50 m and the high tide line which is notable for its marine biodiversity.

The protected area consists of a rocky shore, with several pebble beaches interspersed with cliffs of a very high slope which altitudes often exceed 100 m. The Ocean floor is rocky at about 22 m deep, from which it becomes constituted of sand or crushed shell. Numerous species of can be found in this reserve. According to the Information Centre of Madeira Nature Park, the most common and remarkable are the *Epinephelus marginatus,* which is the main attraction of the Reserve due to their large size and extremely confident and sociable nature.

Figure 8.4. Funchal Metropolitan Area marine and coastal protected areas.

In order to preserve the coastal and marine ecosystems in the western part of Funchal and conciliate them with tourism, the City Council proposed the creation of the Eco-Marine Park of Funchal with the status of Protected Landscape. The Eco-Marine Park covers 139 ha in the Funchal municipality and extends from the 30 m bathymetric line to the maximum high tide of living water equinoctial. The marine fauna of the Funchal Marine Eco-Park, like the entire Madeira Island, has a markedly European and Mediterranean affinities. Due to the international relevance and originality of the local ecosystems, there are 7 protected areas integrated in the

Natura 2000 network in the Madeira Island, which comprise of 21,730 terrestrial ha and 3,420 marine ha.

Madeira belongs to the Macaronesia biogeograhic region, which the European Union selected as pilot region for the implementation of Natura 2000 Network. While on the Portuguese mainland there are Special Protection Areas (SPA) and Sites of Community Importance (SCI), the ecosystems of the Natura 2000 Network in Madeira have been given the designation of Special Areas of Conservation (SAC).

Most of the areas designated as SAC in Madeira are located out of the Funchal Metropolitan Area, principally in the central highlands and in the northern slope of the island, where the indigenous laurissilva forest still subsists. The SAC Madeira Laurissilva (PTMAD0001) and Maciço Montanhoso Central (PTMAD0002) are the largest of those SAC, but, as they are confined to the most interior and mountainous regions of the island, they only cover a small section of the SECOA study area in Madeira. On the other hand, the Funchal Metropolitan Area contains 2 SAC situated at the seashore: SAC Pináculo (PTMAD0007) and SAC Ponta de São Lourenço (PTMAD0003).

The Special Area of Conservation Pináculo is located in the east of Funchal and occupies only 33.7 ha. It essentially consists of a cliff with a maximum altitude of 310 m, including cliffs with endemic flora of the Macaronesian and low formations of Euphorbia close to cliffs, two habitats listed in Annex I, Directive 92/43/EEC. The SAC Ponta de São Lourenço is located at the eastern end of Madeira, integrating a peninsula, the Islet of Desembarcadouro and the Islet of Lighthouse. It has about 9 km long, a maximum width of 2 km and an area of 1,920.31 ha, of which 1,599.8 ha of marine area and 320.45 ha of terrestrial area. The SAC is distinguished by low altitudes (the highest point is 163 m) and by aridity due to the lack of orographic rain. The Ponta de São Lourenço habitats include shallow coves and bays, cliffs with endemic flora of the Macaronesian, low formations of Euphorbia close to cliffs and sea caves submerged or partially submerged, all of them listed in Annex I, Directive 92 /43/CEE.

2.3.3. Cultural and social resources

The most noticeable feature about cultural resources in this study area is their strong concentration in the core of the metropolitan area, i.e. Funchal (Table 8.11). Almost all the music halls and theatres, movie theatres, museums and art galleries are located in Funchal, not far from the coastline.

Table 8.11. Cultural facilities and plays in the Funchal Metropolitan Area, 2008.[*]

Cultural features data	Art galleries and other temporary exhibition spaces (nº)	Museums (nº)	Life performences (nº)	Halls (nº)	Halls capacity	Cinema screen (nº)	Cinema capacity
Madeira	24		853	9	15,738	13	2,676
FMA	20	23	647	7	14,781	12	2,676
Funchal	16	18	600	6	14,781	13	2,676
Santa Cruz	2	1	…	…	…	0	0
Câmara de Lobos	0	1	…	…	…	0	0
Ribeira Brava	2	2	39	…	…	0	0
Machico	0	1	35	1	…	0	0

There is no realstate classified by IGESPAR in Funchal or in other municipality of the Funchal Metropolitan Area. However, it is important to highlight that the Colégio dos Jesuítas, an antique religious moster that is now the Madeira´s University headquarters, was classified as real estate of regional interest.

[*] Source: INE, www.ine.pt, [acessed September 2010]

3. Overview of Users in the Case Studies

3.1 Lisbon Metropolitan Area – Tagus Estuary

3.1.1 Inhabitants and households

Generally speaking, inhabitants/households are users of natural resources and services (e.g. water, air, soil, fossil fuel, biodiversity), which produce pressures on the environment (e.g. pollution, habitat loss).

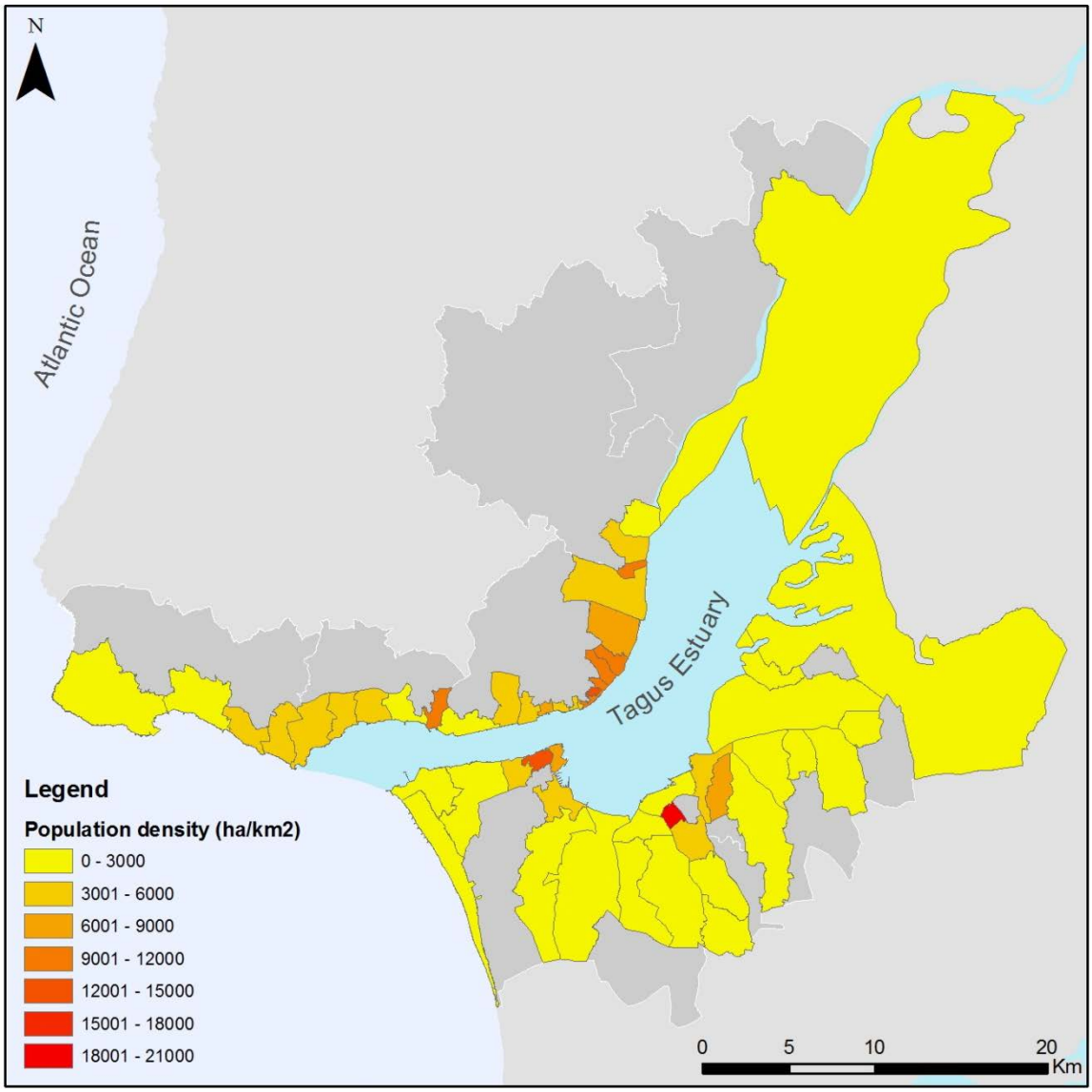
The Lisbon Metropolitan Area is the main urban region in Portugal. It also has one of the largest population concentrations in the whole country. In 2001, the Lisbon Metropolitan Area had 2.661,850 millions inhabitants, 1.729,170 millions of them living in the Tagus Estuary municipalities. Globally, the population density reached at 959 inhab./km^2 in the MAL in 2008 (1906 inhab./km^2 in the Tagus Estuary municipalities), which meant an increase of 2.24% between 2001 and 2008. The highest population densities are observed in the coastal parishes, which correspond to the core of the metropolitan area; in the last decade, however, these areas have experienced a population decrease, whereas the edge municipalities of the metropolitan area have felt the highest population growth.

Table 8.12. Population density in the municipalities of Lisbon Metropolitan Area - Tagus Estuary (inhab./km²).[*]

Municipalities	2001	2008	△ 2001-2008
Lisbon Metropolitan Area	**938**	**959**	**2.24%**
Tagus Estuary	**21,468**	**20,967**	0.003%
Cascais	**1,783**	**1,933**	8.41%
Lisboa	**6,606**	**5,778**	***-12.53%***
Loures	**1,182**	**1,152**	**-2.54%**
Oeiras	**3,572**	**3,758**	**5.21%**
Vila Franca de Xira	**424**	**448**	**5.66%**
Alcochete	**140**	**136**	**-2.86%**
Almada	**2,316**	**2,366**	**2.16%**
Barreiro	**2,487**	**2,139**	***-13.99%***
Moita	**1,232**	**1,296**	**5.19%**
Montijo	**116**	**119**	**2.59%**
Seixal	**1,610**	**1,842**	14.41%

[*] Source: Based on INE data, www.ine.pt [Acessed 8th September 2010].

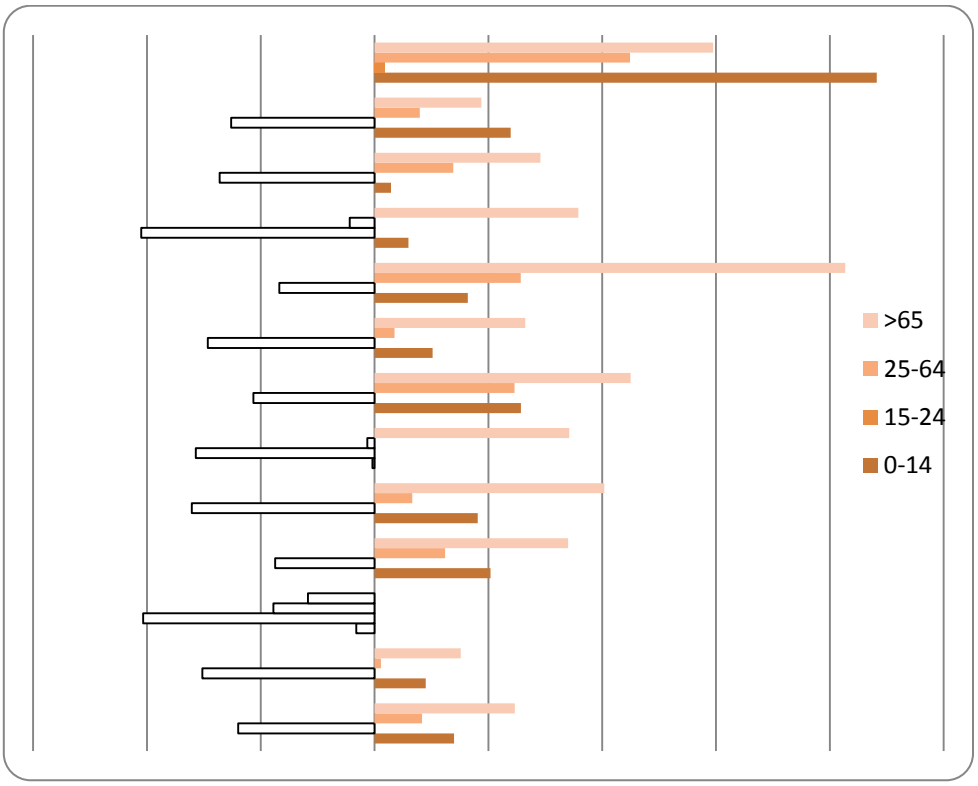
Figure 8.5. Population density in the coastal parishes of Lisbon Metropolitan Area - Tagus Estuary (inhab./km²).[*]



[*] Source: Based on INE data, http://www.ine.pt [Acessed 8th September 2010]. Reference year: 2001.

Population is not as aged in the Tagus Estuary as in Portugal as a whole. Nevertheless, the population ageing is already a visible phenomenon in this metropolitan region, especially in the inner urban areas where depopulation is a pronounced trend. In fact, there was an increase of residents in all age groups between 1999 and 2009 except for the age group 15-24, which had a decrease of 24%. Moreover, all Tagus Estuary municipalities, with the exception of Alcochete, have showed a decrease of residents on the age group 15-24 (between 1999 and 2009). So, it is possible to envisage that in the short term there will be a decrease of the age group 25-64, i.e. the age group that corresponds to those of the work force. We can also conclude that Tagus Estuary municipalities will tend to have a higher aged population in the next future.

Figure 8.6. Group age evolution in the municipalities of the Lisbon Metropolitan Area – Tagus Estuary (1999-2009).[*]



[*] Source: Based on INE data, www.ine.pt [Acessed 8th September 2010].

Table 8.13. Immigrants in the Lisbon Metropolitan Area – Tagus Estuary.[*]

Municipalities	Proportion of foreign residents (%)	Foreign population who requested resident status		△ 2001-2006 (%)
year	2001	2001	2006	
Lisbon Metropolitan Area	**4.82**	**12,168**	**16,709**	**45.4**
Tagus Estuary	**4.1**	**7,920**	**10,418.0**	**2.3**
Lisboa	**3.40**	**2,063**	**3,654**	**15.9**
Cascais	**6.20**	**1,116**	**298**	**-8.2**
Loures	**6.88**	**1,334**	**1,490**	**1.6**
Oeiras	**4.67**	**516**	**532**	**0.2**
Vila Franca de Xira	**3.58**	**241**	**719**	**4.8**
Almada	**4.34**	**947**	**681**	**-2.7**
Alcochete	**1.51**	**11**	**115**	**1.0**
Barreiro	**2.50**	**305**	**495**	**1.9**
Moita	**4.81**	**402**	**465**	**0.6**
Montijo	**1.82**	**58**	**519**	**4.6**
Seixal	**5.42**	**927**	**1,450**	**5.2**

Migration has always been a visible phenomenon in the Lisbon Metropolitan Area, mainly due to its large employment market. Migrants tend to search low price housing in the suburbs of Lisbon and simultaneously to settle near work places. Therefore, Cascais, Loures and Seixal had the highest percentage of foreign residents in 2001. Conversely, Alcochete is the municipality with lower weight of migrants in the total population. This fact is associated with the poor public transportation connections that can be established between Lisbon and Alcochete.

3.1.2 Tourists and tourism sector

Tourism is an important economic activity in the Tagus Estuary municipalities. It competes with other land uses on the consumption of natural and cultural resources, such as water, soil, energy and heritage. In 2009, the Lisbon Metropolitan Area had 7.190 thousand overnights in hotels and pensions, mainly concentrated in the municipalities of Lisbon (c. 75%) and Cascais (c. 11%). Moreover, Lisbon and Cascais are clearly the municipalities with the

[*] Source: Based on INE, Population Census 2001, and SEF data (2001-2006).

greatest tourist function ratio and with the largest supply of tourist accommodation. In this study area, one of the most sensitive tension points regarding tourism is felt in Cascais municipality, where new projects of hotels, residential-tourism developments, marines and golfs have been steadly increasing in the last few decades threatening the maintenance and integrity of SCI Sintra-Cascais.

3.1.3 Industrial establishments and commercial precincts

In the Lisbon Metropolitan Area, the service sector is currently the most important in terms of employment as well as wealth creation. Due to deindustrialization, the manufacturing industry has been losing industrial facilities, as well as jobs, accounting for up to 8% of regional employment. It remains, however, an important economic activity on the south bank municipalities and in Vila Franca de Xira, which have a solid tradition as heavy industry areas, where some large manufacturing plants are still active.

Table 8.14. People employed by economic sector in Lisbon Metropolitan Area – Tagus Estuary, 2008[*]

Area/ Municipality	Total employed	Extractive Industry	Manufacturing Industry	Wholesale and Retail trade / repairs	Other
Lisbon Metropolitan Area	759,105	0.04	7.41	19.00	73.55
Tagus Estuary	70,7801	0.038	14.25	24.33	61.27
Cascais	51,304	0.04	9.28	25.04	65.64
Lisboa	419,686	0.04	3.01	14.05	82.9
Loures	57,103	0.04	17.45	26.74	55.77
Oeiras	87,271	…	6.47	25.24	68.29
Vila Franca de Xira	38,141	0.05	20.87	23.59	55.49
Alcochete	5,326	0.08	16.88	34.83	48.21
Almada	33,690	0.04	6.51	24.45	69.00
Barreiro	15,491	0.04	15.77	21.05	63.14
Moita	9,126	…	19.98	21.35	58.67
Montijo	13,507	0.01	15.18	28.41	56.4
Seixal	28,460	0.08	20.47	24.59	54.86

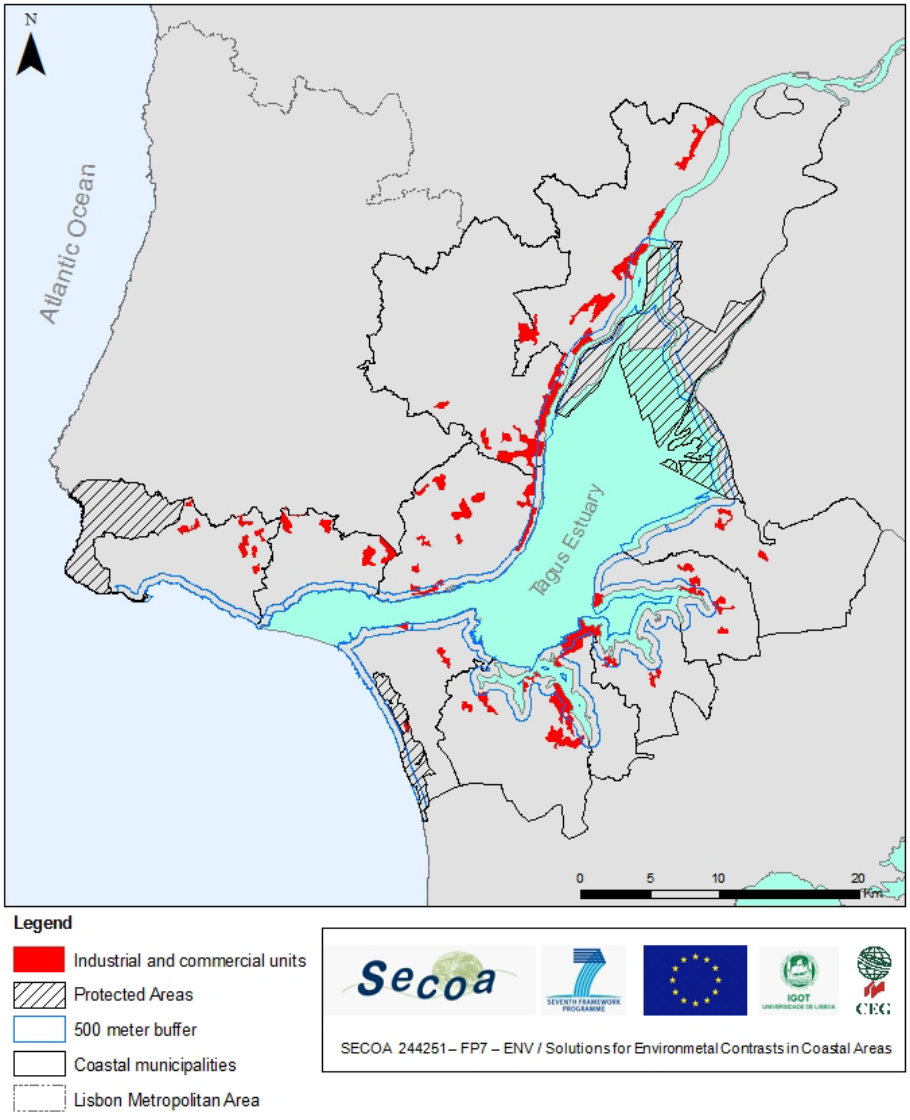
[*] Source: adapted from (MTSS) Work and Social Solidarity Ministry, October 2010.

Retail sector is a very dynamic activity in this study area. In 2008, there were 21,747 retail companies in the Tagus Estuary municipalities, which holded over 144,000 employees. Modernization and concentration are the two main trends in the recent evolution of the retail sector: while traditional commerce has been experiencing some difficulties, shopping malls and other large commercial precincts have grown markedly in the last decades, taking more and more soil, notably particularly in the peripheral locations with good accessibility.

Currently the most significant areas for manufacturing industry and retail are in the municipalities of Vila Franca de Xira (918.76 ha), Loures (888.90 ha), Lisboa (663.84 ha) and Seixal (653.54 ha). Many of the old largest industrial plants, as well as some of the biggest modern retail precincts, are located alongside the coastline given that the waterfronts are very desirable locations for consumption. In Barreiro municipality, for example, 19% of the total area in the 500 m coastline ribbon is occupied by industrial and commercial units; in Alcochete a retail outlet with 75,000 m^2 were built up in the 500 m coastal buffer and near the SPA Tagus Estuary.

With regards to the gross value added and work market, extractive industry is fairly insignificant in the Tagus Estuary. It represents less than 1% of the employment in all riverside municipalities. In terms of gross value added the extractive industry generates 31 million Euros. Its impact on the coastal areas is also minimal.

Figure 8.7. Industrial plants and retail precincts in Lisbon Metropolitan Area – Tagus Estuary.[*]



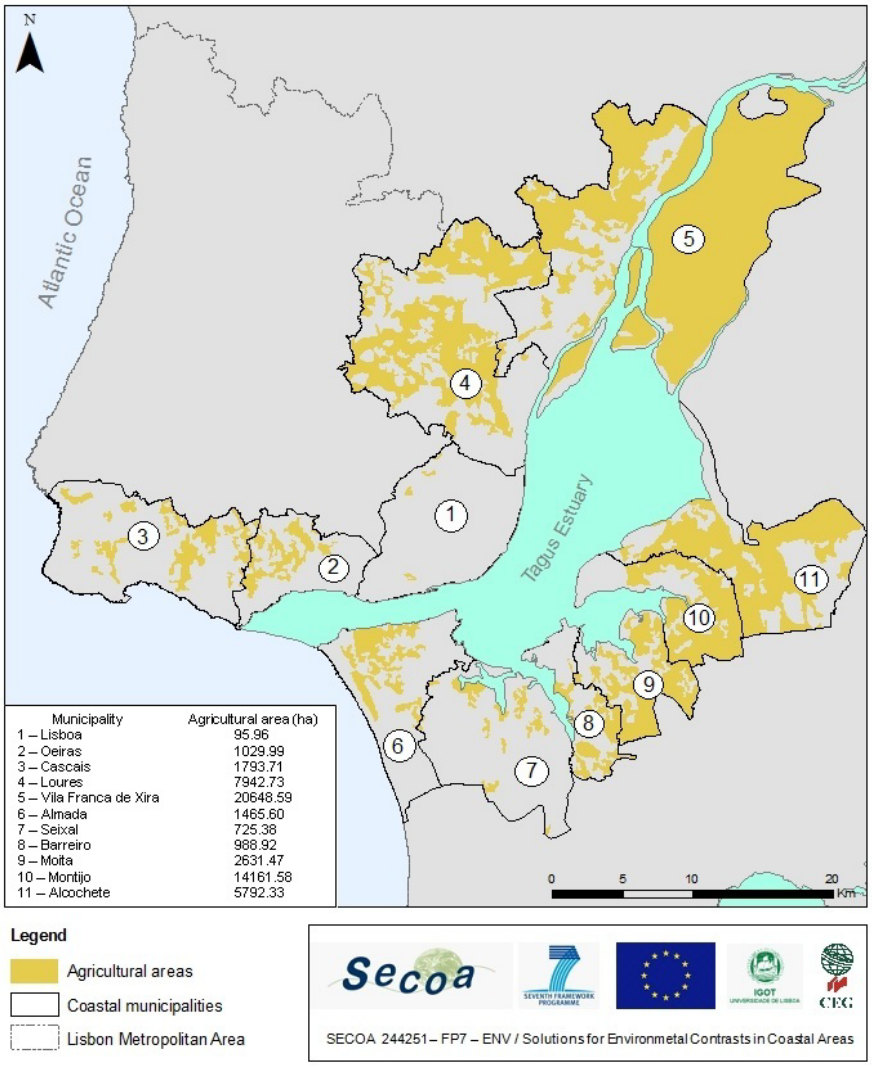
3.1.4 Farmers and agriculture

Intensive agriculture can be a source of soil and water pollution, as well as a contributor for biodiversity and habitat lost. However, less intensive farming can actually provide a very important habitat (e.g. Cork farms) for wildlife (e.g. birds); also, organic farming is starting to be encouraged because of the lesser environmental impacts on the environment.

[*] Source: Based on CORINE LAND COVER (2006).

The most significant agricultural areas in the Tagus Estuary are located in the municipalities of Vila Franca de Xira (20,648.59 ha), Montijo (14,161.58 ha) and Alcochete (5,792.33 ha). In spite of the outdated data it is possible to affirm that there is a lack of organic agriculture holdings in the Lisbon Metropolitan Area, which represents only 0,13% of the total holdings. A total of four organic holdings are included in the Tagus Estuary municipalities, namely in Montijo (2), Moita (1) and Loures. Montijo is also the municipality with more agriculture holdings (1208), followed by Loures (964) and Vila Franca de Xira (789). The municipalities with more cattle heads are also Montijo (**95167)** and Alcochete (20901), in which environmental pressures (e.g. wastewater) resulting from this activity are more significant.

Figure 8.8. Agriculture areas in Lisbon Metropolitan Area – Tagus Estuary.[*]



[*] Source: Based on CORINE LAND COVER (2006).

3.1.5 Ports and fishing fleet

The port of Lisbon, which extends on both banks of the Tagus estuary, is the biggest in Portugal; it is also the busiest in terms of cargo tonnage handled. Port areas in the Lisbon Metropolitan Area encompass commercial and military ports, fishing ports and marinas. Hence, the most significant areas for port facilities are located in the municipalities of Lisbon (211,42 ha) and Almada (156,36 ha).

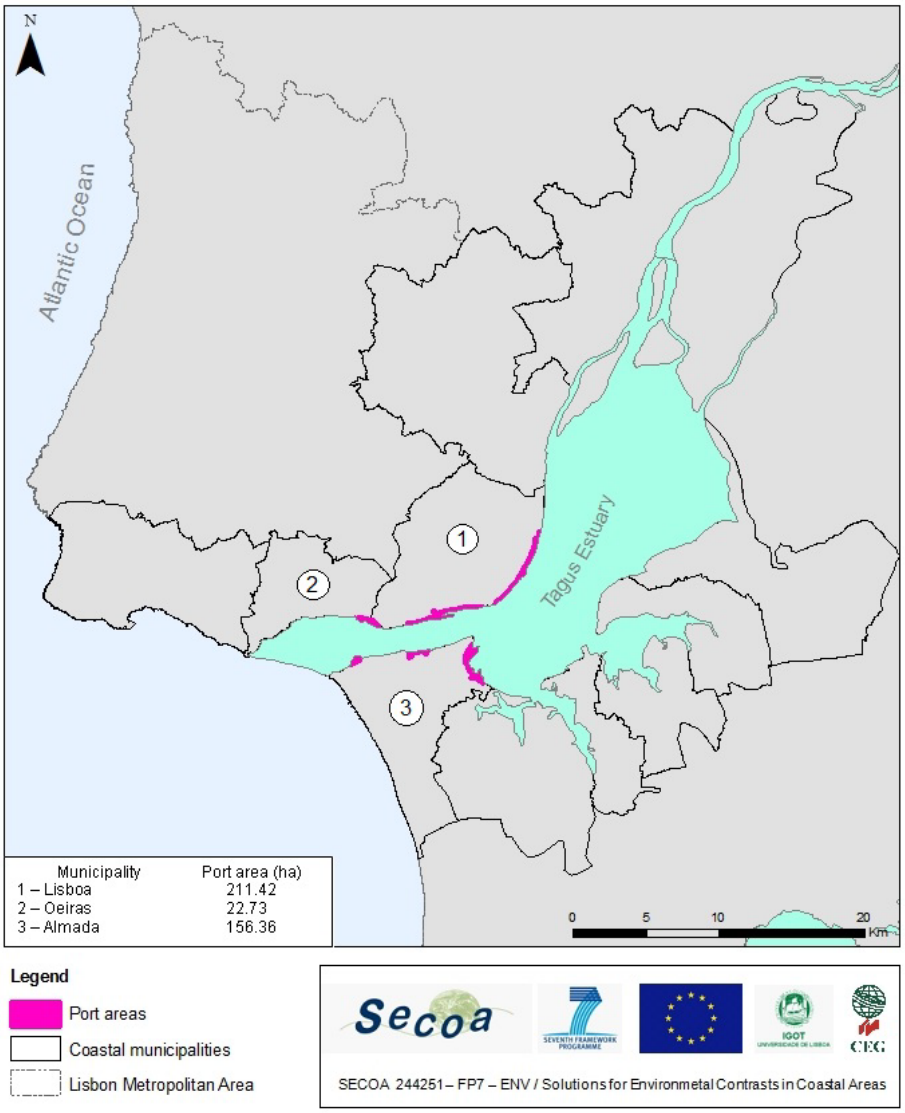
The port of Lisbon has excellent natural conditions of maritime accessibility and shelter, which gives high strategic value in the national port system. The management of the port is handled by the APL – Administração do Porto de Lisboa, SA. The port of Lisbon is important for the socio-economic development of the city of Lisbon, of the region and of the country, having a direct, indirect and induced impact of approximately 5% of the regional GDP and 2% of the National GDP, as well as being responsible for roughly 40000 jobs (Hidroprojecto, 2007). An analysis of the five-year evolution of the Port of Lisbon activity (2005-2009) shows that there was a small decrease of the number of ships calling at the Port (-9,1%), while there was an increase of cruise ships (17,9%) and number of passengers (120%).

Table 8.15. Port of Lisbon activity, 2005 and 2009.[*]

Indicators	2005	2009	Evolution 2005-2009
Number of ships (total)	**3,543**	**3,219**	**-9.1%**
Number of cruise ships	**251**	**296**	**17.9%**
Number of passengers (total)	**1,900**	**4,180**	**120.0%**
Cargo handle (ton)	**1,008,326**	**776,058**	**-23.0%**

[*] Source: Porto de lisboa, www.portodelisboa.pt [accessed 15th october 2010].

Figure 8.9. Port areas in Tagus Estuary.[*]



Seawater fish, captured on the shore, is the main type of fish dropped at both ports in 2002; there was no capture of this type of fish in 2009 in the port of Lisbon and there was a decrease of 38% in the captures received in the port of Cascais. With regards to crustaceous and molluscus, there was no captures in Lisbon, while the port of Cascais had an increase of 50% in crustaceans production and a decrease of 14% in molluscs production.

[*] Source: Based on Corine Land Cover (2006).

3.1.6 Energy production companies

Most energy consumed in the Tagus Estuary municipalities is produced outside this area. The units of energy production are mainly linked to thermal power production (38 units in 2009) and wind power (45 units in 2009). There are only one hydropower units and 2 photovoltaic units in the LMA.

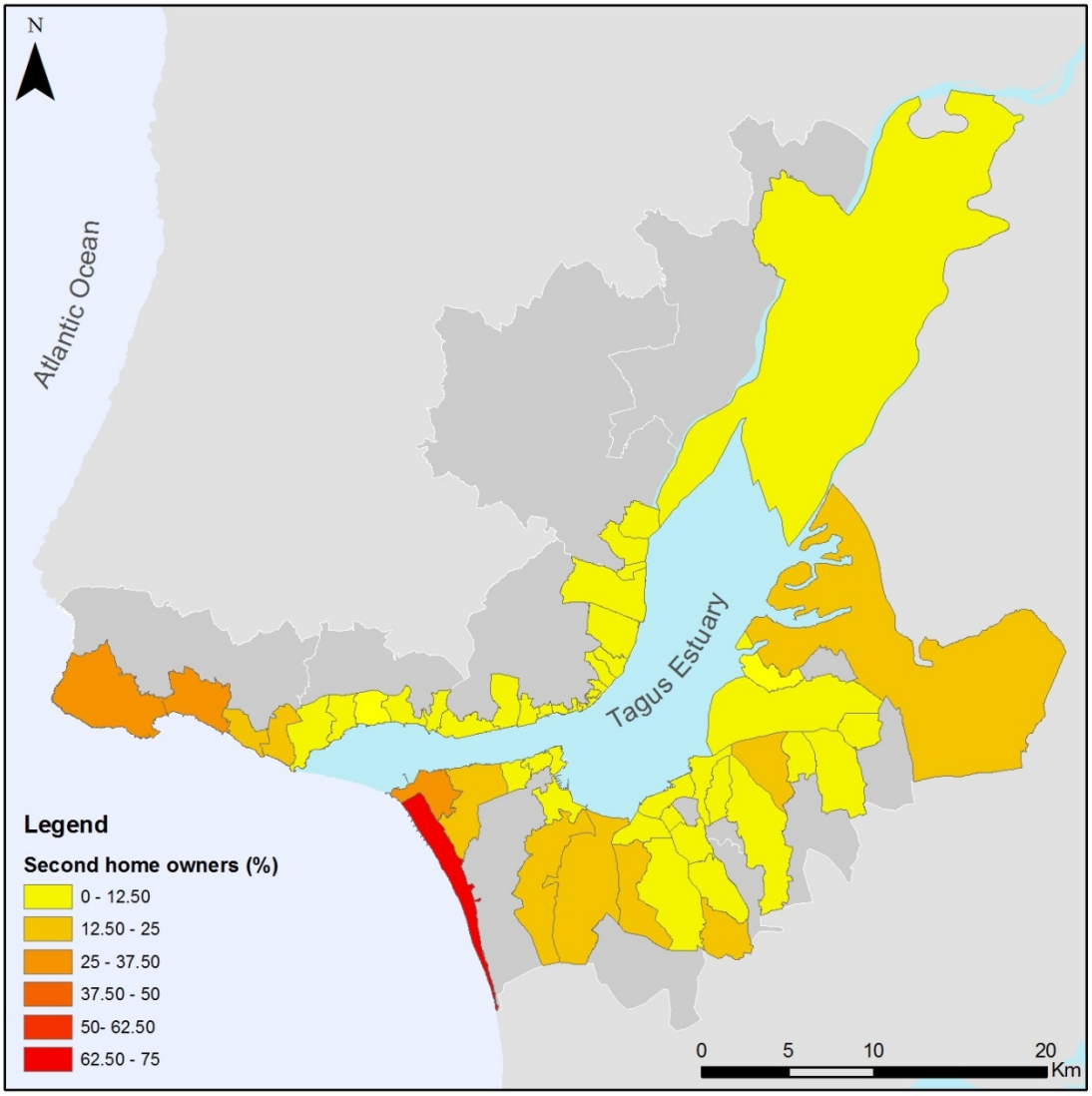
3.1.7 Second homes

Second homeowners are one of the users that have a direct implication in resources consumption. Their action corresponds mostly to punctual uses, since their main residence appear to be in other municipality or other region. However, second homes have been one of the main causes for urban sprawl in the Tagus Estuary.

There are several kinds of second home types: in the Lisbon Metropolitan Area there is a more predominant occurrence of weekend residences. In other words, weekend residences locate preferentially near the main dwelling or near the work place with good accessibilities and several leisure attractions. To better represent this need, data available concerns the proportion of dwelling for seasonal use. According to the Statistics Portugal (INE), this indicator is related to occupied housing that is used regularly and where no one has his customary residence.

Regarding the proportion of seasonal use dwellings, Almada and Cascais are the two municipalities that outstand from the study area. It must be said that Lisbon residents give the main input for this type of second home owners. Second homes have a direct correspondence with beach areas. Thus, the south bank of Tagus Estuary is preferably chosen for weekend short-breaks. Costa de Caparica stands out with 75% of dwellings for seasonal use.

Figure 8.10. Second homes in Lisbon Metropolitan Area – Tagus Estuary, 2001.[*]



[*] Source: Based on Corine Land Cover (2006).

3.1.8 Synthesis: main users and relation with resources

Users	Main resources used	Main Trends
Inhabitants / Households	Fresh water Waterfront / waterscape Energy Soil Air Biodiversity	Pressures on resources from population are increasing in the municipalities of Seixal (14,4%) and Cascais (8,41%); Pressures on resources are decreasing in the municipalities of Barreiro (-13,99%) and Lisbon (-12,53%); Population is aging in all municipalities; Due to the attractiveness of waterscape, new real estate investments concentrate in the waterfront and clashes with other land-uses;
Tourism establishments	Fresh water Waterfront/waterscape Energy Soil Air/clima Landscape and habitats Cultural heritage	Pressures on resources from tourism are increasing, mainly in Lisbon and Cascais; Due to the attractiveness of waterscape, tourism tends to concentrate alongside the coastline and clashes with other land-uses; Marine and coastal biodiversity and habitats are threatened by tourism.
Industry and Commerce	Fresh water Waterfront/waterscape Soil Energy Mineral Resources	Pressures on resources from manufacturing industries are decreasing; Pressures on resources from retail are increasing, especially in the municipalities of Vila Franca de Xira, Loures, Lisbon and Seixal; Deindustrialization creates new opportunities for 'brownfields' redevelopment; Old industrial plants and new retail precincts tend to concentrate in the waterfront and clashes with other land-uses; Pressures on resources from mining industry are minor; Coastal biodiversity and habitats are threatened by industry and retail.
Agriculture	Fresh water Soil Air/clima Biodiversity	Pressures on resources from agriculture are especially felt in the east sector of Tagus Estuary (municipalities of Vila Franca de Xira, Montijo and Alcochete); Environmental impacts of cattle production are especially felt in the southeast sector of Tagus Estuary (Montijo and Alcochete); Organic agriculture is not well developed.
Ports and fishing fleet	Waterfront/waterscape Air/clima Habitats Biodiversity	Pressures on resources from port activity are meaningful and more significant in the municipalities of Lisbon and Almada; Cruise industry is increasingly significant; Fishing is losing importance as an economic activity; Port activity conflicts with other land-uses alongside the coastline; Marine and coastal biodiversity and habitats are threatened by port activity.
Energy production companies	Fossil fuel Air/clima Water	Pressures on resources from energy production are done outside the study area because there is few production companies located in the Tagus Estuary.
Second homes	Fresh water Waterfront/waterscape Energy Soil Air/clima Landscape and habitats Biodiversity	Second homes are rising and are one of the main causes for urban sprawl; Pressures on resources from second homes are particularly significant in the west sector of the Tagus Estuary (municipalities of Almada and Cascais); Coastal biodiversity and habitats are threatened by second homes.

3.2 Eastern Algarve

3.2.1 Inhabitants and households

In the last two decades, population has grown in Algarve much more pronouncedly than in Portugal as a whole, notably the population density rose 10% in the Algarve between 2001 and 2008. Albufeira and Loulé were municipalities where population density increased even more. With regards to coastal parishes, Fuseta (1,449 inhab./km²), Olhão (1,403 inhab./km²), Vila Real (995 inhab./km²), Monte Gordo (928 inhab./km²), Albufeira (602 inhab./km²) and Faro (460 inhab./km²) were those with the highest population density in 2001. These data show that the municipalities of Olhão, Vila Real de Santo António, Albufeira and Faro had the highest pressure on the coastline due to population.

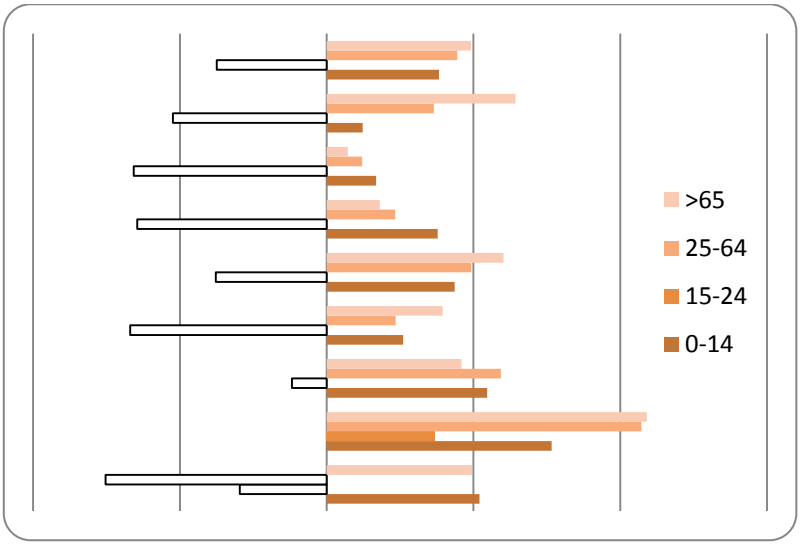
Table 8.16. Population density in Eastern Algarve.[*]

Municipalities	2001 Inhab./km²	2008 Inhab./km²	△ 2001-2008
Algarve	78	86	10%
Eastern Algarve	1,258	1,360	8%
Albufeira	226	277	23%
Castro Marim	21	22	2%
Faro	284	291	3%
Loulé	77	86	11%
Olhão	318	339	6%
Tavira	40	42	4%
Vila Real de Santo António	292	303	4%

With regards to the evolution of the age groups representativeness between 1999 and 2009, there was a decrease of residents on the age group 15-24 in all municipalities except in Albufeira. Indeed, Albufeira showed the highest increase in all age groups, notably those above 65 years old, 25-64 and 0-14 age groups. Population ageing is also less pronounced in Loulé, where immigration has contributed for a rejuvenation of population.

[*] Source: Based on INE data, http://www.ine.pt [Acessed 8th September 2010].

Figure 8.11. Group age evolution in the municipalities of Eastern Algarve, 1999-2009.[*]



The core of Eastern Algarve is where migrants concentrate the most, regarding work availability, especially in tourism, and favorable housing conditions. In 2001, Albufeira and Loulé gather 17.24% of the migrant population of the study area. On the contrary, Castro Marim appears to be the municipality with the lower proportion of foreign residents. It is important to intersect this information with municipality's age groups profile: Castro Marim and Vila Real de Santo António has the oldest population, while Albufeira, Loulé and Faro have their demography mainly based on young and working population.

Table 8.17. Migration and foreign population in Eastern Algarve, 2001 and 2006.

Area/ Municipality	Proportion of foreign residents (%)	Foreign population who requested resident status		△2001-2006 (%)
year	2001	2001	2006	
Algarve	**6.07**	**2,356**	**14,238**	**142.3**
Eastern Algarve	**4.88**	**1,325**	**9,619**	**13.7**
Albufeira	**9.48**	**323**	**2,480**	**24.7**
Loulé	**7.76**	**483**	**3,194**	**31.9**
Faro	**3.87**	**211**	**2,067**	**20.6**
Olhão	**3.76**	**128**	**597**	**5.9**
Tavira	**5.06**	**114**	**718**	**7.1**
Castro Marim	**2.06**	**17**	**130**	**1.3**
Vila Real de St.º António	**2.20**	**49**	**433**	**4.3**

[*] Source: Based on INE data, http://www.ine.pt[Acessed 8th September 2010].

3.2.2 Tourists and tourism sector

The Algarve is the main tourist destination in Portugal, popular for domestic as well as overseas tourists due to its mild climate and beautiful beaches. This region was responsible for 2,739.4 million guests in 2009 (42% of the guests in all Portuguese hotels) and 6,478.7 million overnights. In the Eastern Algarve, the most of the overnights are undertaken in Albufeira (45%) and Loulé (24%). Albufeira and Loulé also differ from other municipalities in the fact that a large part of overnights occur in touristic apartments and resorts instead of hotels and other classical types of tourist accommodation.

Table 8.18. Overnights in hotels and other types of the tourist accommodation in Eastern Algarve, 2006 and 2009.[*]

Area / Municipality	Hotels		Pensions		Aparthotels		Resorts		Touristic apartments	
	2006	2009	2006	2009	2006	2009	2006	2009	2006	2009
Algarve	4971045	4366628	347396	337999	3238396	3036870	1622269	1380165	3771798	3600980
Eastern Algarve	3311408	2960595	216949	121467	2599212	2443944	182206	781233	2115370	2181372
Albufeira	1397637	1323755	101554	No data	1845972	1746507	No data	606265	1944455	1994570
Castro Marim	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
Faro	129681	161604	59280	52993	No data	No data	No data	No data	No data	No data
Loulé	978082	722480	40885	41866	413990	405196	No data	No data	170915	186802
Olhão	No data	4001	No data	7919	No data	No data	No data	No data	No data	No data
Tavira	257326	186786	15230	13530	No data	No data	182206	174968	No data	No data
Vila Real de Santo António	548682	561969	No data	5159	339250	292241	No data	No data	No data	No data

3.2.3 Industrial establishments and commercial precincts

In the Algarve as a whole, the mining industry and the manufacturing sector are not the lead economic activities. The contribution of mining industry for employment and for gross added value is minimal. In the manufacturing sector, the number of enterprises increased between 1998 and 2008. Industrial employment remains however low, with the exception of Tavira municipality where the fish conservation industry has a solid tradition. The development of retail sector has been more significant, with Loulé (more 452) and Albufeira

[*] Source: INE, http://www.ine.pt. [Accessed 8th September 2010].

(more 299) showing the highest increase in the number of retail establishments between 1998 and 2008.

Table 8.19. Employment in mining industry, manufacturing and retail in the Eastern Algarve, 2008.[*]

Municipality	Total employed	Extractive Industry (%)	Manufacturing Industry (%)	Wholesale and Retail trade / repairs (%)	Other
Albufeira	22,967	0.24	2.33	20.14	77.29
Loulé	1,532	0.65	3.79	12.47	83.09
Faro	25,786	0.41	3.5	26.51	69.58
Olhão	30,949	0.29	4.59	18.89	76.23
Tavira	9,294	0.39	14.14	23.96	61.51
Castro Marim	6,552	0.49	3.71	17.46	78.34
Vila Real de St.º António	5,908	…	5.08	17.37	77.55

The most significant areas for industry and commerce are located in the municipalities of Faro (133.49 ha), Loulé (122.66 ha) and Albufeira (95.97 ha). The largest industrial plants and commercial precincts are concentrated on the coastline. There are also units located in Protected Areas, namely in the Natural Park of Ria Formosa and in the Natural Reserve of Castro Marim Salt Marshes, since the most important retail precincts are related with tourism and occur in the strongly urbanized buffer along the seashore.

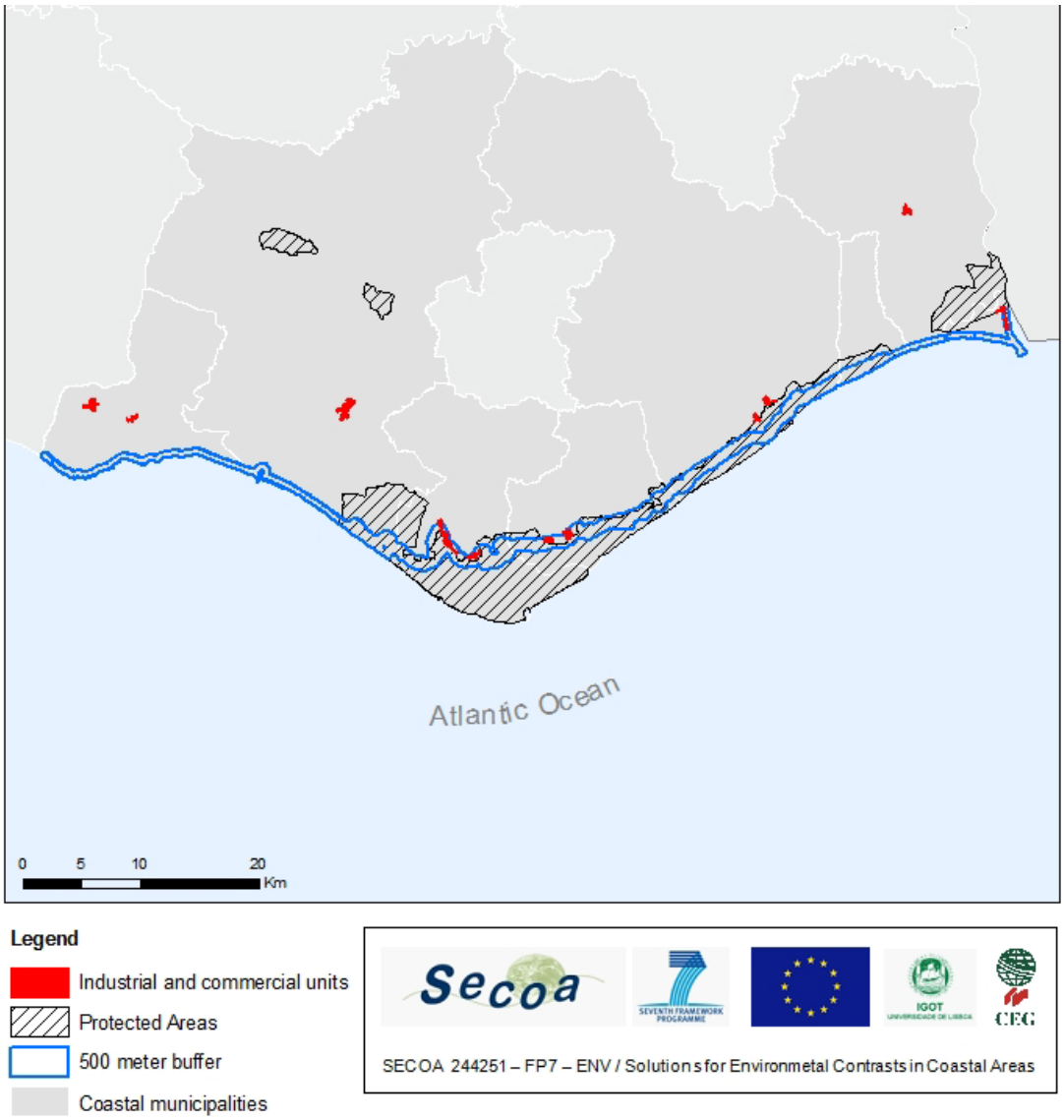
3.2.4 Farmers and agriculture

In the Eastern Algarve the region comprised between the urbanized coastal buffer and the mountainous inland area is largely occupied by agriculture. The most significant agricultural areas are located in the municipalities of Loulé (32,512 ha), Tavira (26,611 ha), Castro Marim (16,606 ha), Faro (11,128 ha) and Albufeira (10,687 ha). The agriculture sector with regard to total of holdings, organic agriculture holdings and number of cattle heads (reference year of 1999). In spite of the outdated data it is possible to affirm that there is a lack of

[*] Source: adapted from (MTSS) Work and Social Solidarity Ministry, October 2010.

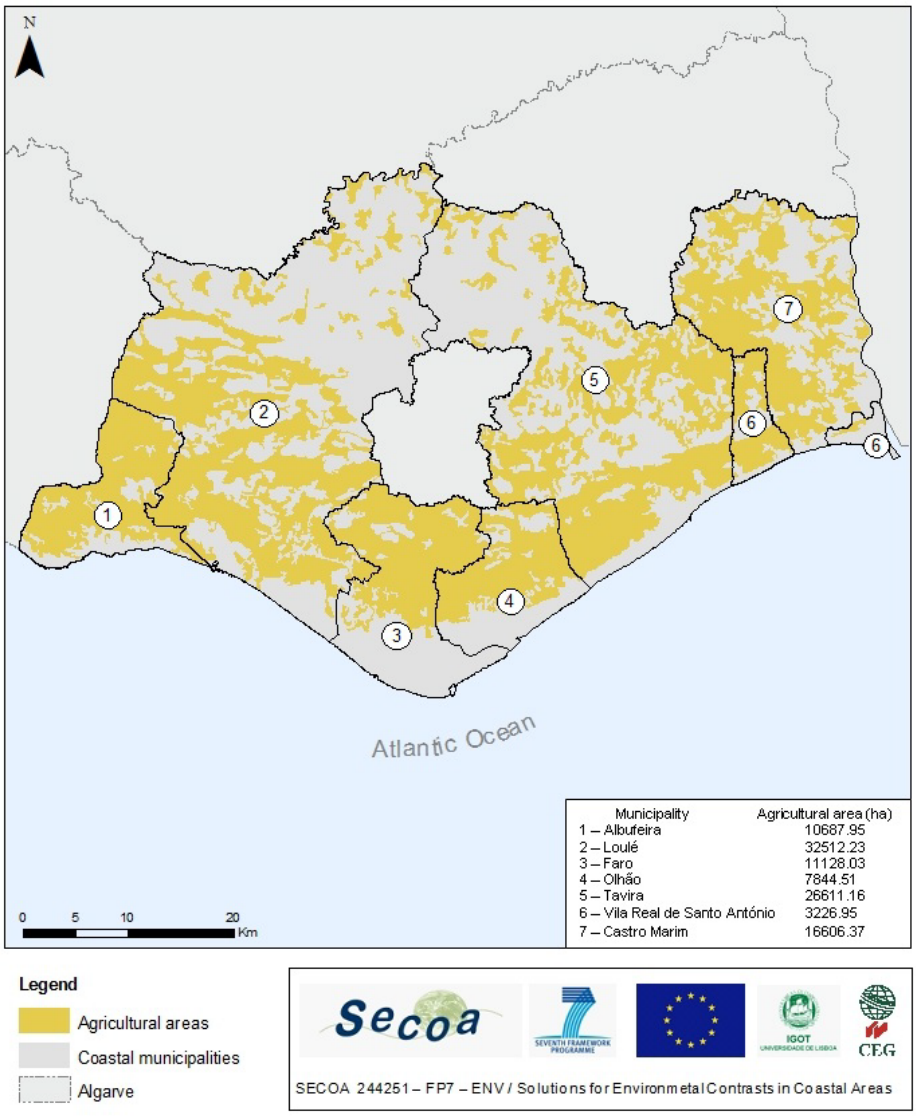
organic agriculture holdings in the Algarve, since only 17 farms are identified, which represent 0,16% of the total holdings.

Figure 8.12. Industry and retail areas in Eastern Algarve.[*]



[*] Source: Based on Corine Land Cover (2006).

Figure 8.13. Agriculture areas in Eastern Algarve.[*]



3.2.5 Ports and fish fleet

Ports and marinas encompass a number of activities which may produce impacts in the environment. Up to 2006, the most significant areas for ports and marinas in the study area were located in the municipalities of Albufeira, Loulé, Olhão, Vila Real de Santo António. Currently, also Faro has a marina in operation in addition to a commercial port. With regards to the port of Faro activity, between 2003 and 2008 there was a decrease of 63% of the number of

[*] Source: Based on Corine Land Cover (2006).

ships, followed by a decrease by 68% of the cargo handle. In order to avoid such a declination, the Institute of Maritime Transportation had invested in international cargo export. Its geographical position towards shipping south was improved with new infrastructures, which brought a new life cycle to this port, wich is currently specialized in shipping cement to Cape Verde. The National Association for Ports indicated that in 2011, Faro's port activity increased to 66 ships (http://www.portosdeportugal.pt).

Table 8.20. Port of Faro activity, 2003-2008.[*]

Indicators	2003	2008	△ 2003-2008
Number of ships (total)	22	14	**-63%**
Number of passengers (total)	No data	No data	No data
Cargo (ton)	148,980	47,490	**-68%**

The fishing port of Olhão is the most important in terms of fishing vessels and captures of seawater fish and molluscs, while Vila Real de Santo António is the most important for crustacean captures. From 2002 to 2009, Olhão had an increase of 14% in seawater fish, while a decrease in crustacean and molluscs was observed in the same period. The other ports have lost relative weight with regard to seawater fish.

3.2.6 Energy production companies

Most units of energy production in the Algarve are located outside the study area (9 units of windpower, 2 unit of thermal power, 3 hydropower). However, Loulé had a new photovoltaic unit installed in 2009.

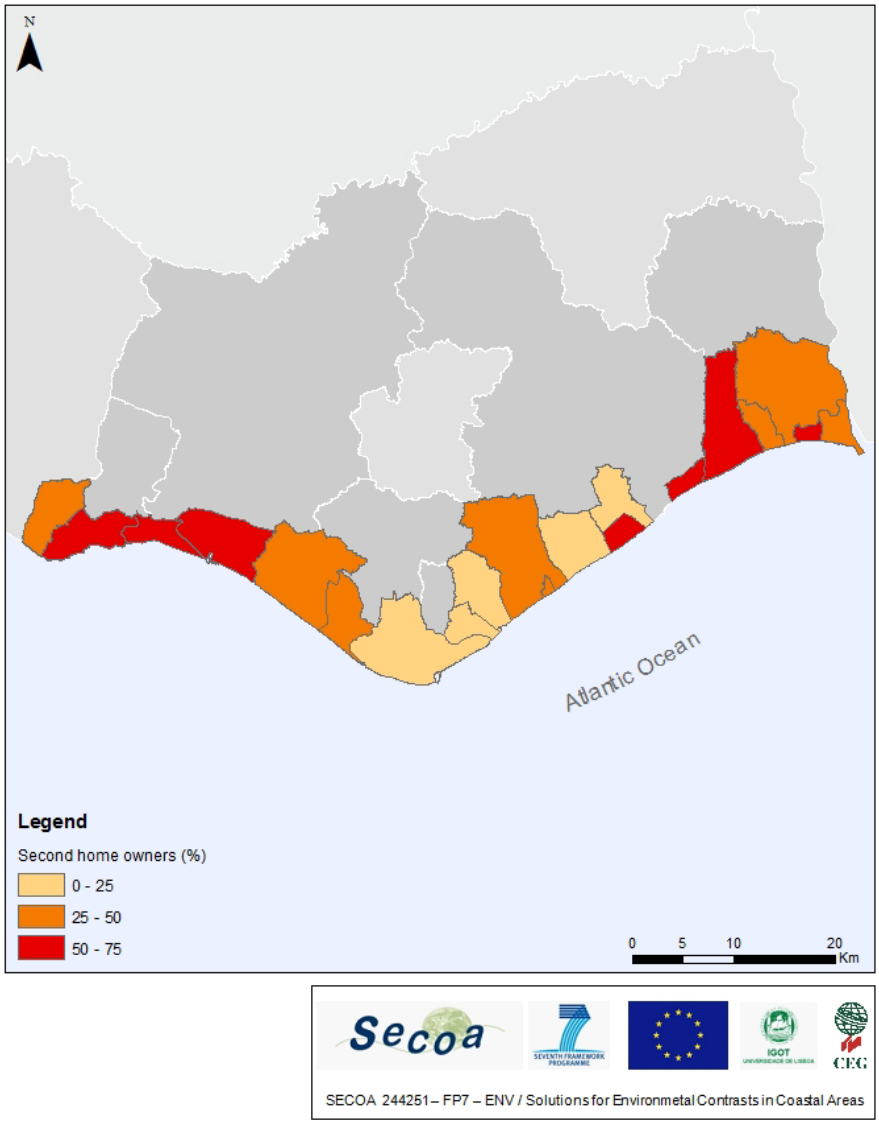
3.2.7 Second homes

The second homes in Portugal have increased significantly in the second half of the 80's. The same is true for Algarve where second homes area particularly important due to a strong seasonal occupation associated with summer holidays. Albufeira and Vila Real de Santo António are the municipalities where second homes have a larger expression, with more than 50% of all dwellings. The same happens in Loulé and Castro Marim. Second homes are

[*] Source: INE, www.ine.pt; http://www.portosdeportugal.pt [accessed 15th october 2010].

concentrated in the coastal parishes, thus contributing severely to the artificialization of coastline. Quarteira parish stands out with a remarkable value of almost 75% of dwellings corresponding to second homes.

Figure 8.14. Second homes (%) in the coastal parishes of Eastern Algarve, 2001.



3.2.8 Synthesis: main users and relation with resources

Users	Main resources consumed	Main trends
Inhabitants / households	Fresh water Energy Soil Air Biodiversity	Pressures on resources are increasing due to population growth; Recent demographic evolution predicts more population growth in the next future; Population growth is mainly concentrated in coastal areas leading to the urbanization of seashore;
Tourism establishments	Fresh water Seashore/waterscape Air/climate Energy Soil Landscape and habitats Cultural heritage	Tourism is the main industry in the region and one of the main causes of urban sprawl; Tourism concentrates alongside the coastline and clashes with other land-uses; Marine and coastal biodiversity and habitats are threatened by tourism and by tourism urbanization;
Industry and Commerce	Fresh water Soil Biodiversity Energy Mineral resources	Although mining industry is minimal, there was an increase in mineral extraction in the last decade, namely in Albufeira and Loulé; Pressures on resources from manufacturing industry and retail are increasing; Industrial and commercial precincts are mainly placed in Faro, Loulé and Albufeira, i.e. the same municipalities where population and tourism are mostly concentrated; New retail precincts tend to concentrate alongside the seashore and clashes with other land-uses; Coastal and marine biodiversity and habitats are threatened by industry and retail.
Agriculture	Fresh water Soil Air/climate Biodiversity	Pressures on resources from agriculture are especially felt in interior Algarve; Organic agriculture is scarcely disseminated;
Ports and Fishing Fleet	Seashore/waterscape Habitats Biodiversity	Pressures on resources from marinas and yacht tourism are increasing; Fishing is still an important economic activity, namely in Olhão and Tavira where a solid tradition on conservation industry exists; Marine and coastal biodiversity and habitats are threatened by port activity, fishing and vessels;
Energy production companies	Fossil fuel Water Air/climate	Pressures on resources from energy production are done outside the study area since there is few production companies located in the Eastern Algarve;
Second home owners	Fresh water Seashore/waterscape Energy Air Soil Landscape and habitats Biodiversity	Second homes are rising and are one of the main causes for urban sprawl; Pressure on resources from second homes are particularly significant in coastal areas; Coastal biodiversity and habitats are threatened by second homes;

3.3 Funchal Metropolitan Area

3.3.1 Inhabitants and households

The population density in Madeira Island is lower than in Tagus Estuary but higher than in Algarve. There was a decrease in the population density of 9,5% in Funchal and of 4,2% in Machico between 2001 and 2008, while the municipalities of Câmara de Lobos (4,8%) and Santa Cruz (3,13%) registered the highest increases. Although population density has decreased in Funchal, this municipality still has the highest population density (1,295 inhab./km²).

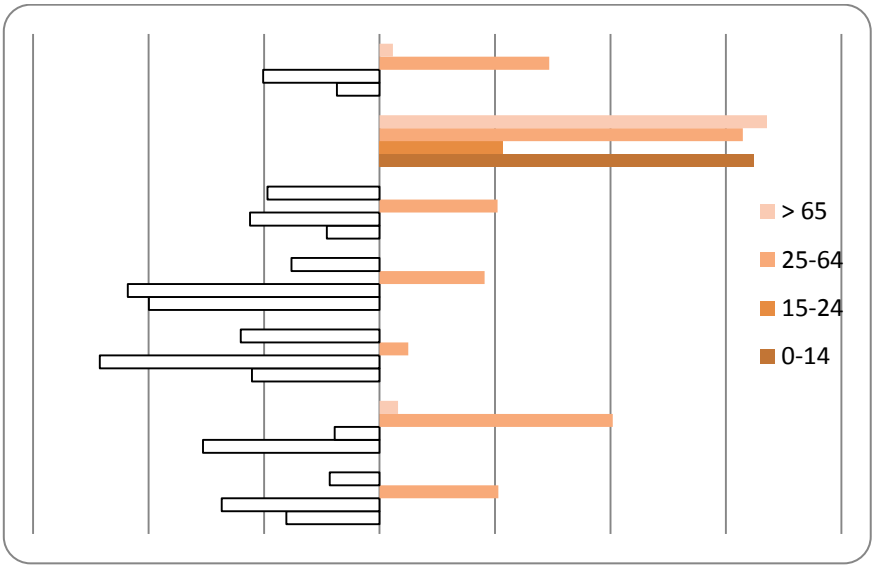
Table 8.21. Population density in Funchal Metropolitan Area.[*]

Area / Municipality	2001 (inhab./ km²)	2008 (inhab./ km²)	△ 2001-2008
Madeira Island	315	309	-1.9
Funchal Metropolitan Area	609	589	-1.08
Câmara de Lobos	661	693	4.8
Funchal	1431	1295	*-9.5*
Machico	321	308	*-4.1*
Ribeira Brava	192	193	0.3
Santa Cruz	442	456	3.1

Except to Santa Cruz municipality, there was a general decrease of residents on the age groups 0-14 and 15-24 in all municipalities. Immigration is much less important in Funchal Metropolitan Area than in the other Portuguese study areas. In 2001 only less than 1.5% of the island population was foreign. This means that immigration will not contribute to the rejuvenation of population in this study area, thus it is expected that aging will intensify in the next few years.

[*] Source: DRE, http://estatistica.gov-madeira.pt [Acessed 8th August 2010].

Figure 8.15. Group age evolution in Funchal Metropolitan Area, 1999-2009.[*]



3.3.2 Tourists and tourism sector

Madeira Island is one of the oldest tourist destinations in Europe with more than two centuries of history. Thousands of tourists come back on an annual base. Madeira offers not only an excellent climate throughout the year, but also unique fauna and flora. Some touristic studies show that the first motive for choosing Madeira as a holiday destination is due to the contact with nature.

The provision of tourist facilities has hardly changed from 2006 to 2009. Santa Cruz and Funchal monopolize the tourist accommodation supply. However, Funchal outstand by concentrating the most of the guests and hotel overnights. The tourism pressures are, thus, mostly located in this area too.

[*] Source: DRE, http://estatistica.gov-madeira.pt [Acessed 8th August 2010].

Table 8.22. Tourist accommodation in Funchal Metropolitan Area, 2006 and 2009.

Area / Municipality	Reference Year	Hotels	Pensions	Aparthotels	Touristic apartments	Resorts
Madeira Island	2009	60	49	35	22	1
	2006	53	53	37	27	0
Funchal Metropolitan Area	2009	45	28	31	15	0
	2006	40	38	33	20	0
Funchal	2009	35	21	24	10	0
	2006	31	24	25	15	0
Santa Cruz	2009	6	5	6	4	0
	2006	6	5	7	5	0
Câmara de Lobos	2009	0	0	0	0	0
	2006	0	0	0	0	0
Ribeira Brava	2009	2	1	1	0	0
	2006	2	2	1	0	0
Machico	2009	2	1	0	1	0
	2006	1	7	0	0	0

3.3.3 Industrial establishments and commercial precincts

As mentioned before, industries and commerce are great consumers of natural resources (e.g. water, energy and soil). The main natural resources in the study area used in industry are the mineral resources. This activity on the island of Madeira is exclusively dedicated to the extraction of basalt for construction and public works and is disseminated in several small mining areas in the central highlands. The extraction of sand for the works is done primarily on the seabed between the municipality of Funchal and Paul do Mar in the municipality of Calheta. It is an activity with negative impact on fish stocks and on the balance of marine and coastal ecosystems. In the Funchal Metropolitan Area the industrial and commercial units are spread throughout the territory with some cases where they are concentrated on the 500 m coastal ribbon along the seashore, thus contributing for potential environmental conflicts. The most significant industrial areas are located in Santa Cruz (103.38 ha) and Funchal (92.50 ha),

with the municipality of Funchal leading the number of extractive (11) and manufacturing (274) industries, as well as retail companies (1643).

Figure 8.16. Industrial plants and commercial precincts in Funchal Metropolitan Area.[*]

[*] Source: Based on Corine Land Cover (2006).

Figure 8.17. Mining and manufacturing companies in Funchal Metropolitan Area, 1998-2008.

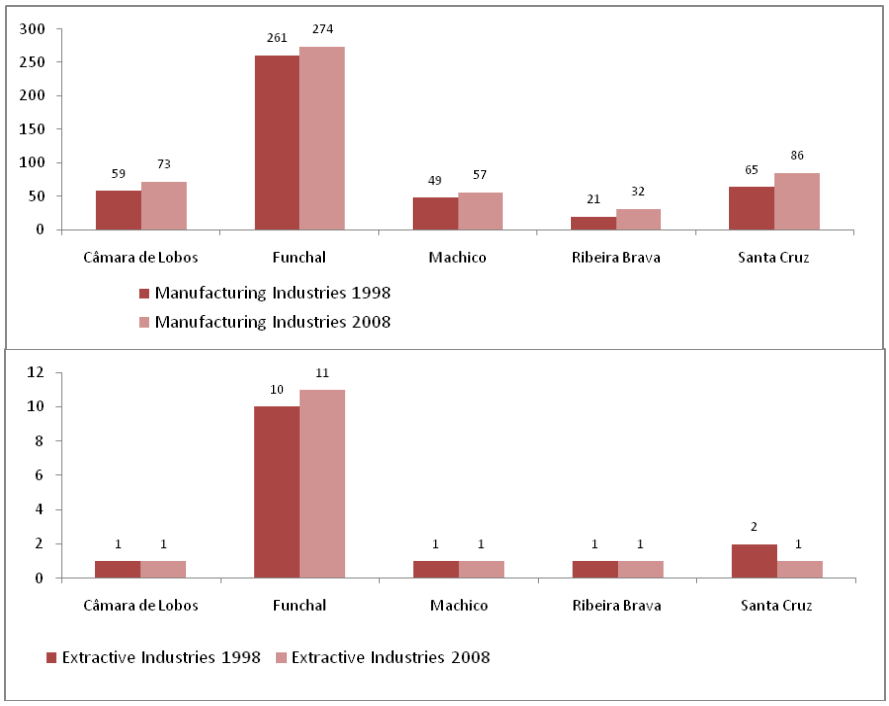


Table 8.23. Employment by economic sector in Funchal Metropolitan Area, 2008.[*]

Municipality	Total employed	Extractive Industry	Manufacturing Industry	Wholesale and Retail trade / repairs	Other
Funchal	44,676	0.16	5.03	22.99	71.82
Santa Cruz	8,547	0.07	10.97	24.8	64.16
Câmara de Lobos	5,670	0.37	16.46	14.83	68.34
Ribeira Brava	2,146	0.09	9.37	26.65	63.89
Machico	3,952	0.43	14.35	19.41	65.81

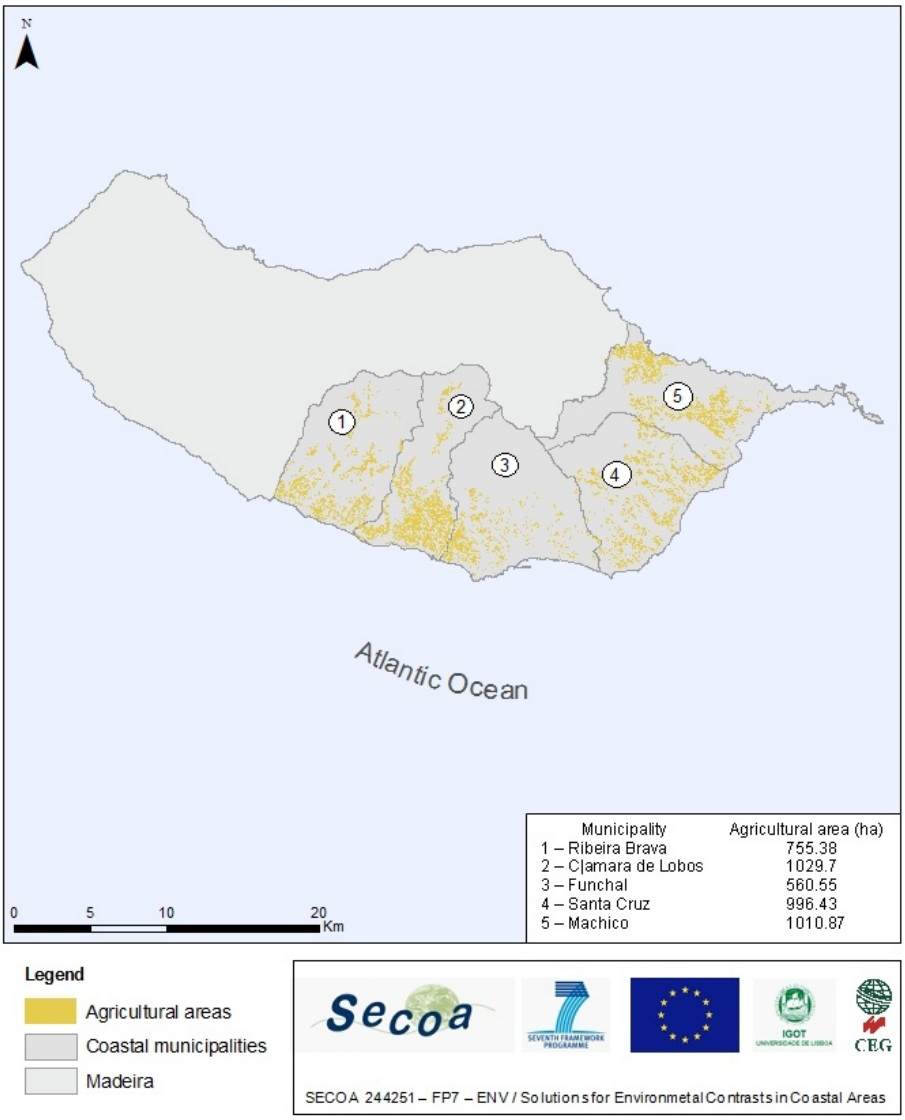
Extractive industry has a low weight in the employment structure of this study area. Employment is strongly concentrated in the Funchal municipality, where the service sector is dominant. Câmara de Lobos and Machico correspond to those municipalities where the industrial employment is more relevant, being this specialization mainly related with a local tradition in alimentary industry.

[*] Source: adapted from (MTSS) Work and Social Solidarity Ministry, October 2010.

3.3.4 Farmers and agriculture

The mountainous relief of the island creates serious problems to agriculture so that people has built retaining walls for small parcels along the slopes. Thus, agriculture in Funchal Metropolitan Area and in the rest of the island is organized in altitude up to about 600 m.

Figure 8.18. Agriculture areas in Funchal Metropolitan Area.[*]



[*] Source: based on COSRAM (2007).

3.3.5 Ports and fish fleet

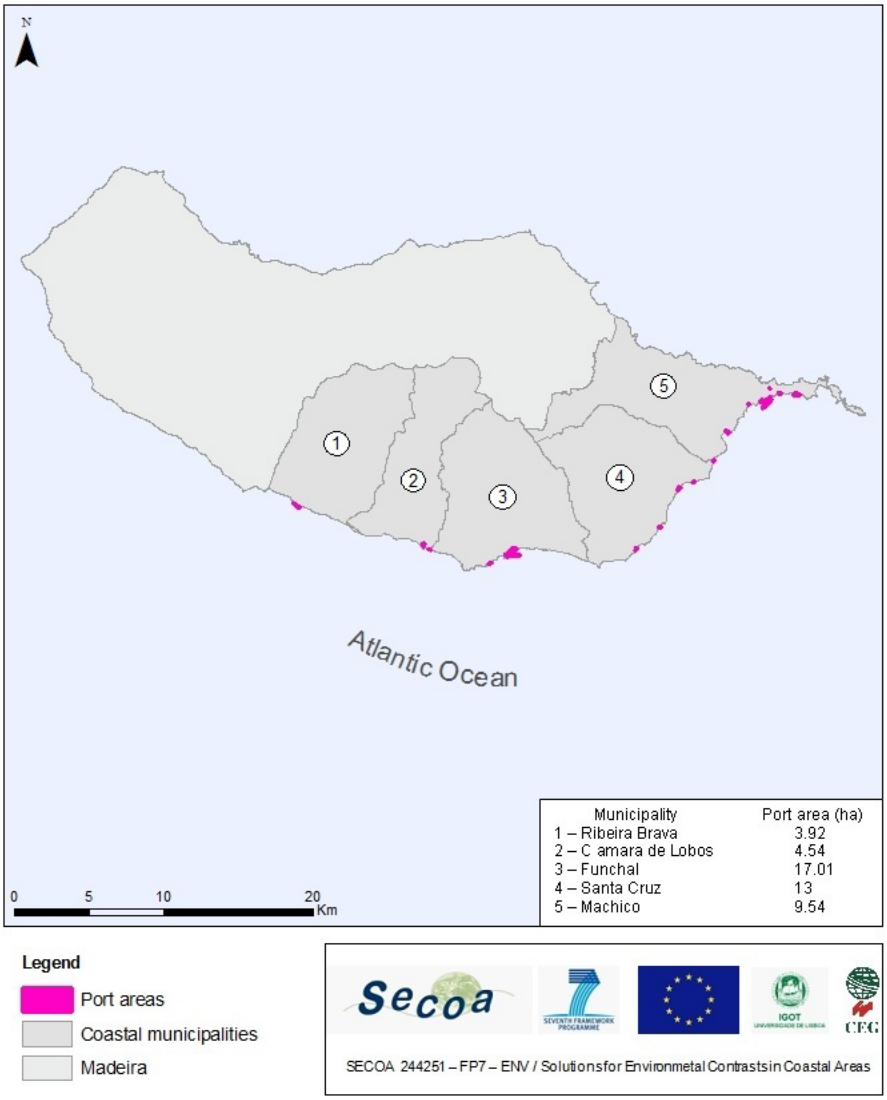
The most significant port areas, including marinas, are located in the municipalities of Funchal (17,01 ha) and Machico (9,54 ha). There has been a positive evolution in almost all indicators except for cargo handle which had a negative evolution (34,5%). The port of Funchal is specialized in the reception of cruises, while the port of Caniçal, in Machico municipality is a commercial port. The cruise tourism is a very important niche in Madeira Island. The number of cruises has increased from 271 in 2005 to 277 to 2009 and the number of passengers had an evolution of 35.7% in the same period.

Table 8.24. Port activity in Madeira Island, 2005 and 2009.[*]

Indicators	2005	2009	Evolution (2005-2009)
Number of ships (total)	**2,999**	**3,234**	**7.8%**
Number of cruise ships	**271,000**	**277**	**2.2%**
Number of passengers (total)	**613,782**	**833,049**	**35.7%**
Cargo handle (ton)	**3,456,942**	**2,263,019**	**-34.5%**

[*] Source: APRAM, www.apram.pt [accessed 13th july 2010].

Figure 8.19. Port areas in Funchal Metropolitan Area.[*]



With regards to the fishery sector (years 2002 and 2009), there has been a decrease in the capture/production of seawater fish at the ports of Madeira. Shellfish fishing has very little significance in Madeira, yet the weight of molluscs unloaded at the ports of the island has almost doubling in the period of reference. In total, the amount of fish caught and unloaded at the ports of Madeira is much lower than that of fish unloaded at the ports of Eastern Algarve and Lisbon Metropolitan Area. The port of Funchal is the main fishing port of the island with

[*] Source: based on COSRAM (2007).

483 fishing vessels. The location of the fishing port is currently a factor of conflict due to the rising specialization of the port of Funchal for cruise ships.

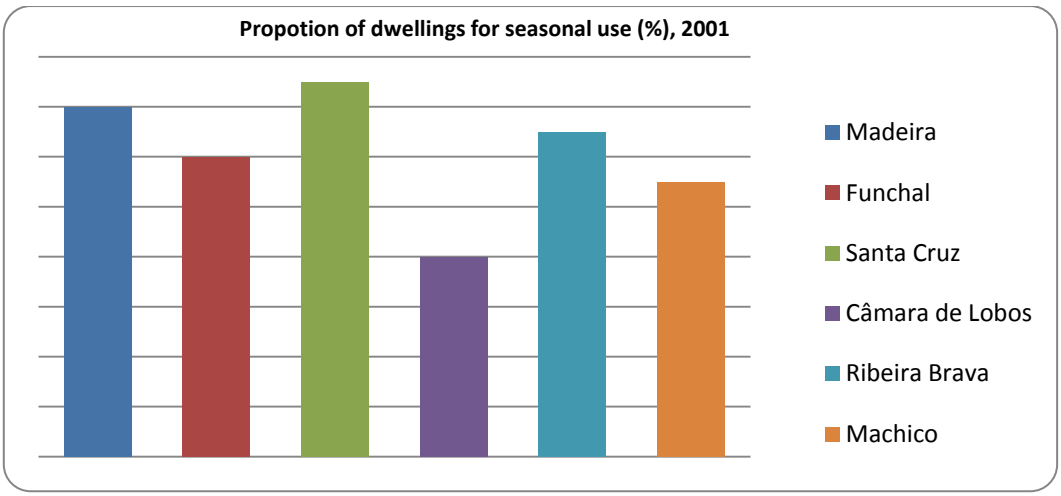
3.3.6 Energy production companies

Similarly to Lisbon Metropolitan Area and Eastern Algarve, most energy consumed in Funchal Metropolitan Area is produced outside this area. Most energy production units are linked to thermal and hydropower production (10 units), windpower (4 units) and thermal power (4 units) while there is one photovoltaic power station in Funchal.

3.3.7 Second homes

In opposition to what happens in the rest of Portugal, second homes are not expressive in Madeira. Still, second homes are mostly concentrated in Santa Cruz and Ribeira Brava.

Figure 8.20. Second homes in Funchal Metropolitan Area, 2001.[*]



[*] Source: INE, www.ine.pt, [acessed September 2010]

3.3.8 Synthesis: main users and relation with resources

Users	Main resources consumed	Main trends
Inhabitants / households	Fresh water Soil Energy Air Biodiversity	Presures on resources from population are increasing in the municipalities of Câmara de Lobos and Santa Cruz; Pressures on resources from population are decreasing in the municipalities of Funchal and Machico; Population is ageing; Immigration is not relevant.
Tourism establishments	Fresh water Waterfront/waterscape Landscape and habitats Air/clima Energy Soil Biodiversity Cultural heritage	Pressures on resources from tourism are increasing; Hotels are mainly concentrated in Funchal municipality and along the coastline, conflicting with other land-uses; Marine and coastal biodiversity and habitats are threatened by tourism;
Industry and Commerce	Fresh water Soil Energy Biodiversity Mineral resources	Pressures on resources from manufacturing industry and retail are increasing; Some industrial plants and the modern commercial precincts tend to concentrate in the 500 meter corridor alongside the seashore; Pressures on resources from mining industry are minor;
Agriculture	Fresh water Soil Air/clima Habitats Biodiversity	Agriculture is spatially constrained due to orography;
Ports and Fishing Fleet	Waterfront/waterscape Soil Air/clima Habitats Biodiversity	Cruise industry is more and more noteworthy; Ports are more and more specialized, the port of Funchal being increasingly devoted to cruise ships; Marine and coastal biodiversity and habitats are threatened by the cruise industry; Commercial ports are losing importance; Fishing industry is modest.
Energy production companies	Fossil fuel Water Air/clima	Most of the energy consumed is produced outside the study area
Second homes	Fresh water Soil Waterfront/waterscape Energy Air/clima Landscape and habitats Biodiversity	Second homes are a minor threaten for environment.

4. Conclusions

4.1 Lisbon Metropolitan Area

Resources	Users	Pressures
Tagus Estuary: ±34.000 ha Largest estuary of Western Europe Riverfront of 11 LMA municipalities Geographic center of LMA Partially with protected status since 1976 (Nature Reserve) High ecological and scenic value	Tagus Estuary: Shelter and nesting area for numerous bird species People and goods interface in a perspective of intra-metropolitan (commuting) "Gateway" to and from overseas of high trade flows Logistic and storage activities area Significant use of the water plan for tourism and leisure activities (cruising, nautical recreational activities) Fishing has a small economic value, however has significant impacts on resource management (e.g. illegal harvesting of shellfish)	Tagus Estuary: Various polluting activities with significant impact in the water plan Management of the estuary uses, notably the final stretch of the river Tagus to Barra (leisure-recreational uses, fishing activities, ...)
Riverfront: Section that extends from both banks of the river-estuary Some LMA estuarine-coastal sections are located in areas with conservation status (e.g. Nature Reserve, Protected Landscape Area, ...) Area with significant heritage assets (historic legacy, iconic buildings, ...) Intense construction for residential and economic purposes (industrial, trade and services)	Riverfront: High touristic flows on natural and heritage resources of this estuarine-coastal section Companies linked to river activities, notably logistics and warehousing due to its location (direct contact with the water plan) and space used on the riverfront Allocation of space for commercial and service activities (support for port activities is progressively less, while there is increasingly entertainment services and a creative and innovative third sector) Intense flows of intra-urban spaces due to the existence of channels of different types of transport along the riverfront (particularly roads and railways that run along the north bank)	Riverfront: Difficult access and enjoyment of the riverside due to the placement of transport facilities along the estuary, which make a barrier to human mobility The strategic benefits of space and port activities (from an economic perspective) vs. the increasing value of the waterfront on the estuarine municipalities for leisure and recreational activities Need of space requirements for ensuring people and goods mobility within a metropolitan (e.g. transport interfaces, storage, ...) and international context (cruise terminal; hinterland for supporting port activities)
Seafront: Coastal strip to the north and south of the Tagus river mouth Strong relationship with the river-estuary, which provides it a framework and that influences the morpho-dynamics of the coast (tendency to sedimentation and erosion phenomena, especially in the south of Tagus Barra) Seafront encompassing long sandy sea cliffs or soft cliffs with direct contact with the sea	Seafront: Intense use of the numerous touristic beaches to the north and south of Tagus Barra, which is a strong attraction for residents, visitors and tourists to LMA Military installations (some still running, others obsolete) with strong territorial impact with regards to space taken and restrictions imposed on land use Residential construction located very close to the shoreline (of different nature: some of illegal origin, and others for high market residential or touristic use) Economic exploitation of the seafront with fishing activities and nautical recreational activities	Seafront: Anthropogenic occupation (residential) on coastal areas subject to a high risk of sea flooding Set in a metropolitan context, high population density and strong tourist attraction ...

4.2 Eastern Algarve

Resources	Users	Pressures
Barrier Islands: Longitudinal alignment of small islands towards the continental shelf Status of protection linked with this stretch of coastline (Natural Park of Ria Formosa) Remarkable environmental and landscape value of the Ria Formosa's system, which is an habitat for numerous species of birds and flora	Barrier Islands: Occupation of some of these barrier islands with construction of illegal and precarious origin, notably housing (primary or secondary) and fishing storage facilities Despite constraints in the access of tourists to the seafront in this stretch of coastline, there is a strong touristic demand during the summer	Barrier Islands: Uses not consistent and sometimes hindering of environmental preservation and prevention of risks Potential conflicting activities on the water plan and the banks of the Ria Formosa, notably between the fisheries/ fish stocks and nautical recreational activities
Coastal cliffs: Coastal zone of nearly 80 Km long (in the municipalities of Albufeira and Loulé) Extensive dunes, punctuated by some areas of direct contact of the cliff with the water plan	Coastal cliffs: High touristic demand in an area with the highest number of attractions, services and touristic facilities. Areas very close to the cliff are occupied with residential construction, including second homes (which are included, or not, in complex / resorts)	Coastal cliffs: Intensive use of tourism with high seasonality (e.g. parking, walking, ...) Erosion triggered by incorrect use / protection of the cliffs
Urban-touristic section (south of EN125): Coastal Range between the EN 125 and shoreline Intense occupation and soil sealing due to construction of buildings and infrastructures	Urban-touristic section (south of EN125): Intense occupation urban with residential areas, commercial areas, industrial areas, ... Co-existence of some relevant equipment and infrastructure (roads, railway, airport, ...)	Urban-touristic section (south of EN125): Overlapping interests, sometimes conflicting, with regards to the function / use to give to the territory High diversity of stakeholders (public and private) with rights and interests over the territory

4.3 Funchal Metropolitan Area

Resources	Users	Pressures
Funchal and Santa Cruz Coastline: Natural Partial Reserve of Garajau with 7 Km of shoreline and 376 ha Marine reserve since 1986 Coastal area is characterized by several pebble beaches interspersed with rocky areas biological richness and crystal clear and clean waters	Funchal and Santa Cruz Coastline: Tourists specialized in underwater activities Researchers Residents	Funchal and Santa Cruz Coastline: Illegal fishery Underwater sewage system as a polluting source
Funchal Marine Eco-park : An area of 139 ha rocky, rugged, steep and often inaccessible coast Pebble beach in the entire area lies within the area of the Gorgulho Sea Public Promenade Proposed status of Protected Landscape by the municipality	Funchal Marine Eco-park : highest concentration of hotels in Madeira Public and tourist facilities (e.g. swimming pools) Existence of private nautical clubs Resident population of Funchal city	Funchal Marine Eco-park : Hotel facilities demanding for more area to expand activity and have easier access to the seashore Eventual sewage system leakages Shortage of space for both private and public uses
Funchal Bay: A shoreline of 7,3 km, of which 3,4 km as a public promenade Cruise port (296 cruise ships in the year of 2009)	Funchal Bay: Intense cruise activity (including mega cruise ships) Marina (for mixed uses: residents and tourists) One of the recreation areas of the Funchal residents/tourists	Funchal Bay: Buildings for public use (including public institutions, restaurants, …) in the waterfront Intense traffic flow (public and private) and parking demand

4.4 Synthesis table – Resources at the three case studies.*

	LMA	EA	FMA	LMA	EA	FMA	LMA	EA	FMA
Resources	Quality	Quality	Quality	Quantity	Quantity	Quantity	Potential use	Potential use	Potential use
Biophysical:									
Drinking water	★★	★★	★★★	★★	★	★★★	★	★★	★★
Minerals	★★	★★	★	★	★★	★	★	★	★
Soil	★★★	★	★★	★	★★	★★	★	★	★★
Habitat	★★	★	★★	★★	★★	★★	★★	★★	★★
Biodiversity	★★	★★	★★	★★	★★	★★	★★★	★★★	★★
Energy sources	★	★★	★★	★	★	★★	★★	★★	★★
Cultural:						★★			★★
Equipments	★★	★★	★★	★★★	★★	★★	★★	★★	★★
Heritage	★★	★★	★★	★★★	★	★★	★★	★★	★★
Leisure	★★	★	★★	★★	★★	★★	★★★	★★★	★★

4.5 Synthesis Table – User at the three case studies.*

Users	LMA	EA	FMA	LMA	EA	FMA
	Economic relevance	Economic relevance	Economic relevance	Spatial relevance	Spatial relevance	Spatial relevance
Agriculture	★★	★	★★	★	★★	★★
Mining	★	★	★	★	★	★
Industry	★★	★	★	★★	★	★
Trade	★★★	★★	★★	★★	★★	★★
Tourism	★★	★★★	★★★	★	★★★	★★★
Population	★★★	★★	★★★	★★★	★	★★★
Ports and fishery	★★★	★★	★★	★★	★★	★★
Energy production	★	★	★★	★	★	★★

* ★ Low; ★★ Medium; ★★★ High.

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CHAPTER 9.

Portsmouth and Thames Gateway: Coastal Environmental Resources and Users

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1. Introduction

The two SECOA study sites in the UK are Thames Gateway and Portsmouth. Both are located in southeastern England, which is the most prosperous and dynamic region in the UK, although they represent contrasting socio-economic and environmental systems.

Portsmouth is a compact coastal urban region which occupies a highly constrained physical site. The city has a long history of development, related to the historical role of the port as both a naval and commercial hub. It has developed mostly on Portsea Island, which is surrounded by two estuarine basins - Portsmouth and Langstone harbours. A low ridge of hills effectively marks the northern and landward edge of the city. The present day City of Portsmouth constitutes a unitary (single tier) administrative region of 6,019 ha, of which 4,028 ha is land with a further 1,991 ha in the two harbours. It had an estimated population of 200,000 in 2008.

The Thames Gateway region is far larger, and more complex than the Portsmouth case study area. It was established under National Regional Planning Policy Guidance as a regional framework for development of housing and economic activities, and to accommodate much of the development pressures in the relatively congested south eastern region of the UK. An average of more than 6,000 new homes have been built per year since 2000, mainly in areas previously dominated by derelict industrial and commercial land. Thames Gateway stretches some 70 kilometres along the Thames Estuary from Isle of Dogs and London Docklands, near the centre of London, to Southend in Essex (north) and Sheerness in Kent (south). Unlike Portsmouth, which is a unitary local authority, Thames Gateway cuts across the boundaries of 18 local government areas. In environmental terms, it covers part of the tidal Thames. About 1.45 million people live in the Thames Gateway, occupying about 111,247 ha of mainly low-lying floodplains. The majority of these are heavily protected against tidal and river floods, although there are still some areas that are less well defended.

The Thames Estuary is protected from flooding by the Thames Tidal Defences which consists of nine major barriers (including the Thames Barrier), many smaller barriers and gates, and over 300 km of walls and embankments which provide a 1 in 1000 year standard of protection from tidal flooding through to 2070 – the highest standard of flood protection in the UK. Other flood defences provide a standard of protection less than 1 in 1000 year from sea

flooding (open coast and tidal estuary) and equal to or less than 1 in 100 years from fluvial (river) flooding. The Thames Estuary 2100 plan – a comprehensive study of the tidal Thames - includes forecasts of possible change over time due to rising sea levels and suggests ways of managing sea level rise over the next 150 years.*

Despite these striking contrasts, the two study areas have in common high population densities on low-lying flood-risk areas, with urban development exerting long and continuing pressures on the natural environment. The management of flood risk is a major issue in both areas, where the maintenance of flood defences is of paramount importance at present and represents an economic and environmental challenge for the future. The risk of flooding already constrains existing plans for further development and regeneration in the study areas. The impacts of climate change and sea level rise are expected to increase flood risk and the cost of maintaining/upgrading flood defences and, at the same time, aggravates the loss of natural habitats due to coastal squeeze. Resources and resource users in these two contrasting case studies are considered in this report against this background of intense, but dynamic, human-natural relationships.

2. Materials and Methods

The chapter draws on material from a range of sources. Maps and other visual materials were drawn from European and UK national sources (for example, European Environment Agency and Ordnance Survey). Where available, datasets supplied and verified by the UK Office of National Statistics - for example, census data – were used to provide supporting evidence. Where raw data was unavailable, or had been analysed and appropriately reported on using the relevant geographies, evidence was drawn from alternative sources. These include central UK government departments (for example, the Department for Communities and Local Government [DCLG], and the Department for Transport [DFT]); Executive Agencies (for example, the Environment Agency and Natural England); local authorities (and work commissioned by local authorities); and academic sources including books and journal articles.

* See www.environment-agency.gov.uk/research/library/consultations/106100.aspx. References to Portsmouth's and PUSH's (Partnership for Urban South Hampshire) environmental strategies including the Strategic Flood Risk Assessment can be found at http://www.push.gov.uk/work/sustainability-and-social-infrastructure/contentstrategic-flood-risk-assessment.htm.

Where relevant, descriptive data was drawn from "grey" industrial/commercial and civil sources.

The two case study areas are quite distinct in terms of their geographical, administrative and natures. Portsmouth is a physically discrete long-established coastal city. By contrast, Thames Gateway is a regional framework for development rather than an established urban centre, encompassing (unevenly) 18 local authority areas located across three government regions.

Data for the Portsmouth case study was, for the most part, available from conventional sources and was suitably bounded. However, the diverse physical and administrative nature of the Thames Gateway study area made it necessary on occasion to look beyond conventional sources to, for example, analyses produced by economic development delivery partnerships. One particular (although minor) issue with regard to socio-economic analysis of the Thames Gateway was the occasional lack of „fit" between the Thames Gateway area(s) and data corresponding to relevant local authority boundaries.

3. Overview of Resources in the Case Studies

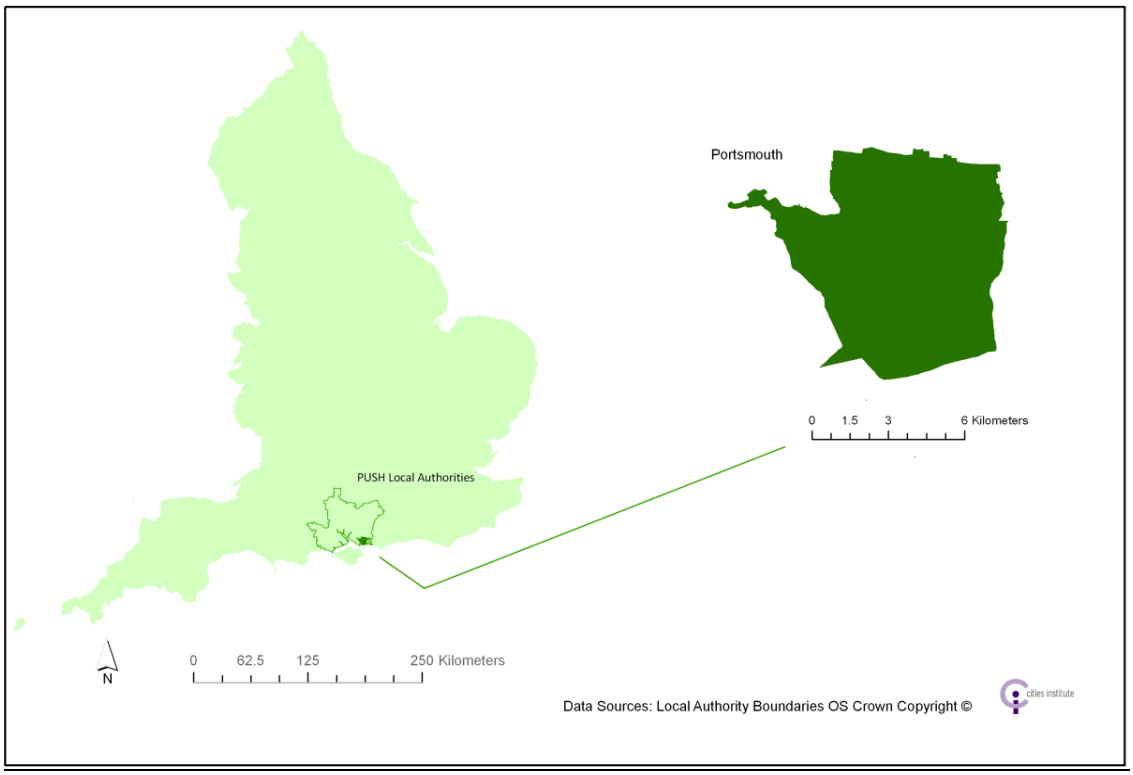
3.1 Case study 1 – Portsmouth

3.1.1 Geographical and historical overview

Portsmouth is located in the county of Hampshire on the southern coast of England, approximately 112km south west of London. Most of the city lies on Portsea Island, bordering the Portsmouth Harbour in the west and the Langstone Harbour in the east.

Historically, Portsmouth's development has been heavily based on its coastal location. It has been an important naval port for centuries (construction of the first docks started in 1212), and today economic activities in the area include shipbuilding, the commercial port and waterfront regeneration related to retailing, leisure and tourism.

Figure 9.1. UK Regional City Case Study: Portsmouth.



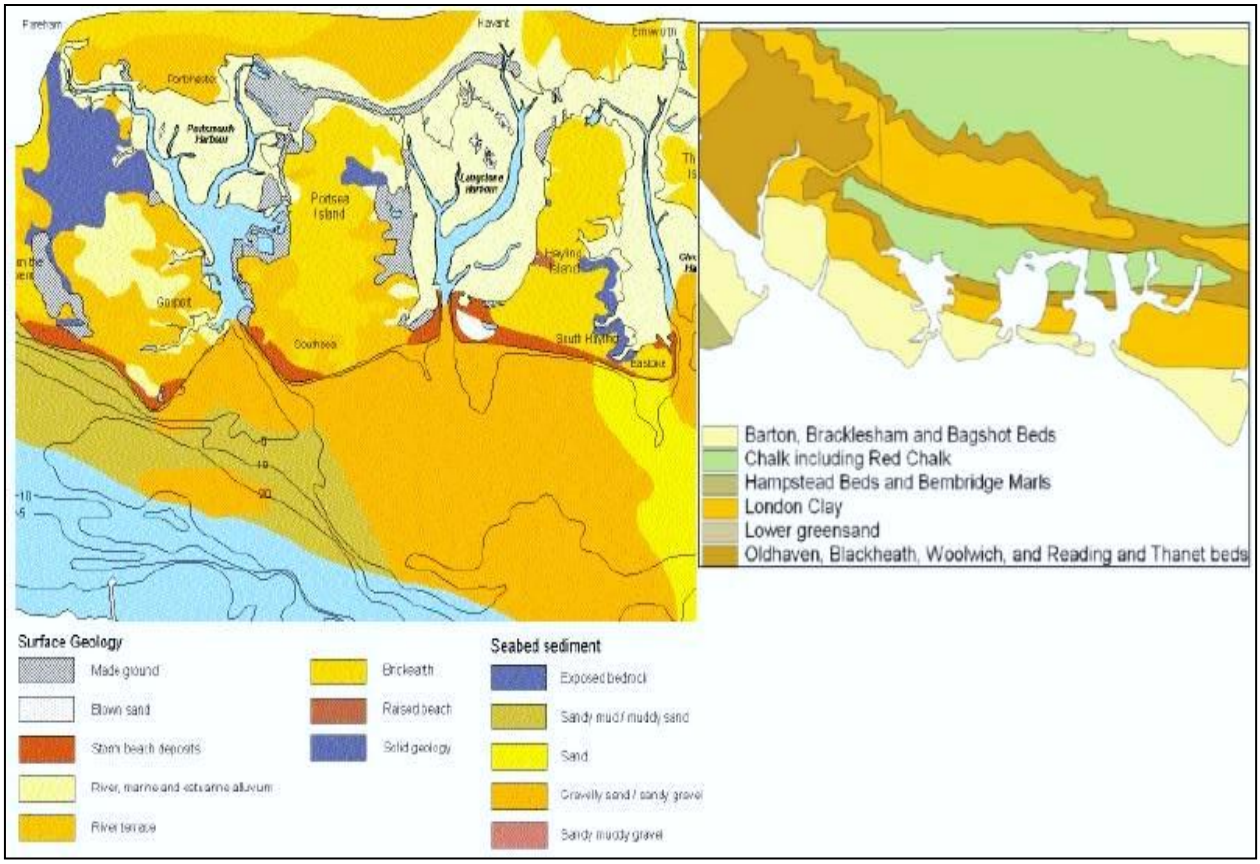
3.1.2 Bio-physical resources

3.1.2.1 Area and typography

The Solent estuarine system is formed by rias - river valleys drowned since the Pleistocene by rising sea levels. Both Portsmouth and Langstone harbours show a steep slope delimited by the antecedent cliff line of the raised beach formed by the Ipswichian glaciations in the north and the narrow harbour entrances, which are about 20m below sea-level in the south (West, 2010).

The geology of the area is dominated by Tertiary clays and sands in the lower areas of the Hampshire Basin (Figure 2) and Cretaceous chalk forming the higher grounds. These sediments record a change in environments from marshy mudflats to more open, marine conditions (Natural England, 2010).

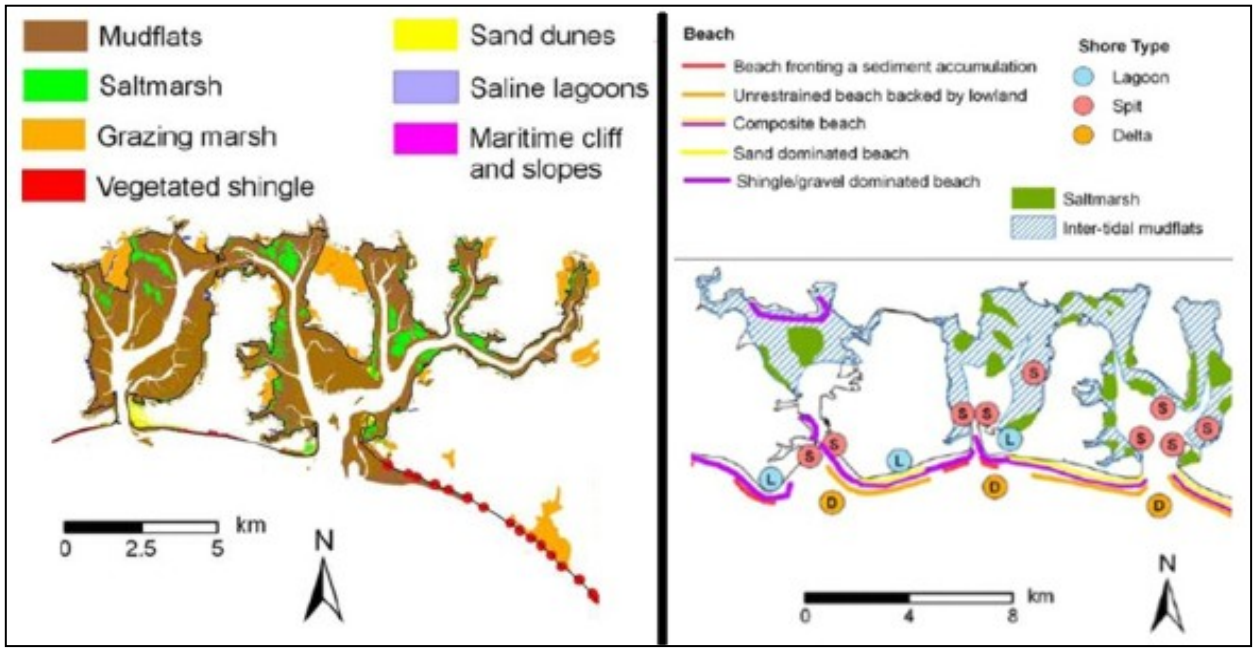
Figure 9.2. Recent (left) and hard rock (right) geological map of the north Solent (modified from North Solent Shoreline Management Plan, 2010).



3.1.2.2 Coastal ecosystems

The coastal geomorphology in this area is highly variable due to changes in coastline orientation, exposure/sheltering, elevation and geology. Coastal processes in the Solent estuarine system are complex due to the combination of open coast and harbours that are partially sheltered by the Isle of Wight. Human activities have altered the functioning of natural processes by affecting the sediment budget through flood and coastal defence works (the entire Portsmouth coastline is protected by coastal defences), controlling river drainage/flow, and dredging for navigation purposes and aggregates extraction.

Figure 9.3. The main geomorphologic features and coastal habitats around Portsmouth.



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As the majority of coastal defences in the north Solent are fronted and backed by European designations, their maintenance must comply with European environmental legislation. The intertidal areas (mudflats and salt marshes) surrounding Portsea Island receive national and international conservation designations, including Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI). Each designation recognises a separate set of criteria that distinguish the sites as of high conservation value.

Salt marshes grew rapidly in the area between the 1880s and late 1920s; although rapid erosion, land reclamation and coastal squeeze have subsequently threatened these environments (see Table 9.1). Between 1971 and 1984, approximately 2.5km² of intertidal area was reclaimed in Portsmouth Harbour.

Table 9.1. Area and % loss of salt marsh in Portsmouth and Langstone harbours.[*]

Portsmouth Harbour

Year	Area (Ha)	Data Source	Period	Total loss		Loss excluding reclamation	
				% loss	% loss per year	% loss	% loss per year
1946	269	CCO					
1971	183	CCO	1946-1971	32	1.3	20	0.8
1984	52	CCO	1971-1984	71	5.5	54	4.1
2002	43	CCO	1984-2002	17	0.9	17	0.9
2005	47	CCO	2002-2005	-8	-2.7	-8	-2.7
			1946-2005	83	1.5	58	1.0

Langstone Harbour

Year	Area (Ha)	Data Source	Period	Total Loss		Loss (excluding reclamation)	
				% loss	% loss per year	% loss	% loss per year
1946	438.0	CCO					
1963	256.5	CCO	**1946-1963**	41.4	2.4	41.4	0.1
1971	123.0	CHaMP	**1963-1971**	52.0	6.5	51.3	6.4
1984	81.2	CCO	**1971-1984**	34.0	2.6	32.4	2.5
2001	75.3	CHaMP	**1984-2001**	7.2	0.4	7.2	0.4
2002	72.5	CCO	**2001-2002**	3.7	3.7	3.7	3.7
			1946-2002	83.4	1.5	82.6	1.5

The recent history of the saltmarshes in the region has been complex, particularly regarding the role of *Spartina* species. Following a hybridisation event between a native species and an introduced American species, a new species of *Spartina* (*S. anglica*) arose in the late 19th century in Southampton Water (Ayres & Strong, 2001). This species rapidly colonised mudflats, converting them into saltmarsh with accelerated rates of sediment accretion, reducing the available mudflat habitats wherever the plant became established. More recently, in some areas including within the Portsmouth case study area, areas of saltmarsh have declined due to die-back of *S. anglica*, associated with rotting of the rhizomes but whose ultimate cause is unknown (http://www.issg.org/database/species/ecology.asp?fr=1&si=76; Garbutt & Wolters, 2008). If current rates of loss continue, salt marshes may disappear by 2093 in Portsmouth Harbour and by 2010 in Langstone Harbour (Cope *et al*, 2008).

[*] Source: Cope & Gorczynska (2007).

Table 9.2. Factors likely to induce wetland loss (modified from North Solent Shoreline Management Plan, 2010).

Factor	Comment
Wave action	Increases in significant wave height and frequency of storm surges may produce stressed vegetation on the seawards edges of the saltmarshes, clifflets, erosion stacks and hollows, abrasion platforms, and fragmented saltmarsh islands.
Sea level rise and climate change	Rising sea levels and increased storminess would produce higher water level resulting in the saltmarshes being inundated for longer durations more frequently.
Water logging of estuarine soils	Poorly drained sediments would result in water-logging of the marsh soil causing the development of anaerobic conditions in the mud surrounding the root system
Vegetation dieback	Concentrations of plant toxins increase as a result of organic matter building up and reduced flushing. This reduces ability of the saltmarsh to bind the sediment through the root network and to trap sediment through the vegetation. This causes slumping and erosion, and the conversion of vegetated saltmarshes to tidal flats/plains or open water.
Lack of sediment supply	A lack of fine-grained sediment supply, either through the retention of eroded sediments, or from other sources, would prevent the saltmarshes from accreting vertically to keep pace with rising sea levels.
Tidal currents	Velocity, duration and direction, ebb dominant in Western Solent.
Bathymetric changes	Sub-tidal erosion and northward migration of palaeolandscape cliffs in the main Western Solent Channel (personal communication HWTMA)
Human impacts	Growth and decline of the saltworking industry, changes in land use management within river catchments, building of hard sea defences causing coastal squeeze; ship-generated waves, dredging and construction of marinas and berths.
Natural loss	Decline in vigour and adaptivity of the vegetation
Coastal squeeze	Under rising sea levels, saltmarshes and other estuarine habitats and ecosystems would naturally migrate landward. This is often prevented however due to the presence of static coastal and flood works (such as sea walls and embankments), and the proximity of urban and coastal developments. This restriction on habitat migration results in the erosion and degradation of these natural flood defences. The loss of saltmarsh area fronting the sea defences allows greater wave action on the shoreline and sea defences and increases the risk of flooding and coastal erosion.

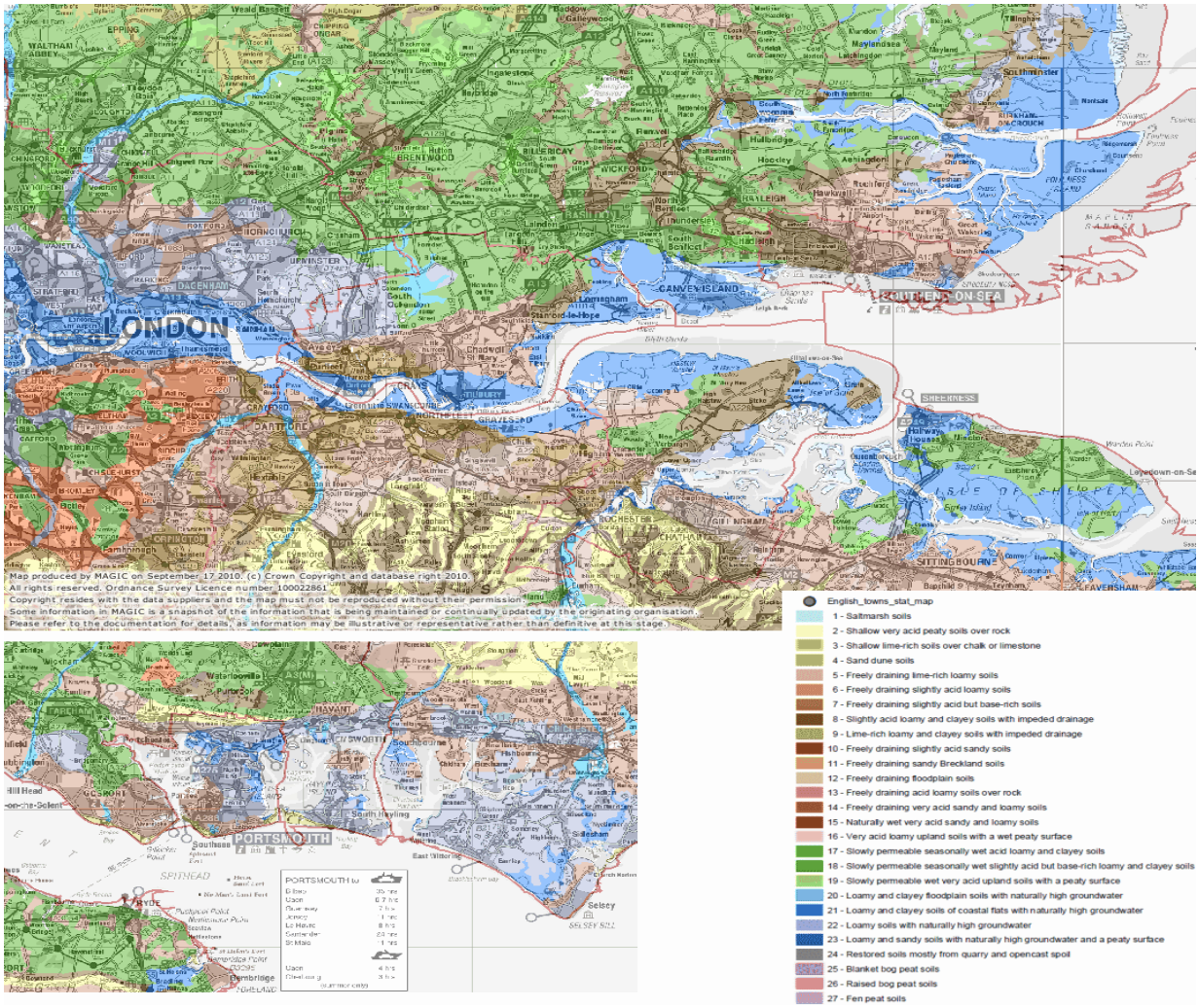
The open coast is formed by gravel barrier beaches showing low gradient sandy foreshores, which are currently relatively starved of sediment. Sediment supply is essential for

the maintenance of both intertidal and open coast environments, with transport around the harbour mouths complex due to tidal currents and the presence of ebb tidal deltas (North Solent Shoreline Management Plan, 2010).

3.1.2.3 Soil and land-uses

Soils in Portsmouth are largely loamy with naturally high groundwater, freely draining slightly acid loamy soils present at the margins of Portsmouth harbour (Figure 4).

Figure 9.4. Distribution of soil types in Southern England.[*]

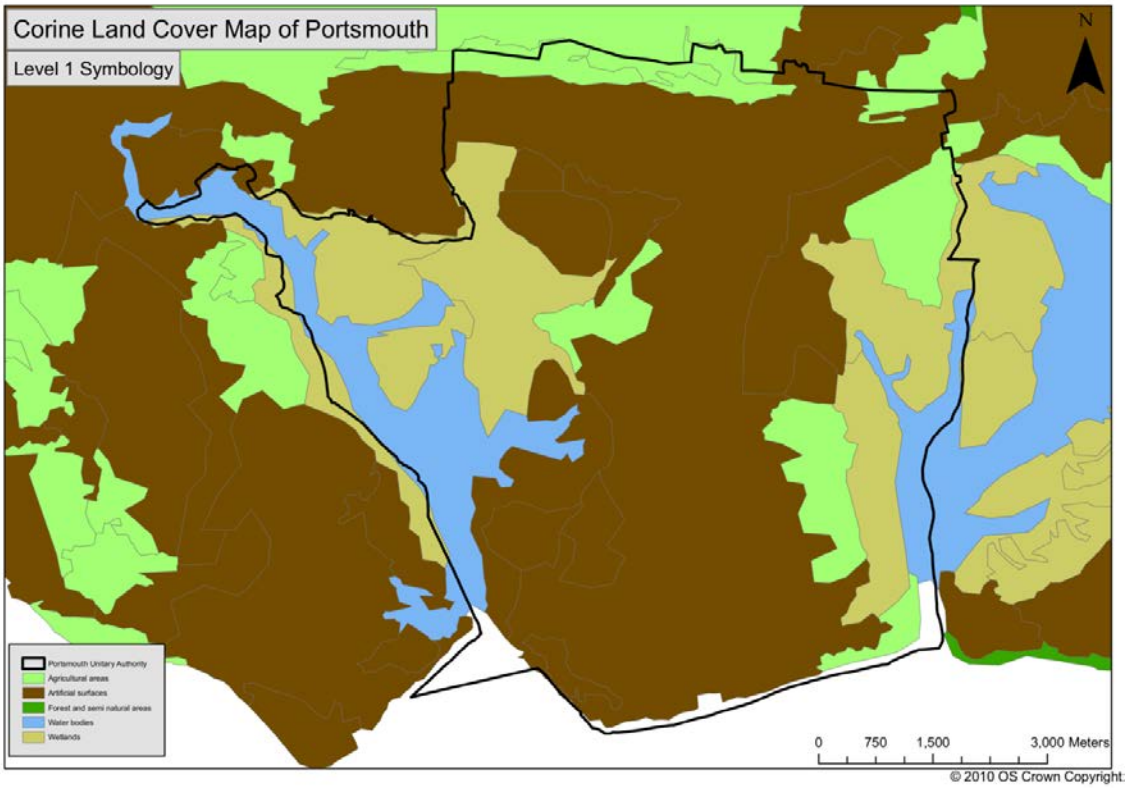


[*] From Magic Soilscape, © Crown Copyright and database right 2009. All rights reserved. Ordnance Survey Licence number 100022861). Source: www.magic.gov.uk/datadoc/metadata.asp?datasetname=Soilscape%20(England).

The land cover visualised at Corine Level 1 symbology (Figure 5) is overwhelmingly dominated by the development of the built environment in this core urban location, despite small areas of agricultural land within the city's administrative boundary. Two significant bodies of water and their associated wetlands constitute unusually high degree of constraint on urban development within a narrow peninsular.

There is limited availability of brown field land - 12 hectares within the local authority boundary, of which 67% is already in use but available for redevelopment. 92% is deemed suiTable 9.for housing growth (DCLG 2008).

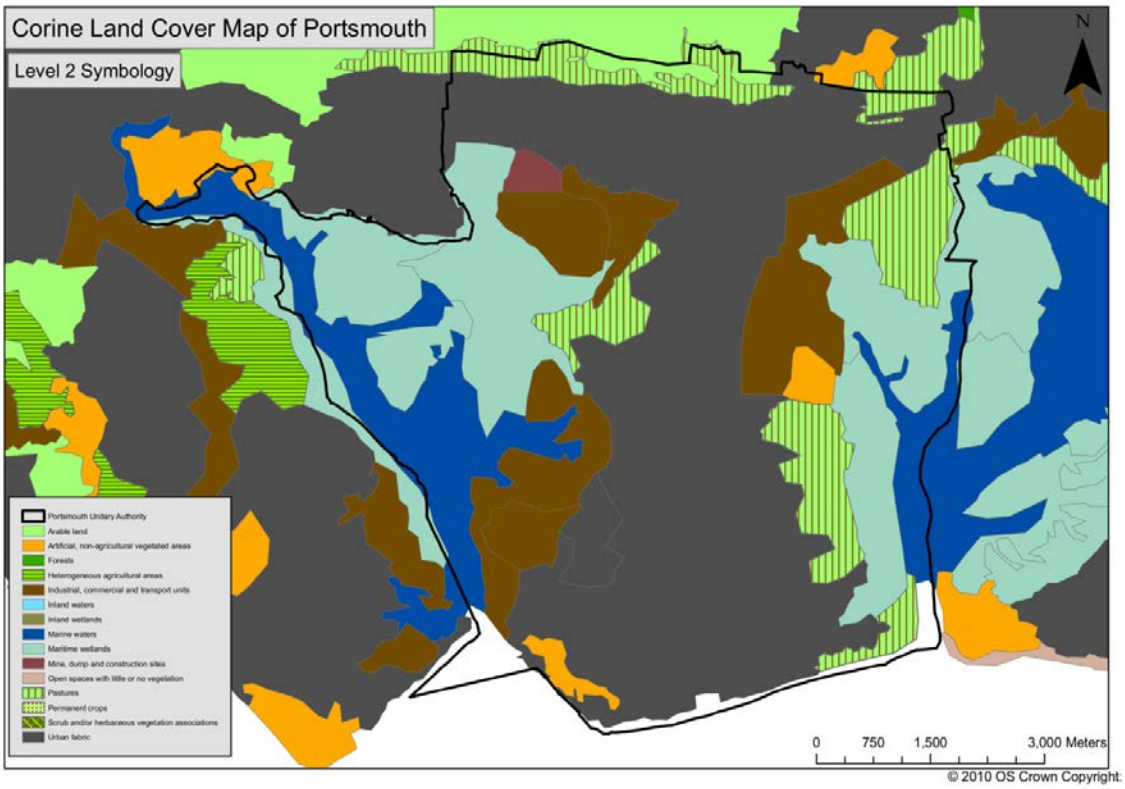
Figure 9.5. Corine Land Cover Map of Portsmouth – Level 1 Symbology.[*]



Corine Level 2 symbology (Figure 6) identifies specific areas of industrial and commercial activity - most commonly located in close proximity to the coast and harbour areas, and thus adjacent to marine wetlands and intertidal flats. There is one key site on the waterfront to the north and west of the city currently designated for waste disposal and dumping. Two areas of artificial surface for recreational use lie adjacent to areas of undefined agricultural land.

[*] Prepared by cities institute using CORINE landcover data, Eyropean Environment Agency 2010.

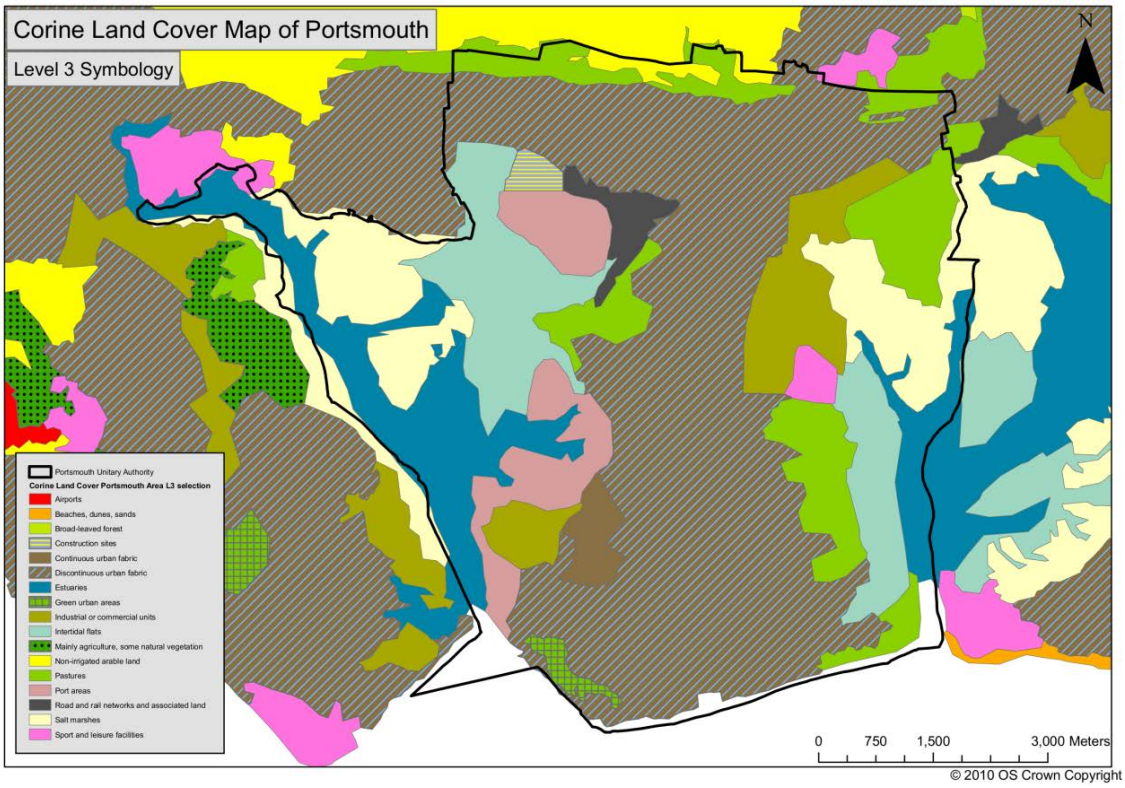
Figure 9.6. Corine Land Cover Map of Portsmouth – Level 2 Symbology.[*]



Corine Level 3 symbology (Figure 7) shows the core of the city clearly surrounded by less dense urban development. There are number of specific sports and recreational open spaces, often bordering agricultural land and the coast. Portsmouth Harbour provides a significant resource for activities such as sailing and angling, and access to wildlife but it is at or near its capacity for recreational use (Portsmouth City Council, 2000).

[*] Prepared by cities institute using CORINE landcover data, European Environment Agency 2010.

Figure 9.7. Corine Land Cover Map of Portsmouth – Level 3 Symbology.[*]



The 2001 General Landuse Database (Table 9.3) indicates that domestic buildings and gardens account for nearly 20% of land use. Roads use over 10% of available land - a level which is almost as high as that for London (11%). Portsmouth lacks green space (23% compared to 35% for London) but has an over-representation of water (30%). The high density of development plays a major formative role in terms of both resources and competing users.

[*] Prepared by cities institute using CORINE landcover data, European Environment Agency 2010.

Table 9.3. Landuse in Portsmouth and England.

Landuse		
	Portsmouth	England
Domestic Buildings	7.13	1.1
Gardens	12.30	4.1
Non-Domestic Buildings	4.22	0.6
Road	10.17	2.3
Rail	0.38	0.1
Path	0.71	0.1
Greenspace	22.77	88.0
Water	29.26	2.2
Other	8.44	1.3
Source: GLUD 2001		

3.1.3 Freshwater and access to water

The city enjoys a small supply surplus of fresh water (Environment Agency, 2004), although Environment Agency projections suggest that by 2025 this will be replaced by 'approximate balance' between supply and demand. All water sources are groundwater based, and the potential for additional abstraction from surface waters is very limited (Ove Arup & Partners Ltd, 2009). It is predicted that climate change may reduce summer rainfall by between 15-60% by the 2080s, which is likely to increase the frequency of drought in the south east region of the UK (Portsmouth LDF & LTP, 2005).

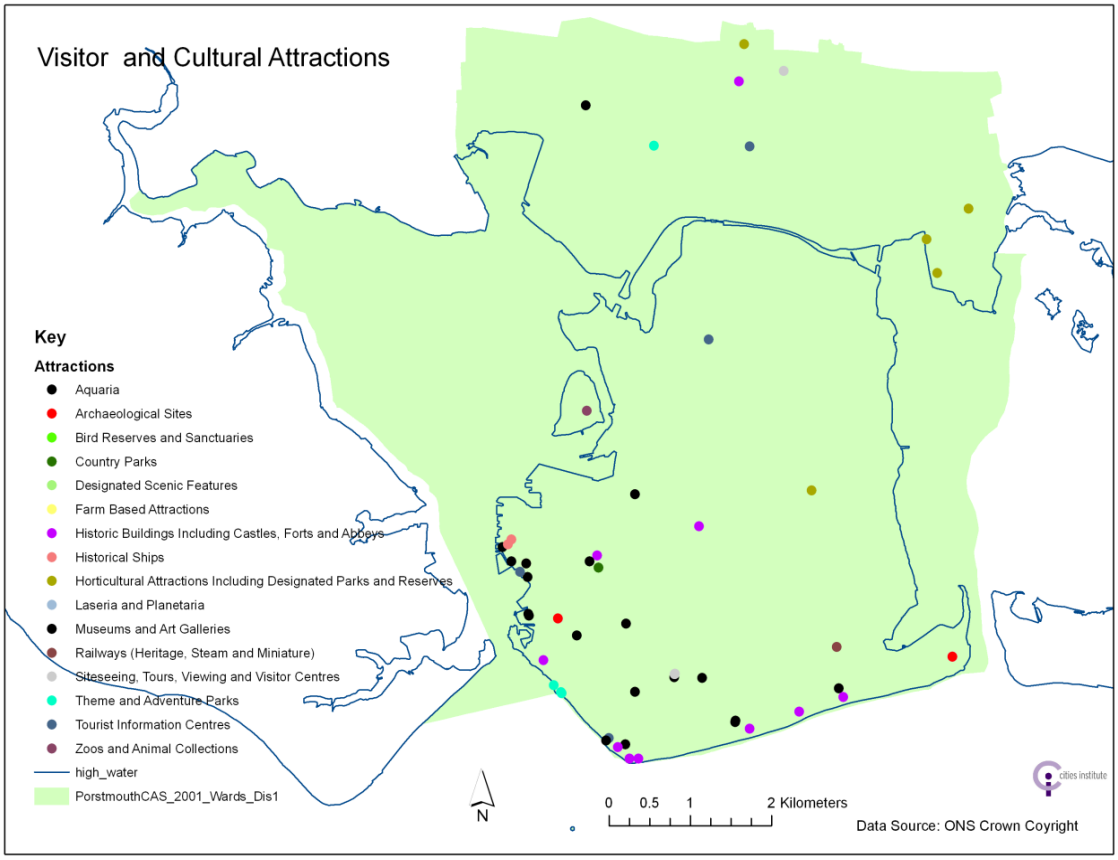
3.1.4 Cultural and social resources

3.1.4.1 Important cultural features

The main visitor attractions in Portsmouth are Gunwharf Quays; the seafront; and the historic Royal Naval Dockyards and the historic ships HMS Victory, the Mary Rose and HMS Warrior (Tourism South East 2008). The Naval History Museum and a Sea Life Centre are also key destinations, and a range of museums and cultural facilities supports local cultural development (Figure 8). The protection of the historic urban landscape of Portsmouth has been a priority, and there are currently 24 Conservation Areas within the city - in particular protecting the seafront, which covers 375 hectares**.** In 2006 Portsmouth hosted 4.6 million

visitors – which represents a substantial three-fold increase compared to 1988 (1.5 million) (Portsmouth Key Tourism Facts and Figures); they are largely concentrated on the waterfront areas.

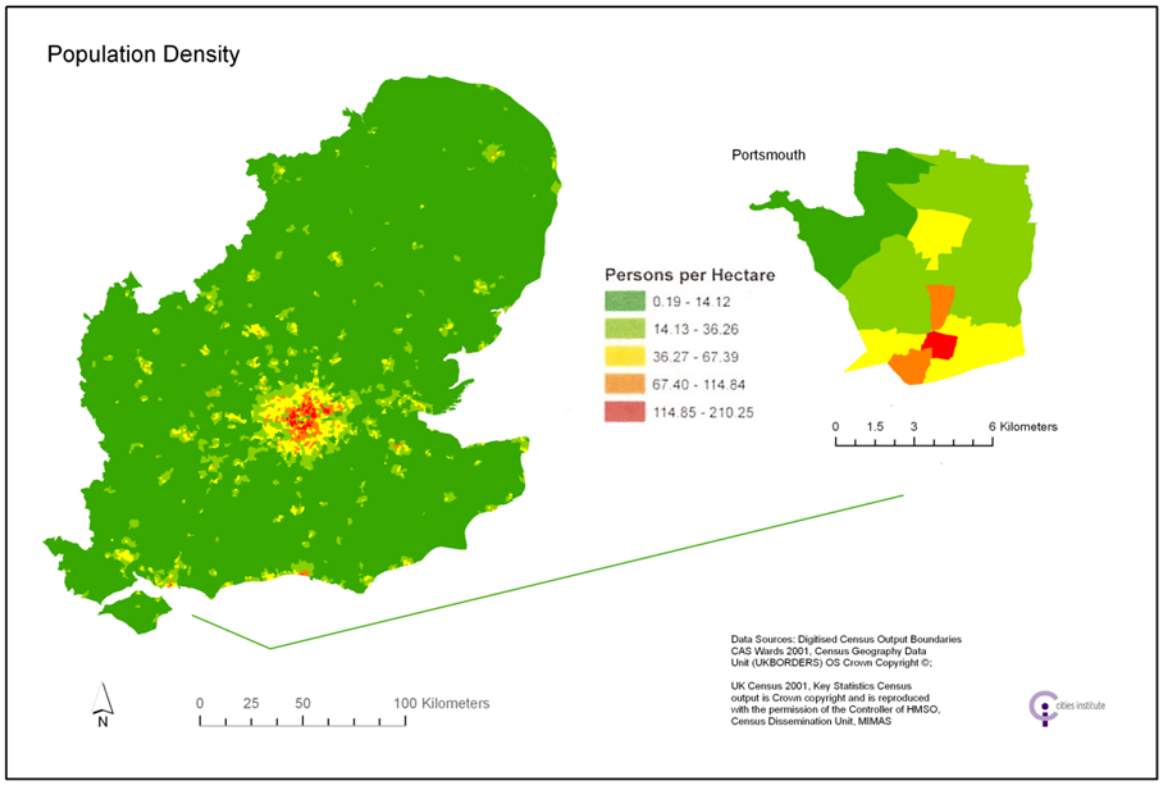
Figure 9.8. Visitor and Cultural Attractions.



3.1.4.2 Important social features

Portsmouth is one of the most densely populated urban areas in Southern England (Figure 9). One city ward, Central Southsea, has a population density of 137 people per hectare - a rate similar to neighbourhoods in inner London. Outside this core population densities are similar to those for outer urban and suburban localities elsewhere in the South East of England.

Figure 9.9. Population density in Portsmouth.



Portsmouth broadly reflects the same urbanisation and counter-urbanisation trends as the rest of the UK. The population declined by 14,600 people (over 7%) during the 1970s, with this trend continuing, although with less intensity, in the 1980s. The decline stopped in the 1990s and the population stabilised at around 185,000. Population growth returned between 2001 and 2009 when the population grew sharply by over 15,000, around 8% (Table 9.4) (Office of National Statistics, MYPE, 1971,1981,1991,2001).

Figure 9.10. Population 1971-2009.[*]

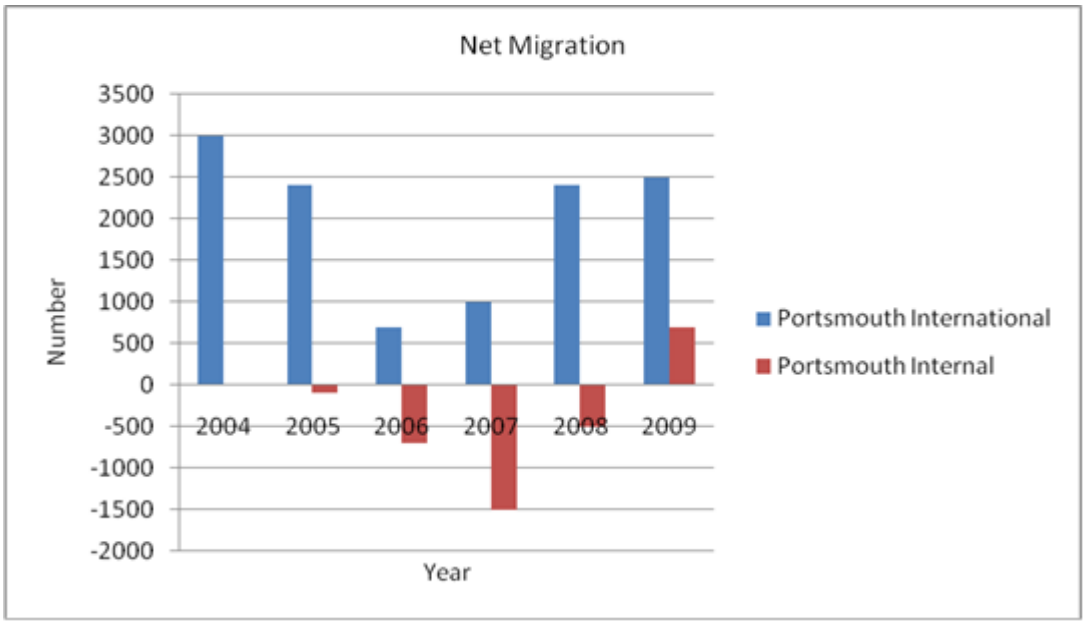
Table 9.4. Population change 1971-2009.[*]

Population Change in Portsmouth			
		Change	%Change
1971	206,000		
1981	191,400	-14,600	-7.09
1991	186,800	-4,600	-2.40
2001	188,000	1,200	0.64
2009	203,500	15,500	8.24

Net migration, particularly international migration in the 2000s, has contributed to this reversal of population decline. Internal migration from elsewhere in the UK did not begin to recover until 2009. Annual net migration (combined internal and external) is now approximately 3.4% (see Figure 11). There is a high level of internal movement within Portsmouth - 16.8% of Portsmouth residents had a different address in the year before the 2001 Census, compared with 12% nationally (Portsmouth City Council, 2003-4). Students are over-represented in the population (11.5%), indicating an increasing number of mobile and temporary residents within the city.

[*] Data Source: Office of National Statistics (1971, 1981, 1991, 2001, 2009).

Figure 9.11. Net Migration.[*]



The gender composition of Portsmouth's population matches that of England (Table 9.5). The age structure (Table 9.6) is also similar with only slightly higher proportions of younger people, including children (under 15 year olds) and those age 16-29.There are, however, proportionately fewer people in the core working age population (between 20-64 years old). Proportions of those of retirement age are similar to the national percentage.

Table 9.5. Population by Gender.

Population by Gender					
	All	Male	%	Female	%
Portsmouth	186701	92042	49	94659	51
England	49138831	23922141	49	25216687	51
					Source: Population Census 2001

Table 9.6. Population by Age.

Population by Age									
	All	0-15years	%	16-29years	%	30-64years	%	65years and over	%
Portsmouth	186701	36131	19.35	41255	22.10	80622	43.18	28673	15.36
England	49138831	9901575	20.15	8630210	17.56	22799035	46.4	7808011	15.89
								Source: Population Census 2001	

[*] Data Source: Office of National Statistics (various years), Local Area Migration Indicators.

A predominantly white population, Portsmouth is significantly less ethnically diverse than the rest of England with less than 3% with Asian ethnicity and under 1% Black Minority Ethnic (Table 9.7). Recent international migration has added to the social diversity of the population, but is not adequately captured by the available statistical data for the period after 2001.

Table 9.7. Population by Ethnicity.

Population by Ethnicity											
	All	White	%	Mixed	%	Asian	%	Black	%	Chinese	%
Portsmouth	186701	176882	94.74	1859	1.00	4555	2.44	942	0.50	2463	1.32
England	49138831	44679365	90.92	643441	1.31	2248107	4.58	1132528	2.30	435434	0.89
Source: Population Census 2001											

The city has a slightly lower proportion of working age residents with no qualifications (27%) than England (29%).

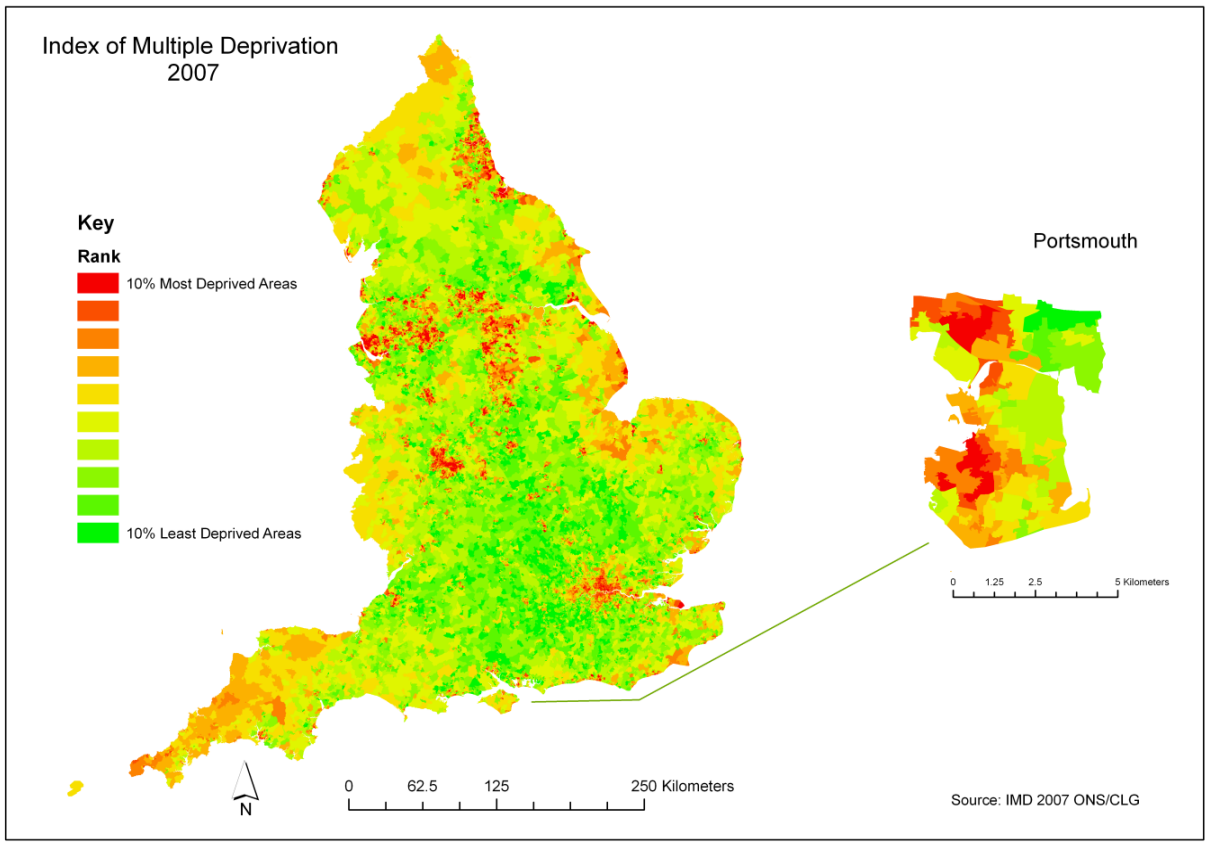
Housing tenure is significant in the UK in terms of access to resources, as well influencing residential mobility. Portsmouth has lower levels of owner occupation (64.8%) and a higher proportion of private renting than England as a whole (Table 9.8). This reflects the local housing tenure structure in which higher levels of temporary residents (including students) have fostered a demand for private rented accommodation. Social renting is slightly higher than the national rate.

Table 9.8. Housing Tenure.

Housing Tenure			
	% Owner Occupation	%Social Renters	%Private Renters
Portsmouth	64.8	18.5	13.2
England	71.2	17.9	10.9
Source: Census 2001			

Portsmouth experiences high social, economic and environmental deprivation (Figure 12) geographically concentrated in areas to the west of the city and close to areas of past industrial and port activity. This reflects the historical legacy of spatial concentration of poverty and inequality; and the uneven distribution of service provision, access to educational and housing resources, and access to better living environments.

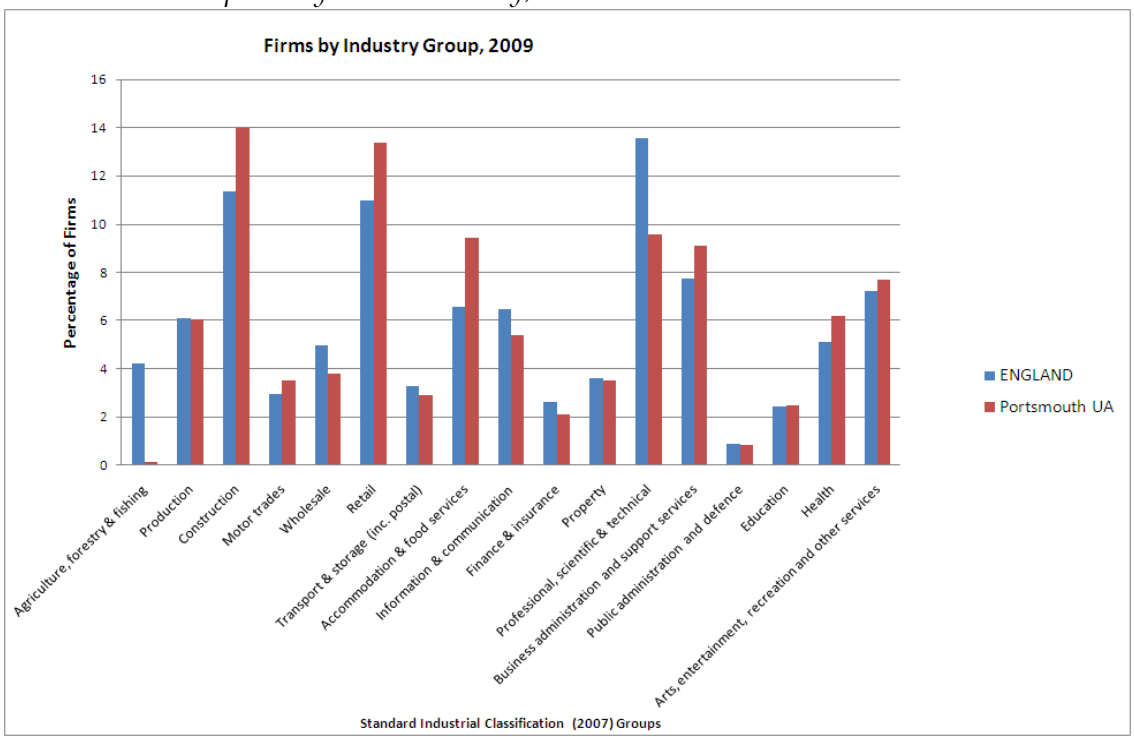
Figure 9.12. Index of Multiple Deprivation 2007 (per Super Output Area, the smallest statistical geographical unit) in Portsmouth.



3.1.4.3 Important economic features

Historically the economy of Portsmouth has been influenced by the presence of the Royal Naval Dockyards. This continues to have an effect, although Portsmouth's industrial structure is now dominated by firms in construction and in the service sectors (see Figure 13). There was significant change in the city's employment structure between 1998 and 2008 with loss of jobs in manufacturing (approximately 4,000 jobs) and wholesale (in excess of 2,000 jobs) as well as in finance and the core public services. The sectors that experienced job growth were those relating to the property and hotel and leisure industries and community and personal services (including creative, cultural and lifestyle services).

Figure 9.13. Percentage share of firms in England and Portsmouth (source: Office for National Statistics, PAYE based Enterprises by Local Authority).[*]



Higher professionals and large employers are slightly under-represented, whilst the pattern of occupations in manufacturing or routine occupations, and in small firms, is similar to England as a whole

Table 9.9. Working Age Population by Occupation.

Working Age Population by Occupation

	All people aged 16 - 74	Large employers and higher managerial occupations	%	Higher professional occupations	%	Lower managerial and professional occupations	%	Intermediate occupations	%	Small employers and own account workers	%
Portsmouth	135628	4256	3.14	6225	4.59	23973	17.68	12835	9.46	8255	6.09
England	35532085	1243918	3.50	1816038	5.11	6656918	18.73	3366757	9.48	2479470	6.98

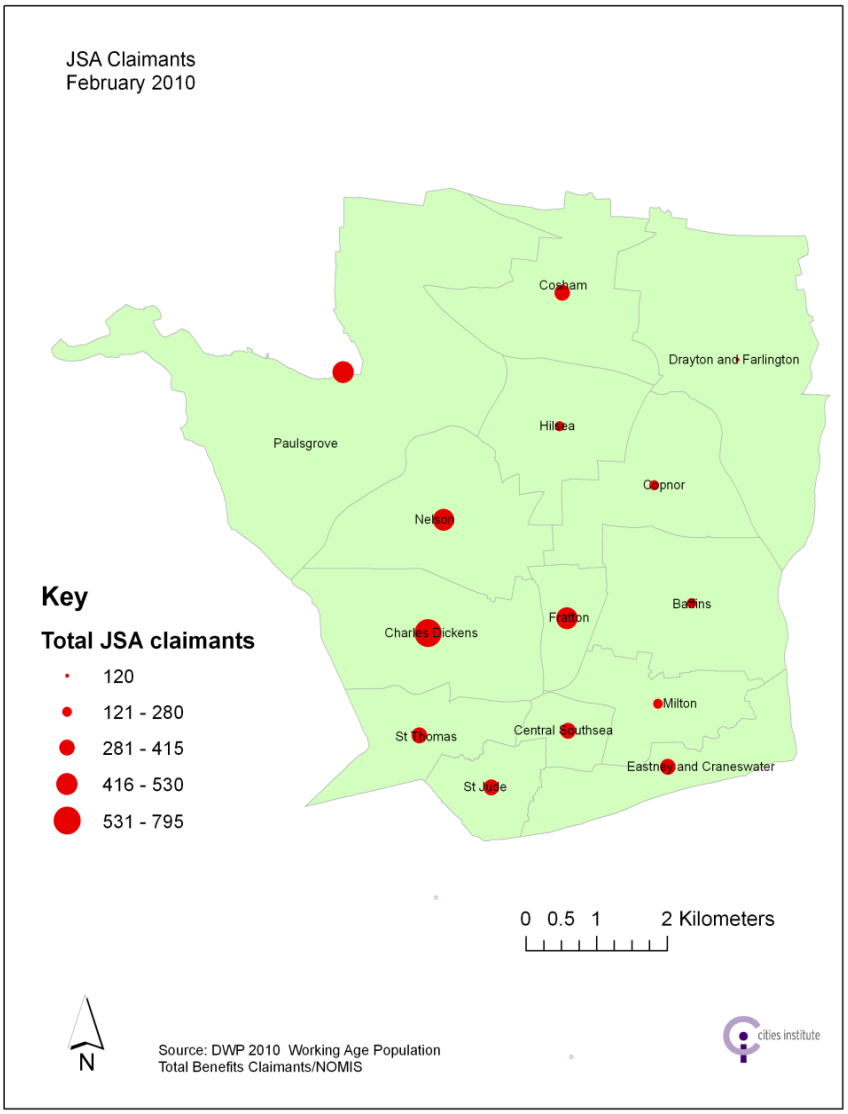
Lower supervisory and technical occupations	%	Semi-routine occupations	%	Routine occupations	%	Never worked	%	Long-term unemployed	%	Full-time students	%	Not classifiable for other reasons	%
10581	7.80	16521	12.18	12818	9.45	3007	2.22	1216	0.90	15002	11.06	20939	15.44
2526120	7.11	4139698	11.65	3203761	9.02	964978	2.72	359731	1.01	2498729	7.03	6275967	17.66

Source: Population Census 2001

[*] Data Source: Inter Departmental Business Register 2009, used under license, Crown Copyright

The percentages of those who have never worked or who are long-term unemployed reflect the national pattern. 3.7% of the working age population currently claims Job Seekers Allowance, a state benefit for those currently out of work and looking for a new job. This is similar to the national rate (3.8%), although this figure masks pockets of job stress, unemployment and reliance on state benefits, especially in the central city wards. In February 2010 there were over 5,000 Job Seekers Allowance claimants in Portsmouth, most aged under 34 and nearly 30% young people aged between 18 and 24. 15% of JSA Claimants live in one ward - Charles Dickens - in the core of the city, an area of extreme deprivation. This pattern illustrates the socio-spatial divisions within this city (Figure 14).

Figure 9.14. Job Seekers Allowance claimants by ward: February 2010

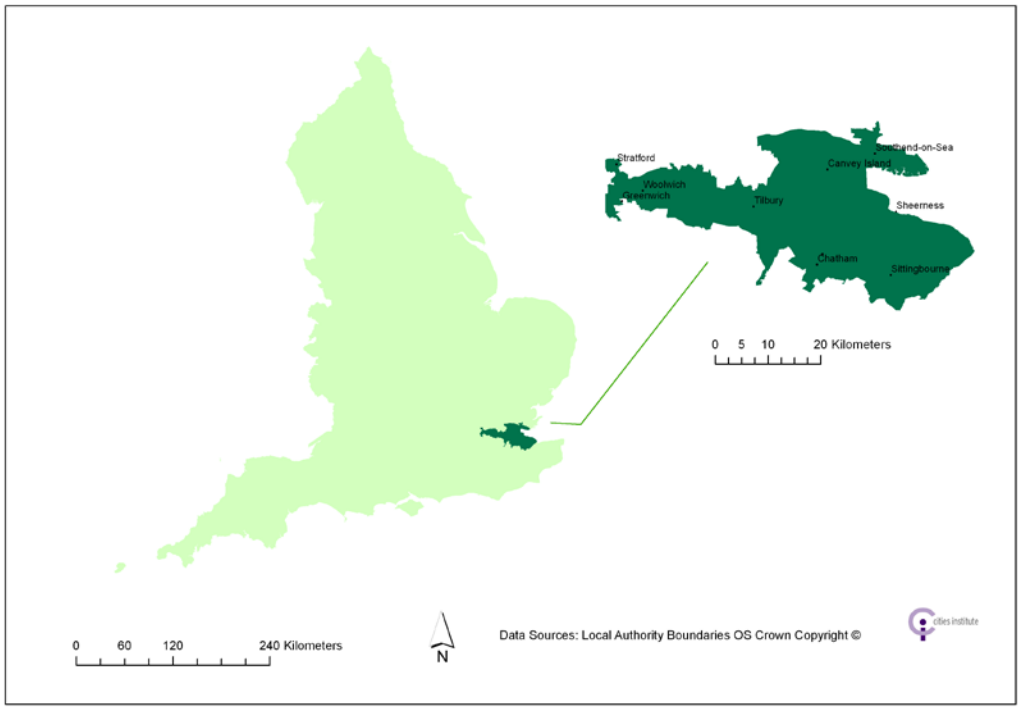


3.2 Case study 2 – Thames Gateway

3.2.1 Geographical and historical overview

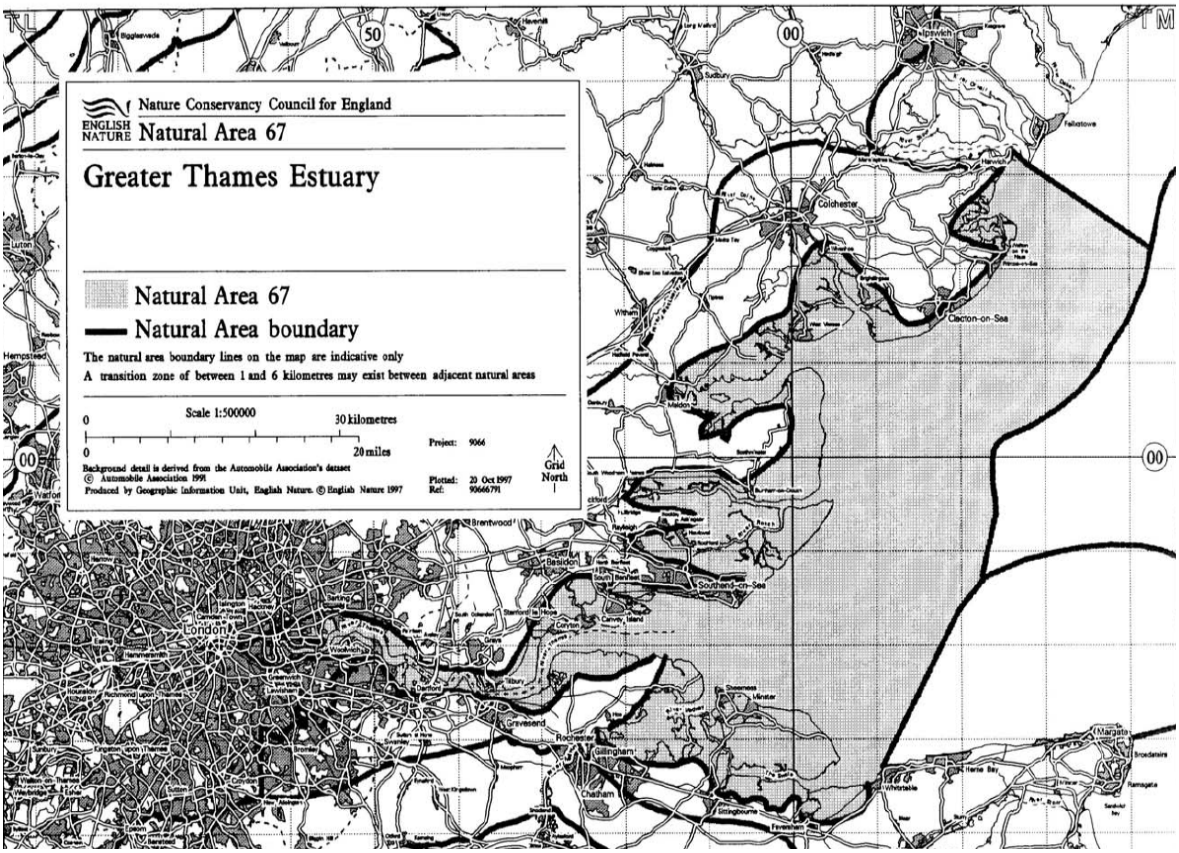
The spatial extent of the Thames Gateway was set out in National Regional Planning Policy Guidance (DTR, 2001) as part of the regional spatial strategy for the development of the south east of England. This designated Development Area reflects past governments' policy priorities - namely identifying areas of brownfield land (previously developed land) which could be made available for new housing and infrastructure development. It covers over 100,000 hectares and stretches over 64 kilometres along the Thames Estuary from Isle of Dogs and London Docklands, near the centre of London, to Southend in Essex (north) and Sheerness in Kent (south).

Figure 9.15. Thames Gateway.



The Thames Gateway occupies a substantial proportion of the Greater Thames Estuary, designated as a Coastal Natural Area by English Nature (1997), the UK government Agency responsible for nature conservation, now re-named Natural England. Figure 16 indicates the extent of the Greater Thames Estuary Natural Area, and demonstrates its wider reach beyond the Thames Gateway.

Figure 9.16. Greater Thames Estuary Natural Area.



3.2.2 Bio-physical resources

3.2.2.1 Area and typography

The coast is largely characterised by shallow water abutting low-lying and flat land above mean high water. The region was just south of the southern-most extent of the glacial ice sheet that covered much of the UK until the end of the Quaternary. The area's coasts remain subject to continual deposition and erosion processes, though modification of the coast by human activity has substantially changed its nature and the influences of such agents upon it. Today, it is dominated by low slope angle and thus by flat lands - normally or frequently inundated by tidal water or flood.

3.2.2.2 Coastal ecosystems

Coastal ecosystems in the Thames Gateway are often dominated by tidal mudflats at lower levels, with saltmarshes at higher tidal levels. Both have highly individual physical characteristics, and associated biota.

Figure 9.17a. Distribution of Thames estuary inter-tidal sediments (substrate)[Thames Partnerships].

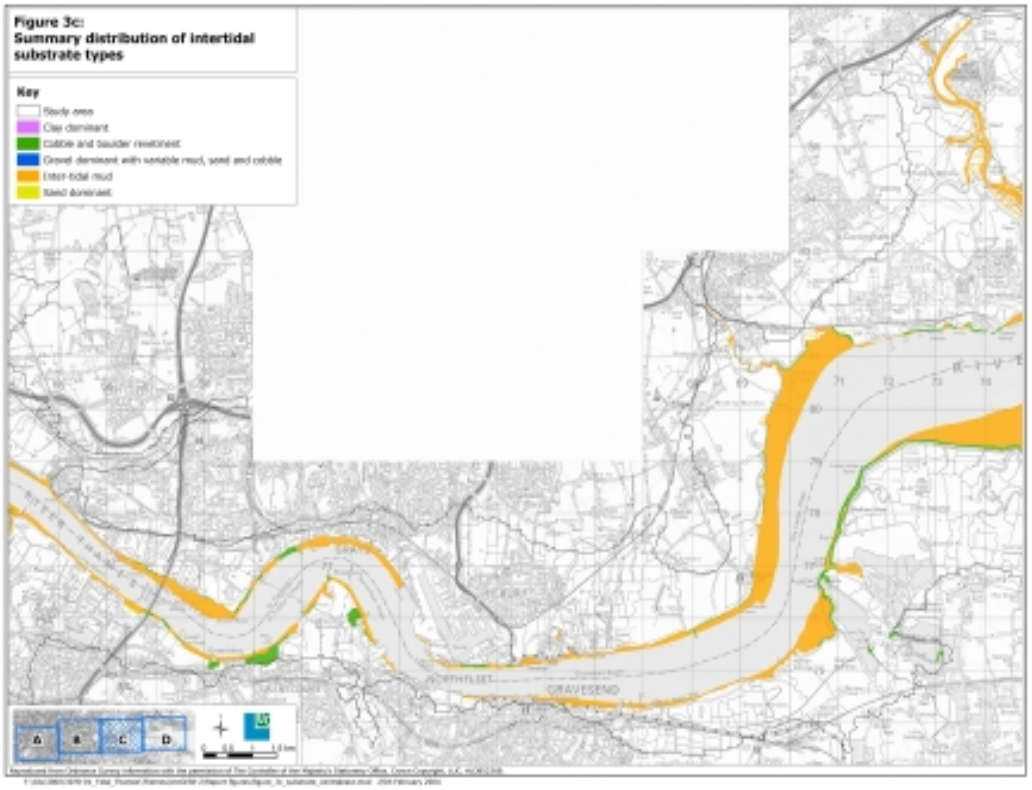


Figure 9.17b. Distribution of Thames estuary inter-tidal sediments (substrate)[Thames Partnerships].

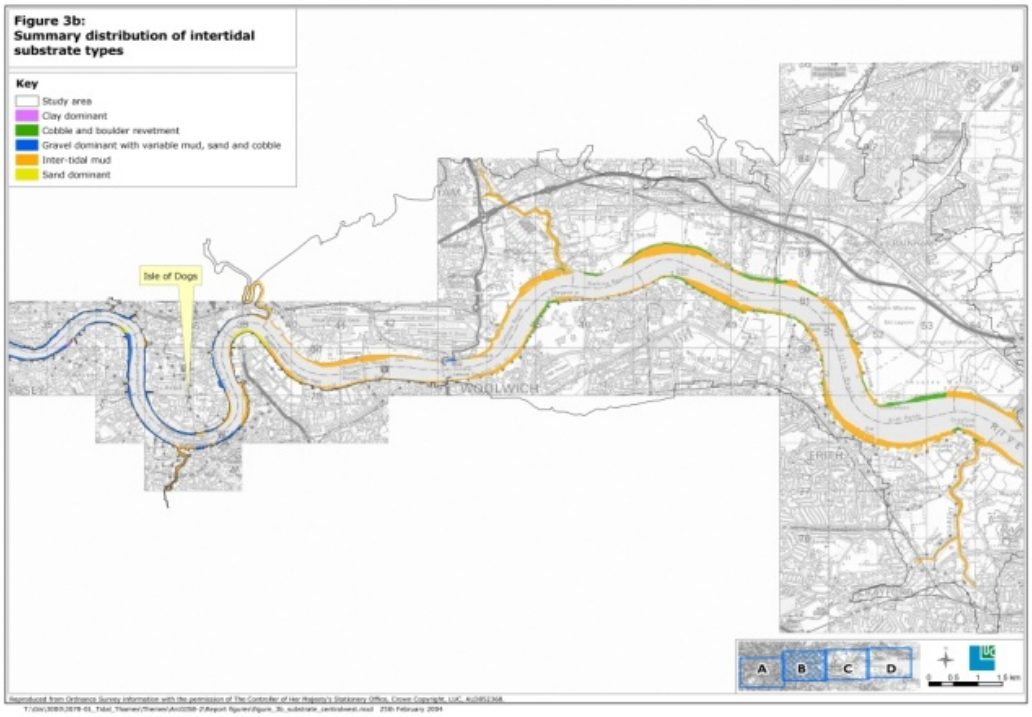
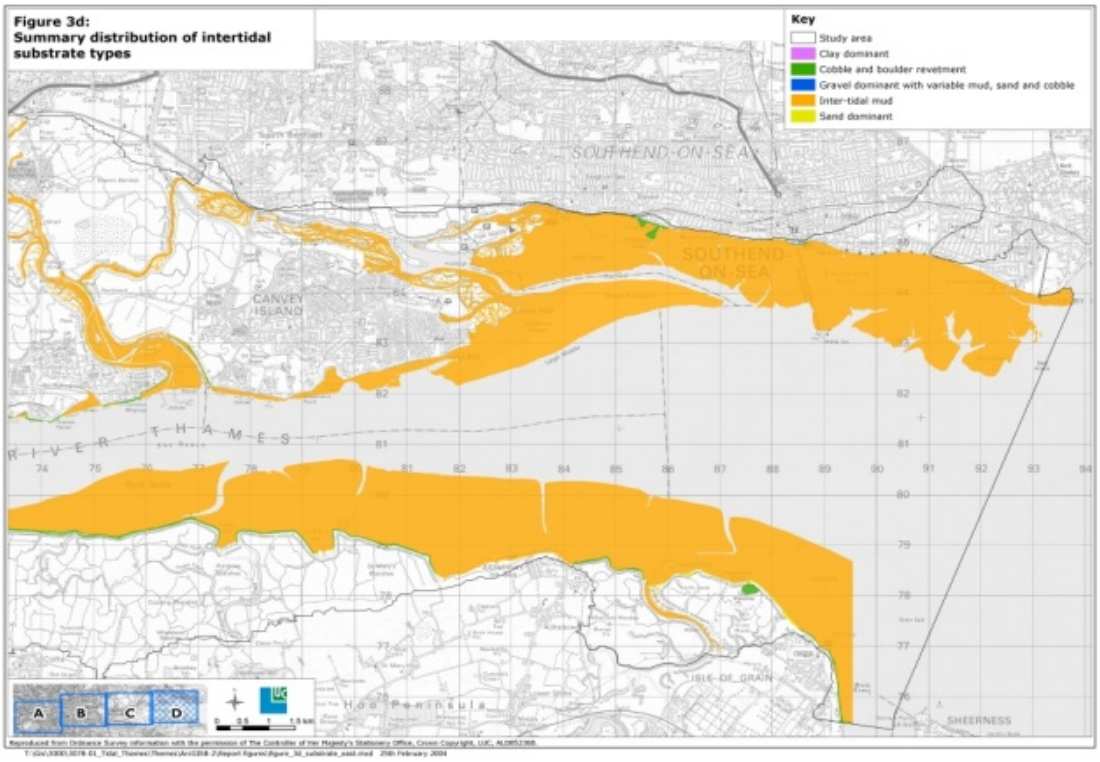


Figure 9.17c. Distribution of Thames estuary inter-tidal sediments (substrate)[Thames Partnerships].



Mudflats are conspicuous in the seascape of the lower reaches of the Thames and in sheltered parts of the adjacent Essex and Kent coasts, but are largely absent or restricted in extent as one moves upstream along the Thames towards London (see Figure 17). The mudflats are inhabited by dense populations of photosynthetic micro-organisms that are highly significant contributors to the biological productivity of the ecosystem. These organisms form the basis of food webs that support populations of invertebrates - fed upon in their turn by a range of fish during high tides, and by birds at low tides.

The saltmarsh plant community is most widely distributed in the eastern sectors of the area - a trend emphasised by rising sea levels and the development of hard sea defences, and development of land immediately landwards of them. This has resulted in the steady reduction in the area of mudflat and saltmarsh, which is limited to the region between sea defences and deeper water (i.e. coastal squeeze). Table 9.10 indicates the scale of loss within the region to 1997.

Table 9.10. Losses of saltmarsh in the Greater Thames Estuary (English Nature, 1997).

	Original area (ha)	Total area lost (ha)	Loss (ha) to reclamation	Loss to erosion	% of original area eroded
Hamford Water	876.1	170.6	1.2	169.4	19.3
Colne	791.5	97.7	5.2	92.5	11.7
Blackwater	880.2	200.2446.7	-	200.2	22.7
Dengie	473.8	146.1	-	46.7	9.9
Crouch	467.1	105.6	22.1	124.0	26.5
Thames (Essex)	365.9	17.5	22.3	83.3	22.8
Thames (Kent)	77.8	198.3	3.2118.2	14.3	18.4
Medway	843.8	61.6	3.4	180.1	21.3
Swale	377.0			58.2	15.4
Total	5153.2	1044.3	75.6	968.7	18.8

In the eastern areas of the Thames Gateway are extensive areas of low-lying flat land that were saltmarsh before sea defence construction, but that became grazing land characterised by freshwater and terrestrial plant communities. These became important habitats for a range of plant, invertebrate and bird species (English Nature, 1997) although changing agricultural practices and drainage schemes have substantially reduced the grazing marshes.

3.2.2.3 Marine ecosystems

The mudflats have a high biological productivity, with very high population densities of a relatively small number of invertebrate species that feed the birds and some fish species.

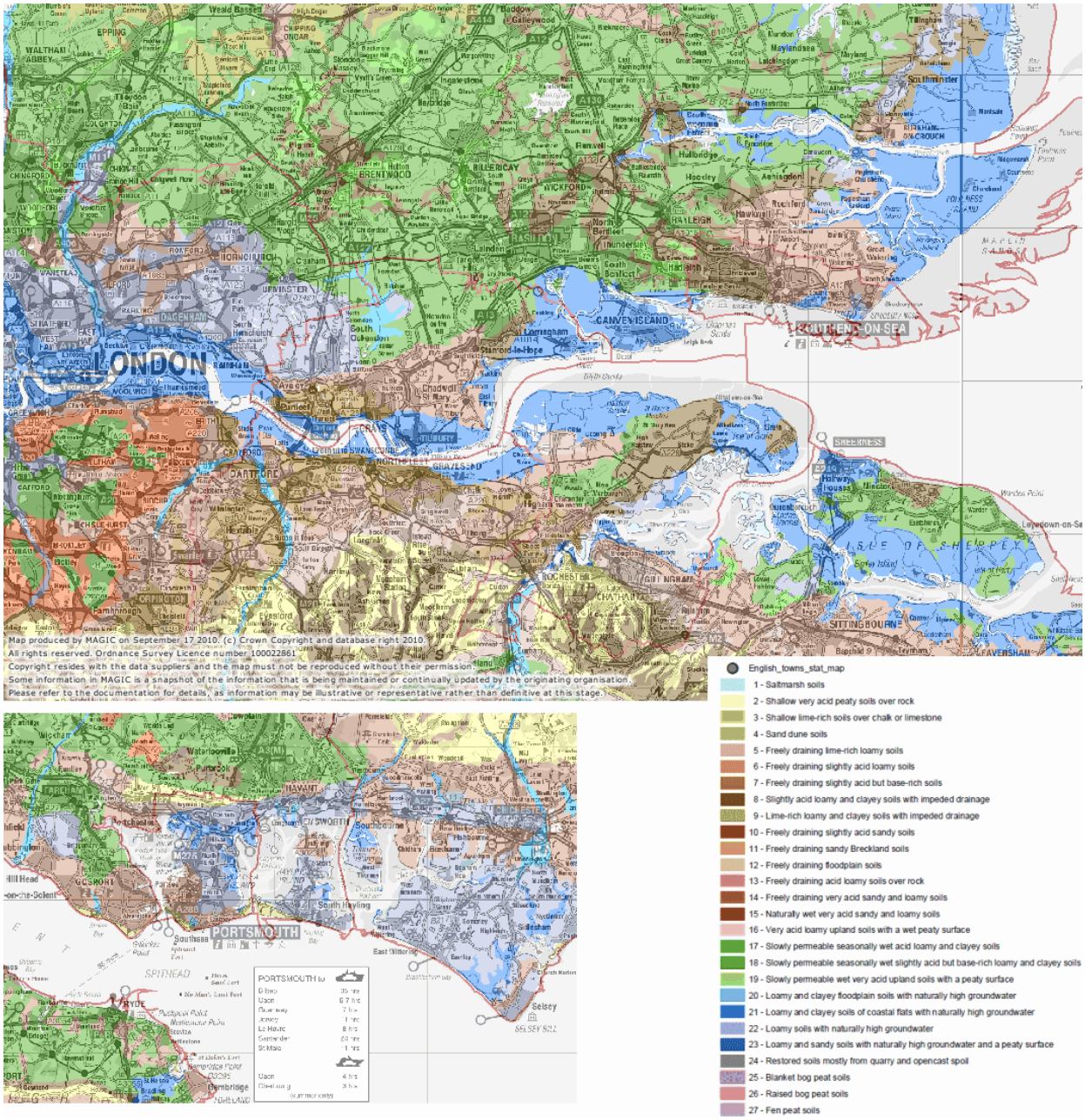
Diverse invertebrate communities exist in the eastern parts of the area, where water salinity is more fully marine. *Cerastoderma edule* (the cockle) occurs extensively - especially along the north coast in the vicinity of Southend, where it is exploited commercially. Many typical fish species are to be found in this ecosystem. Improving water quality has seen Salmon (*Salmosalar*) re-introduced to the Thames, and Spratt (*Clupea sprattus*) occur seasonally in the eastern sectors of the region.

Now restricted and protected, Eelgrass (*Zostera* sp.) is a group of four grass species, specifically and uniquely adapted to the low intertidal and sub-tidal zones, occurring in sheltered waters in sand/mud substrates.

3.2.2.4 Soil and land uses

Along the Thames Gateway, soils are derived from intertidal alluvial mud, which overlay the London Clay, and have been extensively drained for agricultural purposes. In the flood plain, loamy and clayey soils of coastal flats with naturally high groundwater dominate, while freely draining lime-rich loamy soils are common in the easternmost areas and loamy soils with naturally high groundwater (Figure 18).

Figure 9.18. Distribution of soil types in Southern England.[*]



The land use profile of the Thames Gateway study area is less dense than the urbanised pattern seen in London. Corine Land Cover (2000) at Level 1 symbology (Figure 19) shows the extent of urbanisation.

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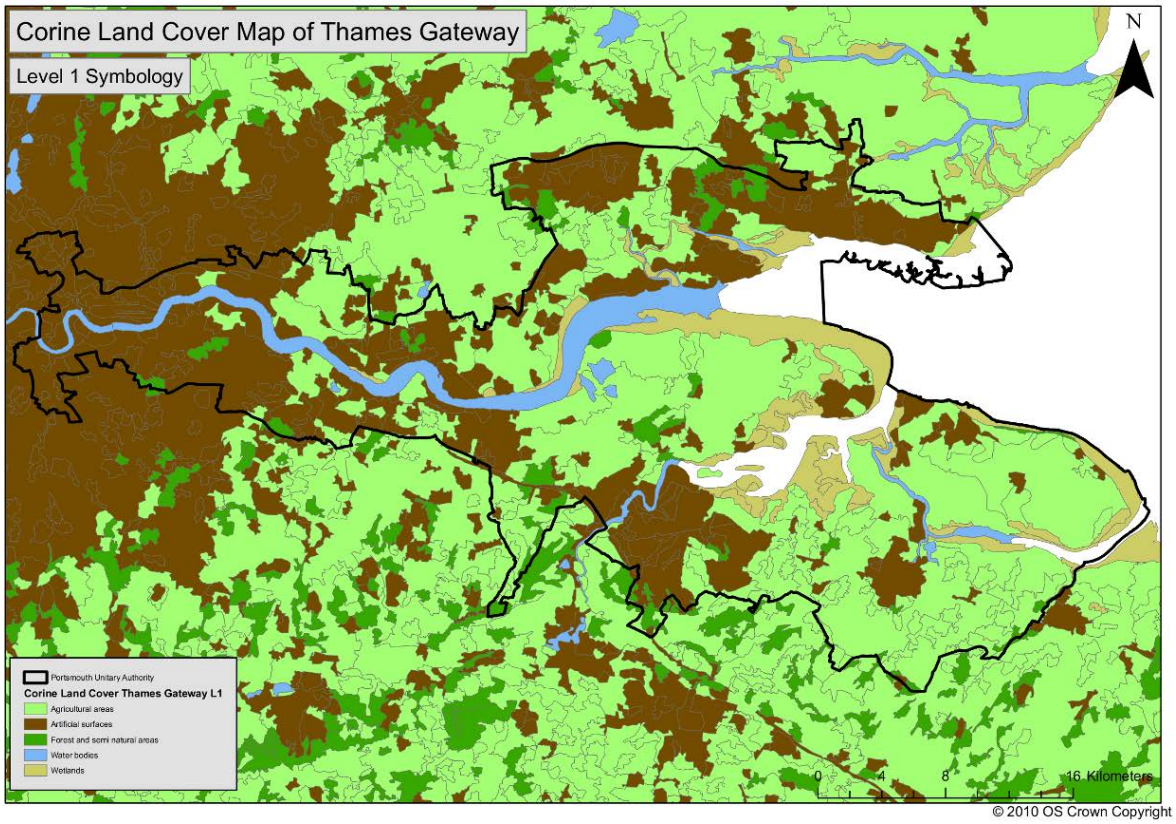
[*] From Magic Soilscape, © Crown Copyright and database right 2009. All rights reserved. Ordnance Survey Licence number 100022861). Source: www.magic.gov.uk/datadoc/metadata.asp?datasetname=Soilscape%20(England).

Figure 9.19. Corine Land Cover Map of Thames Gateway – Level 1 Symbology.[*]



Corine Level 2 symbology (Figure 21) shows a distinction between urban fabric and industrial or commercial land - much of which is now derelict or available for redevelopment. Of the 3,150 hectares of brownfield land in the Thames Gateway (approximately 20% of all brownfield land in the south east of England), 2,058 hectares are considered suiTable 9.for housing development (Table 9.11, Figure 20).

Between 2001 and 2005 an estimated 5,151 dwellings per year (net additions) were completed in the Thames Gateway with over 80% built on brownfield sites or reused buildings.

[*] Prepared by cities institute using CORINE landcover data, European Environment Agency 2010.

Table 9.11. Previously Developed Land(a).

Previously Developed Land				
	Vacant and Derelict land	Land in Use	Available Brownfield Land	%Total Brownfield Land
Land	Hectares			
Thames Gateway	1141	2009	3150	
Essex sub region	135	373	508	6.9
Kent sub region	791	1112	1903	18.4
London sub region	215	523	739	22.9
Land for Housing				
Thames Gateway	912	1146	2058	
Essex sub region	80	254	334	6.8
Kent sub region	696	520	1216	22.6
London sub region	136	371	507	26

Source: DCLG (Local Authority reports) 2004; The State of the Gateway: A baseline for evaluating the Thames Gateway Programme

Figure 9.20. Previously Developed Land (b).

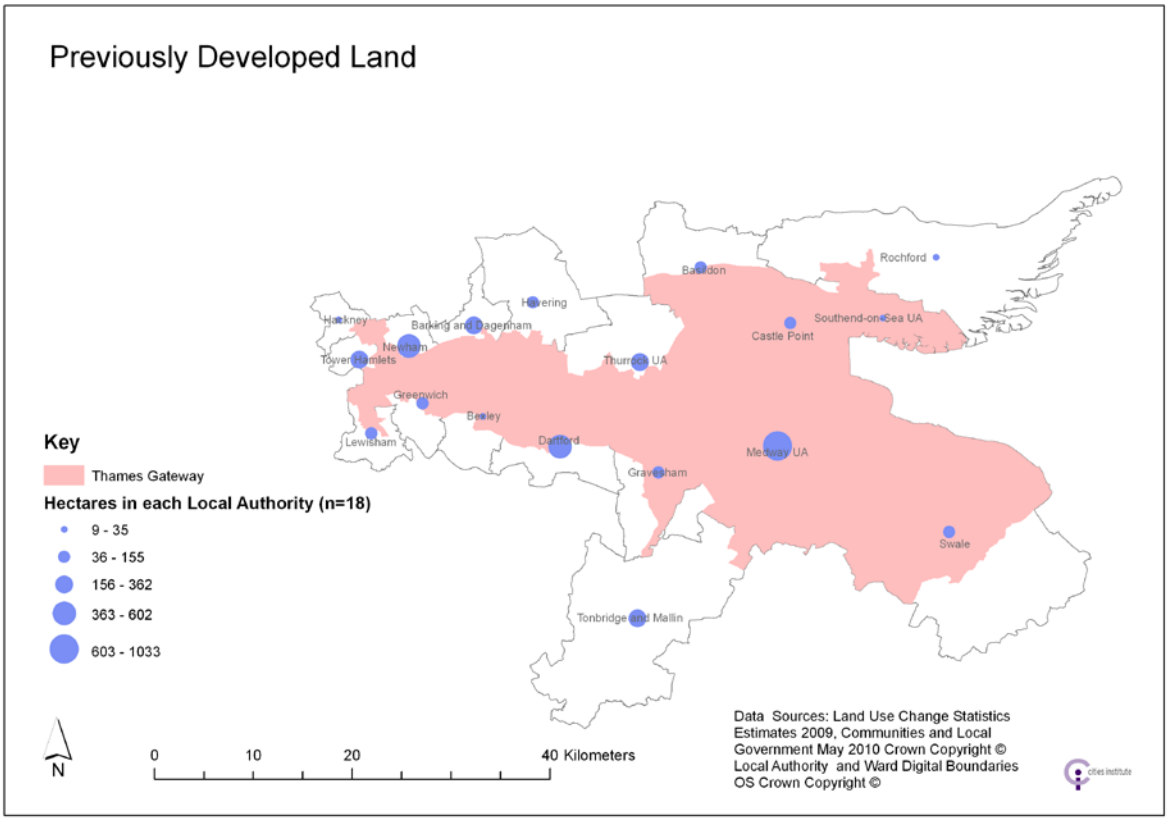
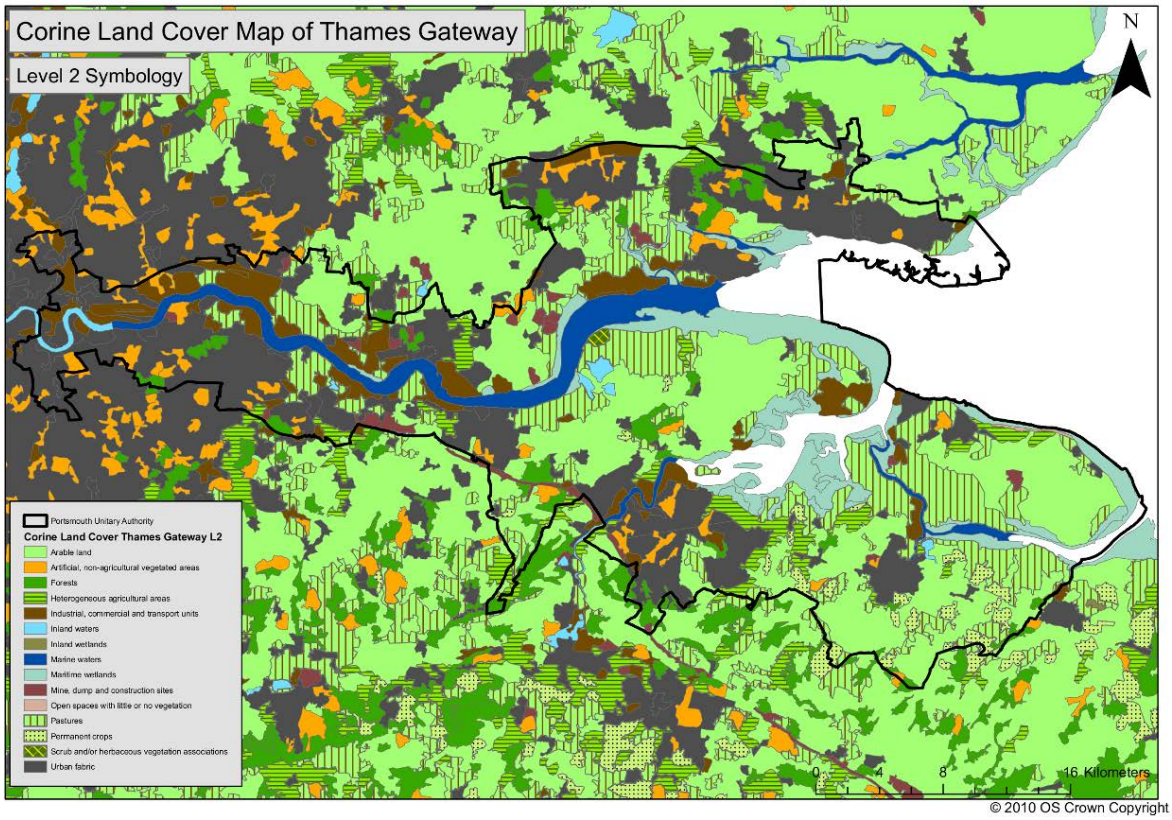


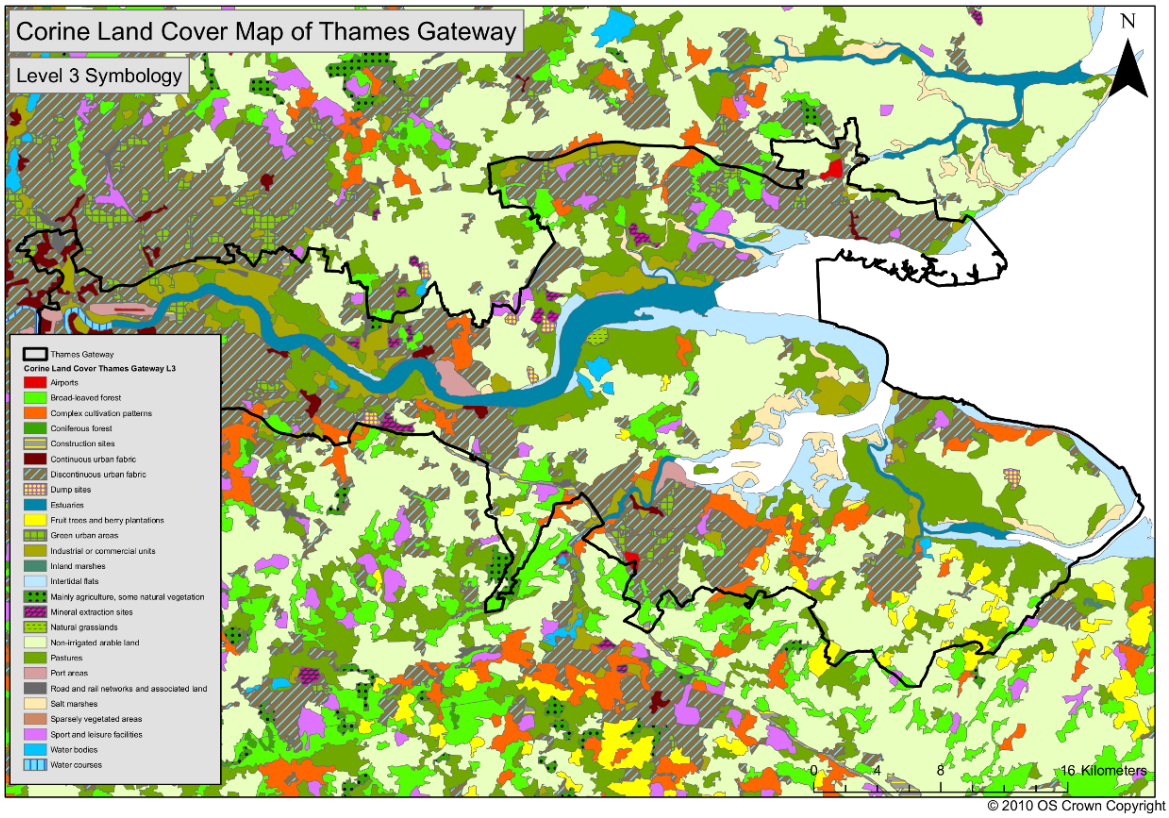
Figure 9.21. Corine Land Cover Map of Thames Gateway – Level 2 Symbology.[*]



Much of the port capacity of London has been reduced or eliminated in recent decades, so that this is now minimal in the upper reaches of the Gateway. However, new port capacity has been developed in the eastern part of the area, and large scale commercial port areas can be identified at Tilbury on the north of the Thames and on the Medway in Kent at Corine Level 3 symbology (Figure 22).

[*] Prepared by cities institute using CORINE landcover data, European Environment Agency 2010.

Figure 9.22. Corine Land Cover Map of Thames Gateway – Level 3 Symbology.[*]



The 2001 General Landuse Database (Table 9.12) indicates that 60% of land in the Thames Gateway is designated Green space. Large parts are protected against development. Approximately 14% of land is used for domestic buildings and gardens.

Table 9.12. Land Use.

Landuse			
	Thames Gateway	London	England
Domestic Buildings	3.3	5.6	1.1
Gardens	10.4	14.6	4.1
Non-Domestic Buildings	2.3	6.1	0.6
Road	5.5	11	2.3
Rail	0.5	1.5	0.1
Path	0.3	0.5	0.1
Greenspace	60.6	35.2	88
Water	12.5	13.6	2.2
Other	4.8	11.8	1.3
Source: DCLG GLUD 2001			

[*] Prepared by cities institute using CORINE landcover data, European Environment Agency 2010.

3.2.2.5 Freshwater and access to water

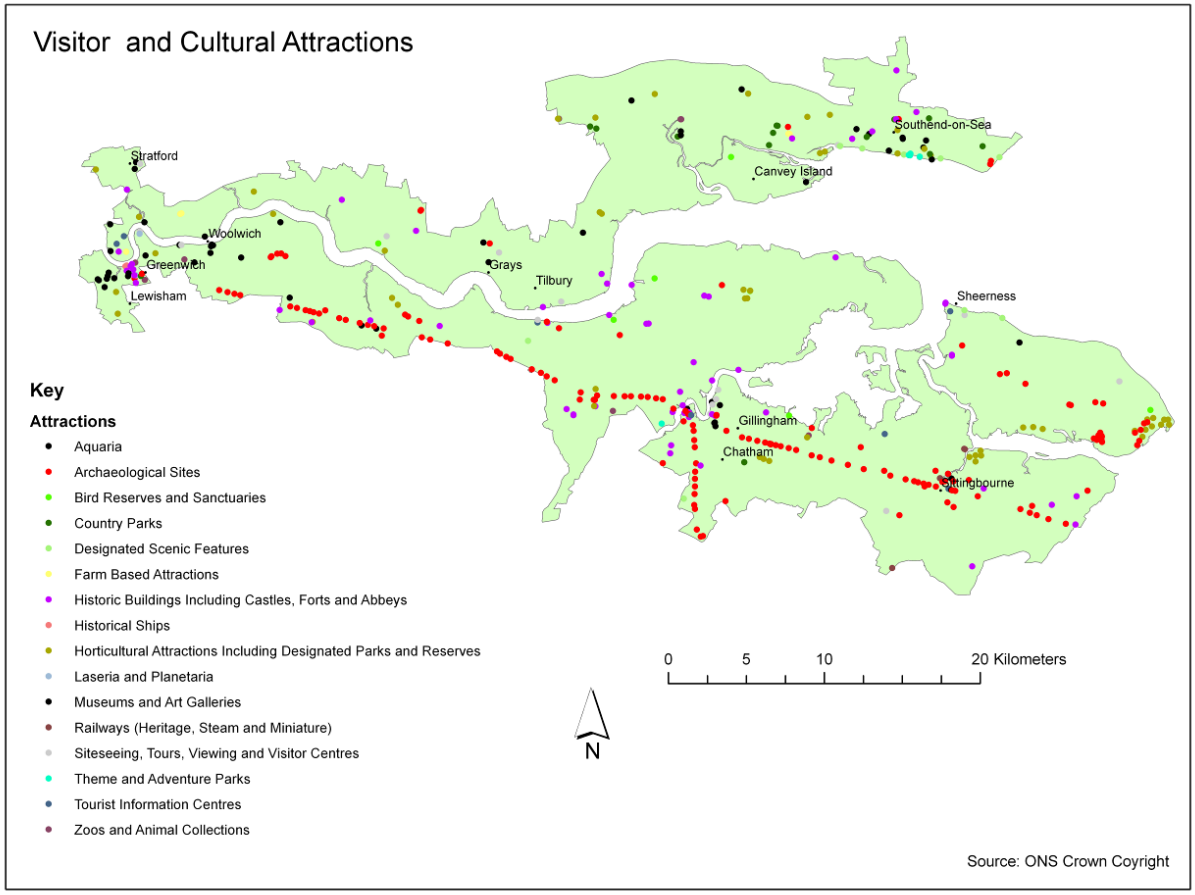
In 2007 in the south east 4,162 billion litres of water were abstracted from the environment, of which 36% was for public water supply, 44% for the electricity industry, 8% for industry, 12% for aquaculture and 1% for agriculture (Environmental Agency, 2010).

The south east and London have been classified as under serious water stress (Environmental Agency, 2008), with most of the region showing a supply-demand deficit - worst in the area of Greater London. In 2008/09, domestic water consumption per capita was 156 litres per day in the south east (161 litres in London), with a reduction to 130 litres per day by 2030 needed to avoid shortage of supply in the future (Environmental Agency, 2010). Although water companies are planning to meter (charge for actual usage) 78% of households by 2020, population growth and climate change are expected to add to the increasing pressure on water resources resulting in at least a 35% reduction in river flow by 2050.

3.2.2.6 Important cultural features

Thames Gateway hosts varied cultural and visitor attractions including 158 archaeological sites, over 100 museums, historic buildings and heritage attractions such as railways and trails. There is an established network of tourist offices and visitor facilities (see Figure 23), and local museums and libraries support local cultural development. The area is overshadowed by London as a tourist destination, and there is little evidence that there is any substantial overspill of visitors from London into the Thames Gateway. Most attractions are relatively small- or medium-scale. Greenwich and the O2 dome in the eastern region are two major destinations. Historically important destinations for day visitors and overnight tourists, such as Southend, have seen sharp declines in recent decades.

Figure 9.23. Visitor and Cultural Attractions.



3.2.2.7 Important social features

There are approximately 1.45 million people living in 600,000 households in the Thames Gateway (CLC, 2006). However, within these, population is concentrated in a number of key settlements on the Thames and in the Medway estuary (see Figure 24).

Figure 9.24. Population Density.

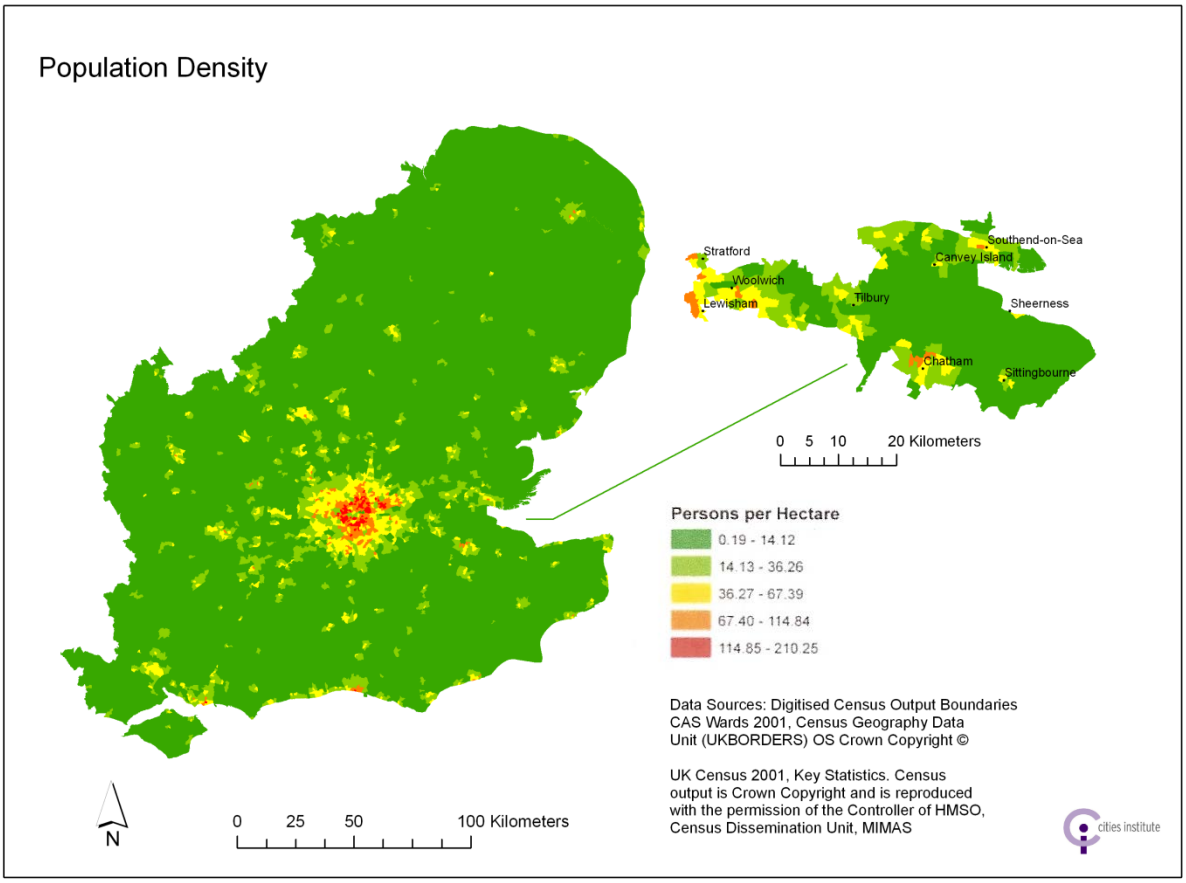
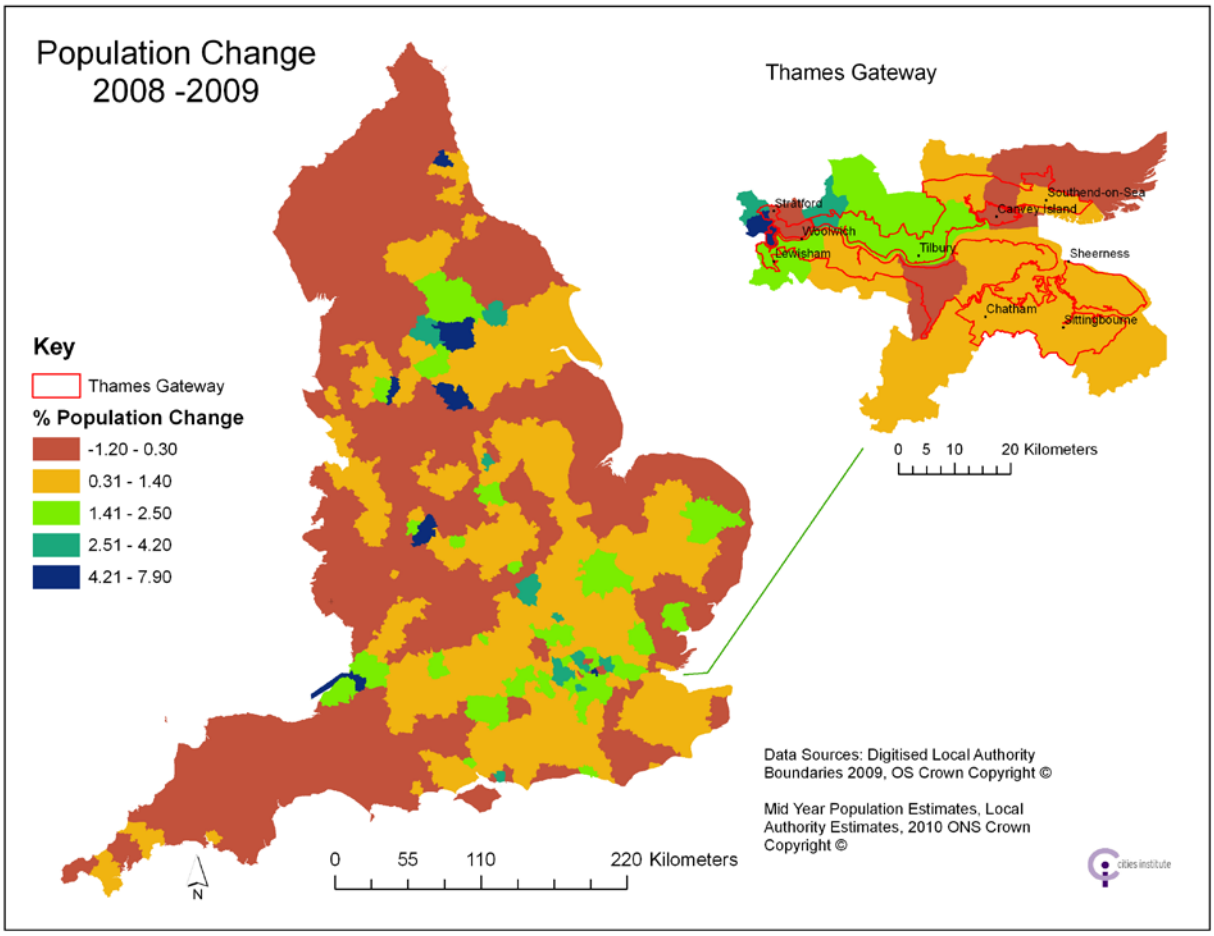
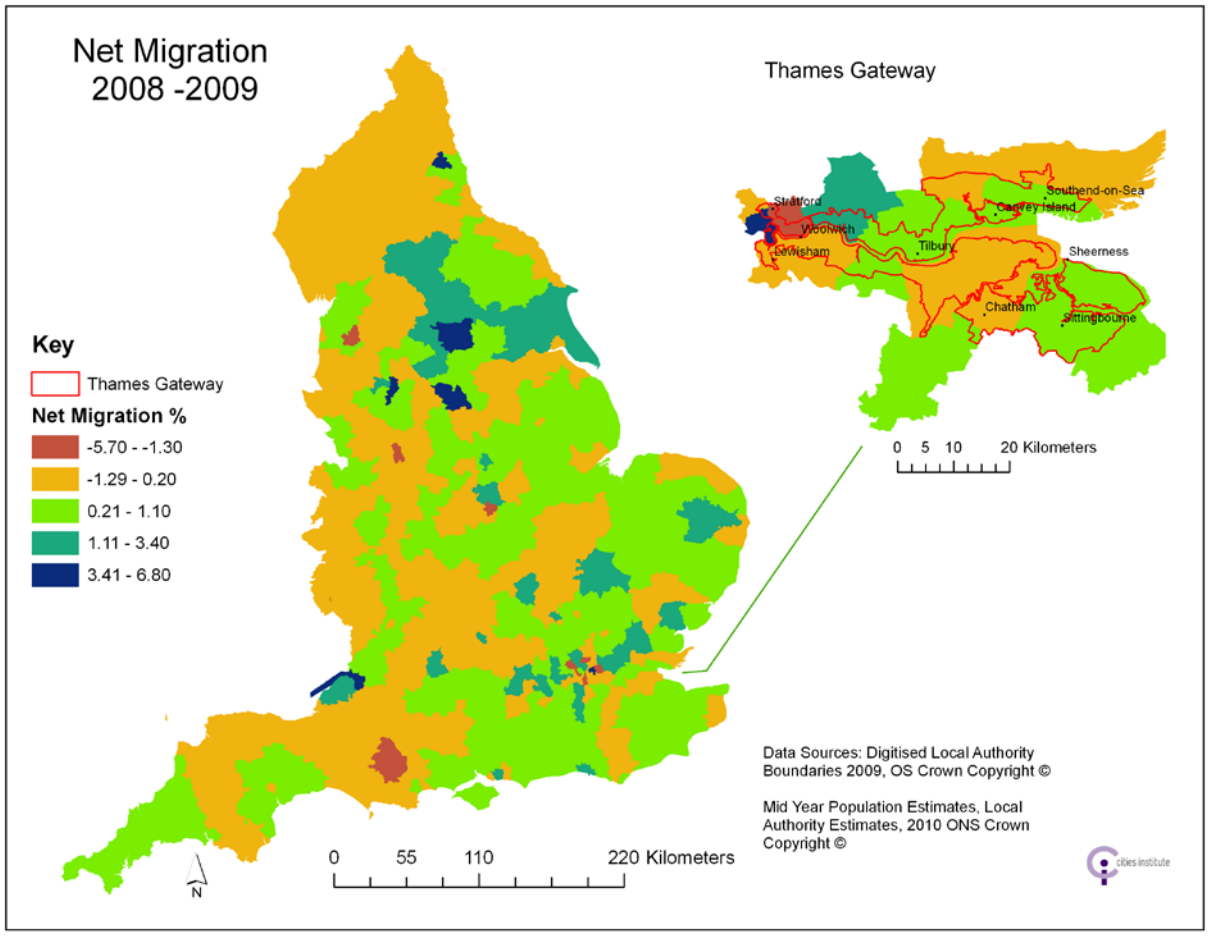


Figure 9.25. Population Change.



Whilst the rate of population change across the Thames Gateway was steady from 1981 to 2001 net migration increased significantly - particularly in the 1990s when levels reached +10,000 per annum in the year 1998-9. Between 2008-2009 that the highest levels of net migration were found in the London sub region (Figure 26).

Figure 9.26. Net Migration.



Gender composition in the Thames Gateway mirrors that of England as a whole (Table 9.13). Age distribution shows that the Thames Gateway tends to be younger than nationally (Table 9.14).

Table 9.13. Population by Gender.

Population by Gender					
	All	Male	%	Female	%
Thames Gateway	1450128	705508	49	744620	51
England	49138831	23922141	49	25216687	51
					Source: Population Census 2001

Table 9.14. Population by Age.

Population by Age									
	All	0-15years	%	16-29years	%	20-64years	%	65years and over	%
Thames Gateway	1450128	318441	22	273499	19	661799	45.6	196389	13.54
England	49138831	9901575	20	8630210	18	22799035	46.4	7808011	15.89
									Source: Population Census 2001

Ethnically, Thames Gateway is more diverse than England as a whole with a higher percentage of people of Black and Chinese origin (Table 9.15). There was a 5% increase in Black and Minority Ethnic residents between 1981 and 2001, driven largely by the population dynamics of London (DCLG, 2006).

Table 9.15. Population by Ethnicity

Population by Ethnicity											
	All	White	%	Mixed	%	Asian	%	Black	%	Chinese	%
Thames Gateway	1450128	1264547	87	23299.00	1.61	63714	4.39	78977.00	5.45	19574	1.35
England	49138831	44679365	91	643441.00	1.31	2248107	4.58	1132528.00	2.30	435434	0.89
										Source: Population Census 2001	

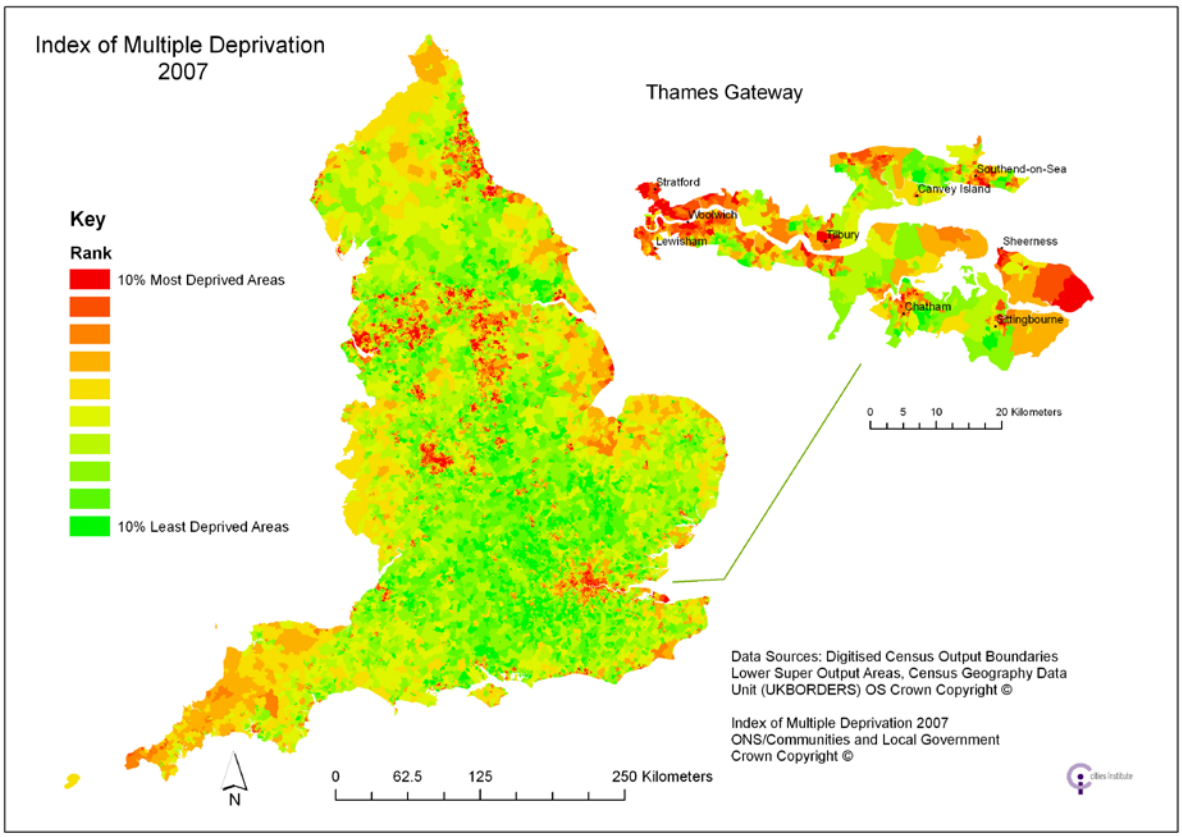
Thames Gateway has a higher proportion of residents with no qualifications (31.6%) than London (22%) or England (29%). However the percentage of secondary school pupils in Thames Gateway leaving school with no qualifications (3.6%) is lower than both London (4.3%) and England (4.6%). There are lower levels of owner occupation and a higher proportion of social renting in Thames Gateway than in England as a whole (Table 9.16).

Table 9.16. Housing Tenure.

Housing Tenure			
	% Owner Occupation	%Social Renters	%Private Renters
Thames Gateway	67.2	22.7	10
England	71.2	17.9	10.9
London	58.4	25.5	16.2
			Source: Census 2001

Significant pockets of the most severe (and long standing) deprivation in the whole of England can be found in the Thames Gateway (Figure 13). These are found mostly in the London sub region, but also in North Kent and North Essex - emphasising the high degree of social polarisation in this region.

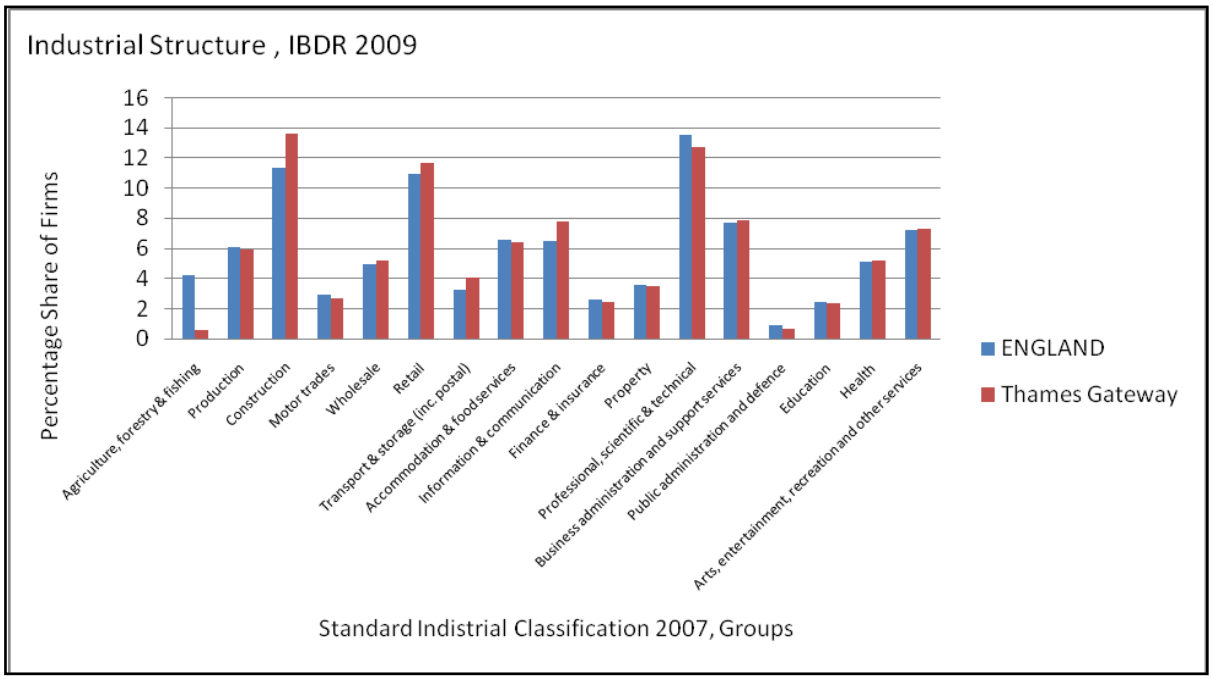
Figure 9.27. Index of Multiple Deprivation 2007.



3.2.2.8 Important economic features

The industrial structure (Figure 28) is dominated by firms in three sectors –construction; retail; and professional, scientific and technical industries which, together, make up almost 50% of the VAT registered firms in the area (despite employing only 5% of Thames Gateway employees).

Figure 9.28. Firms by Industry Group, IDBR 2009.[*]



18% of residents working in Thames Gateway are in lower managerial and professional occupations, with relatively high percentages of semi-routine workers (Table 9.17). Higher professional occupations are better represented in the London sub region (Hamnett, 2003).

Table 9.17. Working Age Population by Occupation.

National Statistics Socio-Economic Classification													
	All people aged 16 - 74	Large employers and higher managerial occupations	%	Higher professional occupations	%	Lower managerial and professional occupations	%	Intermediate occupations	%	Small employers and own account workers	%	Lower supervisory and technical occupations	%
Thames Gateway	1040031	29055	2.79	42352	4.07	190301	18.30	117252	11.27	70250	6.75	79768	7.67
England	35532085	1243918	3.50	1816038	5.11	6656918	18.73	3366757	9.48	2479470	6.98	2526120	7.11

Semi-routine occupations	%	Routine occupations	%	Never worked	%	Long-term unemployed*	%	Full-time students	%	Not classifiable for other reasons	%
129653	12.47	94965	9.13	34238	3.29	13286	1.28	64491	6.20	174420	16.77
4139698	11.65	3203761	9.02	964978	2.72	359731	1.01	2498729	7.03	6275967	17.66

Source: Population Census 2001

[*] Data Source: Office of National Statistics (2010).

Over 3% of the working age population have never worked and 1.3% are deemed long-term unemployed. Currently, 4.02% of the working age population are claiming Job Seekers Allowance - higher than the percentage for England (Table 9.18).

Table 9.18. Job Seekers Allowance Claimants.[*]

Claimants: Job Seekers Allowance: February 2010 (Revised)				
	Number of JSA Claimants	Total Working Age Population	% Working Age Population Claiming JSA	% Total Population within the TG study area
Tonbridge and Malling	1,580	73,723	2.14	3.54
Rochford	1,210	51,693	2.34	9.22
Castle Point	1,780	54,784	3.25	100.0
Bexley	4,800	144,469	3.32	63.06
Dartford	2,120	61,522	3.45	70.78
Havering	5,270	148,954	3.54	11.04
Swale	3,220	83,870	3.84	79.62
England	**1,304,990**	**33,670,780**	**3.88**	
Basildon	4,560	112,109	4.07	57.67
London	**219,070**	**5,362,019**	**4.09**	
Gravesham	2,610	63,221	4.13	87.70
Thurrock	4,360	103,704	4.20	84.37
Medway	7,340	167,970	4.37	97.86
Thames Gateway Local Authorities	**95,820**	**2,106,235**	**4.55**	**48.53**
Southend-on-Sea	4,840	103,049	4.70	94.39
Greenwich	7,230	152,605	4.74	62.14
Lewisham	8,940	187,224	4.78	29.65
Barking & Dagenham	6,480	112,176	5.78	11.73
Tower Hamlets	10,080	172,740	5.84	26.26
Newham	9,830	161,448	6.09	26.09
Hackney	9,550	150,974	6.33	4,88

[*] Data source: Department of Work and Pensions.

4. Overview of Users in the Case Studies

4.1 Case study 1 – Portsmouth

4.1.1 Inhabitants/households

Portsmouth had an estimated population of 203,503 people in 2009 (ONS, 2009) which shows an increase from 188,437 in 2001. The average household size was 2.28 persons, although projections suggest that this will fall to 2.1 persons by 2026 indicating a need for additional housing development (Portsmouth City Council, 2009). This reflects recent migration trends and changes in patterns of co-residence.

There is a lack of building capacity in the city's urban areas within Flood Zones 1 and 2 (flood risk less than 0.5% for tidal flooding and 0.1% for river flooding) to accommodate housing growth targets for Portsmouth of 14,700 new houses by 2026. The relatively young population, including substantial numbers of students, is a source of significant demand both for particular types of housing and leisure activities.

4.1.2 Tourism establishments

Major tourism establishments include those such as Gunwharf Quays and the historic Royal Naval Dockyard, museums, theatres, cathedrals and Portsmouth Football Club. In 2008 Portsmouth hosted 628,000 tourist trips involving an overnight stay and an estimated 7.4 million tourism day trips (Tourism South East, 2008b). Their impact is magnified by the concentration of tourism attractions, and the constrained site of the city. In 2008, tourism overall was worth £471.2 million to Portsmouth, supporting 7,464 FTE (full time equivalent jobs) and 10,142 actual jobs. Visitors to Portsmouth tend to be from older age groups, with 42% aged 55 and over (Tourism South East Research Unit, 2008a).

4.1.3 Restaurants/café/snack establishments

There are approximately 510 facilities within Portsmouth's hospitality industry including restaurants, cafes and accommodation facilities (Table 9.19). 31% of food provision is within the 'fast food' or 'take away' category, which reflects provision in UK cities.

Table 9.19. Hospitality Industry in Portsmouth

Hospitality Industry in Portsmouth	
Restaurants	109
Cafes, Snack Bars and tea Rooms	43
Fast Food Delivery Services	3
Fast Food Take Aways	96
Fish and Chip Shops	28
Internet Cafes	2
Pubs, Bars and Inns	125
Banqueting Facilities	1
Camping and Caravan Sites	5
Guest Houses	42
Hostels	3
Hotels, Motels and Country House Hotels	38
Self Catering Facilities	12
Timeshare Developments	0
Youth Hostels	3
Total	**510**
Source: OS Crown Copyright	

4.1.4 Industrial, trading and commercial establishments

As with all UK cities, the economy is largely based on service activities with only modest numbers of jobs in manufacturing. In 2007, Portsmouth was home to 6,779 businesses employing 97,500 people. Of these, 23% were in distribution, hotels and restaurants; 19% were in banking, finance and insurance; and 11 per cent were in engineering and manufacturing (Portsmouth City Council, 2010). Although nearly 10% of Portsmouth firms are in the professional, science and technical industries, this lags behind the national level of nearly 14%. However 33.74% of employment is in Portsmouth is in the public services, and this has grown by 21.18% over the same period. The city has become a key service centre, although primarily public sector-orientated (Portsmouth City Council, 2004).

Entrepreneurial activity for Portsmouth for 2008, as measured by new business registrations per 1,000 head of adult populations, was 43.0 compared to 60.0 for South East region as a whole (Portsmouth City Council, 2010). This confirms the impression of a city whose economy lags some of the dynamism of the surrounding South East Region – the most dynamic in the UK.

4.1.5 Fishing fleet and farming

Portsmouth is considered a major port (UK Sea Fisheries Statistics, 2008) with the value of all species landed for 2008 valued at £2.4m. However, no vessels are recorded by administration port for Portsmouth, with only 37 people recorded as being employed in the

fishing industry in the 2001 census (Office of National Statistics, 2001a). Portsmouth harbour is reported as supporting around 30 boats, using a variety of fishing methods outside the harbour (Gray, 1995).

According to statistics from the 2001 Census 337 people – 0.39 per cent of the workforce – worked in agriculture, hunting and forestry in Portsmouth (Office of National Statistics, 2001b). It is at best a marginal activity.

4.1.6 Ports

Portsmouth Harbour is a naval port and home and maintenance base for the Royal Navy. The number of Royal Navy ships now based in Portsmouth has decreased, but the facilities are once again being used to build and repair boats - not only for the Royal Navy but also foreign navies and commercial ventures.

In 2009 the various services located at the Continental Ferry Port carried over 10 million passengers, 1.5 million vehicle units and a quarter of a million freight units (Portsmouth Commercial Port, 2009)) (Table 9.20). A new passenger terminal is scheduled for completion in 2011.

Table 9.20. Roll-on-roll-off (RORO) and other ferry services.[*]

Isle of Wight Car Ferry	
Vehicle Units	971,260
Passengers	2,495,971
Isle of Wight Passenger Ferry	
Passengers	1,357,782
Isle of Wight Hovercraft Service	
Passengers	849,150
Gosport Ferry Passenger Service	
Passengers	3,534,248
Continental and Channel Island Services	
Vehicle Units	687,093
Freight Units	264,446
Passengers	2,225,377

[*] Source: From Portsmouth Commercial Port – Port Statistics 2009.

Provisional statistics suggest that, in total, 0.44 million tonnes of freight was handled at the port in the second quarter of 2010 – significantly down on the figure for the equivalent quarter in 2009 (DT, 2010).

Cruise ships made a total of 23 calls during 2009, accounting for 12,000 cruise passengers, and 25,500 vessels entered or left Port Solent Marina. The Marina covers 84 acres, which includes shops, restaurants, pubs leisure facilities, other services and homes.

4.1.7 Energy production companies

The wider South Hampshire region has a Cleantech cluster of 600 firms, generating £1.2 billion for the local economy, some of which are located in the Portsmouth city region (http://www.invest-in-portsmouth.co.uk/index.php?id=41). Cleantech is new technology and related business models that offer competitive returns for investors and customers while providing solutions to global challenges. The Portsmouth city region has been ascribed great potential to further develop its energy and environmental technology sectors, particularly in terms of marine energy and other renewables, marine pollution control, geothermal, water & waste water treatment, air pollution control, and also in terms of other new clean technologies in house building etc.

4.1.8 Environmental groups

Portsmouth is either home to or covered by branches of national and international groups either devoted to environmental causes, or to causes with environmental associations. These include RSPB (the Royal Society for the Protection of Birds), the World Development Movement, Friends of the Earth, Oxfam, and CPRE (Campaign to Protect Rural England).

Local groups include: Portsmouth Climate Action Network (PCAN), a voluntary group concerned about the man-made climate change; Portsmouth Environmental Forum, an independent group hosted by Portsmouth City Council which seeks to make sure that decision-makers take green issues into account, Isle of Wight Wildlife Trust, the Solent Protection Society, which seeks to ensure the ecological and environmental well-being and wise management of the Solent area and the Portsmouth Sustainability Action Group, which is chaired by Portsmouth City Council and pulls together landowners, employers and voluntary

groups in leading a coordinated approach to climate change mitigation and adaptation in Portsmouth (http://www.portsmouth.gov.uk/living/13069.html).

Community groups: Portsmouth is home to a variety of different minority ethnic communities, with associated community organisations. Some women's groups are also ethnically defined. Other community groups and multi-cultural, and a range of multi-cultural welfare projects is run by the local authority in conjunction with local groups. Community associations also represent the many faith groups active in Portsmouth. Besides such groups, Portsmouth is also home to nearly 30 community centres, fulfilling a range of functions in their localities.

4.1.9 Second home owners

According to the 2001 census 0.4 per cent of homes in Portsmouth (340) were either second homes or holiday accommodation, against an average of 0.7 per cent for England and Wales (Office of National Statistics, 2001c). A subsequent estimate (National Statistics consultation document - Second Residences [2005]) suggested that by 2005 approximately 1.0 per cent of homes were second residences.

4.2 Case study 2 – Thames Gateway

4.2.1 Inhabitants/households

The Thames Gateway population of approximately 1.45 million people (DCLG, 2006) has been forecast to grow by approximately 8% by 2018, against UK projections of 7.3% (Jones Lang Lasalle, 2009). Government plans for development of the Thames Gateway aspire to the development of a total of 160,000 new homes by 2016 (DCLG, 2007). This area remains one of the prime foci for development - not only in the south east, but in the whole of the UK.

Table 9.21. Household Spaces – Thames Gateway Local Authorities.[*]

Region	Local authority	Usual resident pop'n 2001	Household spaces and accommodation type All	Household spaces and accommodation type With residents
London	Barking & Dagenham	163,944	68,378	67,273
	Bexley	218,317	91,729	89,451
	Havering	224,248	93,980	91,722
	Lewisham	248,922	109,448	107,412
	Greenwich	214,403	95,835	92,788
	Newham	243,891	93,782	91,821
	Tower Hamlets	196,106	80,781	78,530
	Hackney	202,824	88,446	86,042
Essex	Basildon	165,668	70,843	69,207
	Castle Point	86,608	35,810	35,279
	Rochford	78,489	32,773	31,952
	Thurrock	143,128	59,416	58,485
	Southend-on-Sea	160,257	74,310	70,978
Kent	Dartford	85,911	36,028	35,240
	Gravesham	95,717	39,137	38,266
	Swale	122,801	51,316	49,257
	Medway	249.488	102,892	99,566
	Tonbridge & Malling	107,561	43,907	42,743

4.2.2 Tourism establishments

The London and North Kent sub-regions in particular are home to major tourism establishments – both actual and potential. In London, Greenwich is a World Heritage Site, with famous landmarks including the National Maritime Museum, the Royal Observatory, and Sir Christopher Wren's Old Royal Naval College. Greenwich peninsula is home to the 02 - a 23,000 capacity arena for music and sporting events, that also accommodates leisure and retail facilities. Over nine million people visit Greenwich each year, with tourism worth £532 million to the local economy annually and contributing around 25% of all jobs locally (www.greenwich.gov.uk).

The Olympic Park at Stratford includes the main stadium for the 2012 London Olympic Games and Paraplegic Olympics. The Games have been ascribed the potential to generate an

[*] Source: Figures taken from 'Census 2001: Key Statistics for local authorities in England and Wales' KS01' - tables KS01 'Usual resident population' and KS16 'Household spaces and accommodation type'.

estimated £2.1 billion in additional tourism benefits (2006 prices) over the period 2007-17, although such estimates are contentious and problematic (DCMS, 2007).

The North Kent sub region has a number of major tourism establishments, mostly related to its location on the River Thames. In Medway (which has applied for World Heritage status) these include Rochester castle and cathedral, historic buildings in the town centres; dockyards and industrial sites at Chatham, and Dickens World near Chatham (Shared Intelligence, 2009). In North Kent, the Bluewater shopping centre attracts 27 million visits a year, emphasising the importance of retailing as a form of leisure in the UK (KCC, 2009). In south Essex, seaside towns such as Southend are considered to have a strong cultural and creative offer (EEDA, LDA & SEEDA, 2008) with further development of beach, resort, tourism and facilities a priority.

4.2.3 Restaurant/café/snack establishments

Within the Thames Gateway there are approximately 2,896 hospitality facilities (Table 9.22). Restaurants, cafes and pubs are located within the main settlements and where population density is highest, with additional clusters in traditional holiday and day-tourism destinations, such as Canvey Island (cafes and fast food) and Southend-on-Sea (with a wider mix of restaurants and fast food). The Medway towns show a significant development of restaurants, cafes and food based-enterprises with a high representation of traditional pubs and inns - also the case within the semi-rural areas of North Kent. In terms of accommodation, hotels predominate in the London sub-region of Thames Gateway.

Table 9.22. Hospitality industry in Thames Gateway.

Hospitality Industry in Thames Gateway	
Restaurants	689
Cafes, Snack Bars and tea Rooms	331
Fast Food Delivery Services	25
Fast Food Take Aways	701
Fish and Chip Shops	195
Internet Cafes	27
Pubs, Bars and Inns	582
Banqueting Facilities	11
Camping and Caravan Sites	60
Guest Houses	117
Hostels	10
Hotels, Motels and Country House Hotels	111
Self Catering Facilities	34
Timeshare Developments	1
Youth Hostels	2
Total	**2896**
Source: OS Crown Copyright	

4.2.4 Industrial and commercial/trading establishments

Although the Thames Estuary was once the key for the export and import of goods to London and the Greater South East and the hub of a thriving manufacturing sector, these sectors have long been in decline. Moreover, while there are some booming areas, notably Canary Wharf which is at the heart of the redevelopment of Docklands, many parts of the Gateway have been considered slow in making the transition to "a modern knowledge-based, primarily service sector driven economy." (EEDA, LDA & SEEDA, 2008).

In response, government has worked with Regional Development Agencies to identify sectors of the economy with potential for growth:

- financial and business services
- creative industries and the cultural sector
- environmental technologies and services
- high-value-added, technology-led manufacturing
- sustainable construction (DCLG, 2007).

Four locations in the Thames Gateway have been identified for growth – Ebbsfleet Valley in north Kent, Stratford and the Lower Lea Valley, and Canary Wharf (both London), and London Gateway in south Essex. Canary Wharf has been identified as an international financial and business service centre, with forecasts suggesting that further expansion of financial and business services could result in an additional 150,000 jobs by 2016.

The London Gateway port development has been ascribed the potential of creating 14,000 jobs (9000 by 2016), with opportunities for "global partnering in innovation and learning" and to become "a demonstration centre for renewable energy technologies" (EEDA, LDA & SEEDA, 2008).

4.2.5 Fishing fleet and farming

Thames Gateway has very little in the way of a fishing industry (Table 9.23). However, offshore of the outer Thames estuary (outside the Thames Gateway area) the southern North Sea is an important and productive area for fisheries. Leigh-on-Sea, situated in the south Essex sub region is an important landing port for cockles (Thames Estuary Partnership, 2005). Although oysters (*Ostrea* and *Crassotrea*) have traditionally been reared on the Essex and north Kent coasts, fisheries are not located within the boundaries of the Thames Gateway.

Table 9.23. Employment in Fishing – Thames Gateway.[*]

Sub region	Local authority	Industry of employment (%) Fishing
London	Barking & Dagenham	0.02
	Bexley	0.01
	Havering	0.01
	Lewisham	0.01
	Greenwich	0.00
	Newham	0.01
	Tower Hamlets	0.00
	Hackney	0.01
Essex	Basildon	0.01
	Castle Point	0.02
	Rochford	0.02
	Thurrock	0.01
	Southend-on-Sea	0.03
Kent	Dartford	-
	Gravesham	0.01
	Swale	0.02
	Medway	0.01
	Tonbridge & Malling	0.01

Based on CORINE level 3 land cover data, the Thames Gateway is comprised of nearly 24.51 per cent non-irrigated arable land; 16.20 per cent pastures; 1.5 per cent fruit trees and berry plantations; and 0.15 per cent land principally occupied by agriculture, with significant areas of natural vegetation (www.eea.europa.eu/publications/COR0-landcover). Some 0.20 - 2.03 per cent of those working in each local authority area relevant to the Thames Gateway were employed in farming.

[*] Source: Figures taken from 'Census 2001: Key Statistics for local authorities in England and Wales' KS01' - Table 9.KS11a 'Industry of Employment'.

Table 9.24. Employment in Farming – Thames Gateway.[*]

Region	Local authority	Industry of employment (%) Agriculture, hunting and forestry
London	Barking & Dagenham	0.30
	Bexley	0.39
	Havering	0.43
	Lewisham	0.30
	Greenwich	0.29
	Newham	0.20
	Tower Hamlets	0.19
	Hackney	0.28
Essex	Basildon	0.62
	Castle Point	0.58
	Rochford	1.58
	Thurrock	0.63
	Southend-on-Sea	0.58
Kent	Dartford	0.80
	Gravesham	1.05
	Swale	2.03
	Medway	0.74
	Tonbridge & Malling	1.58

4.2.6 Ports

The Thames Gateway is home to many port and related facilities that have evolved over centuries. Major ports include the Port of London, which stretches along the Thames and includes wharfs, docks, terminals and other facilities. These include the Port of Tilbury in south Essex - the UK's third largest container port – and the London Gateway Port development at Thurrock in south Essex (www.pla.co.uk).

[*] Source: Figures taken from 'Census 2001: Key Statistics for local authorities in England and Wales' KS01' - Table 9.KS11a 'Industry of Employment'.

Medway Ports, which comprises the Port of Sheerness and Chatham Docks in north Kent (www.medwayports.com). Sheerness - one of the UK's most significant ports for importing cars, timber and fresh produce – has been earmarked for redevelopment. Chatham Dock handles in excess of 1 million tonnes of cargo a year (Jones Lang Lasalle, 2009). London Thamesport, also in north Kent, is one of the UK's busiest container ports. In 2009 London was the second busiest port in the UK in terms of tonnage (DT, 2009).

4.2.7 Energy production companies

A range of major companies operates energy production facilities located in the Thames Gateway.

E.On operates power stations at Kingsnorth (dual-fired – 1,940MW) and Grain (oil - 1,380MW). Scottish Power operates a 793MW combined cycle gas turbine (CCGT) power station at Damhead Creek at Kinsgnorth in north Kent, and is currently developing plans for a new 1000MW station at the same site. Scottish and Southern Energy operates Medway power station (gas - 690 MW), located on the Isle of Grain. npower operates Tilbury power station (coal - 1,131MW), to the east of Tilbury Docks in Essex and Littlebrook power station in North Kent (oil – 1,245 MW) .

The London Array is currently being developed by the consortium of E.ON, DONG Energy and Masdar. When complete, it will comprise up to 341 offshore wind turbines situated in the outer Thames estuary and generating up to 1,000MW of electricity. It is expected to become the world's largest offshore wind farm.

4.2.8 Environmental groups

Thames Gateway has been a focus for both national and international groups with environmental interests. Wildlife charity Buglife took Thurrock Development Corporation to Court on the grounds that it had failed to protect the Marshes, whilst the Friends of North Kent Marshes works with local communities and groups such as the RSPB (the Royal Society for the Protection of Birds) as they develop visitor sites. Wildlife Gateway has been created by the Wildlife Trusts in Thames Gateway as part of their commitment to high quality regeneration which. CPRE (Campaign to Protect Rural England) is also a keen commentator on development in the Gateway.

4.2.9 Community groups

The sixteen local authorities whose collective boundaries encompass the Thames Gateway area are each home a variety of minority ethnic communities with associated community organisations. At the sub regional level, reports from the Thames Gateway London Partnership (TGLP, 2006) suggest that that there are 20,000 community and voluntary organisations in the London Thames Gateway alone – not including social enterprises and housing associations.

4.2.10 Second home owners

According to the 2001 census (see Table 9.25) approximately 0.2 per cent of homes in the local authority areas in which the Thames Gateway is located were either second homes or holiday accommodation, against an average of 0.7 per cent for England and Wales. A subsequent estimate (Office for National Statistics, 2005) suggested that by 2005 approximately 1.0 per cent of homes in the UK were second residences.

Table 9.25. Household Spaces – Thames Gateway.[*]

Region	Local authority	Pop'n 2001 census KS1	Household spaces and accommodation type 2001 census KS16	Household spaces and accommodation type 2001 census KS16	Household spaces and accommodation type 2001 census KS16
			All	With residents	Second homes/holiday accommodation
London	Barking & Dagenham	163,944	68,378	67,273	46
	Bexley	218,317	91,729	89,451	139
	Havering	224,248	93,980	91,722	123
	Lewisham	248,922	109,448	107,412	178
	Greenwich	214,403	95,835	92,788	156
	Newham	243,891	93,782	91,821	125
	Tower Hamlets	196,106	80,781	78,530	500
	Hackney	202,824	88,446	86,042	115

[*] Source: Figures taken from 'Census 2001: Key Statistics for local authorities in England and Wales' KS01' - tables KS01 'Usual resident population' and KS16 'Household spaces and accommodation type'.

Essex	Basildon	165,668	70,843	69,207	87
	Castle Point	86,608	35,810	35,279	27
	Rochford	78,489	32,773	31,952	67
	Thurrock	143,128	59,416	58,485	79
	Southend-on-Sea	160,257	74,310	70,978	205
Kent	Dartford	85,911	36,028	35,240	36
	Gravesham	95,717	39,137	38,266	56
	Swale	122,801	51,316	49,257	382
	Medway	249,488	102,892	99,566	467
	Tonbridge & Malling	107,561	43,907	42,743	144
Total			1,136,458		2,673

4.3 Overview of resource conflicts

4.3.1 Portsmouth

Portsmouth's key resource conflicts – both current and future – lie in competition for natural resources in the context of a dense and rising population, planned expansion of the housing stock, a strong and growing tourist economy with a coastal focus, and a susceptibility to flooding exacerbated by rising sea levels as a consequence of climate change (Table 9.26).

Portsmouth's population density is very high – partly due to revived inward migration - with targets for additional growth in housebuilding in the years to 2016. However, suiTable 9.space is heavily constrained by its site and by historical development, meaning that planners must look beyond the urban core. Thus, the spatial demands of economic, housing, recreational and associated infrastructural development threaten the partial or complete loss of natural environments and recreational space. Parts of the city are at a significant risk from flooding. Locating new development outside flood risk areas is acknowledged as the most efficient way of managing flood risk, but there is not enough suiTable 9.capacity in Portsmouth to do this if building targets are to be met.

Land reclamation for development has been a significant cause of the loss of intertidal habitat in Portsmouth Harbour, and the building of 'hard' coastal defences in the context of rising sea levels presents similar challenges through 'coastal squeeze' as habitats are prevented

from migrating inland in the face of rising sea levels. This creates a conflict for conservation, as many intertidal areas surrounding the city receive national and international conservation designations, and compensatory habitat for that lost is both scarce and expensive.

The city's tourism industry – which saw the numbers of visitors triple between 1988 and 2006 and has been the focus of extensive urban development – is economically significant in an area of high social deprivation. However, it also adds to the burden on natural resources – including land for the disposal of waste - and presents additional requirements in terms of protecting infrastructure from the sea (thus undermining the recreational value of the coast for tourists).

Table 9.26. Users and resources – key conflicts: Portsmouth.

Resources / Users	Coastal ecosystems	Marine ecosystems	Soil and land	Fresh water	Cultural features	Social features	Economic features
Inhabitants/ households	Sea defence/ coastal squeeze Sewage effluent Disturbance Trampling		Additional housing Landfill waste sites Pressure on recreational spaces	Pressure on water supplies	Local recreational demands	Rising population – claims on housing	
Tourism Establish-ments	Sea defence/ coastal squeeze Coastal recreation Sewage effluent Disturbance Trampling		Landfill waste sites Pressure on tourism spaces	Demands of hotels	Pressure on particular sites		Spatially polarised
Restaurants etc	Sea defence/ coastal squeeze		Landfill waste sites	Pressure on water supplies		Local versus visitor usage	
Industrial/ commercial	Sea defence/ coastal squeeze Water-borne pollution		Brownfield versus greenfield development Landfill waste Sites	Pressure on water supplies			Changing employment bases Non complementary land uses
Fishing	Bait-digging						
Farming	Agricultural run-off/ Eutrophica-tion						

Ports	Sea defence/ coastal squeeze Potential pollution				Coexistence with tourism sites		Decline in port based industries
Energy production							
Env. groups	Sea defence/ coastal squeeze		Conservation	Conserva-tion	Conserva-tion		Sea defence/ Coastal squeeze
Community groups					Local cultural facilities	Social polarisation	
Second home owners	Sea defence/ coastal squeeze					Limited impact on housing supply	

4.3.2 Thames Gateway

The Thames Gateway's key resource conflicts lie in competition for natural resources in the context of extensive urban regeneration and a susceptibility to flooding exacerbated by rising sea levels as a consequence of climate change (Table 9.27).

The Thames Gateway has been designated a national priority for urban regeneration to allow the continued expansion of Greater London. Besides the construction of new homes, major investments include high speed rail links to central London, an improved network of public transport, the Olympic Park and supporting infrastructure, and the development of a port and business park - the London Gateway. Proposals for a Thames Gateway Bridge drew strong opposition from environmental groups concerned about air quality and additional traffic, whilst the area's significant and expanding power industry has seen public conflict with environmental groups over the continued use of coal as a source for energy.

Thames Gateway occupies mainly low-lying flood plains, which are heavily protected against tidal and river floods. The management of flood risk is a major issue, where the maintenance of flood defences is of paramount importance at present and represents an economic and environmental challenge for the future. 56% of land selected for redevelopment is within the floodplain, and further development in flood risk areas – combined with the effects of climate change and accompanying sea level rise - will increase the number of people and properties at risk from flood events.

As well as increasing flood risks, the impacts of climate change and sea level rise are expected to aggravate the loss of natural wetland habitats due to coastal squeeze. This creates a conflict between the conservation of habitats and the management of flood risk, as the

maintenance or upgrade of flood defences are not permitted if expected to impact negatively on the Thames Gateway's legally protected coastal habitats.

Table 9.27. Users and resources – key conflicts: Thames Gateway.

Resources / Users	Coastal ecosystems	Marine ecosystems	Soil and land	Fresh water	Cultural features	Social features	Economic features
Inhabitants/ households	Sea defence/ coastal squeeze		Loss of grazing pasture	Pressure on water supplies	Local recreational demands		
Tourism Establishments				Demands of hotels			Spatially polarised
Restaurants etc			Landfill waste sites	Pressure on water supplies		Local versus visitor usage	
Industrial/ commercial	Sea defence/ coastal squeeze		Brownfield versus greenfield development Landfill waste Sites	Pressure on water supplies			Changing employment bases Non-complementary land uses
Fishing							
Farming			Loss of grazing pasture	Future irrigation needs			
Ports	Sea defence/ coastal squeeze Potential pollution	Potential pollution					Decline in port based industries
Energy production	Sea defence/ coastal squeeze						
Env. groups	Sea defence/ coastal squeeze		Conservation				Sea defence/ Coastal squeeze
Community groups					Local cultural facilities	Social polarisation	
Second home owners	Sea defence/ coastal squeeze					Limited impact on housing supply	

5. Conclusions

Both cities face challenges rising from the relationships between urban development, human mobility and environmental changes. However, the sites, development histories and environmental settings also mean that these are articulated differently, as are policy responses.

Whereas Portsmouth is a tightly constrained city, bounded by rias that are busy harbours, Thames Gateway is a planning region that was created to provide a framework for urban regeneration and a focus for new development to the east of London. Whereas Portsmouth is a unitary local authority, Thames Gateway, which cuts across the territories of 16 different local authorities, and sits in the shadow of London at least in economic terms, is a long, large and diverse sub-region.

There are marked differences also in the biophysical features of the two case studies. The Solent estuarine system is formed by rias, and coastal processes are complex due to the combination of open coast and harbours that are partially sheltered by the Isle of Wight. Thames Gateway coast is largely characterised by shallow water abutting low-lying and flat land above mean high water. Both have been significantly modified over time by human activity. There are especially acute concerns about the long term losses of salt marshes in Portsmouth harbour, as a result of climate change, but the development of hard sea defences, and development of land immediately landwards of them, has also led to a steady reduction in the area of mudflat and saltmarsh in Thames Gateway.

Portsmouth harbour includes one of the four largest expanses of mudflats and tidal creeks on the south coast of Britain, It has internationally important populations of mud-snails, shrimps and wading birds and wildfowl. Other than in the highly developed London sub-region, coastal ecosystems in Thames Gateway are dominated by tidal mudflats at lower levels that may be exposed at low tide, with saltmarshes at higher tidal levels. The mudflats are inhabited by dense populations of photosynthetic micro-organisms that are highly significant contributors to the biological productivity of the ecosystem. Saltmarshes at the uppermost elevations are often used as roosting areas for wading birds and wildfowl at high tide, whilst terrestrial birds use saltmarshes as feeding areas. A large range of invertebrate species also inhabits this ecosystem.

Given the importance of the ecosystems at both sites, the intertidal areas (mudflats and salt marshes) are protected by national and international conservation designations, including Ramsar, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI).

Turning to demographic and socio-economic features, Portsmouth had an estimated population of 200,000 in 2008, and its population has been increasing again since 2000 after several decades of stagnation or decline. Internal migration, international migration, and a large student population (11.5% of the total) have contributed to this renewed demographic dynamism as well as to the city having a relatively young age. There is a high population density. In contrast, approximately 1.45 million people live in Thames Gateway, and this is forecast to increase by 8% by 2018, that is at above the national average growth rate.

While both case studies are relatively prosperous by the standards of the UK as a whole, they also contain areas of very high social, economic and environmental deprivation. The unemployment rate in Portsmouth is similar to the national average, but there are pockets of higher unemployment and reliance on state welfare benefits in the central city wards. The city is predominantly white with a relatively small ethnic minority population, despite recent inward international migration. Given the scale and economic diversity of the region, Thames Gateway includes both some of the more prosperous and some of the poorest areas in the UK: the latter are found mostly but not only in the London sub region.

In terms of land use, Portsmouth is dominated by the built environment within its highly constrained peninsular setting. There is only limited availability of brown field land, and severe difficulties in accommodating development pressures. Portsmouth lacks green spaces. The land use profile of the Thames Gateway study area is very mixed. While there is continuous development along the upper Thames in eastern London, there are extensive areas of agricultural land in the eastern sub regions: 60% of the region is designated Greenspace. Thames Gateway has one fifth of all the brownfield land in the South East region of the UK, and much of this is available for development: over 80% of recent additions to the stock of housing have been built on brownfield sites or have reused buildings.

Southeastern England has relatively low rainfall by UK standards. Portsmouth currently has a small surplus of freshwater, but this is likely to become more problematic as climate change may reduce summer rainfall by between 15-60% by the 2080s. Per capita water consumption levels may have to be significantly reduced to avoid future supply shortages in the face of population growth and climate change.

Portsmouth has recently developed its socio-cultural resources and now has a cluster of waterfront heritage attractions which attracted some 4.6 million visitors in 2006. Thames Gateway is overshadowed by London as a tourist destination, and most attractions are

relatively small- or medium-scale, with the exception of Greenwich in eastern London, which attracts an estimated 9 million visitors annually (although relatively few stay overnight).

The main users in both cities include different population groups, in context of increasing and socially diverse populations, recent net migration, and relatively young age structures. There are also substantial tourist numbers in particular locations – in the waterfront zones in Portsmouth, and in Greenwich and the Medway towns in Thames Gateway. The tourism streams are diverse and include both (relatively older) cultural tourists and visitors, and (younger) night-time economy participants. There are diverse employers, ranging from small service establishments to major manufacturing enterprises, but the economic structures of both cities are changing rapidly.

As would be expected, a range of international and national conservation bodies are represented in the two case studies, involving the public, private and voluntary sectors. Their focus is mainly on the protected coastal areas, and on historic cultural and industrial sites, many of which are directly connected to estuarine, coastal and harbour sites. There are also a very large number of local conservation groups throughout both regions. Although these are too numerous to have been listed in detail in this report, they will be addresses in more detail in later project outputs.

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