VULNERABILITY OF COASTAL AREAS TO CLIMATE CHANGE: PLANNING RECONSIDERED AT THE CASE OF FETHİYE-GÖCEK SPECIAL ENVIRONMENTAL PROTECTION AREA

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ABSTRACT

VULNERABILITY OF COASTAL AREAS TO CLIMATE CHANGE: PLANNING RECONSIDERED AT THE CASE OF FETHİYE-GÖCEK SPECIAL ENVIRONMENTAL PROTECTION AREA

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Climate-induced natural hazards are threatened more human lives and natural assets than ever before which are especially concentrated in coastal areas. Low-lying coastal areas will be exposed to the unprecedented risk from sea-level rise, storm surges or other sea-ward hazards as these areas are complex socio-ecological systems and most vulnerable places to climate change because of their attractiveness of various human activities such as recreational facilities, residential needs, and economic activities. To strengthen the resilience of coastal areas, potential vulnerabilities and their levels are needed to be defined clearly. Spatial planning is a crucial instrument that plays a critical role in the development of resilient systems at various levels as an effective tool for climate change adaptation response. The hypothesis in this thesis is that planning for coastal areas has to incorporate vulnerability assessment methods to mitigate effects of climate change and induce sustainable development of coastal areas. The thesis contributes to the literature on planning for coastal areas by introducing discussions on crucial factors for assessment of vulnerabilities of coastal areas and summarising methods used for vulnerability assessment of coastal areas on the climate change. The major contribution however is an integrated assessment method is proposed. Fethiye-Göcek coastal area. Fethiye-Göcek SEPA is selected as the case study area to evaluate its coastal vulnerabilities by considering the years 2000 and 2016 comparatively, based on four dimensions (socio-economic, natural systems, built environment and infrastructure) and to provide a new perspective on the coastal areas' planning.

Keywords: Coastal Areas, Vulnerability, Climate Change, Vulnerability Assessment, Spatial Planning.

ÖZ

KIYI ALANLARININ İKLİM DEĞİŞİKLİĞİNE KARŞI KIRILGANLIĞI: FETHİYE-GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİNDE PLANLAMA SÜRECİ ÜZERİNDEN İRDELEME

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İklim değişikliğinden kaynaklanan doğal afetler gün geçtikçe daha fazla insan hayatı ve doğal kaynakları tehdit etmekte ve bunlar çoğunlukla kıyı alanlarında yoğunlaşmakta. İklim değişikliği karşısında oldukça kırılgan olan ve karmaşık sosyo-ekolojik sistemleri barındıran kıyı alanları rekreasyonel imkanlar, barınma ihtiyaçları ve ekonomik aktiviteler gibi çok çeşitli insan faaliyetleri için çekim noktası niteliğinde olduklarından deniz yükselmeleri, fırtınalar ve iklim değişikliğinden kaynaklanan diger tehlikelerle karşı karşıya kalmaktadır. Kıyı alanlarının dayanıklılığının (resilience) arttırılabilmesi için potansiyel kırılganlıklarının ve kırılganlık düzeylerinin ortaya konulması gerekmektedir. İklim değişikliğine karşı uyumun sağlanmasında etkili bir araç olarak planlama, dış tehditlere dirençli mekansal sistemlerin oluşturulabilmesi açısından kritik öneme sahiptir. İklim değişikliğinin etkilerinin hafifletilmesi ve kıyı alanlarının sürdürülebilir gelişiminin sağlanabilmesi için kırılganlık değerlendirme yöntemlerinin planlama mekanizmalarına entegre edilmesi gereği bu tez çalışmasında temel hipotez olarak belirlenmiştir. Bu çalışmanın temel amacı kıyı alanlarının iklim değişikliğine karşı kırılganlığının tanımlanması amacıyla geliştirilen kırılganlık analizlerinin tartışılması, mevcut yöntemlerin incelenmesi ve sonucunda bütünleşik bir analiz metodu önerisinin oluşturulmasıdır. Fethiye-Göcek Özel Çevre Koruma Bölgesi, 2000 ve 2016 yıllarının karşılaştırmalı olarak kıyısal kırılganlığın sosyo-ekonomik, doğal sistemler, yapılı çevre ve altyapı temelinde tartışılması ve kıyı alanlarının planlamasında yeni bir bakış açısı kazandırılması amacıyla örnek alan olarak belirlenmiştir.

Anahtar Kelimeler: Kıyı Alanları, Kırılganlık, İklim Değişikliği, Kırılganlık Analizi, Mekansal Planlama.

To my mother and father

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LIST OF ABBREVIATIONS

CVI	Coastal Vulnerability Index
CEVI	Coastal Economic Vulnerability Index
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO2	Carbon-Dioxide
CVRA	Comparative Vulnerability and Risk Assessment
EU	European Union
ESI	Environmental Sustainability Index Report
EPASA	Environmental Protection Agency for Special Areas
EUROSTAT	European Community Statistical Office
GHG	Greenhouse Gases
GDP	Gross Domestic Product
GDPNA	General Directorate for Protection of Natural Assets,
GVA	Global Vulnerability Index
ICVA	Integrated Coastal Vulnerability Assessment
IPCC	Intergovernmental Panel on Climate Change
IRVA	The Integrated Regional Vulnerability Assessment
SEPA	Special Environmental Protection Area
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
TAR	IPCC Third Assessment Report
OECD	Organisation for Economic Co-operation and Development
PVA	Participatory Vulnerability Assessment Method
SVI	Social Vulnerability Index
SL	The Sustainable Livelihood Approach
PCA	Principle Component Analysis
SLA	Sustainable Livelihoods Model
IUCN	International Union for Conservation of Nature’s

TSI	Turkish Statistical Institute
UNESCO	United Nations Educational, Scientific and Cultural Organization
VRIP	Vulnerability-Resilience Index Prototype Model
VRA	Vulnerability Reduction Assessment
VRIM	Vulnerability Resilience Indicator Model

CHAPTER 1

INTRODUCTION

1.1.The Context and Scope

Natural hazards which are mostly related to climate change are exacerbating more risks than ever before. Human lives and natural assets are facing significant negative impacts of natural hazards, most of which are concentrated on coastal areas. Communities living in low-lying coastal areas will be exposed to the unprecedented risk from sea-level rise, storm surges or other sea-ward hazards.

Coastal areas are complex socio-ecological systems and most vulnerable places to climate change because of their attractiveness of various human activities such as recreational facilities, residential needs, economic activities (fisheries, ports, marine trade and agriculture etc.), as well as their geomorphological characteristics. In order to assess the sensitivity of such complex systems, ‘vulnerability’ and ‘resilience’ are two competing and related concepts widely used over the last decades. These concepts have used extensively in various disciplines, especially related to social-economy and ecology. ‘Vulnerability’ is defined as a function of exposure of any system (e.g., who is at risk/ how severe is the risk etc.); whereas ‘resilience’ is described as the capacity to absorb external shocks without significant deformation (Cutter et al 2008a; Dasgupta and Shaw 2015). Community resilience in coastal areas which covers both vulnerability assessment and resilience concepts requires integration and evaluation of different mechanisms such as social, economic, natural and physical within a complex socio-ecological systems framework. So, to set the community resilience the degree of vulnerability of coastal communities must be indicated to decide and form the policies to reach the coastal resilience.

It is widely acknowledged that spatial planning has an important role in promoting urban resilience and offers the potential to combine adaptation and mitigation measures to climate change (Stead, 2014). Similar to densely populated areas, for coastal regions to alleviate the adverse effects of climate change, planning policies and mechanisms are recently integrating coastal vulnerability measures into the decision-making frameworks. Especially in Turkey, spatial planning processes are rarely mention about climate change issues. It is hardly possible to find substantial interest and awareness on climate change issues and their implications on the levels of spatial planning. However, in order to define the policies about climate change on coastal areas and the principles to be incorporated to the planning processes, there is need to analyse the levels of coastal systems' vulnerability or resilience and prioritise measures to be followed in order to plan resilient coastal areas and settlements.

'Vulnerability' and 'resilience' are useful integrative and multidimensional concepts for evaluation of the potential effects of climate change; however, they are also complex concepts that cannot be directly measured. Over the past few years different researchers have formulated several vulnerability assessment methods proposing qualitative and quantitative indicators of climate-induced natural hazards on coastal areas (Cutter et al. 2010, Gornitz et al. 1994, Thieler and Hammar-Klose 1999, Özyurt and Ergin 2010, Wilhelmi and Morss 2013, Zhou et al 2014, Panray et al 2009, Eidswig et al 2014, Li and Li 2011, Fatorić and Chelleri 2012, Frihy 2003, Sánchez-Arcilla et al 2008, Ge et al 2013 etc.). Nonetheless, most of these studies do not fully consider all determinants of the community resilience. Field of natural hazards is not fully determined and exactly understood because of the unpredictable characteristics of the system or difficulty to reveal the success of evaluation of the natural disaster of climate extreme before it happens and evaluations must be handled much earlier than the framed scenario. Hereby, it is necessary to identify proxy variables or indicators to operate in modeling. Appropriate indicators are variables that summarize or simplify relevant information; make visible or perceptible phenomena of interest; and quantify, measure, and communicate relevant information. Therefore, the success of assessment is related to the selection and design method of indicators and to reach an optimal result integrated manner of the criterion development is needed.

This study aims to propose an integrated coastal vulnerability assessment method to display the vulnerabilities of a coastal area to climate change. To achieve this, indicators of coastal vulnerability are organized under the four dimensions; namely socio-economic, natural systems, built environment, and infrastructure. Theoretical and empirical works in the literature are investigated concerning coastal vulnerability assessment and indicators searched in earlier frameworks and grouped according to these dimensions to design the integrated assessment model. Comprehensive work is needed from different disciplines for application of this model and this evaluation method will make possible to compare different communities or coastal areas' vulnerabilities. There is not generally accepted method to assess vulnerability to climate change and the method is necessarily being the area and/or hazard specific. Despite this framework model has been customized to the local context, it can possibly be applied to similar coastal areas with some adaptations.

1.2.Main Purpose, Research Question, and Hypothesis

Increased vulnerability to climate change implies higher impacts on low-lying coastal areas. Coastal cities are growing faster than their noncoastal counterparts and are already intensively built-in areas. Increased vulnerability to climate change is not only caused by the changing climate itself. A combination of sharp increases in coastal urbanization and population growth and increasingly severe climate events place ever more people at risk. Because these areas encapsulate vulnerable systems of various factors; social, economic, natural and physical assets and developments also contribute to increased vulnerability level to climate change. Increasing urbanization and the pressures of various sectors such as tourism, agriculture, and recreation to locate in coastal areas intensify the possible effects if climate change over time.

Spatial planning has been seen as an instrument and a framework that plays a critical role in the development of resilient systems at various scales. Moreover, spatial planning has a bigger role to play at the local and regional level to climate change issues as it effects of policy measures on spatial development and it possibly has the potential to act as an effective instrument for climate change adaptation response. To develop effective climate change policies for coastal areas, potential vulnerabilities and their levels are needed to be defined clearly.

Several methods have been developed to assess climate change impacts and vulnerabilities: from qualitative guides for vulnerability assessment in general to sophisticated methods for specific hazards that involve specialized impact modeling and damage estimation.

The main purpose of this research is to discuss the coastal vulnerability with respect to climate change underlining the impacts of the climate change on coastal areas. Therefore, to reveal the vulnerabilities of these areas, existing assessment methods of vulnerability to climate change are evaluated and the most appropriate and worthy method is developed in order to give inputs to policy makers and planners to mainstream climate change issues into their spatial planning practice at different levels.

To develop the theoretical framework some research questions are defined:

- What risks are coastal settlements faced to because of climate change?

- What is a vulnerability and in what ways are coastal areas vulnerable to floods, inundation, sea-level rise etc.?
- Are coastal settlements vulnerable to climate change?
- How can we assess vulnerability/coastal vulnerability to climate change?
- What are data and methods available as a basis for quantification of vulnerability?
- Which are vulnerability indicators used to derive the degree of vulnerability selected?
- What kind of spatial planning policies can be developed to reach resilient coastal areas and how can spatial plans be assessed extent to which coastal vulnerability measures are addressed?
- Are climate change policies integrated into spatial plans?

Based on these questions, the main hypothesis in this thesis underlines that planning for sustainable development of coastal areas should consider and focus on existing vulnerabilities and threats coastal areas face and state that "Planning mechanisms have to integrate vulnerability assessment methods for coastal areas to climate change in order to mitigate effects of climate change and induce sustainable development of coastal areas."

1.3.Methodology and Outline

This thesis is comprised of seven chapters. ***The first chapter*** introduces the research problem as well as the objectives utilized to address the problem. The ***second chapter*** provides additional contextual information pertaining to the research problem in the form of a literature review; this chapter reviews climate change issue in a brief way then the concept of vulnerability is discussed broadly. Definitions of climate change, vulnerability, and resilience in the literature are presented in this chapter and vulnerability is associated with climate change sphere. There are many approaches to vulnerability and most widely acknowledged approaches are expressed in this part of the study. Resilience is one of the most important approaches in the literature and this term associated with the term of vulnerability many times in this study.

The ***third chapter*** introduces the vulnerability assessment concept to the impacts of climate change. The need and importance of vulnerability assessment and approaches are broadly discussed in this chapter. General vulnerability assessment methods are described with the classification of the spatial level. Lastly, as an important matter of vulnerability measurement, proxy indicators relating coastal vulnerability and methodological issues that result in the overall vulnerability are mentioned.

In the first part of the ***fourth chapter***, the theoretical frame of coastal vulnerability issue is examined. Empirical studies on coastal vulnerability assessment elaborated and compared according to their components considered, the temporal scale of assessment procedure, used scenarios, operated data and applied assessment methods. Most widely used assessment methods are discussed under two main headings: firstly; in the index based methods, Coastal Vulnerability Index – CVI, Coastal vulnerability index for sea level rise – CVI (SLR), Composite Vulnerability Index, Social Vulnerability Index and Multi-scale coastal vulnerability index are described. Secondly, indicator-based methods are clarified. In the second part of the fourth chapter, spatial planning mechanisms and the tools for vulnerable systems are introduced and associated with climate change issues. Key planning dimensions are argued in this section and some proposals or recommendations for climate resiliency planning are developed for land use, ecology, infrastructure, and transportation.

In the ***fifth chapter***, case study area- Fethiye-Göcek SEPA is generally explained regarding coastal vulnerability. The vulnerabilities of Fethiye-Göcek SEPA are described and then selected criteria are briefly introduced. With reference to the coastal vulnerability methodologies in the literature, for Fethiye-Göcek SEPA coastal vulnerability assessment method is proposed, namely Integrated Coastal Vulnerability Assessment (ICVA) Method for Fethiye-Göcek SEPA. By using 58 indicators depicting study areas' socio-economic, natural systems, built environment and infrastructure, vulnerability index is defined by operating quantitative and qualitative data. To reach the current vulnerability level of case area (2016) and to compare this level with past vulnerability level (2000) statistical data, spatial plans, scientific reports and expert views - from Ministry of Environment and Urbanization, General Directorate for Protection of Natural Assets (GDPNA) was utilized.

In the ***sixth chapter***, the research findings are evaluated and coastal vulnerability level of the study area is discussed and compared to the measured temporal scales. Climate change induced vulnerabilities and other impacts and their relative contributions to overall vulnerability of study area are discussed in the light of policies offered by spatial plans of Fethiye-Göcek SEPA.

The ***last chapter*** encompasses an evaluation of coastal systems' vulnerability to climate change with socio-economic and physical impacts. By revealing the vulnerabilities and the level of resilience of coastal systems this chapter aims to propose mitigative and adaptive solutions and precautions that can be incorporated within the planning process against climate induced hazards. Besides bringing new insights into both regional and spatial planning mechanisms for Turkey.

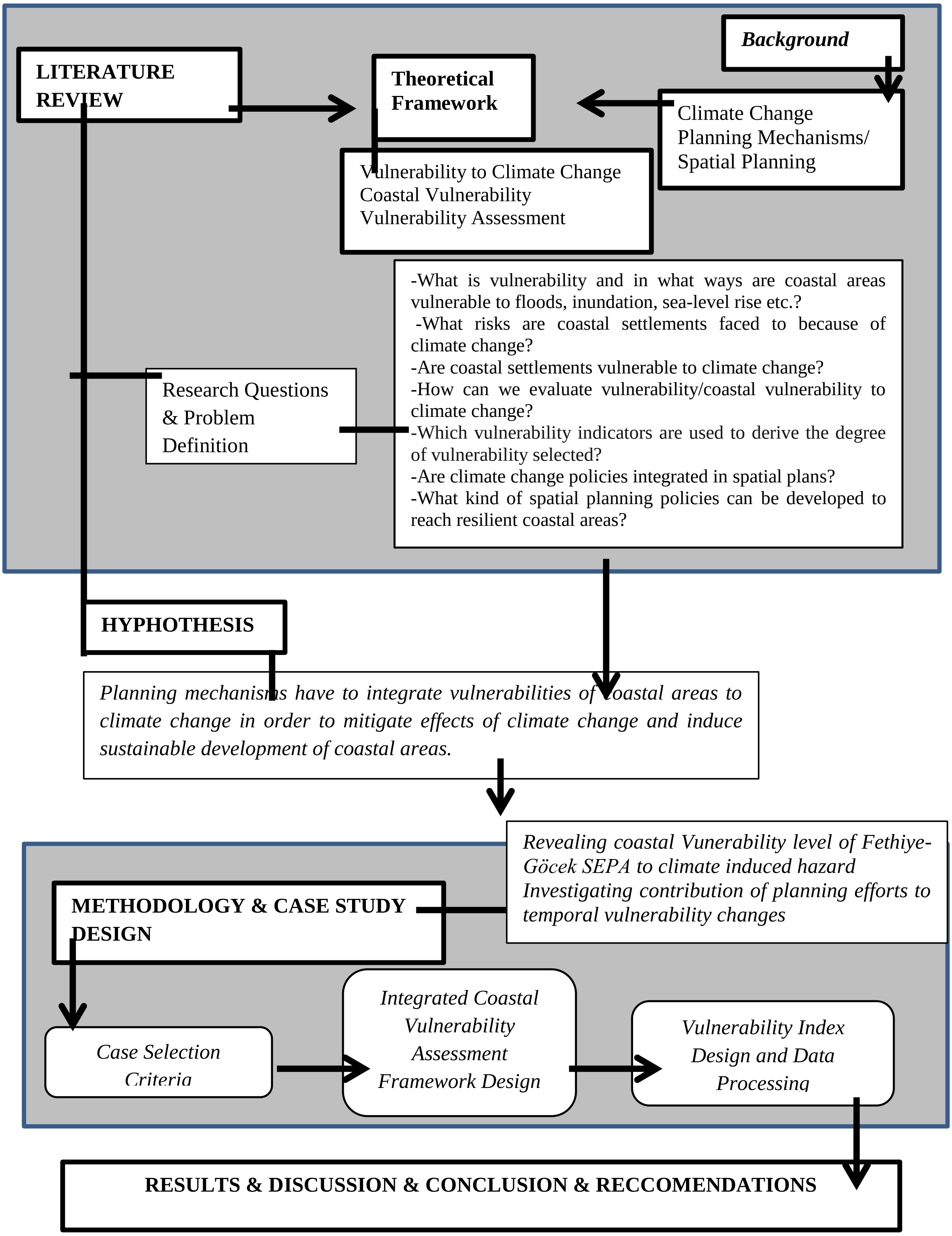

Figure 1: Research Methodology

CHAPTER 2

VULNERABILITY TO CLIMATE CHANGE

2.1. What is Climate Change

Intergovernmental Panel on Climate Change IPCC Fourth Assessment Report: Climate Change 2007 refers to “a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It denotes any change in climate over time, whether due to natural variability or as a result of human activity”- (IPCC, 2007) as climate change. This definition differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), where “Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods” (UNFCCC, United Nations 1992).

Climate change refers to changes in the average weather and weather variability of a region or the planet over time and measured by changes in temperature precipitation, wind, storms as well as sea level rise and other indicators (UNHABITAT 2014). The key climate change indicator that scientists look to is the average surface temperature of the earth. Over the past 50 years, the global average temperature increased by 0.65°C. Global ocean temperature is also an important factor to consider due to its effect on surface temperatures. The world’s oceans are absorbing much of the heat added to the earth’s climate system and, as the ocean circulates, much of that heat is released into the atmosphere, increasing the warming effect over time.

IPCC stated in *5th Assessment Report* in 2013 that, "*Most of the observed increase in global average temperatures since the mid-twentieth century is very likely (>95 percent) due to the observed increase in anthropogenic greenhouse gas concentrations*." In other words, most of the global warming from the past 50 years is caused by human activity. IPCC 2014 Synthesis Report denotes that "warming of the climate system is unequivocal" and following this, it is highlighted in this report that "human influence on the climate system is clear and recent anthropogenic emissions of greenhouse gasses are the highest in history and since the 1950s". The increase in carbon dioxide levels in the atmosphere – primarily from the burning of fossil fuels and land use change – cause evident rises in global temperatures at a rate never before seen in human history. Human activities such as the combustion of fossil fuels, large-scale industrial pollution, deforestation and land-use changes, among others, have led to a build-up of GHGs in the atmosphere together with a reduction of the capacity of oceans and vegetation to absorb GHGs.

Total anthropogenic GHG emissions have continued to increase over 1970 to 2010 and with distinct rise between the years of 2000 and 2010. Besides, emissions of CO_2 from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emissions increase from 1970 to 2010, with a similar percentage contribution for the increase during the period 2000 to 2010 (Climate Change Synthesis Report, 2014, p:5) Intensive usage of fossil fuel sources as to the population growth as well as economic development constitute the most important drivers of the CO_2 emissions' inevitable rise.

Surface temperature is one of the most important indicators to evaluate climate variability. According to IPCC Climate Change 2014 Synthesis Report, each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was *likely* the warmest 30-year period of the last 1400 years in the Northern Hemisphere (Climate Change Synthesis Report, 2014, p: 2)

Greenland and Antarctic ice sheets have been losing mass and glaciers have continued to shrink almost worldwide. As another indicator of climate change sea level rise shows consistency with global warming. Over the period 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21] m. The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (Climate Change Synthesis Report, 2014, p.4)

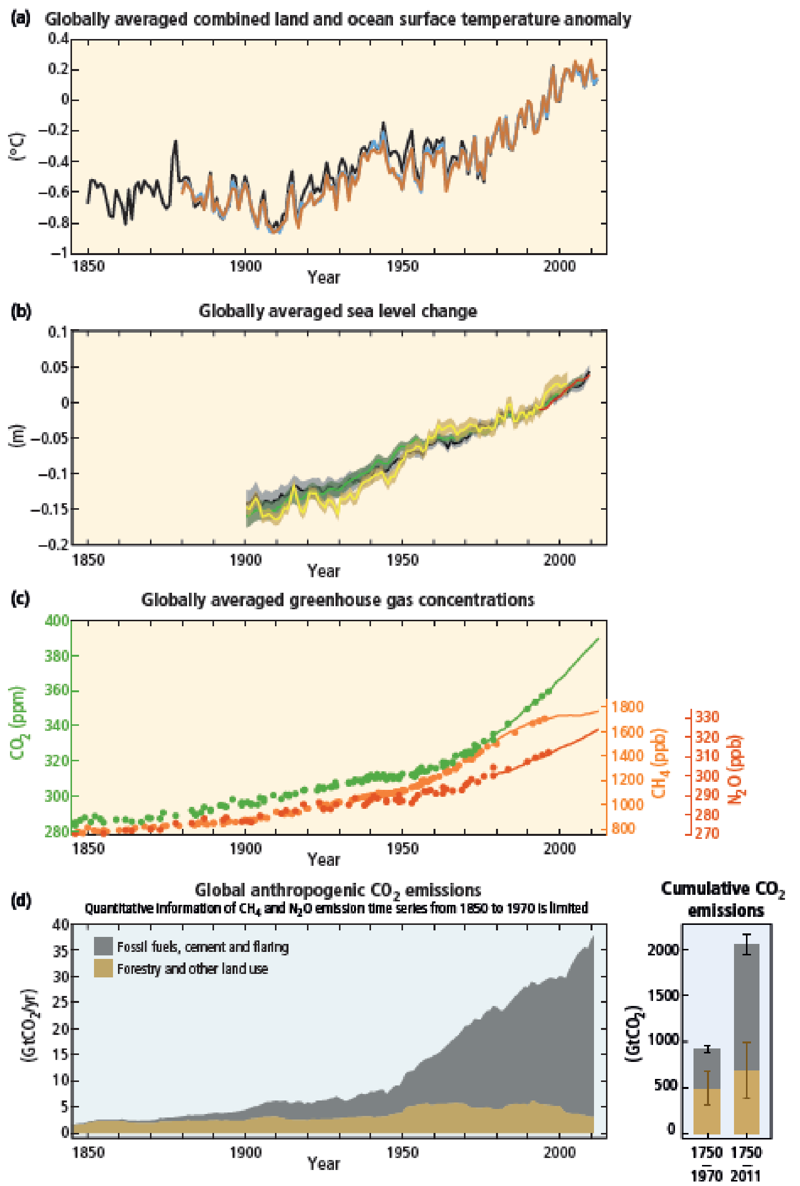

Figure 2: Changes in temperature and sea level
(Source: Climate Change 2014: Synthesis Report)

Furthermore, as it is mentioned in the White Paper 2009**,** the severity of the impacts of climate change varies by region and the most vulnerable regions in Europe are Southern Europe, the Mediterranean Basin, Outermost regions and the

Arctic mountain areas, in particular, the Alps, islands, coastal and urban areas and densely populated floodplains are facing particular problems and outside Europe, developing countries (including small island states) will remain particularly vulnerable.

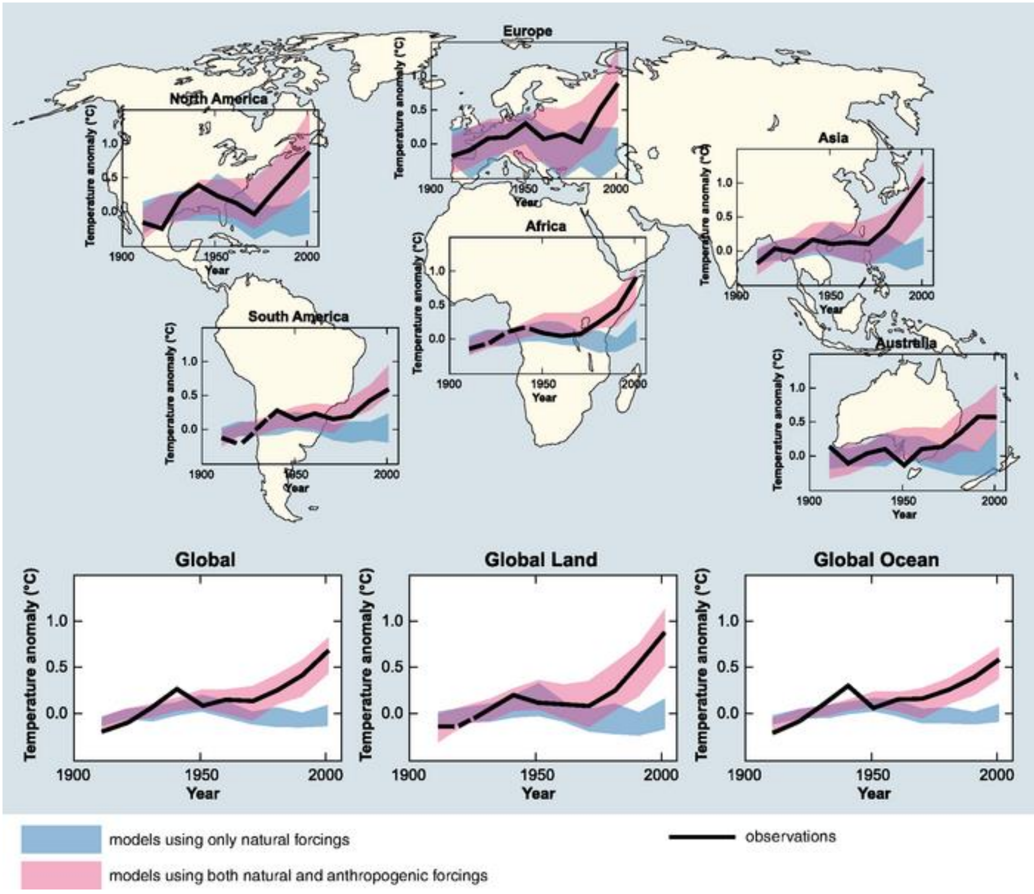

Figure 3: Global and continental temperature change.
(Source: Climate Change 2014: Synthesis Report)

2.2.Mechanisms of Climate Change

From the industrial revolution up until now, human beings has been the reason for the huge amount of greenhouse emissions to the atmosphere, resulting in rising global temperature changing hydrological regime and biological diversity and climatic variations. Due to the climate change impacts most vulnerable groups are developing countries and poorest communities as to the limited resources to use adaptation efforts (Stern 2006). Alterations in climate system generally seen as climate extremes and variability threaten especially the poor people (Denton, 2009, p.115) These effects can be apparently seen as changes in common property resources such as fisheries, degrading river basins, forests etc. on which they rely on their livelihoods. Ecosystems provide such services for many people who depend on their substance mostly threaten by the climate change. So, all risks on these ecosystem services negatively affected these poor people’s resilience. Also, this variability calls forth negative influences on economies.

Developing countries with fragile environments are at higher risk of climate change impacts such as floods, drought, infrastructure damage and diseases. It is mostly related to the experiences of natural hazards; Bohle et al (1994) considered the most vulnerable as those who are most exposed to changes in limited coping capacity and less resilient to recovery.

Until recently, mitigation of greenhouse gas emissions has been the core of debates on climate change. Most developing countries can do better in preparing to adapt the negative impacts of climate change but mostly both mitigation and adaptation efforts have become inadequate to overcome the impacts of climate change not only poor and vulnerable countries but also for all human beings. This global problem requires participatory evaluation at international, national and local levels.

2.2.1. The Concept of Vulnerability

2.2.1.1. Definitions of Vulnerability

There are many definitions of vulnerability in literature: Chamber (1989) defined vulnerability as a high degree of exposure to risks, shocks and stress and tendency to food insecurity. Ellis (2000) cited that vulnerability has two aspects of external threats to livelihood through risk factors such as climate, markets or sudden disasters and internal coping capabilities such as assets, food stores etc. also livelihood vulnerability can be described as a balance between the sensitivity and resilience of livelihood systems.

IPCC Third Assessment Report (TAR) described vulnerability as " *the degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. The vulnerability is a function of the characters, magnitude and the rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity*" (IPCC, 2001, p.995) this definition of vulnerability would contain a number of terms that is needed to be interpreted according to the field of study. In an urban geography with the effects of climate change, the *system* under consideration is an urban geographical area, e.g. a neighborhood or a city rather than on the level of individuals, buildings or other elements within city areas.

Birkmann et al. (2012) in their study defined vulnerability with its key factors namely exposure, susceptibility and coping capacity and vulnerability have been drowned out with three dimensions: social, economic and environmental vulnerability. Arakida (2012, p.291) describes vulnerability as a combination of physical, social, economic and environmental conditions that increases the susceptibility of a community to the impact of the hazard. These conditions increase the susceptibility of a community to the impact of the hazard. The vulnerability factors of exposure, sensitivity and adaptive capacity can either be quantitatively measured or qualitatively characterized. These dimensions or measures can be defined as follows:

> • "*Exposure is a measure of the magnitude and extent (i.e., spatial and temporal scales) of exposure to climate change impacts.*
> • *Sensitivity is a measure how a system is likely to respond when exposed to a climate-induced stress.*
> • *Adaptive capacity is a measure of the potential, ability, or opportunities available to decrease exposure or sensitivity of a system to a climate-induced stress (i.e., adapt)"* (Füssel and Klein, 2006).

Exposure relates to fixed physical attributes of social systems such as infrastructure as well as the human systems such as livelihoods, economies, and cultures. According to Khanal (2009, p.380), exposure to risk means the severities and frequency of a function; sensitivity is the degree of a systems' response to an external event. Exposure is not only the indicator of system vulnerability because of the susceptibility and coping or adaptive capacity level of the specific region. Susceptibility relates the tendency of elements to suffer harm.

On the other hand, coping capacity allows reducing vulnerabilities in a specified time period, not a permanent solution, in other words, it serves immediate response during a hazard event but the adaptation is needed to reduce vulnerability in a medium or long run. Coping strategies or mechanisms can only be understood by answering the questions of whom and what are at risk from what and how specific stress and perturbations convert into risks and impacts.

So, primarily selected indicators are used to assess vulnerability in a medium or long run. So, primarily selected indicators are used to assess exposure, susceptibilities, and coping capacities by using specific flood scenarios.

Exposure indicators are strongly related to the existing type and density of housing and business areas and buildings with regard to flood exposure and the expose number of people. To test susceptibility and coping capacity indicators, household interviews, and micro-census data are used because these indicators can not be measured directly.

The term "exposure" refers the affected people and property and "risk" can be expressed as the expected costs (deaths, injuries, destruction of property) as a consequence of hazard. On the other hand, disaster risk can be formulated as a function of hazard, vulnerability, and exposure. To reduce the disaster risk reducing the level of vulnerability and exposure level to hazard is crucial by means of relocating populations and property.

Disaster risk = function (hazard, exposure, vulnerability)

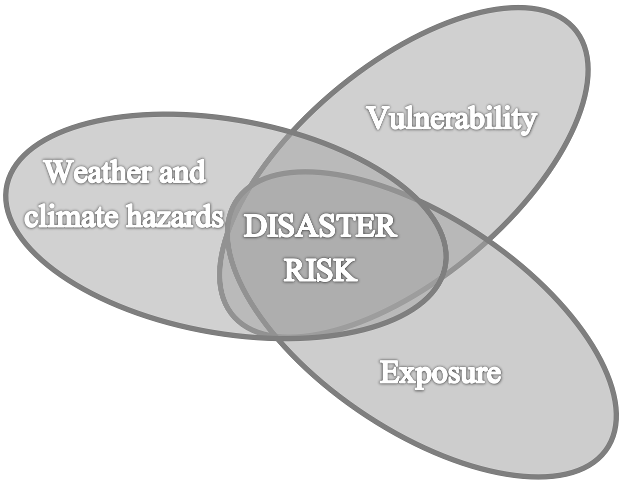

Figure 4: Formulation of disaster risk

2.2.1.2.Vulnerability in Climate Change Setting

One of the clearest definitions on vulnerability is asserted by Blaikie et al, (1994) that: "*ability to anticipate, resist, cope with and respond to hazard*". When climate change is a matter, vulnerability refers to the system of physical conditions as well as the social, economic, institutional and political ones that mediate the human context (Denton, 2009, p.118). Vulnerable physical conditions are strongly related to exposure to systems and human beings to cope with the conditions of the specific region. So, vulnerability assessment is not a straightforward matter that in an environmental change vulnerable people may not necessarily be in vulnerable places. For instance, poor people can live in very resilient environments while the rich ones in the fragile physical surroundings (Vincent, 2004). Societies' capacity to resist to the fluctuations in the living area strongly related with the vulnerability level. To understand the resilience of the society ability to restitute shocks and stress related to climate change can be the focal point. Thus to define vulnerability economic, social, political and environmental assets should be taken into consideration.

The social and biophysical vulnerability cannot be considered as completely distinct attributes as one impact on the other. With regard to the climate change socio-ecological point of view determines socio-ecological resilience as an output of the biophysical and socio-economic inputs.

To distinguish the actual harm or damage potential not only damages of extreme events which are climate driven or not but also vulnerabilities in society, land use system and infrastructure plan have crucial roles (Birkmann et al, 2012). The vulnerability is an internal condition of the social-ecological system that designates the potential harm. The term of 'risk' can be understood as the probability of the occurrence of a hazard on the other hand in a broader context it can be defined as an interaction of the given hazard and the vulnerability of a society. Human action, internal conditions of the social systems, their coping and adaptive capacities are the fundamental determinants of the impact of a hazard.

2.2.1.3. The Approaches to Vulnerability and Climate Change

2.2.1.3.1. Risk-hazard approaches

Risk-hazard approaches describe vulnerability in terms of the consequences (losses) that might be expected when exposed people and/or property are sensitive to a particular (external) hazard and aims to reveal to what systems are vulnerable, what kind of impacts may occur, when and where. This approach assumes that to understand vulnerability has come out/arise from natural hazard literature in geography and tend to consider the negative effects of change in temperature/precipitation or extreme weather events in the light of climate change and potential loss of a specifically exposed population (Eakin and Luers, 2006). While ‘vulnerability’ is not usually explicitly defined its realization is the residual or net impacts of a hazard after adaptive measures are implemented (Eakin and Luers 2006; Kelly and Adger, 2000).

The Adaptation Policy Frameworks for Climate Change Developing Strategies, Policies and Measures (2005) defines risk as the combination of the probability of occurrence and impacts of an climatic extreme event and describes two major approaches for climate risk assessment: a natural hazards-based approach (Risk = Probability of climate hazard x Vulnerability) and vulnerability-based approach depending on the whether the starting emphasis is on the biophysical or the socio-economic aspect of climate-related risk (Risk= Probability of exceeding one or more vulnerability criteria).

Communities have a chance to decrease vulnerabilities either by means of reducing risks directly or indirectly or improving the resilience of the communities.

In the early 1990's US Country Studies Program on climate change was carried out as a research to assess the systems' sensitivity to risks and quantification of the possible economic and social losses result from global warming (Eakin and Luers, 2006). These efforts aimed to measure damage by using rough proxies for vulnerability. After that, in the late 1990's social aspects and institutional conditions became important and efforts were concentrated on to distinguish the impact- oriented research from vulnerability assessment (Kelly and Adger, 2000; Eakin and Luers, 2006).

Within the context of climate change, the risk-hazard approach is typically associated with '*top-down'* or scenario-driven vulnerability assessments, where global climate projections are applied (sometimes downscaled) as the 'source of harm' to assess impacts on physical or natural exposure units, such as watersheds, infrastructure. Thus, a vulnerability assessment drawing heavily from the risk-hazard approach will focus on the expected net impacts of climate change, including their distribution over time and space; it is useful for describing the extent of the problem, whether in terms of financial costs, ecosystem damage, or human lives lost (Kelly and Adger 2000).

These approaches aim to identify which assets are exposed to particular climate impacts, where and when impacts may occur, and what the consequences of impacts might be. The risk–hazard approach assesses what is generally known as an *end point* or outcome vulnerability. The vulnerability is the remaining impact of climate change after feasible adaptations have occurred. The end-point vulnerability is most often used to prioritize international assistance programs, and for technical adaptations to climate impacts. To lighten disaster risk it is an appropriate method that to realize the nature of risk, systems, communities, groups at risk and the potential of these to withstand the risk.

2.2.1.3.2. Political economy-Political ecology approach

In the context of the risk-hazard assessment of impacts of climate change and disasters, two approaches came out for the vulnerability research. These are the political economy and political ecology. Eakin and Luers (2006) depicted political economy perspectives on vulnerability as socio-political, cultural and economic factors that together explain differential exposure to hazards, impacts, and capacities to repair past impacts and to cope and adapt to future threats. This approach was developed in response to criticisms of the risk-hazard approach, focuses on the socio-economic processes that lead to differential exposure, impacts, and capacities to deal with impacts. This focus on human agency and capacity is important, as they can amplify or reduce impacts of hazards. Vulnerability in this approach is seen as a dynamic condition, determined by so-ciopolitical, cultural and economic factors. Climate change vulnerability assessments stemming from the political-economy approach have more '*bottom-up'*, characteristic, since the unit of analysis is typically smaller and more localized, such as households or communities. The vulnerability to current climate variability is crucial to understand vulnerability to future climate conditions. Unlike risk-hazard style assessments, vulnerability assessments will focus their analyses on why systems or populations are vulnerable (drivers of vulnerability) and why some groups are more affected by climate hazards than others (differential vulnerability) (Eakin and Luers 2006). By means of this, it will be possible to identify measures for reducing vulnerability, including the necessary capacity and barriers to the implementation of such measures.

Political economy–political ecology approaches analyze the vulnerability of people to climate change impacts by examining how social and economic processes influence their social disadvantage. They seek to understand why some populations are more vulnerable than others, how they are vulnerable, and who in particular is likely to be most affected by climate change. These approaches assess starting-point or contextual vulnerability and are most often used in policy and social development contexts.

Alternatively, political-ecology focuses on the institutional and environmental dimensions of vulnerability with the importance of scale, politics and economic and social processes in the field of human-environmental interactions and outcomes.

2.2.1.3.3. Mitigation and Adaptation Approach

UNFCC's international policy on climate change is divided into two major subjects namely mitigation and adaptation. While mitigation is interested in reduction of greenhouse emission level, adaptation is related to the reduction of negative impacts of climate change. The former is generally the issue of developed countries; the latter is of developing ones.

OECD's Development Assistance Committee has agreed on a standard set of international criteria to guide all evaluations of development assistance. These are: "*relevance, effectiveness, efficiency, impact and sustainability*" (Hedger et al, 2009, p.246).

Effective adaptation intervention will achieve reduction of vulnerability or risk, increase adaptive capacity and enhanced level of protection. Effectiveness both related with adaptation process and outcomes including capacity building, information exchange, and social learning.

Flexibility**;** given the climate change is uncertain and impacts are related to the future world, successful adaptation has to be flexible, should avoid large costs on adaptation, rather aims to improve current climate resilience.

Equity; vulnerability depends on socio-economic factors, which implies that adaptation may reduce vulnerability across groups. Adaptation has two roles such as can strengthen inequalities or may allow protecting vulnerable groups. Hedger et al (2009, p.249) summarize relationships between equity and vulnerability:

- *"Inequalities between sectors, e.g. ecosystems are particularly vulnerable to climate change because of low capacity to adapt*
- *Inequalities between regions, e.g. greater impacts from climate change in small island states compared to developed countries*
- *Inequalities between societies, e.g. cementing the voicelessness of excluded groups or gender inequalities in access to education or healthcare, lowering adaptive capacity."*

Efficiency or cost-effectiveness generally used to compare the costs of alternative ways which aim the same or similar result. Communities have always faced with climate variability with residual risk in the future. Successful adaptation involves investments to reduce these risks and involves projects or programs as well as governments' climate change science for designing incentives and regulations.

Sustainability; follows the long-term viability of the intervention as well as the environmental, social and economic impacts of implementation. Sustainable adaptation covers partnership building, community engagement, education awareness raising and intervention.

2.2.1.3.4. The Sustainability Paradigm

Sustainability is another crucial term within research on vulnerability and resilience. Unlike risk and insecurity, the sustainability concept is characterized by a pronounced awareness of spatiality and, moreover, there is a partial overlap with the concept of resilience. For these reasons, the notion of sustainability is useful for the development of a socio-spatial perspective on vulnerability and resilience.

The core principle of the sustainability concept is that the long-term prevention of life-sustaining natural resources needs to be linked to economic stability, without disregarding social responsibilities. Ecological sustainability mentions the goal of preserving our nature and environment for future generations whereas economic sustainability focuses on the design of an economic system that is appropriate for to long-term and widespread societal prosperity and social sustainability aims to attain societal development.

The sustainability concept, unlike ‘uncertainty’ and ‘risk’, has always an explicit spatial dimension. Crucially, sustainability is more limited in scope than the resilience concept and sustainable development aims, principally, to prevent the emergence of threats. In contrast, according to the literature, resilience frequently refers to the terms ‘resilience creation’ to express both a preventive approach to hazards as well as an adaption to expected threats.

On the other hand, sustainability implies a distinctly long-term time perspective. It underscores the fact that all planning needs to consider the potential effects this action may have in the distant future.

2.2.1.3.5. Resilience approach

The term resilience is firstly introduced in the literature by Holling (1973) in the areas of ecology and stability research. According to Birkman (2012) resilience is related to the notion of resistance and stability and in the field of crises, it implies the reorganization process focusing on the interplay between robustness and stability. Especially in social-ecological systems, resilience notion analyzes crises in social environment and dynamics of ecological assets. In the process of climate change, the context of resilience is the prerequisite of flexible structures to reach an adaptation to climatic impacts also in environmental approaches that focus adaptive capacity, transforming as well as a learning process.

Resilience concept was firstly applied to natural hazard sphere by Mileti (1999) who suggested that resilience is the ability of a community to recover through using its own resources (Cutter et. al. 2010). It refers to the adaptive capacity of social-ecological systems to disturbances not to be subjected to irrevocable results. Resilient regions in this way can stand to shocks and have the ability to restore preferred condition. That means resilient communities can cope with and recover adverse impacts of climate change.

Resilience reflects the ability of an ecological and livelihood system to resist stress or shocks and a resilient community has the ability to adapt different actions as 'response' which performed by a person, household and community individually or collectively (Khanal, 2009, p.380-381).

According to Hudson (2010, p. 12), resilience is "*the capacity of ecosystems, individuals, organizations or materials to cope with disruption and stress and retain or subsequently regain functional capacity and form*".

Wardekker et al. (2010, p. 988), denote resilient system is that "*a tolerate disturbances (events and trends) through characteristics or measures that limit their impacts, by reducing or counteracting damage and disruption, and allow the system to respond, recover, and adapt quickly to such disturbances"*.

Mc Daniels et al. (2008) provide the graphical definition of properties of resilience. (Figure 5) According to their graphic representation, the resilience of a system can be measured by its performance and while the disturbance occurs, systems' robustness can be able to keep the core functions of a system. When a disturbance is ended the system reaches some level of normality called equilibrium, it starts to recover quickly. Resilience can be enhanced by both mitigation and adaptation activities. Mitigation helps to increase the robustness of system on the other hand adaptation can increase the rapidity of recovery.

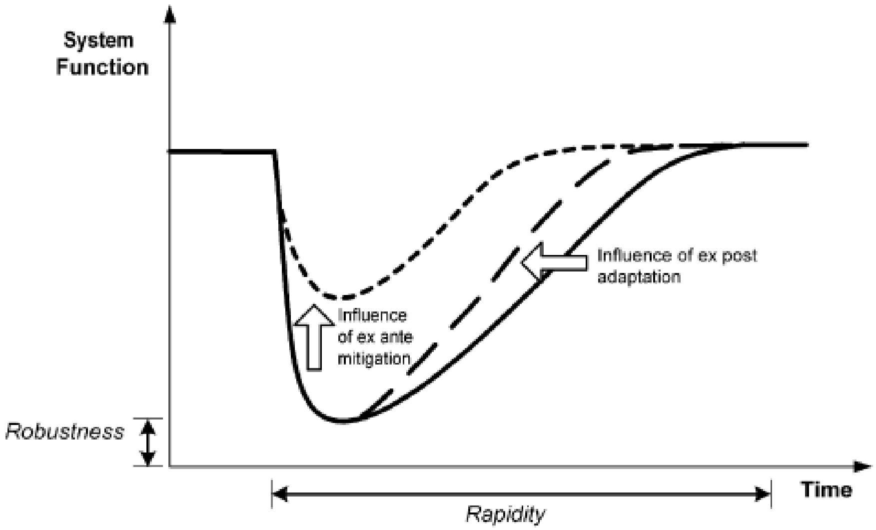

Figure 5: Effects of decision-making on resilience.
(Source: Mc Daniels et al, 2008)

Adaptive capacity and mitigation techniques and planning enable a system's or society's resilience to increase. In hazard research, resilience means the ability to survive and cope with a disaster with minimum impact and damage (Cutter et al, 2008). Resilience generally focuses engineered and social systems and involves measures to prevent hazard-related damage and losses as well as post-events strategies to cope with and minimize disaster impacts (Cutter et al, 2008).

2.2.1.3.5.1.Types of resilience

Different types of resilience that are addressed in the literature require different evaluation methods:

'Ecological resilience' approaches view climate change as dynamic relationships between and within human and natural systems (or social-ecological systems). These approaches recognize that social-ecological systems can exist in a range of states, some of which may be more desirable than others. In applying ecological resilience to climate change the aim is to identify and avoid thresholds that might move a system to a new, less desirable state, or to encourage a system on a trajectory leading to a more sustainable state.

Ecological resilience is influenced by factors like biodiversity, redundancies, response diversity, spatiality, and governance and management plans (Adger, 2006, Cutter et al, 2008a) and understands vulnerability not only in relation to global environmental change also in relation to variety of stresses and shocks in a human environment systems and vulnerability is a part of a system in which humans are in an interaction with biophysical environment. Also, Holling (1973) defined ecological resilience as "*ability to absorb change and disturbance and still maintain the same relationships*".

'Social resilience' has an opportunity to increase through risk awareness and preparedness. Disaster plans, insurance systems and information sharing for aid in recovery process another factor that robust social resilience. Demographic characteristics and access to resources are also crucial for the social resilience.

'Organizational resilience' involves institutions and organizations, as well as the assessment of physical properties of organizations such as number of members, communication technologies, number of emergency assets such as vehicles, hospital beds etc. in addition to these, measurement of organizations' management structure or response to disasters, are other focal points of organizational resilience literature. Like organizational resilience, '*infrastructure resilience'* also involves physical systems for instance number of pipelines, road miles as well as their interdependence on other infrastructure systems. Urban and rural communities depend on series of infrastructural facilities. Resilient infrastructure system as electricity, water, and other public services are important for decreasing the impacts of hazards because they require rescue and relief operations as well as recovery. Interdependency of infrastructure system reduces resilience because discontinuity in one sector impresses other sectors.

'Economic resilience' metrics are generally used for an estimation of loss especially property loss and business disruption after the hazard event. Business disruption is strongly linked with the human role in the operation of business, organizational and institutional entities which occur during a long period of time whereas; property loss measures are taken during a short period of disaster (Cutter et al, 2008).

In addition to these, '*community competence'* is another type of resilience and refers to the attributes of places that promote population wellness, quality of life and emotional health (Norris et al, 2008; Cutter et al, 2008a) and measures communities' coping capacity of pre and post-disaster.

2.2.1.3.5.2.Resilience versus vulnerability

"Vulnerability" and "resilience" are two competing and related concepts in order to assess the sensitivity of coastal systems widely used over the last four decades (DasGupta and Shaw, 2015). Both of these concepts serve as effective tools for rapid decision making and action planning and mutually exclusive; for example, resilient systems are assumed less vulnerable and vice versa (Norris et al. 2008; Miller et al. 2010, DasGupta and Shaw, 2015). The vulnerability is the pre-event, internal capacity or qualities of social systems that constitute the capacity for harm. Resilience is the social system's capacity to respond and recover from disasters, as well as the ability to absorb impacts and cope with an event. Also, it contains adaptive processes that enable the society to reorganize, change and learn after the occurrence of a hazard. Compared with disaster vulnerability, disaster resilience is more proactive and positive expression of community engagement with natural hazard reduction (Cutter et al, 2008a).

According to Birkmann et al. (2011, 25), *vulnerability* comprises conditions and processes that determine the exposure and susceptibility of a system or object to hazards, as well as its capacities to respond effectively to them, be they physical, social, economic or environmental. It is not only external natural hazards such as those arising from climate change that is presumed responsible for a particular form of vulnerability. Instead, internal or societal variables are also decisive factors for vulnerability. Moreover, the definition also explicitly refers response capacities that thus may be separately defined as an aspect of resilience. The intention here is to assess the degree of vulnerability, which does not simply emerge from the interactions between external natural hazards and internal factors such as social inequality. To a great extent, it is also shaped by a system's capacity to deal with threats.

The concept of *resilience* emerged originally from ecology and describes a system's capacity to absorb shocks and disturbances in order to continue existing with as little damage as possible (Birkmann et al. 2011, 17). Therefore the literature has identified three dimensions of resilience. Firstly, the resistance of a system with regards to shocks, or towards gradual changes secondly, its capacity to restore original conditions relatively quickly and finally, the capacity of the system to learn and adapt to changing contexts. In this context, Folke (2006) proposes understanding resilience as a process rather than a state and thus he argues for a consideration of processes of adaptation, learning, and innovation. Existing notions of vulnerability and resilience have generally lacked a theoretical footing; it is also evident that they are based upon an essentialist perspective of the world. While the vulnerability is understood as the de facto susceptibility of systems, resilience is seen as a system's coping capacity.

To represent relationships between vulnerability and resilience, Cutter et al. (2008a) developed a DROP (Disaster Resilience of Place) Model. This model focuses on resilience at the community level with an emphasis on the social resilience of places. While it is a place-based model, exogenous factors such as federal policies and state regulations positively affect resilience on the community level. DROP is designed to present relationship between vulnerability and resilience contrary to some expressions that resilience and vulnerability are oppositional. Cutter et al (2008a) argue in this model that they are not mutually exclusive or totally mutually inclusive. While some characteristics affect only vulnerability or only resilience of a community, some social characteristics affect both vulnerability and resilience such as socio-economic status, education, and insurance.

2.2.1.3.6. Integrated approaches

The vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity (McCarthy et al., 2001). The potential for a system is formed by its exposure to external changes in climate such as temperature, precipitation, extreme events and its internal sensitivity to such changes and capacity to moderate or recover from the impacts of such changes. The integrated status of vulnerability put forth the multidisciplinary nature of the problem while operationalizing it remains challenging because the nature of identifying appropriate metrics for each of exposure, sensitivity and adaptive capacity and combining them to construct a compelling policy narrative on how to adapt to climate change (Preston et al. 2011).

The risk-hazard approach and political economy approach have been combined and extended in various integrated approaches most notably the hazard-of-place model (Cutter et al., 2000; Cutter, 2003; Dolan and Walker 2006, Füssel and Klein, 2006). Integrated approaches to vulnerability research have their roots in ‘geography as human ecology’ and one of their key features is the combination of ‘internal’ factors of a vulnerable system with its exposure to ‘external’ hazards. This can be conceptualized as the interaction of the hazards of place with the social profile of communities. Integrated definitions of vulnerability are widely used in the context of global environmental change and climate change with reference to regions, communities, or other social units. Another important application is vulnerability (or risk) mapping, which is a multidisciplinary approach for identifying particularly vulnerable (or critical) Integrated vulnerability assessments have traditionally focused on physical stressors, such as natural hazards or climate change and some efforts have assessed the combined effects of biophysical and socioeconomic stressors.

Turvey (2007) defines place vulnerability as a multiple function of different factors and determinants (economic, geographic and socio-political) in a given area or geographical domain (local, state, national and regional) so conditions of vulnerability reflect the complex interaction between the physical and societal systems in a geographic space and the scale of analysis. In other words, this approach considers inherent susceptibilities and resiliencies of both biophysical and social environments as an interrelated and interdependent human-environmental system (Dolan and Walker 2006).

Consequently, integrated approaches are a useful tool which is engaged in interdisciplinary vulnerability assessments, specifically those concerned with climate change and for those developing formal models of vulnerability. Their application needs to accept that the diversity of conceptual models and definitions of vulnerability as a reflection of the wide range of valid perspectives on the integrated human–environment system (Füssel and Klein, 2006).

Herewith, defining the situation being assessed, as well as the conceptual understanding of how vulnerability is shaped is important to designing and ultimately communicating the results of an assessment. The decision of which conceptual approach to vulnerability to use in undertaking an assessment will be shaped by a number of factors including the specific policy and research questions being asked, the disciplinary training of those undertaking the analysis, as well as available resources and capacities.

CHAPTER 3

VULNERABILITY ASSESSMENT TO THE IMPACTS OF CLIMATE CHANGE

Environmental hazards are a reality of life over thousands of years, human beings could not be able to predict exactly when it comes, who will be affected most and how severe will be the impacts. It is difficult to detect the success of evaluation of the natural disaster of climate extreme before it happens because adaptation projects are designed according to the disaster probability. Evaluations will usually occur much earlier than the framed scenario and the prospected effects as well as the uncertainty of climate scenarios regarding their climate variability and change. It is now generally accepted that some impacts of climate change and climate-driven hazards are inevitable and varying degrees of regulations will be needed. The understanding vulnerability is central to identifying adaptation needs and developing adaptation policy. However, there is not generally accepted method to assess vulnerability to climate change and the method is necessarily be the area and/or hazard specific but it is crucial for the development of adaptation strategies and increasing sustainability of least developed nations as well as developing ones.

3.1. Importance of Vulnerability Assessment

Vulnerability assessment is a process for assessing, measuring, and/or characterizing the exposure, sensitivity, and adaptive capacity of a natural or human system to disturbance. A range of approaches is available for assessing vulnerability (Fussel and Klein 2006). As illustrated in Figure 6, an "*impact* *assessment*" focuses on understanding biophysical changes in terms of the exposure to future change in climate and sensitivity of the environment to that change. *Vulnerability assessment* is an impact assessment with the addition of socio-economic considerations and non-climatic factors (i.e., all elements of exposure and sensitivity as well as an assessment of adaptive capacity (i.e., all elements of exposure, sensitivity, and adaptive capacity). This approach recognizes that human and ecological systems will have some capacity to respond to the effects of climate change which needs to be considered.

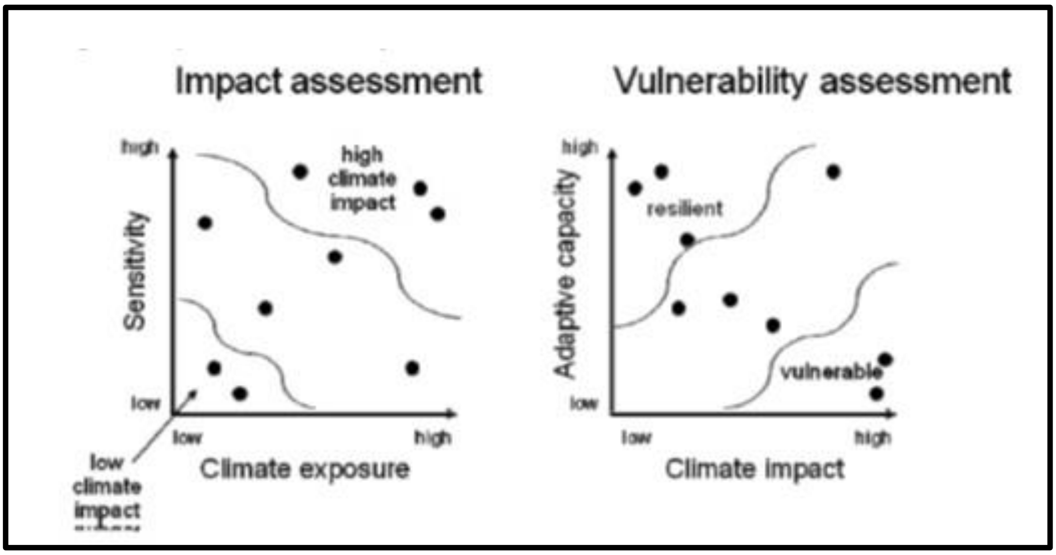

Figure 6: Impact and vulnerability assessment framework.
Source: Harley et al. 2010

Vulnerability assessment reveals many ways of difficulties in measuring something before it happens so it is an ambiguous process. To manage progress and change, evaluation is the focal point and it is essential for many aspects: "*provision of information, accountability, learning, impact assessment*" (Denton, 2009, p: 117) in a context of high uncertainties. In the manner of evaluation, not only results but also process taken into action is important.

According to Birkmann (2012, p.68), vulnerability impact and damage assessment are overlapped and confused but they generally have different meanings. While damage assessment features the real losses such as fatalities, economic losses, and physical infrastructure damage vulnerability assessment should go beyond damages; in addition to this impact assessment also refers positive effects on social groups, specific economic sectors and environment due to the hazard welded events.

The difference between damage and vulnerability assessment can be interpreted according to the time dimension. Damage assessment is focused on a fast investigation to take first aids while vulnerability assessment is associated with the likelihood of injury, loss, disruption of the livelihood and other deficits from extreme events as well as interruptions in recovery. So, susceptibilities of people in different conditions should be defined to express vulnerability. It is also impossible to estimate the vulnerability by means of evaluation of past events but through the analyzing of past events various indicators and criteria should be developed and weighted (Birkmann 2012, p. 69). Thus, vulnerability measurement has a forward-looking perspective as well as processing of past events based data.

Vulnerability assessment is based on social-ecological system and resilience research involves the natural, physical and societal capacities to withstand a short period of time and aims to adapt in the larger term (Duman Yüksel, 2014). The common part of vulnerability and resilience assessments is systems' respond to the climate change.

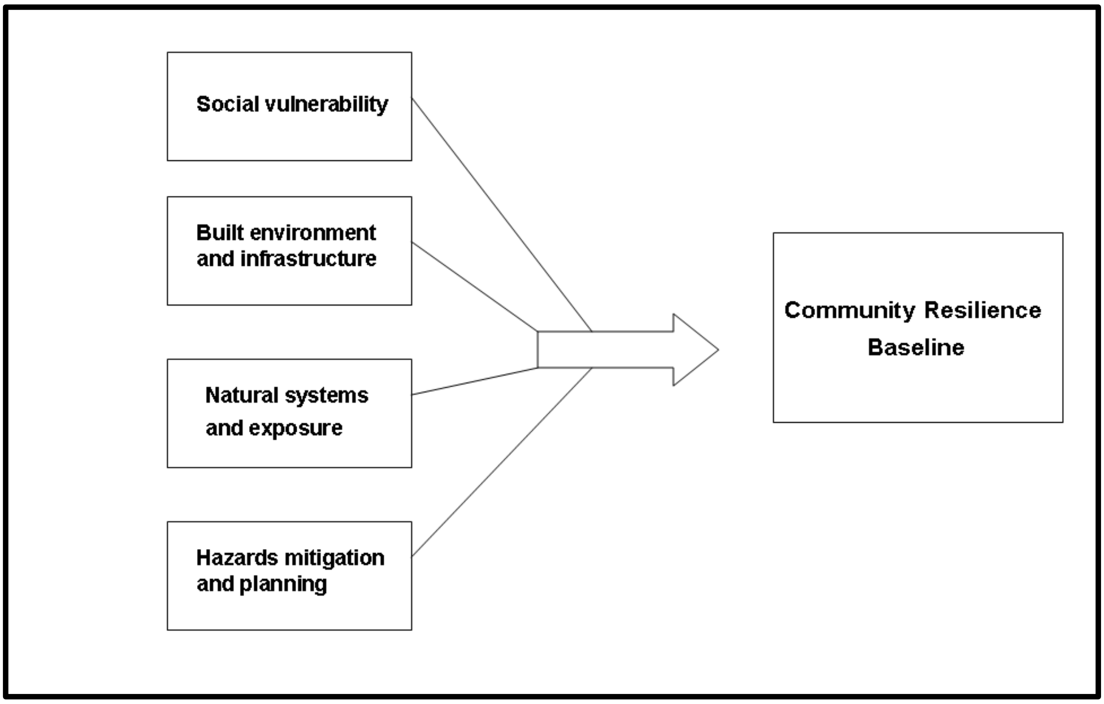

Figure 7: Data Required for Baseline Assessment of Community Resilience (Source: Cutter et al, 2008b)

3.2.Approaches to Vulnerability Assessment

Assessments of climate change impacts and vulnerability vary widely, depending on the subject matter, time frame, geographic coverage and purposes of the assessments thus, a wide range of methods and tools have been developed and applied to facilitate the assessments, with the support of appropriate data and information.

A substantial amount of studies were focused on climate adaptation using **"General Circulation Models"** which seeks to designate potential impacts with the very narrow addressing of regional impacts of climate change. Recent works, on the other hand, address the vulnerability and adaptation assessments within the sphere of climate change. This assessment strategy relies on current climate stress as well as longer term. Because in the long term, communities which are not vulnerable to climate change effects may become more vulnerable whereupon global temperature rises and rainfall patterns etc. So, adaptation strategies firstly aim to yield up current vulnerabilities issue more resilient communities and secure livelihoods that resist impacts of climate change.

Peeling (1999) analyzed the flood vulnerability of urban populations living in coastal developments by means of economic swing and political power struggles to study and his survey and interview data concludes that flood vulnerability is strongly related with political community organization and social capital which is necessary to reduce household's sensitivity to floods.

To assess the vulnerability of Vietnamese coastal communities, Adger (1999) used poverty and dependence of livelihoods on climate-sensitive economic activities as an indicator of household sensitivity to climate impacts and he revealed that by means of Vietnam's liberalization program collective coastal protection schemes and an increase in incomes and resilience of part of the community is achieved.

According to Eakin and Luers (2006) case studies shows that relevance of indicators such as wealth, diversity, participation, equality, and local vulnerability is suspicious and institutional change, policy and social capital has a crucial role in individual and social group vulnerability. Other studies use the method of mapping the theoretical determinants of vulnerability through spatial distribution of differential capacities and sensitivities. Determining and defining of spatial scale, weighting and relevance of particular indicators are important steps and to interpret spatial relationship, surveys and interviews play a crucial role to observe climate change effects on local populations.

Kally et al (1999) developed economic vulnerability including elements of environmental resilience (Vincent and Cull, 2014). Then Turvey (2007) integrated the elements of **composite vulnerability index** involving four sub-indices namely coastal index, peripherally index, urbanization index and vulnerability to natural disasters(Vincent and Cull, 2014).

Many approaches for vulnerability assessment are dealt with a relative vulnerability which searches vulnerability between different groups, entities, and geographic areas. **Disaster Risk Index** is one example and searches for hotspots of vulnerability. These approaches focus mainly on single or composite indicators to measure and estimate vulnerability and risk.

Khanal (2009; p.380) deals with one of the views on vulnerability assessments that is "**The Participatory Vulnerability Assessment (PVA) Method"** to assess vulnerability from climate change variability at the community level. The method involves a systematic process of examining potential risks, community level awareness informing local people on adverse impacts of climate change by means of encouraging participation of stakeholders. A study performed through the consultative process of community groups, natural resource manager experts, and local level project staff and based on experts' inputs, field level discussions and joint work with the community group. Simple ranking matrix was used to determine most vulnerable areas, sectors, and people.

PVA has also been carried out for Turkey at the local level in order to reveal the vulnerable areas in Turkey and to determine the impacts of the climate changeon those areas (The Ministry of Environment and Urbanization, 2010). This research is fulfilled in 2009 and 2010, and identified vulnerabilities against the impacts of climate change at local level in selected 11 provinces. In this research, the impacts on relevant sectors or themes in changing climate conditions were analyzed; sustainability levels of ecosystem services and natural resources were examined and preparedness level against natural disasters originating from the climate was described. The research process was designed for active involvement of local stakeholders to address a climate change adaptation. The participation of the stakeholders was the crucial part of this methodology and it is believed that the development precautionary issues through facilitated consultations can give insights to the framing of the local vulnerabilities.

According to Vincent and Cull (2014) in biophysical or outcome vulnerability assessment it is given little attention to the human factor that people are different and different people respond various ways when they exposed to the same hazard. So, Blaikie et al. (1994) served the term "social vulnerability" to describe an ability to anticipate, resist, cope with and respond hazard. In disaster management, maps of exposure to environmental risk have been used for many years but recently development of spatially referenced indicators such as "**Social Vulnerability Index (SVI)"** became to be used to represent some aspects of vulnerability (Cutter et al 2003; Eakin and Luers, 2006; Cutter, 2008; Ge et al. 2013; Eidsvig et al 2014). SVI evaluates changes in water availability due to climate change in Africa on the basis of economic well-being and stability, demographic structure, global interconnectivity, institutional stability and well-being and natural source dependence. Moss et al (2001) and Vincent (2004) developed "**Vulnerability-Resilience Index Prototype Model (VRIP)"** which used the statistical analysis to select indicators from a wide range of variables covering food sensitivity, human resources, water resource sensitivity and environmental coping capacity.

Brooks et al. (2005) created "**Climate change vulnerability index"** to test the significance of indicators by statistical correlation analysis and two methods were followed to weight the indicators in the creation of vulnerability index: first, all indicators are weighed equally, second indicator weights are decided after consultation with experts.

To estimate and measure vulnerability, collecting reliable, exact and reachable data is a major problem. Often, globally available data is limited and not applicable to the different spatial levels. To solve this problem various ways of collecting data is needed to be used: tangible data including reinsurance companies database on economic losses, reported materials and human loss information due to specific hazards, damage on houses, impact on agriculture, infrastructure, and lifelines; intangible data such as questionnaires or data sampling, interviews, focus group approaches even though it is expensive and time-consuming.

As shown in Figure 8 below, the provision of observational data, as well as characterizations of future conditions on the key environmental and socio-economic variables are essential to the assessment of climate change impacts and adaptation planning. In-situ field measurements and statistical data are useful tools to understand ongoing trends and key processes within and between the natural and socio-economic systems. climate change is the most important factor which determines the vulnerability of communities and natural systems, policy-relevant assessments and adaptation planning need to consider other environmental as well as socio-economic dimensions of vulnerability. Therefore, non-climatic environmental variables namely land use and land cover, natural environment, and air/sea pollutants, as well as socio-economic indices such as demography, employment status, and education level are as important as climatic information as inputs for policy-relevant assessments and informed adaptation decisions.

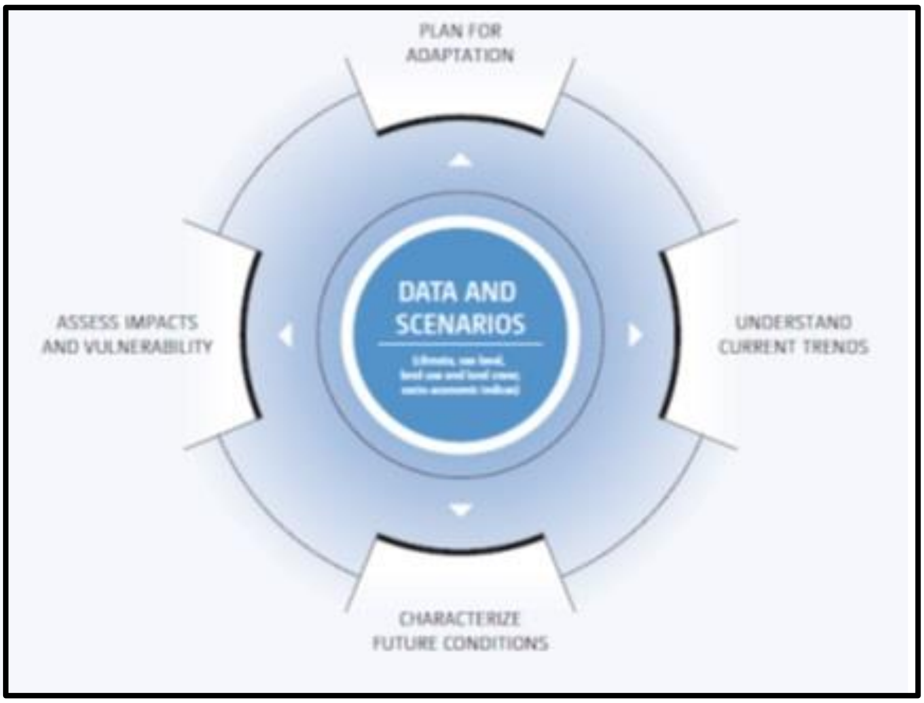

Figure 8: Data and information needs for climate change impacts and vulnerability assessments.
Source: UN, 2011

3.2.1. Spatial Scale of Vulnerability Approaches

3.2.1.1. National Level

UNDP's "**Vulnerability Reduction Assessment (VRA)"** approach is an important element of monitoring and evaluation framework for climate change adaptation projects, especially at national level. It aims to measure the changing climate vulnerabilities of communities and to be comparable across vastly different projects, regions, and contexts, making it possible to determine if a given project is successful or unsuccessful in reducing climate change risks (Droesch et al. 2008).

The VRA is based on a composite of 4 indicator questions, focusing on community perceptions of vulnerability to climate change and capacity to adapt. Responses to the questions take the form of a numerical score, provided by the respondents during these community meetings. Repeated evaluations of community perceptions of project effectiveness and climate change risks permit an indication of the relative change in vulnerability. The VRA is intended to be a flexible methodology for assessing reduction in vulnerability to climate change in varying sectors and in different types of communities.

Frankel-Reed et al (2009, p.294) also define VRA as ***"**an evaluation tool that allows stakeholders to rate behaviors, vulnerabilities, capacities or practices through surveys or interviews on a scale from 1-10 and to provide reasons alongside their scores. Survey questions structured around the VRA build on the vulnerability and hazard factors identified by stakeholders and other assessments undertaken during project development phases (consideration6) monitored throughout a project's lifetime, VRA scores should reveal changes in conditions and the reasons for these changes, as seen through the eyes of stakeholders. Reasons provided n these evaluations can feed into adaptive management and help to describe the role of project activities in progress observed."*

Environmental Sustainability Index Report (ESI) for 2005 is another method of comparison between nations' environmental protection capacity and aims to create a comparative index of national-level environmental sustainability for making environmental management more quantitative and empirically grounded. Index, developed in 2005, based on a compilation of 21 indicators derived from 76 underlying data sets. Indicators enable five categories of issues and these are environmental systems, reducing environmental stress, reducing human vulnerability to environmental stress, societal and institutional capacity to respond to environmental challenges and global stewardship (Esty et al, 2005). In this study, exact sustainable measures are not included but many aspects of environmental sustainability can be measured in relative terms.

Environmental sustainability concept arose from the national resource depletion, pollution, and ecosystem destruction, especially after the industrial period. Other reasons are strongly related with the poverty induced problems of underdeveloped countries. ESI analysis reveals critical determinants of environmental performance such as low population density, economic vitality and quality of governance (Esty et al, 2005).

In this ranking, Turkey is the 91st over 146 countries, environmental sustainability described as "long-term maintenance of valued environmental resources in an evolving human context" (Esty et al, 2005) measuring sustainability is a controversial case. Economists' approach is closely related to accounting which focuses on the maintenance of capital stocks. Environmental sphere shares the natural resource depletion approach having the vision of sustaining current rates of resource into the distant future. ESI view reflects the dynamic condition of society with economic environmental and social senses depend on more than the protection and management of environmental resources.

Parallel with this work, Duman Yüksel (2014) used **Vulnerability-Resilience Indicator Model (VRIM)** in her study that was firstly developed by Moss et al. (2001) to assess the vulnerability of Turkey. VRIM uses vulnerability index as the geometric mean of various measures of sensitivity and adaptive capacity. Sensitivity (settlements, food, ecosystems, health and water) sector and adaptive capacity (economy, human resources, environment, and governance) indicators with two or three proxies are used in VRIM.

The vulnerability of a nation in the future is closely related to not only climate change but also development pattern (IPCC, 2001; Duman Yüksel, 2014). So, vulnerability assessment is crucial for the development of adaptation strategies and increasing sustainability of development of least developed nations as well as developing ones. Duman Yüksel (2014) and IPCC (2001) states that adaptive capacity to climate change is strongly related to sustainable development because of adaptive capacity's constructive effect on sustainable development.

3.2.1.2.Regional Level

Vulnerability and its components of exposure, sensitivity and adaptive capacity first proposed in IPCC's 4th Assessment Report, with this formation regional vulnerability assessment discourse find its place in climate change vulnerability research (Preston et al, 2011). The aim of this assessment is to evaluate preliminary regional spatial vulnerability by using various indicators to identify regions' exposure, sensitivity and adaptive capacity to the extreme weather events.

Regional Vulnerability Assessment (Crick et al. 2012; Torresan et. al 2012) is a way to shape regional climate change adaptation decision making as developing the vulnerability hotspots with the exploration of different elements creating these hotspots. With the help of this method, not only the components of vulnerability at a regional level but also by focusing the key localities analysis and decisions could be shaped at the local level to make further investigation and to narrow the research from various factors to climate-related extreme events. The vulnerability of specific region could then be addressed by proactive decisions centered climate hazard planning rather than by reactive measures after the occurrence of a hazard. The identification of vulnerability hotspots (Crick et al. 2012) can give a vision to policy makers who are able to have insights about sectors, places, and people at risk in a variety of sectors including urban planning and coastal management. But this study should only be concerned as a first step to understanding the vulnerability of a region and allows further research to constitute adaptive capacity of a region.

Regional vulnerability research can also focus on or include stakeholder involvement processes, especially helpful in generating agreement on issues and understanding context-specific aspects of vulnerability and prospective adaptations. Creating scenarios is another increasingly useful method that helps researchers, policymakers, and other stakeholders think about the future and plan options for alternative futures. Current research efforts are emphasizing stakeholder involvement, with a dual focus on vulnerability assessment and social learning in the process; and scenario analyses, which may be expert-defined or stakeholder-driven.

One method that assesses the regional vulnerability is "**The Integrated Regional Vulnerability Assessment (IRVA)"** in which the likely climate impacts are determined through the development of a region-scale climate impacts scenario. This method can assess the way in which the vulnerability of people is influenced by socio-economic institutions and activities (with a focus on the provision of government services) and biophysical resources (Figure 9). The IRVA process attempts to consider the decision-maker centrally, as the point where action can be taken. It offers an integrated view of the relationships people have with the landscape system and the changes in its components (climatic conditions, bio-physical and socio-economic processes), and identifies links between people, institutions and places at a range of scales.

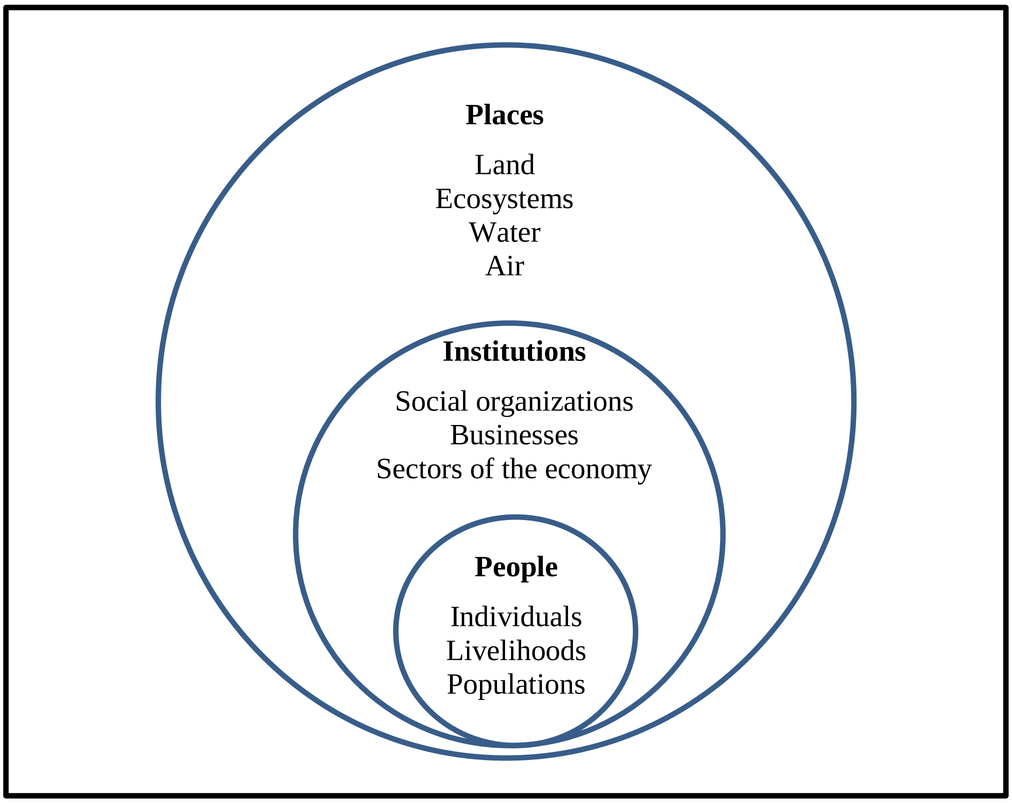

Figure 9: The IRVA assesses the vulnerability of people within the context of socio-economic institutions and activities, and regional biophysical resources, at a range of scales
(Source: Office of Environment and Heritage, 2013)

The IRVA has therefore carried out a regional scale as there is scale appropriate climate modeling and impact information, which allows stakeholders to identify the likely effects of these changes on local socio-economic and biophysical systems. In addition, because the IRVA uses a consistent approach, findings from individual sector or place-based workshops can be integrated across scales. This allows regional vulnerabilities and capacity constraints to emerge. This type of analysis is termed meta-analysis. This analysis accumulates and integrates local study evidence to develop generic relationships, wich help inform public policy at a wider scale.

On the other hand, it is important to recognize that regions are not closed systems, their boundaries are ‘fuzzy’, subject to external influences, and communities often do not recognize administrative boundaries.

3.2.1.3.Household Level

The Sustainable Livelihood Approach (SL) sees poverty as vulnerability to shocks, aims to decrease vulnerability by using methods focusing livelihood assets of households, securing their access to many kinds of assets consequently obtaining household resilience (Osman-Elasha et. al, 2009, p.339). The study seeks to express potential coping and adaptive mechanism and evolving them.

Sustainable livelihoods have a crucial role in refining resilience to climate impacts (Osman-Elasha et. al, 2009, p.341; Hossain et al. 2013). To measure sustainable development, poverty reduction, and ecosystem resilience, there should be a balance between qualitative and quantitative indicators.

Macro and micro scales should support each other by means of scaling up or scaling out for climate change adaptation. At the macro scale, key policy processes are aimed to sustain such as national adaptation planning and relevant national decision making namely poverty reduction, disaster mitigation, biodiversity conservation, water resources, forest management etc to reach them understanding interplay between local livelihood conditions and the range of policies and institutions. These connections constitute the mainstream of sustainable livelihoods approach (Osman-Elasha et. al, 2009, p.342).

Singh and Nair (2014) used this model to construct a livelihood vulnerability index for climate variability and change based on peoples’ perceptions while providing indicators for evidence-based decision-making. The purpose of this study was quantifying stakeholders’ perspectives while capturing interconnected interactions in order to estimate livelihood vulnerability to climate variability or change of poor people. The stakeholders’ perceptions are central to development planning and with the contribution of this index decision makers can access indicators for resource allocation and prioritize development-related activities incorporating stakeholders' perspectives.

In their UNDP Project, Osman-Elasha et al (2009, p.343) were performed a case study research with examples of community-level initiatives through local resilience to drought impacts. Sustainable livelihoods measures were used to investigate the system resilience and community resilience that was studied by using community consultation, word picture construction (description of household circumstances by focusing livelihoods) and local informant validation. Community exercises utilized to develop a criterion for indicator selection.

The tool of "**Livelihood Asset Status Tracking system**" involved quality of life indices related to measuring household resilience both qualitative and quantitative indicators such as income, crop productivity, livestock population, local grain reserves etc.) and qualitative indicators (such as access to forest produce, rangelands, and fertile soil, or access to credit, seeds, and markets) community and individual consultations draw out the set of indicators for each five capitals-natural, physical, financial, human and social (Osman-Elasha et al, 2009, p.346) then, these indicators were integrated and evaluated into assessment sheets for scoring of response.

3.3. Assessment Indicators

Birkmann (2012, pp.55-56) states that measuring vulnerability doesn't refer to the quantitative approaches also targets to develop all types of methods to make vulnerability practical and applicable consisting qualitative criteria, quantitative indicators, and institutional aspects. 2005 World Conference on Disaster Reduction held in Cobe mention the need of indicators as: "….*develop systems of indicators of disaster risk and vulnerability at national and sub-national scales that will enable decision-makers to assess the impact of disasters on social,* *economic and environmental conditions and disseminate the results to decision-makers, the public and population at risk(UN, 2005:9*"

According to Gallopin (1997, p.15) indicators are defined as "*variables representing complicated functions of the primary data*" based on these definitions Birkmann (2012, p.57) states that "*a variable which is an operational representation of a characteristic or quality of a system able to provide information regarding the susceptibility, coping capacity and resilience of a system to an impact of an albeit ill-defined event linked with a hazard of natural origin".*

Indicators can be a single variable or an aggregated measure. The UN Development World Water Development Report cited that an indicator can be a single variable or data or a processed set of data (UNESCO 2003:3, p.33; Birkmann (2012, p.58).

Traditional literature on indicators characterize the features of them as simplification, comparison of places and situations, the foresight of future condition and trends, assessment of condition and trends associated with goals and trends (Gallopin, 1997; Birkmann 2012, p. 62).

In the literature, there are many methodological issues to use indicators. Niemeijer (2002) classified these approaches as inductive (data driven) and deductive (theory driven). In inductive approach some related indicators are selected across a wide variety of indicators then, expert judgment is used to finalize the selection process (Kaly et al. 1999; Vincent and Cull, 2014) or statistical analysis could be used. Also weighing of indicators which reflect the drivers of vulnerability are driven by either expert judgment or by Multi- Criteria Decision Analysis.

Data-driven indicators are served as proxy variable basic examples of which are deaths or financial losses from disasters. The need for testing vulnerability against given outcome requires vulnerability indicators but there is no such tangible element of vulnerability (Vincent and Cull 2014). Deductive method could possibly be the alternative way by means of using existing theoretical insight into the nature and causes of vulnerability to select related variables. But practically there is limited data to test these variables. Indicators can be combined to form indices as composite or aggregate. This addresses to the subjectivity of indicator selection but reflects its characteristic of literately based and transparency.

To develop the set of indicators it is important to formulate goals and the success of an indicator can be measured by its capacity to reflect the characteristic of a system. To make vulnerability measurement be a part of decision making, process indicators should enhance to integrate vulnerability reduction strategies into preventive planning. Indicators need to lead decision-making process thus the principal aim of defining and measuring vulnerability should aim to reduce it.

The development of indicators to measure vulnerability has to be based on some criteria:

Table 1: Standard criteria for indicator development
(Source: Birkman 2006b, p: 65)

• measurable • relevant • represent an issue that is important to the relevant topic • policy-relevant • only measure important key elements instead of trying to indicate all aspects • analytically and statistically sound • understandable • easy to interpret • sensitivity; be sensitive and specific to the underlying phenomenon • validity/accuracy • reproducible • based on available data • data comparability • appropriate scope

Vincent and Cull (2014) express the indicators as one method of assessing the vulnerability to climate change and can be designed to use at from country level to the smaller units: provinces, districts or communities. Community-level indicators especially based on household level data with the help of informed stakeholders' opinion.

Proxy or indirect indicators are used when the impact is difficult to directly calculate or its lifespan goes beyond the project duration. Context indicators are related to the scale of the study area from the household to the national level. Because the household level is the critical unit for poverty reduction outcomes reducing the vulnerability of the climate change risks impacts. Ordered by UNDP, Disaster Risk Index was aimed to analyze potential links between vulnerability to natural hazards and levels of development (Peduzzi et al, 2009). It contains national level indicators while rates of access to potable water data are the local level indicator.

"Composite Indicator" is manipulation of individual variables to produce an aggregate measure of disaster resilience (Cutter et al 2010) qualitative and quantitative measure of an indicator helps to simplify the complex situation and derived from observed facts. Individual variables or thematic sets of variables are transformed into composite variables through mathematical operations leads different dimension of concept that is completely different from the previous indicator which is not operated.

Indicators are context specific and it is almost impossible to transfer to different types of analysis. To design clear and reliable vulnerability indicators firstly clear conceptual framework is needed to be developed then assumptions and sources of data should be established and indicators should be selected apparently (Vincent and Cull, 2014). According to Schroeter et al. (2005) vulnerability assessments should have five criteria: a knowledge base from various disciplines and stakeholder participation, be place-based, consider multiple interacting stresses, examine differential adaptive capacity and be prospective as well as historical (although this is not in agreement with those above that believe current vulnerability is an appropriately suitable proxy).

In addition to these, due to the fact that vulnerability is multidimensional and time and scale specific, developing an indicator or an index at a specific time is impossible to reflect or display ongoing evaluation of various dimensions at the same time to capture the correlation between different driving forces. Thus, updating them regularly is needed to identify the change over time.

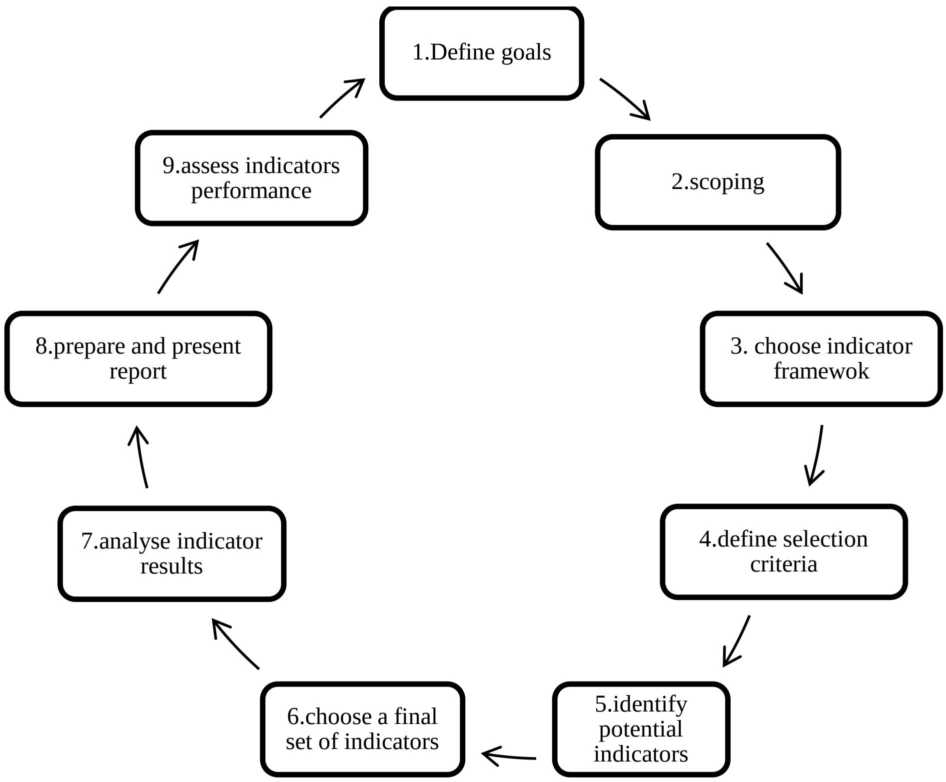

Figure 10: Standard criteria for indicator development
(Source: Birkman 2006b, p:64)

CHAPTER 4

COASTAL VULNERABILITY AND SPATIAL PLANNING

4.1.Coastal Vulnerability

4.1.1. Theoretical Frame

Projected climate change, including sea-level rise and associated changes in frequency and/or intensity of storm surges and erosion, threaten human and natural systems at coastal areas in various ways (EEA 2012) and expected to have significant impacts on the physical, social, environmental and economic environments of coastal cities and settlements. Low-lying coastal areas, deltas, and countries are generally densely populated places and their social, ecological and economic components are vulnerable to various threats: anthropogenic and natural. Anthropogenic processes can be categorized as urbanization, industrialization, and related effected such as pollution, water consumption, levee construction etc. whereas natural processes, exemplified by sea-level rise, precipitation, storm surges, the tide etc.

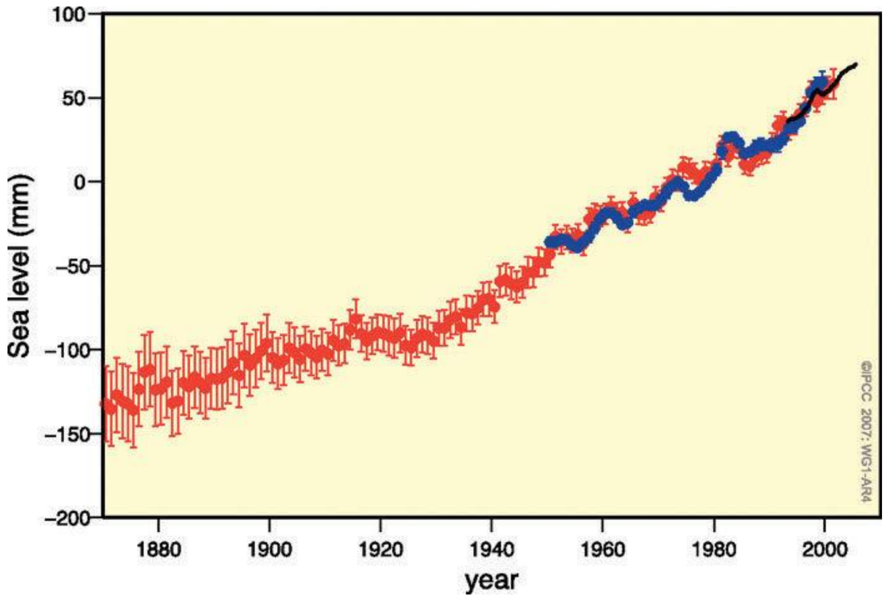

Figure 11: Annual averages of global mean sea level in millimeters from 1870 based on tide gauge and satellite data. The red curve shows sea-level fields; the blue curve displays tide gauge data and the black curve is based on satellite observations.
(Source: IPCC 2007; Burkett and Davidson 2012)

Coastal areas are complex systems with their internal (which originate from inside of the area itself and impact it) and external (which affect the area but originate outside of it) processes (see figure 12) There are highly interrelated economic, ecologic and social components. So, threats within the specific coastal area as well as external threats from integrated systems and overall climate must be determined concurrently to specify the degree of vulnerability.

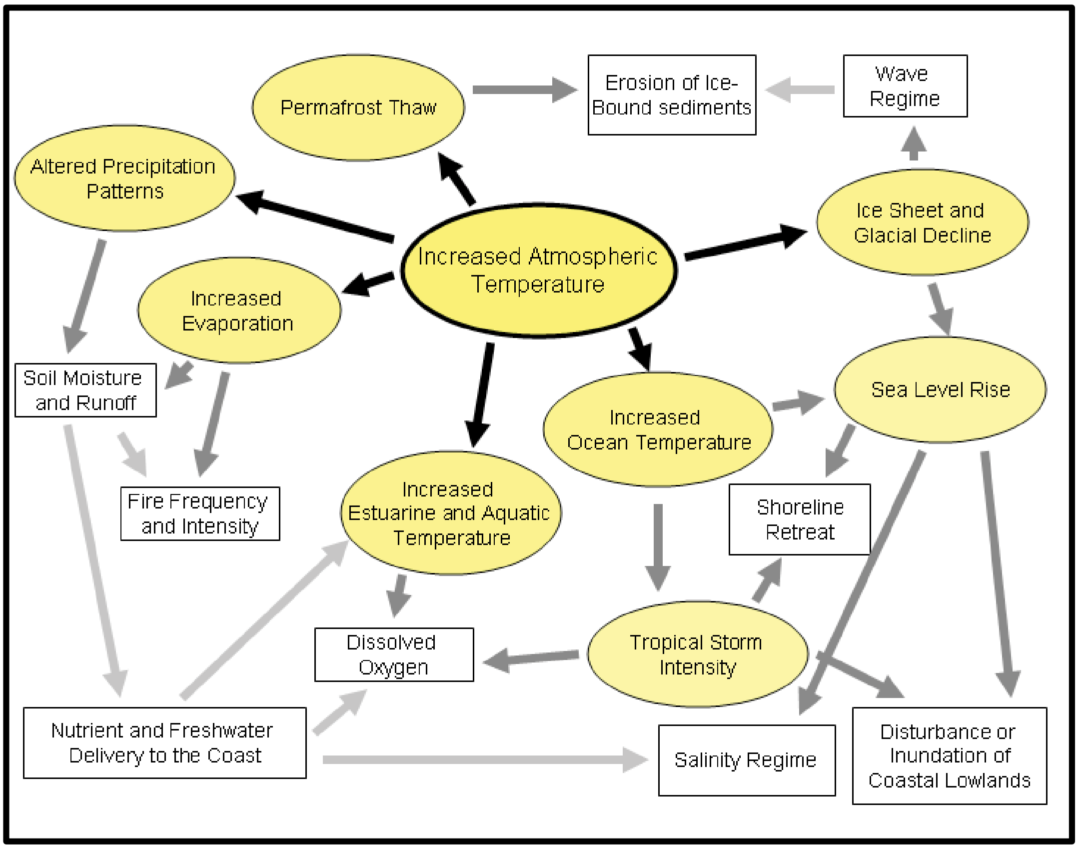

Figure 12: Schematic diagram showing the main impacts of climate warming and the effects on coasts.
(Source: Burkett and Davidson, 2012)

The IPCC-CZMS (1992) defines vulnerability of coastal zones by their degree of incapability to cope with the impacts of climate change and accelerated sea-level rise. Vulnerability assessment includes the susceptibility of the coastal zone to climate-induced physical changes, the expected impacts on socio-economic and ecological systems, and available adaptation options (Dolan and Walker, 2006).

Wolterz and Kuenzer (2015) represented the concepts of vulnerability, resilience, coping and adaptive capacity in a way to applied for a coastal river delta (see figure 13). The socio-ecological system of coastal river delta is shown as a triangle. The color of the triangle designates the overall status of the coastal system (healthy/undisturbed/unthreatened=green, disturbed/threatened=yellow, majorly disturbed/severely threatened=red). The coastal river delta in situation A is stable and resilient: an ‘ideal’ situation with components having the high coping capacity to different threats. Situation B shows threaten coastal river delta by external processes (thick black arrows). In Situation C, intensifying threaten impacts gradually erode the coping capacity. So coastal area becomes less resilient and more vulnerable to these impacts, hence the degree of coping capacity is still above a certain threshold because of the strong interrelationships of each component. Situation D visualizes a recovering coastal river delta system, after threats seen in situation C. available resources are used (adaptive capacity) to restore the lost coping capacity, the degree of adaptive capacity is diminished. Situation E shows major threat from impacts the river delta is subject to. The area is now vulnerable because the coping capacity of certain components has eroded to almost below the threshold line without enough adaptive capacity to bolster these components. Finally, Situation F shows a very vulnerable river delta, indicated by the red triangle. The coping capacity has eroded below the threshold, may lead to a complete loss of the social and economic component of a delta.

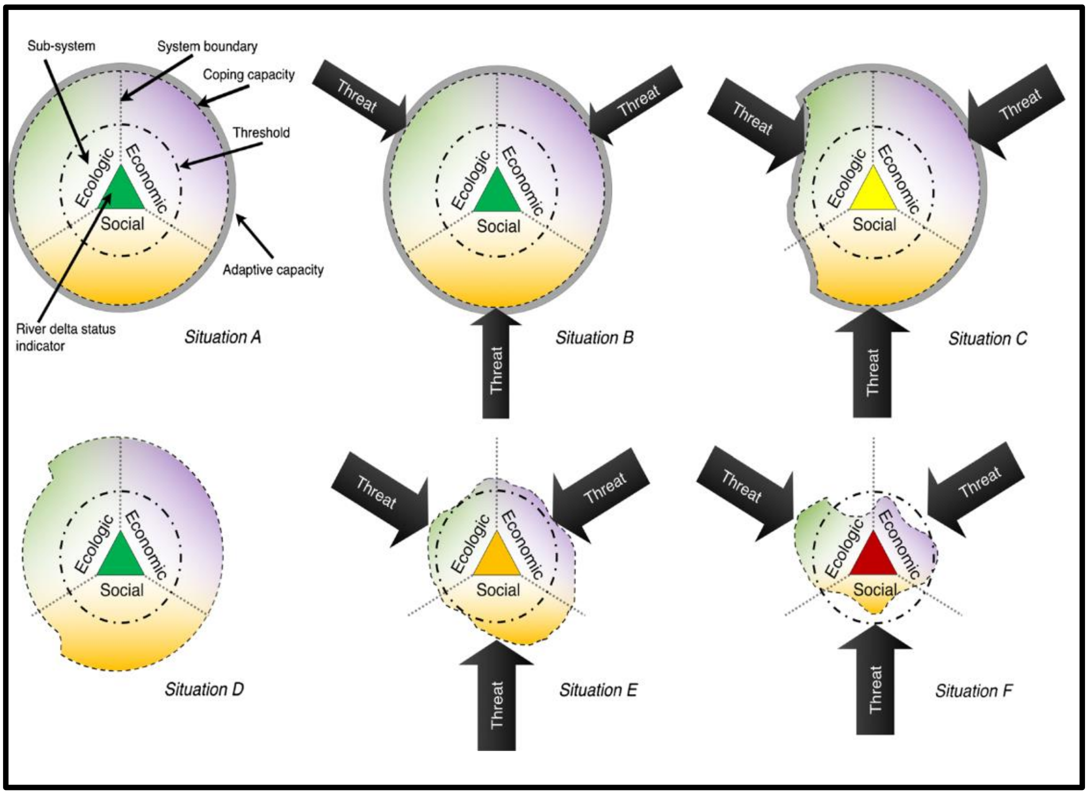

Figure 13: A graphical representation how vulnerability and related terms influence the state of a river delta and its ecologic, social, and economic social components
(source: Wolterz and Kuenzer, 2015)

Coastal areas seem particularly vulnerable to climate change impacts as they are exposed to both extreme climate events and sea-level rise (IPCC, 2007). This vulnerability is exacerbated by the accumulation of multiple stressors and increasing human-induced pressures such as growing population and urban development. The rich biodiversity, land fertility and abundance of natural resources diverted the attention of human to the coastal areas. The increasing concentration on coastal areas for development purposes results increasing vulnerability (Cutter et al. 2007, Cutter 2008). Coastal uses to develop new dwelling units and recreational space, industrialization, transportation facilities like port, harbor etc. negatively affect the vulnerability of these regions.

Table 2: Climate and non-climate drivers of coastal change
(Source: Burkett and Davidson, 2012)

Climate drivers:	**Non-climate drivers:**
Sea-level change • Waves and currents • Winds • Storminess(frequency, intensity, track) Atmospheric CO2 concentration Atmospheric temperature Water properties(temperature, pH, turbidity, salinity Sediment supply Groundwater availability	Tides Vertical land movement(tectonic, glacial isostatic, sediment compaction, fluid withdrawal) Coseismic uplift or subsidence Tsunami Human development and management actions (urbanization

Climate change is increasing the frequency of natural disasters with progressive impacts on the health and resilience of coastal ecosystems and the global economy. Sea level rise; extreme weather events; increased flooding; and the degradation of freshwater, fisheries and other coastal resources could impact so many people. This occurs especially in areas which are densely populated coastal zones and where households are highly dependent on coastal resources. Initial National Community plan of UNFCC in April 1999 stated that coastal zones and agricultural sector were identified as most vulnerable socio-economic sectors. IPCC Fourth Assessment projected a rise of 0.2–0.6 m sea level by the year 2100 unless greenhouse gas emissions are reduced substantially (IPCC 2008). As sea level rise is happening, the ability to accurately identify low-lying lands is a critical factor for assessing the vulnerability of coastal regions (Gilmer and Ferdana 2012, p:26; Torresan et al. 2012).

Table 3: Summary of climate change observations and trends in coastal zone (Source: USAID, 2007)

Coastal Impact	Observations	Projected Trends
Sea Level Rise	• For the 20th century, sea levels rose at a rate of 1.7 to 1.8 mm/yr • In the last decade, the worldwide average rate was measured to be 3.0 mm/yr • Coastal erosion is increasingly observed around the world; it can be related to either sea level rise or subsidence, or both	• Sea levels are expected to rise by at least 0.6 meters by the century's end; glacial melt is expected to increase this rise • Coastal flooding could grow tenfold or more by the 2080s, affecting more than 100 million people per year due to sea-level rise, especially in Southeast Asia • It is projected that seawater intrusion due to sea-level rise could severely affect aquaculture in heavily-populated mega-deltas, such as in Southeast Asia • A 2°C increase in temperature could result in the loss of a number of island states
Sea Surface Temperature Change	• Between 1970 and 2004, sea surface temperatures around the planet rose between 0.2-1.0°C, with a mean increase of 0.6°C • The Caribbean Sea has warmed by 1.5°C in the last 100 years • Observations since 1961 show that the ocean has been absorbing more than 80% of the heat added to the climate system	• By 2100, temperatures are projected to rise in the tropical Atlantic (2-4°C), Pacific (1.5-3.5°C) and Indian (3°C) Oceans • Increases in sea surface temperature of about 1-3°C are projected to result in more frequent coral bleaching events and widespread mortality
Increased Frequency of Extreme Weather Events	• Increases in category 4 and 5 tropical cyclones, hurricanes and typhoons during the 20th century have been reported • Tropical cyclone activity has increased since 1970, with a trend towards longer-lived storms and storms of greater intensity	• Models project a likely increase of peak wind intensities and increased mean and peak near-storm precipitation in future tropical cyclones • The population exposed to flooding by storm surges will increase over the 21st century, especially in South, Southeast and East Asia
Precipitation Change	• Precipitation has increased by up to 10% in the Northern Hemisphere and decreased in other regions (e.g., North and West Africa, parts of the Mediterranean and the Caribbean) • The frequency and severity of drought has increased in some regions, such as parts of Asia and Africa • Very dry areas have more than doubled since the 1970s • Australia incurred over US$13 billion in drought damage between 1982-2003	• Projections for Latin America show a general year-round drop in seasonal precipitation of up to 60% with the greatest effects felt in Mexico and Central America • Precipitation change is very likely to increase the frequency of flash floods and large-area floods in many regions In Tarawa, Kiribati, it is projected that drought damages could reach 18% of the gross domestic product by 2050
Ocean Acidification	• Since 1750, an average decrease in pH of 0.1 units has been observed	• It is projected that the pH of the world's oceans could fall by up to a further 0.3 – 0.4 units by 2100, resulting in the lowest ocean pH levels in 20 million years

Ramieri et al (2011) summarized biophysical effects of sea level rise in Table 5. These factors may induce a wide variety of socio-economic impacts on coastal areas such as, increased loss of property and coastal habitats, flood risk and potential loss of life, damage to coastal protection works and other infrastructure, loss of renewable and subsistence resources, loss of tourism, recreation, and transportation functions, loss of non-monetary cultural resources and values and impacts on agriculture and aquaculture through decline in soil and water quality.

Table 4: Most significant bio-physical effects of sea level rise including relevant interacting climate and non-climate stresses.
(Source: Ramieri et al. 2011)

<table>
<tr><th colspan="2" rowspan="2">Bio-geophysical effect</th><th colspan="2">Other relevant factors</th></tr>
<tr><th>Climate</th><th>Non-climate</th></tr>
<tr><td colspan="2">Permanent inundation</td><td>Sea level rise</td><td>Vertical land movement (uplift and subsidence), land use and land planning</td></tr>
<tr><td rowspan="2">Flooding and storm damage</td><td>Surge (open coast)</td><td>Wave and storm climate, morphological change, sediment supply</td><td>Sediment supply, flood management, morphological change, land claim</td></tr>
<tr><td>Backwater effect (river)</td><td>Run-off</td><td>Catchment management and land use</td></tr>
<tr><td colspan="2">Wetland loss (and change)</td><td>CO_2 fertilization, sediment supply</td><td>Sediment supply, migration space, direct destruction</td></tr>
<tr><td rowspan="2">Erosion</td><td>Direct effect (open coast)</td><td>Sediment supply, wave and storm climate</td><td>Sediment supply</td></tr>
<tr><td>Indirect effect (near inlets)</td><td></td><td></td></tr>
<tr><td rowspan="2">Saltwater intrusion</td><td>Surface waters</td><td>Run-off</td><td>Catchment management and land use</td></tr>
<tr><td>groundwater</td><td>Rainfall</td><td>Land use, aquifer use</td></tr>
<tr><td colspan="2">Rising water tables/impeded drainage</td><td>Rainfall</td><td>Land use, aquifer use</td></tr>
</table>

To protect coastal areas and their components, the degree of vulnerability should be assessed. In the climate change sphere, the coastal vulnerability was first mentioned as a major issue and the aim was to highlight the importance of adaptation as well as climate change mitigation (Romieu et al. 2010) then a coastal vulnerability assessment within globally driven coastal studies considered basically sea level rise impacts and storm or hurricane events.

Briefly, assessing a coastal area's vulnerability to the impacts of climate change needs to clarify: "*1) the climate projections for a given region or locale, 2) what is at risk (climate change exposure and sensitivity), and 3) the capacity of society to cope with the expected or actual climate changes (adaptive capacity)*". The combination of these three factors gives us the vulnerability of people in a place to climate change (USAID, 2007).

Climate change impacts and risks on coastal zones are strictly associated with regional geographical features, climatic and socio-economic conditions and impact studies related to these areas should be performed at the local or at most, at the regional level (Torresan et al 2012).

The coastal area's ecological, social, and economic components are vulnerable to a wide variety of natural and anthropogenic threats. Starting from here, in this research, coastal vulnerability assessment studies in the literature are classified according to their focus in the empirical work on ecological or, geophysical, social, economic and socio-economic and were depending on their spatial scale, temporal resolution, and numerous other research characteristics. Studies mainly focused on aspects such as flora or fauna species, location, and vigor of the wetland or coastal area and/or geophysical properties are qualified as ecological or geophysical assessment studies and these studies are mentioned roughly. Coastal vulnerability assessments based on geophysical properties are taking place extensively in the literature and these studies generally stand in engineering research and focus on the aspects of parameters of tidal range, soil type, bathymetry, land surface elevations, etc. The principal aim of this research is to discuss the assessment methods considering socio-economic aspects target to reveal the most vulnerable communities and settlements. So the location of a settlement, land use characteristics, population density, demographics, type of economic activity, adaptation and mitigation efforts etc are designated as main measurement parameters.

4.1.2. Categorization of Assessment Methods

4.1.2.1.Component Considered

The CVI (Coastal Vulnerability Index) method that was used by Gornitz (1991), Gornitz et al. (1994), and Thieler and Hammar-Klose (1999) is a well-known method to assess vulnerability in coastal areas, and after these studies, some researchers have used it to assess vulnerability in coastal river delta areas as well. Since the CVI method originally only includes geophysical parameters, Cutter et al. (2003) underscored the addition of social, and economic factors related characteristics in to get better results. Thatcher et al. (2013) employed this method by including a range of economic parameter pertaining to commercial and residential building values, public works locations, as well as social parameters such as urban pixel density and population density, using datasets such as statistical measurements and census data, combining them with geophysical parameters from the CVI from a previous coastal vulnerability assessment by Pendleton et al. (2010). Thatcher et al. (2013) take forward CVI and designed CEVI (Coastal Economic Vulnerability Index).

Pendleton, Thieler, and Williams (2010) and Pendleton *et al.* (2010) developed a CVI to designate the physical effects of sea level rise at regions of Gulf of Mexico, US. According to this study a range of vulnerability assigned from low to very high to assess a coast’s potential susceptibility to physical change as sea levels rise. The local physical characteristics such as geomorphology, shoreline-erosion rate, tidal information, coastal topography, mean wave height, mean tidal range, and local relative sea level rise rate are the determining factor of vulnerability map which the CVI results include.

Ozyurt and Ergin (2010) used the method of Thieller and Hammar- Klause (1999) as a starting point to assess the coastal vulnerability of Göksu Delta. CVI-SLR method utilizes human influence parameters as well as physical parameters to measure the susceptibility of the delta to the sea level rise.

The concept of vulnerability is closely connected with humans and society so anthropogenic effects can not be kept separately. Studies mainly based on social aspects are Panray et al (2009), Wilhelmi and Morss (2013), Zhou et al. (2014) are used Vulnerability index, Integrated Assessment of societal vulnerability and Social Vulnerability Index (SVI) assessment methods. Family status, in-house provision, house structure, house supplies, housing age, buildings heights, and types of building structures, GDP, population density, savings, gender, age structure, education, unemployment, employment structure (primary, secondary, and tertiary industries), etc are the basic indicators that were chosen to evaluate the vulnerability of coastal areas.

Besides the studies focusing specifically on the geophysical aspects of an ecologic component, other aspects of the ecologic component (also flora and fauna related aspects) can be seen in the literature. For example, the study of Hossain et al. (2013) focused on natural assets (fisheries, mangrove, deer and bird, cropland and grassland) of Nijhum Dwip, Bangladesh as well as human, physical and social assets. Hereher (2015) signified biotic component, which delineates the fauna/flora ecosystems that are threatened by a sea-level rise in South Sinai, Egypt as an ecological component.

Firstly Hoozemans et al. (1993) highlighted the implication of socio-economic components focusing risk factors especially people at risk zone and wetlands that have been threatening to loss. Global Vulnerability Index (GVA) which is based on IPCC Common Methodology was used to evaluate the study area to characterize future assessments of vulnerability. Parallel to this study, Eidswig et al (2014), Cutter et al (2003), Rufat (2013), Abdrabo and Hassaan (2015) used local or regional case areas comparatively assessed in a current situation.

The study of Li and Li (2011) is an important example of socio-economic assessment model considers various vulnerability factors comprehensively. Aiming to assess the risk of storm surges in a Guangdong Province, this method betrays the comparison of the coastal cities' vulnerabilities in the region to guide the land use of these cities in the future. Evolving from the model of coastal vulnerability assessment proposed by Gornitz, they developed assessment index system having five vulnerability assessment indicators social economic index, land use index, eco-environmental index, coastal construction index, and disaster-bearing capability index.

4.1.2.2.Temporal Scale

Coastal studies mainly undertake the current moment vulnerability of a specific area or region (Frihy and El-Sayed, 2013, Frihy, 2003, Fatorić and Chelleri, 2012, Sánchez-Arcilla et al., 2008) but some of them assessed current and future vulnerabilities. Sales Jr. (2009) analyzed the vulnerability of social groups among the coastal population in Cavite City, Philippines, with their adaptive capacity to cope with the impacts of climate variability and extremes of sea level rise. As a data source, participatory research tools and techniques, interviews and consultation workshops are distinguished. Outcomes of this research reveal that the most vulnerable communities are natural source dependant ones for their livelihood because these sources are vulnerable to climate variabilities. Moreover, income level and dependency rates are other important factors affecting vulnerability but local governments' planned adaptation activities are shown as the factors that increase the community resilience. Also, studies suggest a local framework to mainstream climate change adaptation strategies and actions for integrated coastal management (Sales Jr. 2009, Yoo et al, 2011, DasGupta and Shaw, 2015).

As the temporal scale considered, in their research Ge et al. (2013) analyzed the social vulnerability of the Yangtze River Delta in China for the years 1995, 2000, 2005, and 2009 was calculated by using a PPC (projection pursuit cluster) model. Nine socio-economic parameters extracted from census data and normalized. This model is a technique used to seek out a linear projection of multivariate data and the PPC method is designed to reveal clustering characteristics in multivariate high dimensional data.

4.1.2.3.Scenario Based

Sea level rise is important to the impact of climate change and many studies focused their assessments based on sensitivity to sea level rise (Thatcher et al. 2013, Ozyurt and Ergin, 2010, Li and Li, 2011, Pendleton et al. 2010) apart from these studies in their research Yoo et al, (2011) framed the main climate exposures as sea level rise, heat wave and heavy rainstorm and sensitivities to these components are measured separately given in adaptive capacity.

The case study mentioned by Panray et al. (2009, p.363) assesses vulnerability and resilience of coastal villages of Maurutis and the assessment associates with climate change and sea level rise. With sea level rise Maurutis is expected to face with a land loss on account of beach erosion, damages on coastal infrastructure, degradation of coral reefs and loss of wetlands etc.

Various sea level rise scenarios have been used in the different coastal vulnerability assessment studies in the literature Rao et al. (2008), El-Raey (1997), Torresan et al (2012), Frihy and El-Sayed (2013). For example; Boateng (2012) in his study searched coastal vulnerability of Vietnam based on three sea-level rise scenarios firstly, IPCC (2007) scenario which is the estimation of 1 meter rise by the year 2100; secondly by 2100, 2 meters sea level rise according to Pfeffer, et al.

(2008), and the last and worst case scenario of 5 meters (Vaughan 2008). On the other hand, in the work of El-Raey (1997) which was designed to assess the coastal zone of the Nile delta, Egypt settlements namely Alexandria, Rosetta, and Port-Said, for every settlement different sea-level rise scenarios was operated.

Snoussi et al. (2008) in their study with the different worst case and best case sea level rise scenarios and they associated them with socio-economic impact scenarios. The socio-economic impacts were based on two possible alternative futures: first 'worst-case' scenario, obtained by combining the 'economic development first' scenario with the maximum inundation level; and second, 'bestcase' scenario, by combining the 'sustainability first' scenario with the minimum inundation level.

Birkmann et al (2012) used HQ-100 scenario and its spatial coverage as basic information to assess the exposure of people to floods in urban areas in Cologne, Germany. Flood risks are mainly addressed in spatial planning through the designation of flood-prone areas and to determine these designated flood-prone areas, spatial planning at the regional scale draws primarily on the HQ-100 flood events. This scenario represents a flood that statistically occurs once every 100 years.

4.1.2.4.Data Considered

Vulnerability assessments are often data driven so data availability determines the extent of the assessment. Choosing the right data sources are important for vulnerability assessments, as each data type has different strengths and weaknesses. In-situ field measurements, Census data, earth observation data, statistical measurements, data supplied by other sources (institutions or authors) stakeholder consultations, household surveys are commonly distinguished in the literature.

Earth observation data is utilized often in the vulnerability assessments like satellite images, specifically either multispectral data or radar data (often in the form of Digital Elevation Models, DEMs). Examples of assessments that use earth observation data are mainly El-Raey (1997) Sherly et al (2015), Mahapatra et al (2015), Van der Veen (2005), Ozyurt and Ergin (2010), Gornitz, et al. (1990) Gornitz, et al. (1994) and Frihy and El-Sayed (2013).

Census data is used by predominantly the studies that are conducted in developed countries that have accessible census data and focus on socio-economic aspects. Studies that consider socio-economic aspects but do not have access to census data are more reliant on third party databases. Census data contains much data about socio-economic system components and is easily converted to parameters for vulnerability assessments. Examples of assessments that use census data are the highly social focused studies such as Cutter et al. (2003), Birkmann and Fernando (2008), Sherly et al (2015) and Mahapatra et al (2015).

Rufat (2013) used this kind of data to visualize **socio-economic indicators like** the proportion of persons less than 10 years old and over 75 years old, the proportion of disabled persons, details about employment status and Per capita income etc., in the study areas namely Lyon, France, and Bucharest, Romania. Also, Birkmann et. al. (2012) considered surveys as a main data source for Cologne to measure susceptibility and Coping capacity indicators.

Other types of data that are used mainly in the coastal vulnerability assessment studies are in- situ field measurements and data from measurement stations. Data from measurement stations is used to estimate the degree of vulnerability of the coastal areas due to upstream natural and anthropogenic influences, such as Boori et al. (2010) and Torresan et al. (2012). Frihy (2003) and Sánchez-Arcilla et al. (2008) used in-situ field measurements to acquire a greater insight in the geophysical properties.

4.1.2.5.Methods Used

This part of research describes the methods most commonly used to assess coastal vulnerability to climate change. Assessment methods can be described in two main categories: Index-based methods and indicator-based methods. They are characterized by methodological differences, although a sharp distinction is not always evident.

Index-based approaches express coastal vulnerability by a one-dimensional, and generally unitless, risk/vulnerability index. This index is calculated through the quantitative or semi-quantitative evaluation and the combination of different variables. These approaches are not immediately transparent since the final index does not enable the understanding of assumptions and aggregations that led to its calculation. A clear explanation of the adopted methodology is, therefore, essential to support the proper use of index-based approaches. Indicator-based approaches, in contrast, express the vulnerability of the coast by a set of independent elements via indicators or variables that characterize key coastal issues such as coastal drivers, pressures, state, impacts, responses, exposure, sensitivity, risk, and damage. These indicators are in some cases combined into a final summary indicator. This approach allows the evaluation of different aspects related to the coastal vulnerability within a consistent assessment context.

4.1.2.5.1. Index-based methods

These assessment methods are based on several forms of the coastal vulnerability index (CVI) including some slight modifications to adapt the index to local specificities. The most important constraint of this method is the incapacity to address socio-economic aspects such as a number of people affected, infrastructure potentially damaged and economic costs in the assessment of coastal vulnerability (Gornitz et al., 1993; McLaughlin and Cooper 2010). To overcome this constraint, two main possible approaches are available: (i) use of the original CVI index in association with other indicators and integrated indices able to more properly represent the complexity of the coastal system; (ii) modify/extend the original formulation of the CVI also taking into account socio-economic systems. Mendoza and Jimènez (2009) developed a methodology to assess coastal vulnerability at regional and local scales, focusing on the impacts of storms. More precisely, flooding and erosion were taken into account separately and then integrated into a single CVI to storms. GIS-based analysis also enables the overlap of CVI results with other spatial information such as layers representing coastal defense measures, population density, urbanization indices, and ecological and/or biodiversity values. Thus, GIS supports the integrated analysis which is crucial in coastal vulnerability assessment.

4.1.2.5.1.1.Coastal Vulnerability Index – CVI

The Coastal Vulnerability Index (CVI) is one of the most commonly used and simple methods to assess coastal vulnerability to sea level rise, in particular, due to erosion and/or inundation (Gornitz *et al*., 1991). The CVI provides a simple numerical basis for ranking sections of coastline in terms of their potential for change that can be used to identify regions where hazard risks are at considerable level. The CVI results can be displayed on maps to highlight regions where the factors that contribute to shoreline changes may have the greatest potential to contribute to changes to shoreline retreat. The first methodological step deals with the identification of key variables representing significant driving processes influencing the coastal vulnerability and the coastal evolution in general (Gornitz et al., 1991). As successively described, the number and typology of key variables can be slightly modified according to specific needs; in general CVI formulation includes 6 or 7 variables then quantification of key variables. Afterwards, key variables are integrated into a single index, proposed and tested for the derivation of the final CVI.

4.1.2.5.1.2.Coastal vulnerability index for sea level rise – CVI (SLR)

Özyurt (2007) and Özyurt et al. (2008) developed a CVI to specifically assess impacts derived from sea level rise. The index is determined through the integration of 5 sub-indices, each one corresponding to a specific sea level rise related impact. The author applied this methodology to the Göksu Delta in Turkey, where the five considered SLR impacts were: coastal erosion, flooding due to storm surges, permanent inundation, salt water intrusion to groundwater resources and salt water intrusion to rivers/estuaries. Each sub-index is determined by the semi-quantitative assessment of both physical and human influence parameters and each parameter may contribute to the definition of more than one sub-index. A value ranging between 1 and 5 is assigned to each parameter, in relation to its severity and contribution to the vulnerability of the analyzed coastal system.

4.1.2.5.1.3.Composite Vulnerability Index

Szlafsztein and Sterr (2007) formulated an index combining a number of separate variables that reflect natural and socio-economic characteristics that contribute to coastal vulnerability due to natural hazards in the coastal area of Brazil. Selected indicators can differ in number, typology, and scales of evaluation according to the study area. Once selected, indicators are aggregated according to an appropriate set of weights. First of all, with respect to the two existent vulnerability dimensions, the parameters that characterize them can also be classified as natural and socioeconomic variables. The classification of all the coastal information has been greatly aided by the development of GIS applications as well as integrated remote sensing applications and separated GIS-layers are overlaid and the variable scores combined into natural and socio-economic vulnerability indices, which when combined represent the total vulnerability index considering the following 'natural' parameters: coastline length and sinuosity, continentality in terms of coastline density into municipal areas, coastal feature (estuarine, beach etc.), coastal protection measures, fluvial drainage, flooding areas. Socio-economic parameters considered were: total population and total population affected by floods (both divided into age classes), a density of population, non-local population (i.e. born elsewhere but living in considered areas), poverty, municipal wealth.

Khan (2012) searched Hutt Valley's (New Zealand) vulnerability to floods through scores of Statistics New Zealand and the New Zealand Deprivation Index (NZDep 2006) by comparison of the results of **principle component analysis [PCA]** and **composite vulnerability index [CVI]**. Because inductive data is limited to the use of census data indicators are also selected from existing literature and theories. In total 38 initial proxy indicators are used for vulnerability assessment in the Hutt Valley that is varied in the categories of demographic, social and economic.

4.1.2.5.1.4.Social Vulnerability Index

Social vulnerability to natural hazards was firstly divided into socioeconomic and built environmental vulnerability in the study of Zhou et al. (2014) and using factor analysis, they identified the dominant factors that influence the provincial social vulnerability in China to natural hazards based on the socio-economic and built environmental variables in 2000 and 2010. They calculated Socioeconomic Vulnerability Index (SeVI) and built environmental vulnerability index (BeVI) scores for studied province, then with a simple algorithm results were aggregated into an SVI, where SVI = Se-VI + BeVI.

Eidsvig et al (2014) used the SoVI (Social Vulnerability Index) method from Cutter et al. (2003), with improving and categorizing socioeconomic parameters namely **"Vulnerable elements**" such as Children below 5 years and people above 65 years of age, people with language and cultural barriers, rural populations who are dependent on the surrounding natural resources for their primary source of income, high-density populations, people without a post-secondary education, housing type, critical infrastructure; **"Preparedness and response"** for instance the risk awareness of the population, the early warning capacity of the society, the stringency of regulation control and the extent of emergency response procedures, the emergency response; and lastly "**Recovery"** parameter with the indicators of Personal wealth, Insurance and disaster funds, quality of medical services.

Orencio and Fujii (2013) proposed a new approach to creating an index for a disaster-resilient coastal community at the local level and developed a tool by prioritizing national-level components of a risk-management and vulnerability-reduction system. They used Analytic Hierarchy Process (AHP) which is a methodological approach to decision-making that can be applied to resolve highly complex problems involving multiple scenarios, criteria, and actors. An outcome framework for disaster-resilient coastal communities was designed based on priority components which included environmental and natural resource management, human health and well-being, sustainable livelihoods, social protection, financial instruments, physical protection and structural and technical measures and planning regimes.

Sustainable livelihoods model (SLA) introduced by Hossain et al. (2013) which was conducted to identify human, physical, financial, natural and social assets to analyze fishing community resilience. They suggested that SLA may play a leading role in analyzing adaptive capacity to climate change through livelihood asset analysis at the community level. The results of this study conclude that livelihood assets analysis related to fishermen resilience requires greater examination of the interaction among households on how to allocate their own resources and services to their family members and consideration can develop a better understanding of climate change adaptation in a fishing community context.

4.1.2.5.1.5.Multi-scale coastal vulnerability index

McLaughlin and Cooper (2010) introduced a multi-scale CVI, incorporating erosion impacts, which can be applied to other climate change induced impacts, too. The index integrates three sub-indices: (i) a coastal characteristic sub-index, describing the resilience and coastal susceptibility to erosion, (ii) a coastal forcing sub-index, characterizing the forcing variables contributing to wave-induced erosion, (iii) and a socioeconomic sub-index, describing targets potentially at risk. The computation of each sub-index is determined on the basis of various variables, whose specific identification (number and typology) depends on the considered application scale. Figure 14 illustrates the variables used to derive the three sub-indexes inNorthern Ireland (at the national scale. Authors applied the CVI index with their sub-indices to the regional and the local scale, too; in these cases, a selection of the national scale variables was used.

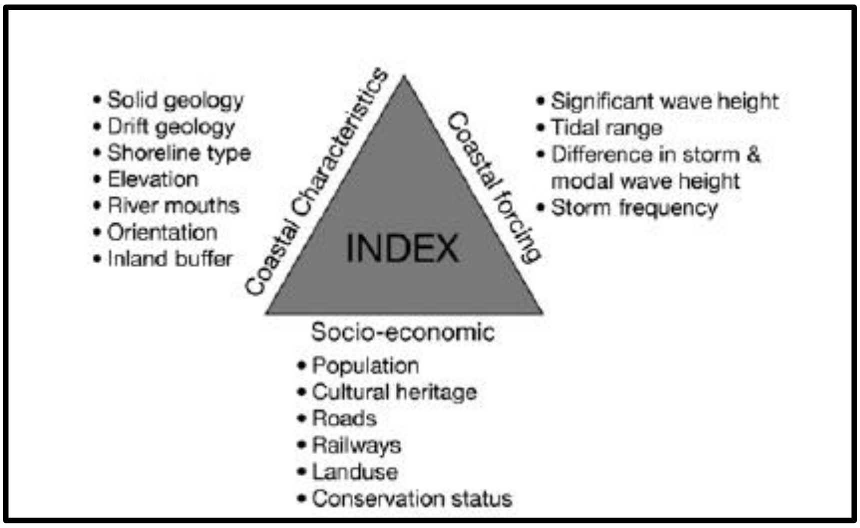

Figure 14: Variables used for the national scale application in Northern Ireland (Source: McLaughlin and Cooper, 2010).

This CVI index is rather easy to calculate and can be applied to various spatial scales, thus supporting multiscale analysis that is important for coastal planning and management (McLaughlin et al., 2010). Besides the characterisation of physical elements, the CVI also integrates socio-economic elements. However, this component does not always significantly influence the overall index score, probably because the socioeconomic sub-index depends on variables that in some or even many cases are dichotomous variables.

4.1.2.5.2. Indicator-based methods

Indicator based studies essentially reduce the complexity of the measuring progress enables comparative analysis among different places and guide decision makers (Cutter et al 2008a). Coastal urban areas differ from coastal rural areas in terms of community dependence on coastal ecosystems services so the socio-ecological way of system resilience arises. Rural dependency on coastal areas particularly in declining economies often makes human-environment relation unsustainable (DasGupta and Shaw, 2015). Thus, loss of coastal ecosystem services negatively affects rural communities' capacity to cope with a crisis. Therefore, a new set of appropriate indicators is required to assess the resilience of the resource-dependent rural communities in the low-lying coastal areas instead of the traditional indicators used in the earlier frameworks (Cutter et al. 2010).

To assess disaster resilience of coastal rural communities, more specifically in the low-lying Asian mega deltas DasGupta and Shaw (2015) developed a set of appropriate indicators along with a comprehensive framework. In this study, the initial phase of identification of appropriate indicators involves extensive background literature survey dealing with community resilience against natural disasters, the final list of major dimensions, indicators and variables were developed after an iterative discussion with the local stakeholders such as local government officials and community groups. Five major indicators and twenty-five variables were framed under key dimensions of coastal resilience namely socio-economic, physical (structural), institutional, coastal zone management (ecological) and environmental/natural resilience. By using these indicators they measured the intrinsic capacity of the community (community competency) with respect to an external stress and further, it also fasten disaster recovery.

Li et al (2016) developed a vulnerability assessment tool for assessing coastal vulnerability and making prescriptive recommendations on urban planning in coastal regions at a local level. The framework of vulnerability analysis of the Haikou coastal zone identified the assessment indicators that influenced the coastal vulnerability due to the aspects of exposure, sensitivity, and resilience. The results demonstrate that vulnerability was not evenly distributed across Haikou's coastal zones, which may be linked to the different stages of ongoing urban planning for coastal Haikou and vulnerability tends to increase with higher levels of urbanization. With the operation of Turner Vulnerability-Assessment framework, the study applies 9 indicators to analyze the vulnerability of the case area with quantification of the Exposure Indicator (EI), Sensitivity Indicator (SI) and Resilience Indicator (RI). Respectively, EI reflects the extent of human activities and includes data on; land urbanization, population urbanization and tourism development. SI reflects the conditions of the natural and geographical environments, in addition to traffic accessibility levels and includes data for; digital elevation modeling geological hazards and traffic conditions. RI represents the resilience of the ecosystem, which includes; natural habitats, coastal-type data, and services. To quantify the EI, SI, and RI, a Vulnerability Indicator (VI) can be assessed and compared among different communities.

The study of IMHEN (2011) uses a ‘comparative vulnerability and risk assessment’ (CVRA) methodology and framework which is a useful approach to presenting quantitative estimates of the risks that climate change poses, at both the regional and the local level for estimating aggregate vulnerability for five dimensions, these being: population; poverty; agriculture and livelihoods; industry and energy; urban settlements and transportation. This approach is based on the generally accepted IPCC approach to vulnerability assessment for the natural system, in combination with a risk-based approach for assessing the impacts of natural hazards such as flooding, inundation and sea level rise on human systems. Placing social vulnerability within the context of risk, and viewing biophysical vulnerability and risk as broadly equivalent, provides a relatively simple framework for assessing both the comparative geospatial and sectoral vulnerability on the Mekong Delta.

Table 5: Categorization of Coastal Vulnerability Assessment Methods

SOURCES	CATEGORIES										
	STUDY AREA	COMPONENTS CONSIDERED	PROCESS CONSIDERED	SPATIAL SCALE	TEMPORAL SCALE	DATA USED	METHOD OF INDICATOR SELECTION	ASSESSMENT METHOD	SCENARIO	WEIGHING OF INDICATOR	ASSESSMENT INDICATORS
Frihy (2003)	Nıle Delta-Alexandrıa Coast	Geophysical	Natural	local	Current situation	in-situ field measurements					soil accretion and erosion rates (extracted through EO data), predicted changes in sea level, tectonic faults and earthquake locations and severity
Fatorić and Chelleri (2012)	Ebro Delta (Spanish Mediterranean)	Geophysical	Natural	local	Current situation	stakeholder consultations, data supplied by existing studies, earth observation data,				Assessor	Temperature, annual precipitation, average monthly wind speed, annual average wave height, sediment levels, relative sea level rise
Rao et al. (2008)	Andhra Pradish coast, India	Geophysical	Natural	local	Current situation	earth observation data		coastal vulnerability index (CVI)	0.59 m sea-level rise (IPCC,2007)		coastal geomorphology, coastal slope, shoreline change, mean spring tide range significant wave height
Sánchez-Arcilla et al. (2008)	Ebro Delta (Spanish Mediterranean)	Geophysical	Natural	local	Current situation	in-situ field measurements			1. wave direction (scenario W0D90) W0D110) 2.wave height (scenario W10D0) (W-10D0)		increases in inundation/flooding, decreases in storm return periods, coastal erosion, salinity intrusion, and changes in wave climate (wave height, direction, and storminess
Boori et al. (2010)	Apodi River (Atlantic Ocean, Northeast Brazil)	Geophysical	Natural	local	Current situation	earth observation data, statistical measurements	using assessment models	coastal vulnerability index (CVI)		Expert	Geomorphology, shoreline change rate, coastal slope, means tide range, mean Significant wave height and SLR.
Thieler and Hammar-Klose (1999)	US coastal regions	Geophysical	Natural	national	Current situation	statistical measurements, data supplied by other sources (institutions or authors)	using assessment models	coastal vulnerability index (CVI)			coastal geomorphology, regional coastal slope, and shoreline erosion and accretion rates, rate of relative sea-level rise, mean tide range, mean wave height
Gornitz, et al. (1990) Gornitz, et al. (1994)	U.S. Atlantic Coast U.S. southeast	Geophysical	Natural	Local and comparative	Current situation	In situ field measurements, earth observation data		coastal vulnerability index (CVI)		expert opinion	relief (elevation), lithology (rock type), coastal landforms, geomorphology, vertical land movements (relative sea level changes), horizontal shoreline changes (erosion and accretion), tidal ranges, wave heights.
Boateng (2012)	coastal zone of Vietnam	Geophysical	Natural	national	Current situation	earth observation data		Flood risk assessment	sea-level rise: 1. 1 meter (by 2100; IPCC 2007), 2. 2 meters (by 2100; Pfeffer, et al. 2008), 3. 5 meters (worst case scenario Vaughan 2008)	Assessor(qualitative) and automatic(quantitative)	Flood layers

Table 5 (continued)

Pendleton et al. (2010).	22 National Park Service sea- and lakeshore units(US)	Geophysical	Natural	national	Current situation	data supplied by other sources (institutions or authors)	using assessment models	coastal vulnerability index (CVI)			tidal range, ice cover, wave height, coastal slope, historical shoreline change rate, geomorphology, and Historical rate of relative sea- or lake-level change.
Ozyurt and Ergin (2010)	Goksu Delta	Geophysical	Natural and anthropogenic	local	Current situation	statistical measurements, in-situ field measurements, earth observation data	using assessment models	coastal vulnerability index sea-level rise (CVI-SLR)		No weighing	**Physical:** rate of SLR, coastal slope significant wave height, sediment budget, tidal range, proximity to coast, type of aquifer, hydraulic conductivity etc. **Human influence:** reduction of sediment supply, river flow regulation, engineered frontage, grounwater consumption, land use pattern, coastal protection structures etc.
Frihy and El-Sayed (2013)	Nile River Delta	Social and Highly Geophysical	Highly natural	local	Current situation	Census data, earth observation data, statistical measurements, in-situ field measurements		Qualitative risk assessment	Sea level rise 0.5 m and 1 m Copenhagen Accord 2009 (UN/UNFCCC 2009)	Not mentioned	Population density Tourism and recreation activities agricultural land ports and transportation Geology and tectonics Land subsidence Shoreline morphodynamics
DasGupta and Shaw (2015)	Indian Sundarbans	Geophysical highly Socio-economic	Natural and anthropogenic	Regional and comparative	Current	survey	Stakeholder and expert opinion	composite resilience index		Survey respondents	**Socio economic**: demography, livelihood, health, social capital, education and awareness. **Physical:** transportation, residential infrastructure, electricity, tele-communication, water and sanitation. **Institutional**: laws and policy, coordination, energy response, adaptive action, governance, emergency response, adaptive action, governance. **Coastal zone management**: embankment and shoreline, mangrove management, coastal bio-diversity conservation, coastal pollution control, coastal land use. **Environmental/natural:** frequency of natural disaster, climate components, geo-physical components, bio-geochemical components
Torresan et al (2012)	North Adriatic Sea (Italy)	Geophysical and Socio-economic	Natural and anthropogenic	Regional	Current situation	statistical measurements, in-situ field measurements	expert opinion	regional vulnerability assessment (RVA)	0.6m for sea level rise inundation 2m for storm surge flooding. 59 cm as higher sea level rise scenario at the global scale	expert opinion	Elevation, Distance from coastline, Artificial protection, Vegetation cover, Coastal slope, Geomorphology, Dunes, Sediment budget, Mouth typology, Wetland extension, Urban typology, Agricultural typology, protection level
Mclughlin and Cooper (2010)	Northern Ireland	Geophysical and Socio-economic	Natural and anthropogenic	Local and comparative	Current situation	In situ field measurements, earth observation data		Coastal Vulnerability Index Coastal characteristics+ Coastal forcing + *Socio-economic sub-indices*			**Coastal charactheristics**: solid geology, drift geology, shoreline type, elevation, river mouhs, orientaion, inland buffer **Coastal forcing**:significant wave height, tidal range, difference in storm and modal wave height, storm frequency ***Socio-economic* attributes**:population, cultural heritage, roads, railways, landuse, conservation status.
El-Raey (1997)	Alexandria, Rosetta and Port-Said- (coastal zone of the Nile delta, Egypt))	Highly Geophysical and Socio-economic	Natural and anthropogenic	Regional	Current situation	In situ field measurements, earth observation data, statistical measurements, survey			Various sea-level rise scenarios for each city		

Table 5 (continued)

Sherly et al (2015)	Mumbai, India	Geophysical and Socio-economic	Natural and anthropogenic	local	Current situation	earth observation data, Census data		Vulnerability Index(VI)		Data envelopment analysis (DEA)	**Social and Socio-economic:** Total population, Number of households, Female population, Children < 6 years, Illiterate people, Illiterate females, Main cultivators, Marginal workers, Nonworkers, Slum, Hotels, banks, restaurants, malls, private companies, and buildings **Infrastructure and critical facilities:** Water treatment plant, School, Hospital, Institutes, Fire station, police station, Subway, Road, railroad track, train station, airport, harbor, Public building, Power station, Refinery **Adaptive capacity:** Total literate/illiterate ratio, Female literate/illiterate ratio, Total workers/nonworkers ratio, Female workers/nonworkers ratio, School, higher education, Hospital, Fire station, police station, Skyway, overpass, road, train station, airport, harbor, public buildings, Religious institutions
Mahapatra et al (2015)	South Gujarat coast, India	Geophysical and Socio-economic	Natural and anthropogenic	local	Current situation	earth observation data, Census data, statistical measurements		integrated coastal vulnerability index (ICVI): physical vulnerability index (PVI) + social vulnerability index (SVI)		analytical hierarchical process (AHP)	**physical variables**: coastal slope, Coastal, landforms/features, Shoreline change rate, Mean spring tidal range, and Significant wave height. **Social variables**: population density of adjacent coastal villages, land use/land cover, proximity to road network and settlement
Snoussi et al.(2008)	Moroccan Coast	Geophysical and Socio-economic	Natural and anthropogenic	Local and comparative	Current situation	In situ field measurements, earth observation data		Integrated Assessment (IA)	-Sea-level rise from 200 to 860 mm in 2100, with a 'best estimate' of 490 mm Warrick et al. (1996) inundation level 2meter and 7 meter -Economic development first scenario, Sustainability first scenario		Coastal topography, land use
Panray et al(2009)	Mauritis	Social	Natural and anthropogenic	Local	Current situation	Questionnaires		Vulnerability index			Family status, in-house provision, house structure, yard/compound, house supplies, bio-geophysical and socio-economic impacts.
Wilhelmi and Morss (2013)	Fort Collins, Colorado, U.S.	social	Natural and anthropogenic	Local	Current situation	Census data, statistical measurements		Integrated Assessment of societal vulnerability			**Exposure**: Fort Collins precipitation data, Front range watersheds boundaries, NWS flash flood guidance values for 07-28-97 **Sensitivity:** Physical disadvantages (residents with disabilities and over 65 years old), Linguistic disadvantages (linguistically isolated households) **Coping capacity** Access to resources residents living below poverty level) **Outcomes:** Threats and damages to people and property
Zhou et al. (2014)	China	social	Natural and anthropogenic	National Provinces compared	Time series(2000 and 2010)	Census data, statistical measurements	Existing studies	Factor analysis(FA), Social Vulnerability Index(SVI) = socioeconomic vulnerability index(SeVI) +built environmental vulnerability index (BeVI)		equally weighted, Cutter et al. (2003)	housing age, buildings heights, and types of building structures, GDP, population density, savings, gender, age structure, education, unemployment, employment structure (primary, secondary, and tertiary industries), urbanization (rate), medical services, transportations, and lifelines

Table 5 (continued)

Van der Veen (2005)	South Holland Province	Economic	Natural	local	Current situation	statistical measurements, earth observation data					
Thatcher et al. (2013)	Northern US Gulf Coast (US)	Socio-economic	Natural and anthropogenic	Regional and comparative	Current situation	statistical measurements, in-situ field measurements, Census data		Coastal Economic Vulnerability Index (CEVI)	a mean global SLR of 18–59 cm between 1990 and the end of the 21st century (IPCC (2007)	No weighing	**Economic:** Infrastructure building value **,** Commercial building value **,** Residential building value **,** Population density **,** Urban pixel density **Physical**: geomorphology, shoreline change rate, regional coastal slope, relative sea-level change rate, mean wave height, and mean tide range
Khan (2012)	Hutt Valley, New Zealand	Socio-economic	Natural and anthropogenic	Regional and comparative	Current situation	Census data	existing literature and theories	Comparison of principal component analysis [PCA], composite vulnerability index [CVI]		Comparison of with and without weight	**Demographic**: Population distribution, crowding, gender, age, disability and migration. **Social**: Family type, education, language, Ethnicity. **Economic** :Income, source of income, employment, occupation, housing condition, communication
Li and Li (2011)	Coasts of Guangdong Province (South China Sea)	Socio-economic	anthropogenic	Regional and comparative	Current situation	statistical measurements,		coastal vulnerability index (CVI)-assessment index system			**social economic index**: factors of population, industrial output value, agricultural output value, buildings, roads, land use index: farming, forestry, aquaculture, and salt industry **eco-environmental index:** factors of beaches, wetlands, and mangroves **coastal construction index**: factors of seawalls, harbors, wharfs, and coastal facilities **disaster-bearing capability index**: factors of financial revenue, investment of tide-prevention engineering, and labor population
Sales, Jr. (2009)	Cavite City (Philipinnes)	Socio-economic	anthropogenic	Local and comparative	Current and future	stakeholder consultations			1 meter accelerated sea level rise		income level, employment status, gender, degree of dependent people, evacuation and health facilities, planned adaptation strategies etc.
Yoo et al, 2011	Busan (South Corea)	Socio-economic	anthropogenic	Local and comparative	Current	statistical measurements, survey, earth observation data		Delphi Method – Dimenson Index(DI)			**Sensitivity to sea level**: Percentage of flooded area, population density and population at age 65 and over **Sensitivity to heavy rainstorm and heat wave:** sectors' sensitiveness (agricultural land, forest/wetland/ grassland, commercial areas, residential area, industrial area etc) **Adaptive capacity**: economic capability, area of green cover, medical service, water resource accessibility, awareness level to climate change, governance and institutional capability
Ge et al. (2013)	Yangtze River Delta (China)	Socio-economic	anthropogenic	Local	Time series	census data	Statistical (projection pursuit cluster model (PPC)	Social Vulnerability Index (SVI)		No weighing	population growth, percentage of rural and urban population, regional per capita GDP, average household size, percentage of females, GDP per square kilometer, investment in fixed assets per square kilometer, per capita income, and the number of hospital beds per 1000 inhabitants
Birkmann and Fernando (2008)	Batticaloa and Galle (Sri Lanka)	Socio-economic	Natural	Local and comparative	Current situation	Survey, Census data, statistical measurements					**Susceptibility and exposure**: *Gender and age(dead and missing) Exposure: housing damage inside and outside the 100-metre zone.* **coping capacities and difficulties in recovering:** Land title and recovery(ownership) Knowledge and social networks, *Knowledge of the hazard, Social networks(*consisting of networks, membership of community-based organizations, relationships of trust and reciprocity, and access to wider institutions in society), receipt of financial support after the tsunami

Table 5 (continued)

Eidsvig et al (2014)	Grevena (Greece), Andorra la Vella(Andorra), Barcelonnette(France) Sla˘nic(Romania); Grevena(Greece), Skien and Stranda (Norway)	Socio-economic	Natural and anthropogenic	Local and comparative	Current situation	Census data, survey/questionnaire, other studies		Socio-Economic Vulnerability Index (SoVI)		expert opinion	**1. Vulnerable elements**: Children below 5 years and people above 65 years of age, People with language and cultural barriers, Rural populations who are dependent on the surrounding natural resources for their primary source of income, High-density populations, People without a post-secondary education, housing type, critical infrastructure. **2. Preparedness and response**: The risk awareness of the population, The early warning capacity of the society, The stringency of regulation control and the extent of emergency response procedures, The emergency response. **3. Recovery**: Personal wealth, Insurance and disaster funds, Quality of medical services
Cutter et al(2003)	U.S. counties	Socio-economic	Natural and anthropogenic	Local and comparative	Current situation	Census data	factor analysis (principal components analysis)	composite social vulnerability index (SoVI)			Personal Wealth, Age, Density of the Built Environment, Single-Sector Economic Dependence, Housing Stock and Tenancy, Race, Ethnicity, Occupation, Infrastructure Dependence
Rufat (2013)	Lyon, France, and Bucharest, Romania	Socio-economic	Natural and anthropogenic	Local and comparative	Current situation	Census data, survey/questionnaire, other studies		relative vulnerability assessment			**socioeconomic indicators:** prop of less than 10 year old, prop of persons over 75 years old, prop of disabled persons Management, Professionals Technicians, Civil servants and employees, Self-employed, Skilled workers, Unskilled workers, Per capita income, Long-term unemployment. **housing supply and facilities indicators**: Lack of running water, Lack of sewerage, Lack of domestic gas, Lack of electricity, Lack of lavatory, Open fire installation., density, prop of informal or mobile homes, prop of deteriorate housing, prop of long-term unemployed, prop of persons without training, sports infrastructure, medical infrastructures, cultural infrastructures, education and administration, transport stations and malls.
Abdrabo and Hassaan (2015)	18 urban coastal areas of Nile Delta	Socio-economic	Natural and anthropogenic	Local and comparative	Current situation			Urban resilience index	Three global SLR scenarios, up to the year 2100. 1. 80–200 cm 2.50–140 cm 3. 52–98 cm (IPCC, 2013). The averages of these ranges are 140, 95 and 75 cm, respectively.		**Socioeconomic context**: Household density; Population growth rates; Demographic dependency ratio, Heath status, Education and income levels of the community; Unemployment rate. **Physicals context:** Infrastructure and services rate of provision. **Environmental context:** Air quality, Water quality, Soil quality, Exploitation of natural resources. **Institutional context:** Formal and informal institutional settings; Capabilities to mobilize various resources to deal with hazards, whether sudden or gradual. **Climate change hazards:** Vulnerable built-up areas; Population susceptible to inundation
Orencio and Fujii(2013)	Philippines	Socio-economic		Local			Analytic Hierarchy Process(AHP)	disaster-resilient coastal community index		Delphi technique-paired comparison	Environmental and natural resource management, Health and well-being, Sustainable livelihoods, Social protection, Financial instruments, Physical protection; structural and technical measures, Planning regimes
Hossain et al. (2013)*	Nijhum Dwip, Bangladesh	Socio-economic	Natural and anthropogenic	Local	Current situation	In situ field measurements, earth observation data, interviews		sustainable livelihoods model (SLA) (resilience assessment of fishing community)		Analytic Hierarchy Process(AHP) The pairwise comparison matrices	**human assets** (fishermen, day labor, farmer, livestock raiser and crab collector), **physical assets** (house, cyclone shelter, craft and gear, bazaar and road network), **financial asset**s (fishery yield, crop, livestock, credit and wage), **natural assets** (fisheries, mangrove, deer and bird, cropland and grassland) and **social assets** (social harmony, fishermen association, union *parishad*, religious bond and trading system)

Table 5 (continued)

Birkmann et. al. (2012)	Cologne	Socio-economic	Natural and anthropogenic	Local	Current situation	Household surveys and interviews, statistical measurements	From a research project		HQ-100 flood event scenario(flood statistically occurs once every 100 years)		Susceptibility: • Ability to evacuate without external help: key indicator, proxy: age-based household types (official statistics); • Time people need to evacuate and move to safe places: key indicator, proxy: age-based household types (official statistics); • Awareness of flood risks—peoples' estimation of their own flood risk: locally specific indicator (survey/census); • Information about flood risk—flood risk information received/requested by people when they moved into their flat/house: locally specific indicator(survey/census). Coping capacity: • Potential insurance coverage: key indicator, proxy: household income (official statistics); • Flood experience: key indicator, proxy: duration of occupancy (official statistics); • Actual insurance coverage: locally specific indicator(survey/census); • Flood protection measures taken by the city and citizens: locally specific indicator (survey/census).
Hoozemans et. al (1993)	Ocean coasts (Atlantic, Pacific, Mediterranian, Indian, Asia, Caribbean etc.)	Socio-economic	Natural and anthropogenic	Regional comparative	Current situation	other studies, statistical measurements		Global Vulnerability Assessment (GVA) IPCC Common Methodology	-1 m sea-level rise per century. -No socio-economic development and 30 year predicted development -Response strategy: no measures vs full measures	Concordance analysis	People in risk zone, population at risk, coastal wetlands remaining unaffected, wetlands at loss through development, wetlands potentially at loss.
Hereher (2015)	South Sinai, Egypt	Socio-economic	Natural and	local	Current situation	earth observation data, statistical measurements		Coastal Vulnerability Index CVI	Sea level rise		coastal slope, geomorphology, fauna/flora, socioeconomic factors
IMHEN et al (2011)	Mekong Delta, Vietnam	multi-component		local	Time series	earth observation data, statistical measurements, interviews		Comparative Vulnerability and Risk Assessment (CVRA)			Geophysical:(geomorphology, precipitation data, temperature, SLR, flooding events, storm surges, salinization, erosion, subsidence Socio-economics: land cover and land use, considering different crop types, fishing activities, industrial activities, energy supply, sewage disposal, water supply, infrastructure, population density, education and unemployment rates Environmental:(type of natural area, biodiversity anthropogenic mitigation aspects: institutions, dykes, hospital capacity
Szlafsztein and Sterr (2007)	state of Para, Brazil	Natural and Socio-economic		local		earth observation data, statistical measurements, in situ field measurements		GIS-based composite vulnerability index (CVT)			Natural dimensions vulnerability: Coastline Length (km) Continentality Coastline complexity Coastal features Coastal protection measures Emergency relief - historic cases Fluvial drainage Flooding areas. Socio-economic dimensions vulnerability Demographic Population density Children Population (0-4 years-old population) Elderly population (population older than 70 years old) 'Non-local' population or people bom in a different place that they live now Poverty Municipal wealth

Table 5 (continued)

Kleinosky et al. (2006)	Chesapeake Bay (U.S.)	Geophysical and Socio-economic				earth observation data, census data	principal components analysis				
Omo-Irabor et al. (2011)	Niger delta region of Nigeria	Geophysical and Socio-economic		local	Current situation	Questionnaire, satellite images, field survey) or obtained from existing data (satellite images		Vulnerability Index - Direct or Weighted Linear Combination		expert knowledge	Socioeconomic Population pressure, Deforestation, Civil conflicts, Poverty, Environmental Carbon dioxide, Relative humidity, Temperature, Sea level rise, Precipitation, Alien invasive species, Pollutant input

4.2.Vulnerable Systems Planning

4.2.1. Climate Change and Spatial Planning

Planning is a crucial way to manage climate change because well-planned cities are better able to adapt to climate change and are more resilient to its negative impacts than unplanned or poorly managed cities (UN-HABITAT 2014). Urban planning is thus a very important approach for mitigating emissions and adapting cities to climate change and promotes mitigation by facilitating actions to address the unsustainable use of energy in buildings, industries, and transport, through discouraging sprawl, reducing travel distances in cities, and ensuring that building construction and upgrading meets acceptable standards. By creating parks and open spaces, urban planning can also produce multi-functional components that provide essential cooling in mitigation of the urban heat island effect. Moreover, urban planning reduces human vulnerability in cities through the range of adaptation actions it undertakes focusing.

Land use planning has the ability to combine technical analysis and community participation to make meaningful choices among alternative strategies to manage changes in land use. Burby et al. (2000) state that integration of natural hazard mitigation into land use planning can lead more resilient communities through:

- "*Intelligence about long-term threats posed by natural hazards to the safety and viability of human development and environmental resources*
- *Problem-solving to cope with imminent threats prior to, during, and after a disaster*
- *Advance planning to avoid or mitigate harm from a future disaster and to recover afterward*
- *Management strategies to implement plans through policies,*

regulations, capital improvements, acquisition, and taxation"

The World Summit on Sustainable Development in Johannesburg, 2002, introduced the concept of integration of climate policy and the developmental planning process. With the consideration of risks posed by climate change to cities, it is imperative that policy initiatives integrate resilience planning in the urban development of the cities.

Spatial plans are the way of legally fostering the community and institutional vision for future socio-ecological development and controlling land use change and spatial development of the settlements by arranging urban or rural space (Kumar and Geneletti 2015). Thus, spatial planning has a crucial role as an effective instrument for climate change adaptation response to implement climate issued policies at local level.

Ball (2012) states that, climate planning efforts are important players of climate change policy. According to Baynham and Stevens (2014) various research showed that good planning is the precondition of meaningful climate action on the ground. Related to this, Nelson and French (2002) revealed that high-quality hazard mitigation policies within comprehensive plans reduced impacts of damages after 1994 Northridge Earthquake in Los Angeles, California (Baynham and Stevens, 2014).

In the Intergovernmental Panel on Climate Change (IPCC) the role of urban areas and spatial planning concerning climate change adaptation has become distinctly highlighted. Especially in the fifth assessment report, the chapter namely: "Human Settlements, Infrastructure and Spatial Planning" is treated this subject (Seto et al., 2014). This report strongly indicates that especially small to medium-sized urban areas in developing countries will show great expansion trends and the expected increase in urban land cover during the first three decades of the 21st century will be greater than the cumulative urban expansion. This trend will be resulted in the need of a massive build-up of urban infrastructure, which is a key driver of CO_2 emissions. As the city macro form and infrastructure are strongly related, the demand of new transportation networks will be inevitable calling transportation infrastructure provision. For more sustainable and low carbon pathways, mitigation options including shaping urbanization and infrastructure and successful implementation of mitigation strategies at local scales are required for rapidly developing settlements.

Spatial planning and climate change adaptation are also recognized in the Green Paper and White Paper of the European Commission. The importance of spatial planning at the regional level was mentioned in the documents on the other hand at the local level, it is asserted that to adapt climate change land use and land management techniques was showed to build awareness (EC, 2007; Birkmann et al., 2012).

According to Birkmann et al., (2012) recent studies focus on developing strategies for climate change in urban areas and many projects are drawn up to relief the impacts of climate change by enhancing new planning tools at state, regional and local level. Risk reduction is at the center of these studies to strength the robustness and flexibility in response to climatic or non-climatic stressors. Climatic extreme events include floods, heat waves, and storms etc. show a strong relation with climate change and protection of infrastructure and shaping resource efficient settlements are crucial actions to decrease the impacts of climate change.

Climate adaptation strategies can be mainstreamed into the different levels and stages of planning processes, such as comprehensive plans, regional plans, land use plans, management plans, and hazard mitigation plans to consolidate climate policy and planning activities.

Some arguments are focused on the mitigating role of urban planning. Xiao et al. (2011), for example, has a view of urban planning is vital for mitigating the effects of climate change and for increasing urban resilience. Other arguments are about the key role for urban planning is in promoting adaptation. For example, Gleeson (2008) argues that '*new urban scientific evidence suggests that planning's principal role in the fight against warming will be one of adaptation, not mitigation*'.

Spatial planning offers a potential to combine adaptation and mitigation measures and ensure that these measures are complementary. Z. Tang et al (2009) mentioned that local land use planning can attribute to reduce the adverse impacts of climate change with approaches:

- *"mitigation by reduction of greenhouse gas emissions by acting directly or indirectly on the principal sources of human origin; and*
- *Adaptation by adjusting land use activities and practices so that vulnerability to potential impacts associated with climate change can be reduced or avoided."*

Given the quantification of the regional impacts of climate change is an ambiguous sphere; urban environments added another layer of this ambiguity. With its characteristics of due to the rapidly changing variables such as economic and demographic indicators, land-use patterns, resources and utilization formations, lifestyle changes, policy regulations, urban settlements encounter a high level of uncertainties. For this reason, urban resilience policies should succeed to get over this complexity and variability to achieve resilience over the long term.

Table 6: Sectorial responses in various impact scenarios (TERI, 2011)

IMPACTS OF CLIMATE CHANGE				
Sector	**Drought**	**Flood**	**Sea Level Rise**	**Health Effects**
Land Use Planning	Include water efficiency in building codes and infrastructure plans	Include flood protection in building codes, zoning	Prevent new construction in vulnerable areas	Promote healthy lifestyles with walking/ biking rout
Water Supply	Improve storage Reduce leakage Improve efficiency	Maintain quality Retain supply	Diversify sources Protect supply from saltwater intrusion	Improve potability and access
Sewerage	Adopt low water treatment options	Prevent overflow	Protect/relocate infrastructure	Improve coverage of sewage treatment
Storm Water Drainage	Harvest/store rainwater	Expand drainage capacity Improve natural catchments	Protect/relocate infrastructure Protect natural coastal defenses in delta regions	Improve drainage Prevent standing water
Solid Waste	Improve organic waste re-use, for compost and moisture retention Encourage low water processes	Improve containment	Prevent release Protect/relocate infrastructure	Improve collection services
Roads/Traffic	Use pervious surfacing to allow for aquifer recharge	Improve road drainage Use pervious surfacing to encourage runoff Establish/improve evacuation routes	Protect/relocate infrastructure	Establish/improve evacuation routes and accessibility of health services
Public Transport	Reduce water use for vehicle/system cleaning	Improve adaptive capacity of infrastructure Establish/improve evacuation routes	Protect/relocate infrastructure	Expand coverage and promote equal access to mobility options
Housing	Improve water use efficiency	Promote flood-resistant designs	Prevent new development in vulnerable areas Relocate highly vulnerable settlements	Prevent overcrowding
Recreation/ Open space	Employ water-efficient landscaping and maintenance techniques Encourage tree planting to reduce urban heat island	Increase water retention capacity in open space. Manage flood-prone areas as green space to prevent settlement	Manage low-lying coastal areas as green space to prevent settlement	Promote healthy lifestyles

Climate scientists are declaring the need for planning efforts associated with mitigation strategies to reduce the climate change impacts and adaptation measuring to prepare for these impacts (Baynham and Stevens, 2014). Municipalities and local governments have a key role when the climate change focused planning comes to the agenda. Cities are generally susceptible to extreme climatic events; on the other hand, those sited on the coastal terrain of underdeveloped countries are arguably the most at risk. Various coastal cities do not have the ability to build protective infrastructure and resources to safeguard themselves against the impacts of climate change. In its Fourth Assessment Report (Working Group II) for example, the IPCC (2007) shows that sea level rises will increase the effects of coastal erosion which is causing severe damage to the poorest coastal cities.

Coastal cities are undertaken a crucial role to take an action, in the case of GHG emissions were ceased from now on, temperature and sea levels would continue to rise globally because of the GHG emissions already released into the earth's atmospheric system (IPCC, 2007). Urban planning is primarily called upon to play an important role in adapting cities to climate change impacts, and in mitigating GHG emissions. The role of urban planning is critical since most municipal governments making urban planning decisions also have a great deal of influence over emission sources and the range of adaptation activities that take place.

Coastal areas are subject to dynamic and complex physical and anthropogenic processes such as storm surges, sea-level rise, erosion as well as overpopulation, exploitation by the development and economic purposes. Global climate change with its negative effects is exacerbating the pressure on coastal areas by means of rising temperatures, sea-level rise, drought, heavy rainfalls etc. It will potentially lead to disruptions in systems of livelihood, including the loss of lives and properties. Prediction of future characteristics of coastal areas due to the limited ecologic and natural resources has gained importance on the agenda and uncontrolled use of these resources and unforeseeable risks and threats on these areas necessitates the integrated management and planning practices to ensure the sustainable development of coastal regions. Integration of impacts of climate change to the planning mechanism is possible with the priority of vulnerability assessments to estimate and project the effects of climate change induced risks on coastal areas. In an urban planning point of view, identification of vulnerability hotspots can be useful to guide planning decisions in terms of the location of future development as well as the management of risks associated with existing sectors (Crick et al 2012).

While many planning documents focus on physical changes raised by climate change, it is important to consider the risk brought about by physical changes, socio-economic and spatial structures and development patterns (IPCC 2012b, Birkmann et al., 2012). To consider the adaptation mechanisms in the region there must be some extend vulnerable social groups and physical structures, land use, infrastructure, and production systems. Sustainable spatial development is the key point to achieve adaptation mechanisms in the complexity of the risks of climate change. According to Cutter et al. (2008), community resilience is strongly related to the environmental conditions and the treatment of its resources. Thus, the concept of sustainability constitutes the base of resilience research.

4.2.2. Climate Resiliency Planning

A major moral principle of sustainable development is intergenerational equity, ensuring that present and future human needs will continue to be satisfied within the limits of the natural environment and in a manner that can cope with the certainty of change. Thus, planning for this change requires the ability to cope with and adapt to hazards, and the creation of decision-making and management approaches with the ability to operate in the face of uncertainty.

In order to adapt planning tools and strategies to the emerging climate change, the vulnerability assessment takes an important role in spatial planning mechanisms. Clearly, planning needs to consider the various aspects of vulnerability especially exposure, susceptibility and societal response capacities that highlight the paradigm shift from hazard identification to the vulnerability assessment (Birkmann et al., 2012).

Like other policy concepts applied to cities namely sustainability or flexibility, urban resilience can be evaluated as guiding principle rather than end-state (Stead, 2014). Urban resilience provides a way of conceptualizing and guiding urban change and evolution. But there is no single optimal state or definite blueprint of urban areas (Gleeson 2008, Stead, 2014). It is widely accepted that spatial planning has a crucial role in building resilience. Cities' and towns' land use and development attempts have many implications for strategies of adaptation and mitigation to the climate change. Xiao (2011) states that urban planning is indispensable to reduce the negative impacts of climate change and increase the urban resilience.

4.2.2.1.Key planning dimensions for Coastal Resilience

Various impacts of climate change on coastal communities are accompanied by urbanization patterns and population and development pressures that are placing ever more people and property in harm's way. Because these development patterns impact and disrupt the ecological patterns of natural systems, the ability of coastal environments to mitigate and absorb the likely impacts of flooding, storms, and sea level rise is lessened, further contributing to increasing levels of coastal vulnerability.

The replacement of wetlands, forests, and agricultural areas with roadways, rooftops, and impervious urban hardscapes is a recipe for increased coastal flooding. The problem of designing and planning coastal cities in the face of climate change is a critical issue. Coastal settlements are growing faster and a combination of sharp increases in coastal urbanization and population growth and increasingly severe climate events will place ever more people at risk.

To contribute systems' resilience there has been many constituent elements and implies many different planning tools and policies. It suggests a profoundly new way of viewing coastal infrastructure—a new approach that values smaller, decentralized kinds of energy, water, and transport more suited to the hazardous physical conditions coastal communities possibly exposed. It suggests new ways of understanding community sustainability—arguing that sustaining, nurturing, and restoring coastal environments will be one of the essential fragments in resilience. The coastal resilience will require concerted work on the natural and built environments and on the social, economic, and political ones as well.

To achieve resilient land use, three geographical classifications are needed: the community and regional levels, the neighborhood and site level, and the building and facility level. Action at each geographical level is required:

Community and Regional Land Use and Growth Patterns

Avoidance of natural hazards is perhaps the most effective coastal resilience strategy, one that can be affected by steering development away from high-risk locations or zones. Local and regional land acquisitions efforts can be aimed at not taking account these locations, and at trying to keep coastal ecosystem that preserves the mitigative features of the natural environment. So, coastal communities can prepare comprehensive plans or community land use plans that guide future growth away from and out of these risky locations, use land use regulatory tools, such as zoning, to keep the extent of density and development away from high-risk locations.

Preserving regional systems of green space, protecting those essential elements of a green infrastructure network, and restoring regional ecosystem functions are important strategies for enhancing resilience.

Neighborhood and Site Level

Designing and planning actions at the neighborhood or site level can enhance resilience in many ways. Neighborhoods can be designed and built with wind-resistant and flood-resistant trees and vegetation and can incorporate a number of urban greening ideas and techniques, from rain gardens to green rooftops to permeable paving that will enhance resilience.

Building and Facility Level

Building codes and coastal construction standards aiming to decrease the exposure to the hazard are an essential aspect of coastal resilience. Building construction is increasingly recognized as providing tremendous new opportunities to reduce our energy and ecological demands and to enhance broader goals of resilience, such as less dependence on fossil fuels. The design of buildings should purpose the survivability of essential services in the event of a natural hazard in order to provide the conditions for a safe living following a disaster (daylight, natural ventilation, on-site water collection, etc.). There are some examples of certification systems that are helpful in promoting sustainable and resilient building design (e.g. Leadership in Energy and Environmental Design, or LEED) thus buildings can be designed so as to utilize natural daylight, allow natural ventilation, and include power generation that does not rely on the coastal power grid (e.g. photovoltaic panels, solar hot water heating systems) (Beatley, 2009, pp: 32).

Table 7: Planning for Coastal Resilience at Different Scales
(Source: Beatley, 2009, pp: 31)

SCALES	**DESIGN AND PLANNING ACTIONS AND IDEAS**
Building	Energy Star house Passive solar design Local materials Solar water heating/photovoltaic panels Safe room Rainwater collection/purification Passive survivability Green rooftops and rooftop gardens Daylit interior spaces and natural ventilation
Street	Green streets Urban trees Low-impact development (LID) Street designed for stormwater collection Vegetated swales and narrow streets Edible landscaping Pervious/permeable surfaces Sidewalks and walkable streets
Block	Green courtyards Setback from ocean or high-hazard area Clustered housing outside of floodplains and high-hazard areas Photovoltaics Native species yards and spaces
Neighborhood	Stream daylighting, stream restoration Decentralized/distributed power Urban forests Community gardens Neighborhood parks/kitchens, pocket parks Greening greyfields and brownfields Neighborhood grocery, food center, or co-op Neighborhood energy/disaster response councils/committees
Community	Urban creeks and riparian areas Urban ecological networks Walking, hiking, biking trails Green schools City tree canopy Community forest coverage (min 40%)/community orchards Greening utility corridors Disaster shelters and evacuation capacity
Region	Conservation of wetlands River systems/floodplains Riparian systems Regional greenspace systems Greening major transport corridors Regional evacuation capacity

Resilience requires advance planning and being prepared ahead of an event. This means thinking systemically how the community might rebuild and redevelop before the hazard in ways that will reduce exposure and enhance long-term resilience, and that will allow for adaptation and learning and taking advantage of unusual postdisaster opportunities. So, climate change planning can, and should, improve and be integrated and mainstreamed with existing city plans, planning processes and development activities across all sectors. Climate change is simply another piece of information that should be considered during every planning process, or when existing plans are modified and updated.

4.2.2.1.1. Resilient Coastal Land Use

Careful attention to physical land use and urban form is a way for planners to manage and adapt to the effects of climate change. Effective land use management and well-designed structures allow communities to recover more quickly after a disaster event. It is clear that well-designed and properly constructed buildings and infrastructure lead to less destruction and loss and thus lead to a quicker recovery. For example, planners are involved in the designation of land uses and can help shape settlement patterns to reduce and minimize exposure to lands that are climate hazards (e.g. steep and unstable slopes, flood zones, coastal areas subject to sea level rise and storm surges).

4.2.2.1.2. City macro form

The compact urban form is emerging as the central paradigm for sustainable cities, with New Urbanism and Smart Growth as its two very closely related factors. Considerable research has been carried out on the social and economic benefits of compact macro form but a small number of researches have been carried out on those specific aspects of smart growth that might lead to greater resilience to coastal hazards. Proximity and compactness, if well designed, is a measure of urban vitality not achievable with conventional automobile-dependent, sprawling development. Ewing et al. (2007) state that coastal land use patterns should be compact and walkable and simultaneously conserve land, reduce car dependence and energy consumption, and allow the possibility of healthier lifestyles and living patterns. Using the pedestrian ways, as the primary design standard, results in a high level of residential and commercial diversity within relatively short distances. The idea of resilience is not tied to specific urban form, but the many other benefits, social and physical, associated with a compact urban form, needed to be taken into consideration.

4.2.2.1.3. Zoning

Development codes for areas of high resiliency needed to have zoning districts that allow compact mixed use development. Building type regulations also provide communities with the ability to require building-specific hazard defense strategies, depending on the zoning district where the building is located.

Directing particular land uses away from vulnerable areas to less hazard-prone locations led a community can reduce the risk to individuals and livelihoods. However, in a case of the particular types of development do occur in vulnerable areas, structural design can be operative to relieve the effects of coastal hazards. For example, by elevating coastal buildings and using appropriate construction techniques and building materials, a community can greatly reduce the potential impacts from coastal hazards.

Depending on the extent of risk and vulnerability, a buffer zone between settlement and sea may be appropriate. This can be a landscaped and sloped area, helping to absorb flood water and to protect development from flooding (in particular due to extreme events). This planted surface may serve for the absorption, slowing, and filtering of rainwater runoff from adjacent development. So, communities and developments will possibly be located, outside of and away from high-risk coastal hazard zones, to the extent possible. Buildings should be set back a substantial distance from coastal shorelines, and developments should not be allowed within 100-year flood zones as much as possible (Beatley, 2009; pp:73).

4.2.2.1.4. Building code

Design and development in climate change hazard risk areas require for planners to regulate and control building forms and design. Numerous location and design features can be encouraged to make areas and buildings more resilient to climate impacts. For example, living areas can be required to be located at a suitable height so that they are above flood hazard levels. Tree planting and other sun shading tools can be required to reduce urban heat island effects. Buildings can also be designed to withstand other potential climate change effects, including storm-related high winds, rising temperatures, and inundations. From a mitigation perspective, decision makers can encourage and promote more environment-friendly building design to reduce energy and water consumption.

Avoidance is ultimately the most effective and sensible approach to resilience in the face of physical forces. Land use planning and a variety of implementation tools from zoning to transfer of development rights to conservation easements and land acquisition can be used to steer development and people away from and out of harm's way. A variety of coastal hazards are already mapped and delimited—high-erosion zones, floodplains, and high-slope areas subject to slides etc. and ideally these areas should not be developed, permitted only to low-density developments. These are areas, moreover, where opportunities will exist for more resilient sustainable relocation following a disaster event.

Design and siting of critical facilities are also important factors such as basic infrastructure namely sewage collection and treatment; water supply systems; roads and highways; and hospitals and critical medical facilities. These facilities are sited to avoid exposure illustrating the importance of locating critical facilities and response functions such as fire stations outside of high-risk locations.

Facilities and infrastructure can generally be designed and built to minimize future exposure.

4.2.2.1.5. Ecological Resilience

Communities' natural ecosystems and green infrastructure represent one of the most important lines of resistance to natural hazards. Coastal land use policies and regulations should be enacted to protect, preserve, and restore ecological systems and natural features such as wetlands, and forests. Planners play an important role in protecting and enhancing environmentally sensitive areas, ecosystems, and biodiversity. In particular, planners can help to relocate, minimize or prohibit development (planned and informal) in environmentally sensitive areas like estuaries, wetlands, and important coastal habitats. These areas provide valuable natural services and orienting development out of these areas can help to improve a city's protection from river flooding, marine storm surges and erosion. Green spaces also act as carbon sinks to mitigate carbon emissions as well as helping to cool the air and provide shade to help limit urban heat island effects.

Protecting natural coastal marshes and wetlands that absorb floodwaters, dune and beach systems that act as natural seawalls and trees and healthy tree canopies that shield homes against the wind are all positive steps that will have long-term resilience. Examples of planning actions that might be taken to ensure the ecological resilience in the built environments and human communities include the following; ensuring sufficient wetlands buffers, existence and health of beach and dune systems because they are effective flood barriers, permitting coastal wetlands to migrate landward in response to long-term sea level rise, preserving extensive coastal marsh systems, retaining large amounts of floodwaters, protecting ecological systems and land area (landscape) sufficiently large and complex and diverse that any particular perturbation (storm, wildfire) will not cause irreversible harm (e.g., extinction of a species, complete loss of a biological community) (Beatley, 2009; pp:32).

In addition to the environmental benefits of these actions such as habitat protection, other climate benefits can also be realized. Urban green spaces can help to cool the air and provide shade to help limit urban heat island effects and also these areas act as carbon sinks to mitigate carbon emissions.

Also, urban greening and stormwater management strategies can be achieved with green rooftops, reduced and permeable paving, rain gardens, planting public spaces and other natural and green features, reserving soil, using native plant species, designing landscapes to minimize consumption of energy and water, and utilizing sustainable planting materials.

4.2.2.1.6. Local Infrastructure and Public Facilities

As populations in coastal areas grow, spatial infrastructure is needed to develop to meet higher demands, and its tendency to thus degrade can lead to increased coastal hazard.

Critical facilities (e.g. hospitals, police and fire stations etc.) should be sited outside of high-risk locations, and in places where in the event of a major community disruption they will remain functional. Water and sewage treatment plants should be sited outside of high-risk zones and designed similarly to operate after a disaster event.

Coastal lifelines include community infrastructure providing such essential support systems as water; wastewater collection and treatment; police and fire service; roads, bridges, and transport; communication; and power supply and transmission. Essential community lifelines and infrastructure should be designed and integrated into a community's land use to reduce exposure and vulnerability and to ensure operability during and after community disruptions such that elevating roads, placing power lines underground, and shifting to distributed energy systems that minimize large power outages.

Land use patterns should emphasize the benefits of green infrastructure instead of traditional infrastructure systems that are more vulnerable to hazards. The green infrastructure comprises stormwater management; small-scale on-site stormwater collection and retention; green rooftops and living walls and building facades; and trees and tree canopy coverage, which offer cooling and shading benefits that minimize reliance on mechanical and energy-intensive methods. For example, green rooftops can help mitigate the urban heat island effect and reduce the need for air conditioning and “Cool City” scenario schematically shows the margin for climate adaptation. The main idea is to develop huge green corridors combined with water surfaces within the inner city, which produces airflow corridors to cool and alleviate climatic burdens in specific areas (Marton-Lef`evre 2012).

Planning and improving a settlements’ stormwater management infrastructure that, in turn, is an important issue to handle and adapt resilient city to climate change-related hazards such as keeping residential and working areas above flood hazard levels and including stormwater management features in these areas namely infiltration areas, pervious surfaces, impoundment areas.

4.2.2.1.7. Transportation

Especially in developing countries, the growth of transport infrastructure and ensuing macro forms are important determinators for long-run emissions trajectories. The transportation sector is typically responsible for a considerable amount of energy-related greenhouse gas production and private cars constitute significant proportion of that activity. As car ownership rates increase in developing countries and urban areas continue to spread, further separating the distances between the places people live, work and shop; the more greenhouse gas emissions will be left to the athmosphere via this travel demand and vehicle kilometres travelled. Planners can help mitigate greenhouse gas emissions by working to reduce vehicle miles traveled and urban congestion through strategies such as compact, high density, mixed-use development (Ewing et al. 2007).

Strategically planned development can also direct development to areas less vulnerable to climate change impacts.

Traditional car dependent transport and mobility systems emphasize the fast movement of people and goods by extensive networks of ever-expanding vulnerable highways and roads. Respecting coastal planning, different attempts need to be considered in transportation infrastructure. Firstly, reliance on walking and bicycling should be given equal priority. Secondly, more emphasis should be given to transit systems, which are often more resilient in the face of natural disasters by means of lower levels of damage, quicker functioning and service, and having fewer negative environmental impacts. And lastly, pedestrian-friendly neighborhoods design and planning is an essential way to reach community resilience (Beatley, 2009; pp: 92-93).

In summary; resilient communities should be able to adapt to changing conditions without losing function, recover from random events in unexpected ways, rely on local and regional resources to recover from hazard events, and learn from prior experience to reduce future vulnerability and risk. In the face of coastal disasters, resilient communities should exhibit the following measures for the built environment. Firstly the ability to facilitate the survival of its inhabitants, second the ability of people to remain in the community or return quickly after an event, third infrastructure remaining functional or quickly repaired after an event, and lastly the maintenance or enhancement of community amenity values such as ecosystems and recreational areas. For coastal communities, resilience should result from a combination of good land use planning, non-disruptive engineering and resistance, redundancy of critical systems, and enhancement of natural buffers.

CHAPTER 5

RESEARCH AREA AND METHODOLOGY

5.1.Aims and Scope

Settlements which are habitats for human and other species were formed by various combinations of vulnerable systems. Vulnerability conveys the idea of susceptibility to damage or harm, but much debate remains around how to characterize vulnerability. Vulnerability has frequently been characterized as a function of both a system's exposure and sensitivity to stress and its capacity to absorb or cope with the effects of these stressors (IPCC, 2001); however, clearly framing of these attributes and relationships between them are crucial to understand the vulnerability level of these settlements. Being one of the most important stressors climate change has been strongly affecting the vulnerability of many settlements with its destructive effects. Planning is a crucial way to manage climate change because well-planned settlements are better able to adapt to climate change and are more resilient to its negative impacts than unplanned or poorly managed cities (UN-HABITAT 2014) and Xiao et al. (2011), has a view of urban planning is vital for mitigating the effects of climate change and for increasing urban resilience. Thus, vulnerable systems needed to be identified and prioritized in the sphere of spatial planning to successfully plan the future settlements.

Cities have been identified as among the most vulnerable human habitats to the effects of climate change and the accumulation of populations and assets in cities exacerbates their vulnerability. Cities are generally susceptible to extreme climatic events, on the other hand, those sited on the coastal terrain of underdeveloped countries are arguably the most at risk. Various coastal cities do not have the ability to build protective infrastructure and resources to safeguard themselves against the impacts of climate change. In its Fourth Assessment Report (Working Group II) for example, the IPCC (2007) shows that sea level rises will increase the effects of coastal erosion which is causing severe damage to the poorest coastal cities.

Over recent years the challenges of climate change have become more prominent. The significant size of changes in climate and land use cause a decreasing supply of ecosystem services, resulting in increased vulnerability. Coastal areas are subject to dynamic and complex physical and anthropogenic processes such as storm surges, sea-level rise, erosion as well as overpopulation, exploitation by the development and economic purposes. Global climate change with its negative effects is exacerbating the pressure on coastal areas by means of rising temperatures, sea-level rise, drought, heavy rainfalls etc. it will potentially lead to disruptions in systems of livelihood, including the loss of lives and properties. Prediction of future characteristics of coastal areas due to the limited ecologic and natural resources has gained importance on the agenda and uncontrolled use of these resources and unforeseeable risks and threats on these areas necessitates the integrated management and planning practices to ensure the sustainable development of coastal regions. Integration of impacts of climate change to the planning mechanism is possible with the priority of vulnerability assessments to estimate and project the effects of climate change induced risks on coastal areas. Planning for this change requires the ability to cope with and adapt to hazards, and the creation of decision-making and management approaches with the ability to operate in the issue of uncertainty. In an urban planning point of view, identification of vulnerability hotspots can be useful to guide planning decisions in terms of the location of future development as well as the management of risks associated with existing sectors (Crick et al 2012).

So, coastal cities are undertaken a crucial role to take an action, in a case of GHG emissions were ceased from now on, temperature and sea levels would continue to rise globally because of the GHG emissions already released into the earth's atmospheric system (IPCC, 2007). Urban planning is primarily called upon to play an important role in adapting cities to climate change impacts, and in mitigating GHG emissions. The role of urban planning is critical since most municipal governments making urban planning decisions also have a great deal of influence over emission sources and the range of adaptation activities that take place.

The vulnerability of coastal areas to associated hazards due to population growth, development pressure and climate change. It is the liability of planning authorities to address the vulnerability of coastal inhabitants to these hazards. This is especially so at the local level where development planning and control has a direct impact on the vulnerability of coastal communities. To reduce the vulnerability of coastal populations, risk mitigation and adaptation strategies need to be built into local spatial planning processes.

Spatial planning also requires new strategies and methodologies to incorporate climate change as a challenge for future development. Planning also provides a basis for charting courses of action, so that vulnerability is reduced in ways that are optimal, given the unique circumstances, future prospects, and goals and aspirations of community residents.

In order to adapt planning tools and strategies to the emerging climate change arena, vulnerability assessment takes an important role in spatial planning mechanisms. Clearly, planning needs to consider the various aspects of vulnerability especially exposure, susceptibility and societal response capacities that highlight the paradigm shift from hazard identification to the vulnerability assessment (Birkmann et al., 2012).

Vulnerability assessment in a policy setting is a useful tool for building the 'country vulnerability profile' for policy analysis and planning for development in a holistic way; the economic, environmental, social and physical dimensions of vulnerability (Turvey 2007) for classifying a region and in framing development policies. Findings could be used for development evaluation if the task is to set priorities for, and allocation of, external aid for developing countries. Also, it could broaden our current understanding of the nature and extent of a region's vulnerability. What is being posited is that, from a policy viewpoint, the results from vulnerability assessments could shed light on the question of vulnerability as it affects an area.

Another equally important task of coastal vulnerability assessment is to mitigate the risk of vulnerability, can set out decisions and action programs for reducing the vulnerability risk and the likely response pattern or strategies to deal with potential risks, threats, and hazards based on vulnerability assessment.

The central question then becomes: How we will assess the coastal vulnerability? Measuring vulnerability often lacks any systematic, transparent and understandable development procedures. Assessing the coastal vulnerability of a region is not an exactly defined process and there is no universally accepted method to measure and monitor community resilience or vulnerability (Birkmann 2006a, Cutter, 2008).

In this chapter, the purpose was to explore empirical works in the literature on coastal vulnerability assessment performed until today and develop a suitable model for the case area to reveal the level of coastal vulnerability with investigating spatial plans' contribution to the temporal change of this vulnerability level. At further stages, using the findings of this research, it is aimed to seek the risky areas that are more vulnerable to climatic events or coastal hazards and subjects on whom different policies and action programs needed to develop to remove the obvious effects or mitigate negative effects of these vulnerabilities of the region and to robust the resiliencies.

5.2.Assessment Perspectives

The agenda of resilient coastal communities has many constituent elements and implies many different planning tools and policies. It suggests a profoundly new way of understanding community sustainability arguing that coastal environments will be one of the essential segments in resilience. The coastal resilience will require concerted work on the natural and built environments and on the social, economic, and political ones as well.

Resilience offers an especially relevant and useful perspective on how to design, plan and manage coastal communities. There is no one single thing to be done but rather many things that need doing together and impacts of climate change may necessitate a fundamental rethinking of the approach to spatial planning.

The problem of designing and planning coastal cities in the face of climate change is a daunting one. Sea level rise, high temperatures, stronger, more frequent coastal storms will challenge the normalcy of coastal living and cause immense economic, social, and environmental disruption (EEA 2012). These significant changes in physical dangers a combination of sharp increases in coastal urbanization and population growth and increasingly severe climate events will place ever more people at risk.

Urbanization, industrialization, tourism, residential areas and activities alike that lead to irregular and unplanned development that have severe impacts on coastal and marine areas. The pressure of fast urbanization and settlement activities on coastal areas leads to many problems including loss of dunes, salt beds and marshes; marine and coastal pollution, deterioration of coastal ecosystems and sometimes habitat loss and this situation makes coastal areas are more vulnerable.

To make coastal settlements more resilient in the face of climate change; land use strategies organized at local and regional levels like steps to move people and structures away from the most dangerous locations. Zoning ordinances prohibiting development of high hazard areas that will likely be subject to sea level rise and flooding should be mentioned. Coastal distance is an important determinant to design the area on which safer settlements can be built to lessen the effects of sea level rise and flooding and storm surges. Increasing the ratio of pervious areas another crucial item should be discussed in the planning strategies.

Resilience suggests, for instance, a profoundly new way of thinking about coastal and transportation infrastructure, one that understands that many needs must be addressed. Transit-oriented community design, ride sharing programs and multimodal transportation strategies can be designed. Pedestrian and bicycle friendly transportation moods and streets to decrease GHG emissions, minimum fuel efficiency standards and acquisition of alternatively fueled vehicle could be touched upon in the planning documents. Waste and renewable energy strategies gain importance when we consider the buildings and transportation modes to build energy efficiency by means of building codes and renewable energy programs such as wind, solar or geothermal. At the formation of planning policies, the local climate should be the starting point in understanding how buildings can be designed to incorporate fresh air and daylight, to minimize energy and resource demands, and to lessen the vulnerability to a storm or disaster event. On the other hand in the planning area, negative effects of traffic originated from boats on critical species cannot be ignored on the phase of policy design.

Rising temperatures as well as changing precipitation and droughts can be seen as the mostly occurring effects of climatic change. Some policies focusing agriculture sector and farmland can be adequate such as conservation of farmland, encouraging cultivation of field or discouraging dense housing on farmland. Also, selecting or orienting agricultural products that don't require excessive irrigation and some vegetables that are compatible with temperature changes may be noticed. Another important economic activity of the study area is greenhouses and both impacts of climate change on this sector and sector's effects on climate change should be regarded.

Fishing strategies should be considered through the lens of coastal resilience, such that nourishment areas of important species which are under threat of extinction should be assigned as areas that are restricted to fisheries (Derinsu, 2009) or small scale family fisheries and quota system can be described in policies for protected special areas.

Tourism activity is another factor that shows two-way relationships for the vulnerability of coastal areas to climatic changes. Rising tourism demands on coastal areas bring about new and various human usage pressures on these areas which are very sensitive places because of inherent natural characteristics. Densely built tourism developments and other constructions remove some species' breeding and nutrition areas, for example, lighting systems of these buildings and noise from these developments with intensive usage of beaches negatively affect caretta carettas' nesting and reaching to sea. Yacht tourism fosters the yacht induced pollution (Derinsu, 2009) besides by reason of the tourism buildings' polluting influences, hotels' wastewater strategies come into question. So, another type of tourism activity rather than mass tourism like ecotourism and nature-based tourism can be mentioned and encouraged as an alternative to forming the sustainability of coastal environments. On the other hand under various climate change scenarios provides important information on the relative attractiveness of a destination in the future, it cannot reveal estimates of the impact. These changes are likely to have on tourism demand climate changes, especially rising temperature and precipitation have important effects on tourists choices' and comfort perceptions (Gössling et al. 2006) for example approximately 2°C of temperature rise negatively affects the tourists' comfort perceptions and may be resulted by the changes on destination points. But this increase can be resulted by the extension of the tourism season to the spring and autumn (Moore, 2010) via tolerable temperatures and decreasing precipitation.

5.3. Study Area: Fethiye –Göcek Special Environmental Protection Area

5.3.1. Description of an area

As one of the sixteen Special Environmental Protection Areas in Turkey, Fethiye-Göcek SEPA is located on the southwest coast of Turkey, in the borders of the Mediterranean and the southeast part of Mugla city (GDPNA 2016).

Figure 15: Location of Fethiye-Göcek SEPA in Turkey (Google Earth, 2015).

The study area, Fethiye-Göcek SEPA is one of the most important preservation areas in Turkey. It hosts many kinds of biologic, natural and historical values which make the area special for living things. The natural assets and locational characteristics are also the main reason of the rich agricultural and fishing resources. These facts also increase the region's attractiveness for many sectors. With its special location and coastal layout, particularly residential, agricultural, marine resource utilizations, touristic and recreational facilities and coastal activities are tending to take part here. Development of these sectors with the effects of global climate change as well as climate-induced hazards increases the pressure on coastal areas that makes biodiversity and natural values much more vulnerable to the excessive use of resources.

As an ecologically rich region, Fethiye-Göcek SEPA covers significant biologic elements as well as the habitat for many species. It hosts 40 species of conservation concern in the Mediterranean listed by the Bern and the Barcelona Conventions as well as International Union for Conservation of Nature's (IUCN) Red List. Out of the 5 sea turtle species represented in the Mediterranean basin, 3 species *(Caretta caretta, Chelonia mydas, Dermochelys coriacea)* are identified in the waters of Turkey. Fethiye Beach is one of the nesting and reproduction areas for Caretta caretta, which is protected under Bern Convention and CITES (Keskin et al., 2011).

In addition to the ecological elements, the study area is an example of important development areas, Fethiye covers an area of around 3,060 km^2 and is a well-developed district center and tourism destination, catering for the mass tourism market. Fethiye is one of the biggest settlements among Muğla Province's districts and Göcek, on the other hand, can be characterized as a small town, offering an upmarket, small sized tourism experience centered on yacht tourism. The area is hosting intensive yacht tourism, especially in the Göcek section.

The agriculture industry is another important economic sector especially chooses a place intensively around Fethiye district. Peripheral locations of district center have fertile irrigated farming areas. This fertile land constitutes 22 percent of total province area corresponds to 67.300 hectares. Also with respect to greenhouse activities study area is one of the leading districts in Turkey. With the existence of natural assets, local population preferred to operate both agricultural activities with tourism sector different from mass tourism industry so this situation makes possible to create various kinds of tourism activities based on exploitation of ecological and natural values.

The study area is also historically significant place because the initial establishment of the area is estimated to dates back 16th century B.C., It hosts significant civilizations in history hereby are one of the most important historical centers of Turkey. Historical ruins spread extensively over the study area from the Lycian, Roman and Byzantines times, also there are many historical artifacts belonging to Ottoman Period. Historical values contribute to the tourism potential of as well as the intensive usages' pressure to the case area while negatively affecting vulnerability of an area to the various kinds of natural hazards.

In the light of these values, with the purpose to protect the environmental, natural, cultural and historical values, to prevent the environmental degradation, to leave natural beauties and historical assets onto future generations; research area was granted its marine and coastal conservation status by the Decree of Cabinet of Ministers number 88/13019 in June 1988. It covers approximately 816 km^2 of which 345 km^2 is the marine zone and has a coastline of 235 km (Derinsu, 2009). After this declaration, to be more operative, boundaries of the site were expanded two times in 1990 and 2001 consisting of Mugla Fethiye town and 6 sub-districts and 6 villages it has (GDPNA 2016).

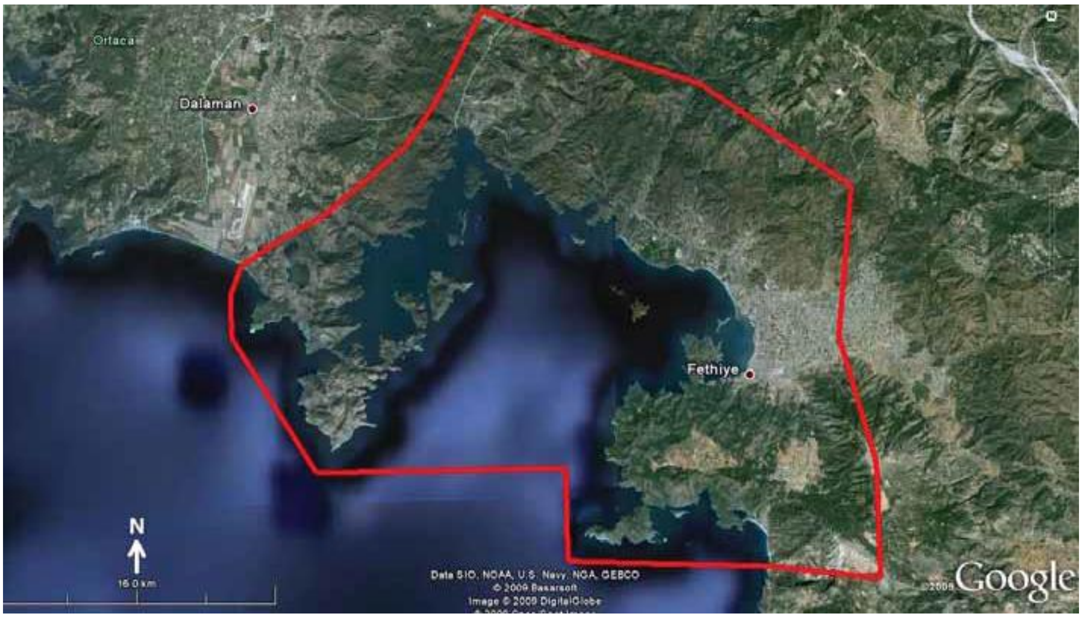

Figure 16: Fethiye-Göcek SEPA.
(Source: GDPNA 2016)

5.3.2. Study area selection criteria

Being a low-lying coastal area and having originally marshy land, Fethiye-Göcek SEPA is vulnerable to the hazards especially originated from coastal threats. Coastal areas are considered particularly vulnerable to the adverse effects of climate change in that it is widely recognized that climate change can have far-reaching consequences on coastal surfaces and groundwater (e.g. saltwater intrusion), coastal ecosystems (e.g. wetlands and biodiversity loss), marine biological communities and commercial species (IPCC, 2008; Torresan et al 2012). So, with the rising impacts of climate change vulnerability of the area is expected to rise.

5.3.2.1. Natural assets:

The study area is exceptional coastal protection area having numerous natural assets and one of the evidence that represents the vulnerability of an area is that declaration of an area as a special protection region. To prevent the deterioration of natural, ecological, cultural and historical values that it owns, protection against environmental harms and to guarantee the natural and cultural values to be passed for future generations, this site was granted its marine and coastal conservation status in June 1988 by the Decree of Cabinet of Ministers.

Ecosystem functions and biodiversity are pointed out as the elements that mostly affected by climate change (McCarthy et al., 2001) so Fethiye-Göcek SEPA represents its vulnerability with remarkable amount and quality of natural resources and biodiversity.

Fethiye-Göcek SEPA’s nature and climatic conditions are the main motives of significant biodiversity in its coastal areas. So, it is one of the most important protection areas in Turkey because of its biodiversity and hosting many habitats of endangered and threatened species. The site hosts 40 species of conservation concern in the Mediterranean listed by the Bern and the Barcelona Conventions as well as International Union for Conservation of Nature’s (IUCN) Red List. These include 7 Mollusca species, 6 Porifera species, 6 Crustacea species, reptiles such as Loggerhead sea turtle *(Caretta caretta)* and Nile softshelled turtle *(Trionyx triunguis)*, and mammals such as Mediterranean monk seal *(Monachus monachus)* and Bottlenose dolphin *(Tursiops truncatus)*. Out of the 5 sea turtle species represented in the Mediterranean basin, 3 species *(Caretta caretta, Chelonia mydas, Dermochelys coriacea)* are identified in the waters of Turkey. Fethiye Beach is one of the nesting and reproduction areas for Caretta caretta, which is protected under Bern Convention and CITES (Keskin et al., 2011, Bann and Başak 2013).

The algae species in the region are dominated by Cystoseira spinosa, a species of conservation concern, found on rocky bottoms between 35-40 m and whose habitats are affected by the intensely used bays of the SEPA (Derinsu, 2009; Bann and Başak, 2013).

Flora and fauna and their habitats are mostly affected elements from adverse effects of climate change. Climatic changes pose a threat to the survival of many species sometimes habitat loss. Flora such as *Liquidambar orientalis* and *Posidonia oceanica* (seagrass meadows) as well as fauna like caretta caretta and celonia mydas which are at risk of extinction should be interested in a special way. Besides the climate-induced hazards pollutant, intensive and uncontrolled coastal usages and activities are harming the marine and terrestrial vegetation and biodiversity at coastal parts of the study area.

5.3.2.2.Economic sectors and development:

Agriculture is a prominent sector in the study area with 55% of the population involved in agriculture. Most of the agriculturally fertile areas in Muğla are situated in Fethiye town, which is surrounded with good quality land which can be conveniently irrigated. On the other hand, tourism is another important activity within Fethiye-Göcek SEPA and closely linked to the marine and coastal environment. Activities related to tourism and agriculture places a substantial amount of pressure on the SEPA's coastal ecosystems. Development pressures are evident especially in the Fethiye section of the SEPA. In 2010, there was a 64% increase in building permits within Fethiye district's urban zone (Fethiye Chamber of Commerce and Industry, 2011). Fethiye is a developed district center and tourism destination, catering for the mass tourism market. Fethiye is one of the biggest settlements among Muğla Province's districts; Göcek, on the other hand, can be characterized as a small town, offering an upmarket, and boutique tourism experience centered on yacht tourism (Bann and Başak 2013). In addition to the residential and tourism development pressures, actually, the site has been experienced to the new requests considering large-scale coastal constructions such as yacht harbor and a pier for cruise boats indicates a wish to promote mass tourism in the area, rather than to focus on conservation.

The study area is facing intensive yacht tourism, especially in the Göcek section. The current use of the bays in Göcek is far beyond the carrying capacity determined for the area (METU, 2007). As a result, marine pollution and anchoring activities are harming the marine vegetation and biodiversity despite the launch of some government initiatives restricting the use of the Göcek. Similarly, in Fethiye, marine biodiversity and the natural ecosystem of the bay are damaged and their long-term sustainability is at risk. Solid waste pollution from marina activity, fisheries and houses have affected species' distribution and fish population in the SEPA is threatened by illegal hunting and trawling activities. Also, unplanned construction and developments to accommodate tourism are threatening nesting population, resulting in a serious decline in nesting. Usage of these nesting areas is controlled and monitored at specific times, however, there are concerns regarding the impact of current levels of development and management of the turtles' reproduction processes (Bann and Başak 2013).

5.3.2.3. Climate effects: Climate Change in Fethiye –Göcek SEPA

Coastal Fethiye-Göcek SEPA is low lying and significant part of an area was created by drying of marsh land. Via locating at the intersection of Aegean and Mediterranean seas, geographical characteristics of the study area reflects the effects of both regions and according to Turkish State Meteorology Service (2016) the region has a typical Mediterranean climate typology is characterized as semi-arid, sub-humid and between steps and humid.

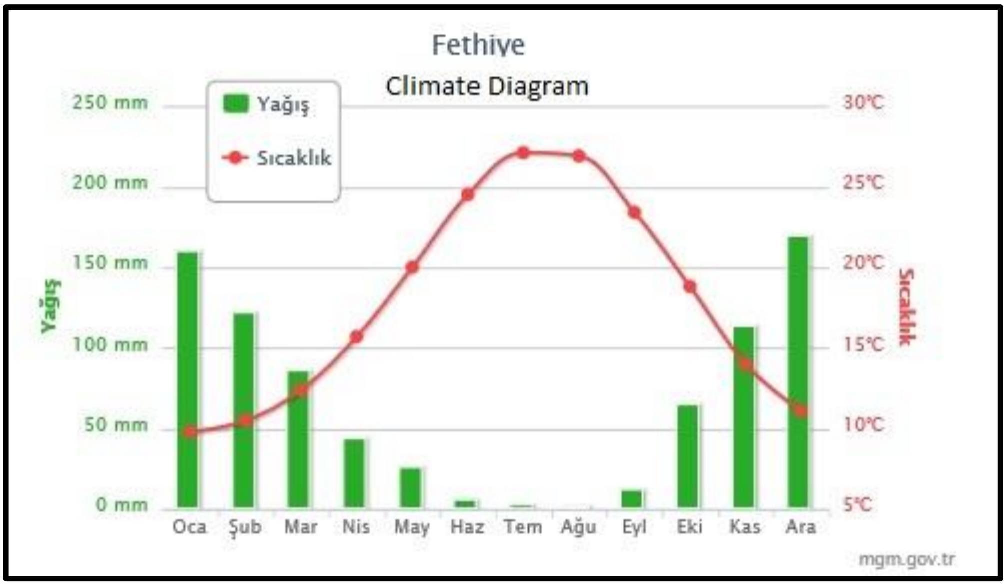

Figure 17: Climate classification of Fethiye.
(Turkish State Meteorology Service 2016)

Climatic factors and geographical location are prominent for the exposure of climate-induced hazards and extreme events for the case area. Some disasters can be seen more widely in different regions of Turkey according to the geographic location, demographic and climatic situation (Figure 18 Kadıoğlu, 2012). Meteorological studies show that Coastal Mediterranean and Aegean Regions including Fethiye-Göcek SEPA are standing out apparently as the most frequent occurrence of natural disasters makes study area more vulnerable to this kind of hazards.

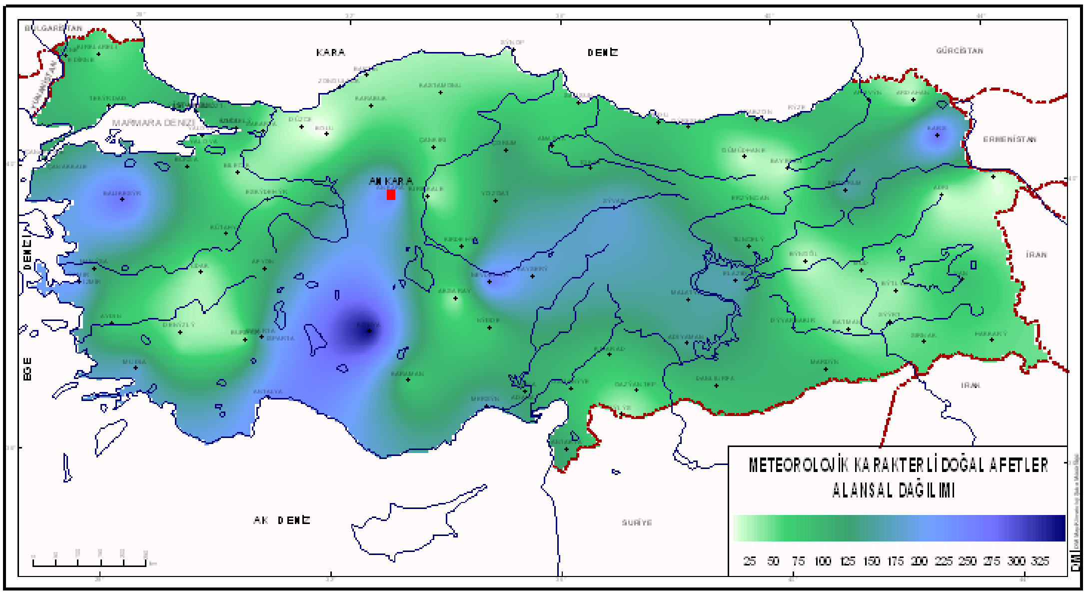

Figure 18: Spatial distribution of natural disasters based on meteorological characters according to Turkish State Meteorological Service (Source: Kadıoğlu, 2012)

In addition to these, in respect of the number of meteorological events, between the years of 1950 and 2000 inundation deficits and risks are very high for Mediterranean regions including Fethiye (Kadıoğlu, 2012) (See appx at Figure A-1)

The area is settled on the Mediterranean coast of Turkey and in the climate change sphere Mediterranean coasts are showing significant vulnerabilities to the climate change via sudden inundations, temperature rises and sea level rise (White Paper 2009), for example in the Mediterranean Sea there are regions with increases of more than 6 mm/year (EEA, 2016). Also, low-lying coastal location is another crucial factor that affects the vulnerability of a region to climate change (Gilmer and Ferdana 2012; Torresan et al. 2012; DasGupta and Shaw 2015). Furthermore, Kadıoğlu (2012) states that considering the climate change induce hazards, Fethiye Region is emphasized as one of the riskiest areas in Turkey considering sea level rise expecting that many sectors will be affected. Also, Kadıoğlu (2012) adds that unstable and sudden rainfalls are commonly experienced climatic events of Coastal Mediterranean Regions including Fethiye town which results in floods and inundations.

As the study area shows Mediterranean characteristics with respect to the climatic conditions, generally Mediterranean climate extremes and vulnerabilities were associated with case area in this study. Temperature values serve significant evidence about climate change or extremes on Mediterranean regions. Climate indices for Turkey inform about the extreme weather events that will negatively affect daily life and Figure A-2 in appx illustrates the annual changes of indices that are based on the ECHAM5 A2 projections. The hot spell index is defined as the longest number of consecutive days where a daily maximum temperature is higher than 35°C (The Ministry of Environment and Urbanization 2013). Maximum and minimum daily temperatures values were calculated for the periods of 2011-2040, 2041-2070 and 2071-2099. For the first period temperature changes are relatively small but at the end of 21st century, these values are rising in the coastal areas of Mediterranean.

As the Mediterranean Sea is a semi-closed, very deep basin, exchanging water with the Atlantic Ocean through the narrow Gibraltar Strait only, evaporation greatly exceeds precipitation and river run-off. Therefore, salinity is one of the main physical parameters influencing the thermohaline circulation and sea-level variability in the Mediterranean basin, which may counteract the thermal expansion due to a rise in temperature (http://www.eea.europa.eu/data-and-maps/indicators/sea-level-rise-3/assessment, Accessed: December 2016).

As both thermal expansions on oceans and melting glaciers on Grönland and Antarctica, it is expected that sea level rises are inevitable. According to Kadıoğlu, (2012) Fethiye Region is emphasized as one of the riskiest areas in Turkey with respect to sea level rise and it is stated that primarily coastal constructions, fishing, and tourism sectors will be adversely influenced.

On the other hand, the map of average inundation hazards in Turkey by provinces between 1940 and 2010 (see appx at figure A-3) indicates that erratic rainfalls have frequently be seen on Coastal Mediterranean Regions including Fethiye which results in sudden inundations and cause significant harms economically (Kadıoğlu, 2012).

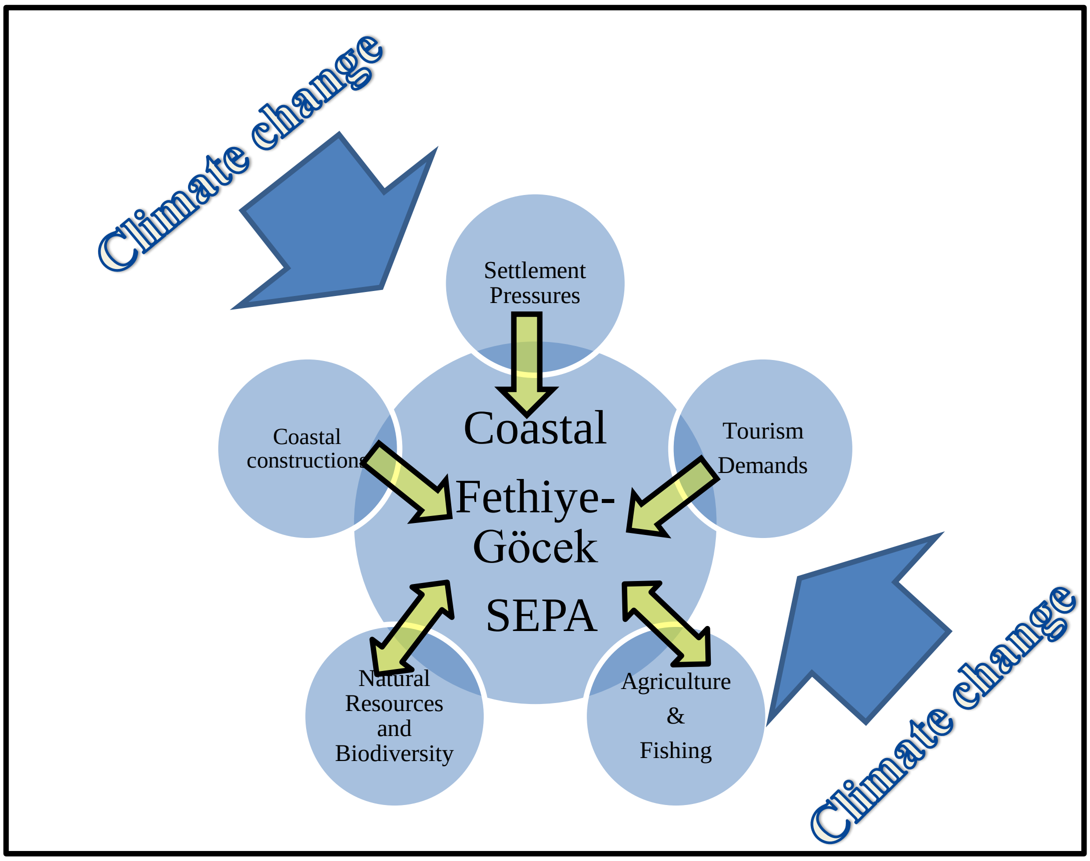

Figure 19: Vulnerability of Coastal Fethiye-Göcek SEPA to Climate Change

5.3.2.4.Planning process

The natural and historical assets in study area create various pressures and all these pressures make Fethiye-Göcek SEPA more vulnerable to the harms and effects especially from coastal hazards and it can obviously be seen that climate change will exacerbate these impacts. To minimize these impacts resources management strategies, conservation of natural protection areas, parks, forest, and wetlands are significant that should be concerned in the planning policies.

To foster the resiliency of the study area planning instruments have crucial role via their regulative manner. Area's special preservation status is crucial input and gives direction for planning mechanisms. Fethiye-Göcek SEPA is selected as a case study area to present a model which contains all related factors to assess vulnerability to climate change and some guiding policy principles to be considered by planning authorities and decision makers to diminish the adverse effects of climate change and encourage sustainable development.

With the declaration of special environmental protection area, spatial plan efforts were started. Firstly in 1989, 1/25.000 scaled Fethiye-Dalaman Territorial Plan was approved by Environmental Protection Agency for Special Areas(EPASA), Ministry of Environment and Forestry. The aims of the plan are: (i) protection of natural beauties and historical ruins, (ii) ecological balance and marine ecosystem with passing these on to the future generations, (iii) support of special agreements for Mediterranean protected areas, (iv) protection of agricultural lands, (v) planned tourism development, (vi) assure environment-friendly architectural solutions and urban macro forms and (vii) prevent the disordered settlements.

Based on this territorial plan land development plans were prepared and approved for the primary settlements namely Fethiye, Göcek, Ovacık-Hisarönü, Kargı and Karaçulha between the years of 1989 and 1991. Then, boundaries of the site were expanded two times in 1990 and 2001 to cover more areas that host habitats of endangered and threatened species. For the purpose of preparing plans for newly added areas via boundary expansions and responding changing needs of an area, plan revisions were performed. Basically, 1/25.000 scaled territorial plans were revised in 1998 and 2008 and 1/5000 and 1/1000 scaled land development plans were revised by EPASA following these territorial plans.

With the enforcement of 644 Decree Law in 2011 preparation and admission of these plans have become the responsibility of GPNA.

Territorial and land development plans for the study area are mainly based on general conservation and settling principals. Besides the main conservation principals about natural assets of the region these plans mostly focus the regulations about building codes and fundamental architectural measurements that intend to preserve the local settlement pattern. Regulative principals about housing, commercial and tourism constructions can be seen at every scale (1/25000, 1/5000 and 1/1000). Since the study area is special protection area, both building heights and size are restricted to reduce the pressure of development areas on habitats of natural resources. However, these regulations do not cover the detailed application procedures on development areas that reflect the social, economic, natural, and spatial characteristics of these settlements.

The regulations about ecologic environment partially based on scientific researches about the natural assets of the study area and serve the general procedures and guiding principals to preserve the flora and fauna. But these regulations are still needed to have detailed precautions to lead the physical applications and other activities in the region.

5.4. Methodology:

Coastal areas are complex systems where each of the ecologic, social, and economic components is highly interrelated. Parallel to this, coastal vulnerability assessment is a complex process that must consider multiple dimensions of vulnerability, including both physical and social factors mixture of qualitative and quantitative methods has been employed to explain the complexity of vulnerability drivers and to determine which combinations of attributes best characterize the vulnerability of specific populations in particular places. Furthermore, the degree of vulnerability is determined not only by internal processes and threats originating from within the coastal area but also by external processes deriving from the area as well; overall climate is also a crucial factor that orienting both internal and external processes. So, all the factors framing the assessment process needed to be investigated and expressed thoroughly with its all mechanisms.

5.4.1. Existing Coastal Vulnerability Assessment Models

In the vulnerability research scene, there is no common framework for coastal vulnerability assessment to reach a method to be applicable to each region. In this part of the research, models used in coastal vulnerability assessment studies were reviewed in terms of their methods employed and methodologies operated to specify the study area; dimensions that reflects the social, economic, environmental, ecological or physical extent with their method of handling; operated indicators that were selected to measure the vulnerability level qualitatively or quantitatively with respect to the dimensions; temporal scale concerning assessment study in terms of measured time period(s); data types that utilized in these studies and their index calculation procedure to reach the overall vulnerability score:

5.4.1.1. Defining a study area and spatial level in framing a methodology/ Scope definition:

A clear definition of “vulnerability” must be provided for the context of the study area, as it will have implications for how the study is carried out, and the types of results that are generated along with the geographic or administrative boundaries and the type of information and data available. Thus, this stage is important determinator for designing the method of assessment to draw the limits of the study area for defining the comparison criteria with other spaces. As mentioned at chapter 4 before, in the literature there are various amount of studies at national, regional and household level, on the other hand VRA (Vulnerability Reduction Assessment Model)(Droesh et. al.2008, Frankel-Reed et. al. 2009), Environmental Sustainability Index (ESI) (Esty et. al. 2005) and Duman Yüksel’s (2004) Vulnerability-Resilience Indicator Model (VRIM) are the methods to measure nations’ vulnerabilities and environmental protection capacities with their sustainabilities of development. For the household level, the factor of poverty appears as a crucial item for measuring vulnerabilities against various shocks and hazards. According to this approach, the main aim is to focus on livelihood assets to lighten the effects of the vulnerability. In their study Osman-Elasha et al. (2009), emphasized the description of potential coping and adaptive mechanisms to achieve household resilience. In another study, Singh and Nair (2014) developed livelihood vulnerability index to assign the climate variabilities which is mainly based on stakeholders’ perceptions.

On the other hand, firstly introduced in IPCC 4th Assessment Report, the concept of Regional Vulnerability Assessment find its place in regional climate change vulnerability assessment studies, evaluation of regional spatial vulnerability was aimed via using various related indicators. To assign the vulnerability level of the special regional unit, proactive decisions based climate hazard planning was performed and, areas, social groups, and sectors at risk were identified in the context of urban and coastal planning in these studies.

5.4.1.2.Dimensions:

To assess the coastal vulnerability of a specific area, main factors that shape systems' vulnerability were examined primarily in the literature. Risk factors, regional geographical features, physical, climatic and socio-economic conditions and impact studies related to the area were usually firstly analyzed (Torresan et al 2012). In this context, coastal areas' ecologic, social and environmental components' level of robustness to the natural and anthropogenic threats were executed. Accordingly, depending on the nature of an area, components that specify the coastal vulnerability and their dimensions were identified and classified so as to give direction to the study. As can be seen from the theoretical studies, according to the focus of a study, empirical works diversified according to the dimensions of ecological, geophysical, social, economic, socio-economic or integration of these on the basis of spatial scale, temporal resolution or other numerous research characteristics and in the next stage vulnerability testing variables were accordingly take form. As an example of initial studies in vulnerability assessment literature Gornitz (1991), Gornitz et al. (1994), Thieller-Hammar Klause (1999) were primarily used CVI method which is based on geophysical parameters of an area while, in the light of these studies Pendelton et al. (2010), Thieler-Williams (2010), Ozyurt and Ergin (2010) used indexes that purpose to indicate the physical effects of sea-level rise in their empirical studies. In these cases, the coastal vulnerability was defined by means of local physical parameters such as geomorphology, shoreline erosion rate, tidal range, coastal topography, mean wave height etc.

Vulnerability is not merely a function of hazard, severity or probability of occurrence, certain properties of a system will make it more vulnerable to certain types of hazard so not only a function of the physical characteristics of climate events but more importantly an inherent property of a society determined by factors such as poverty, inequality, gender patterns, access to health care and housing, etc. are decisive (Young and Nobre, 2012).

Some other studies in the literature asserted that human or anthropogenic factors cannot be thought separately from the physical factors when framing the vulnerability concept so they included the social factors in their studies. Hozzemans et al. (1993) were the first study that considers the social components then Cutter et al. (2003), Panray et al (2009), Wilhelmi and Morss (2013), Zhou et al. (2014) followed this movement. Some livelihood and household structures were integrated into these studies and it was intended that fundamental indicators like family status, population density, age structures and dependence, GDP, employment /unemployment status needed to be influential for the vulnerability assessment methods.

The nature of social vulnerability depends on the nature of the hazard to which the human system is exposed and influences individual and community abilities to prepare for, respond to, and recover from disasters (Cutter, 2008). The aim of coastal vulnerability approaches is to help coastal communities adapt to risks (Dolan and Walker, 2006).

Another viewpoint intended that, besides the effects of geophysical assets that constitute the basis for coastal vulnerability assessment, effects of ecological components that localities specifically possess researched and they included the flora and fauna related aspects in their studies. For example, Hossain et al. (2013) and Hereher (2015) starting with the idea of natural assets and biotic components on study area can be affected by sea-level rise as an ecologic component, then they preferred to use these variables as an indicator.

Besides the geographic factors and anthropogenic elements affecting them and socio-economic structures; starting from the idea of determination of risky areas and people at risk zone are significant, initially Hozzemans et al. (1993), Blaikie et al. (1994) and then Cutter et al. (2003), Eidswig et al. (2013), Rufat (2013) and Abdrabo and Hassaan (2015) asserted that especially rich areas with regard to flora and fauna and wetlands that have been threaten to loss needed to be evaluated in vulnerability assessment studies locally or regionally.

As mentioned above, many of the studies in the literature cover only one or more dimensions herewith integrated studies concerning internal factors and the nature of study area are limited in number. Integrated approaches are beneficial for an understanding of potential climate change impacts and of the role of adaptation options in alleviating negative consequences (Dolan and Walker 2006) that integrate indicators of social vulnerability with the environment and spatial considerations. This approach regards internal susceptibilities and resiliencies of both biophysical and social environments as an interrelated and interdependent human environmental system (Dolan and Walker 2006). One of the representatives of integrated vulnerability assessment studies is the empirical work of Li and Li (2011) in which dimensions were investigated in a comprehensive way. Addressing storm surges risks, with a comparison of the coastal vulnerabilities of various cities, the coastal vulnerability was researched under the titles of socio-economic, land use, eco-environmental, coastal constructions and disaster bearing capacity and then this study substantially offered suggestions about future land use structures.

Multi-component studies are very rare and one of the best examples of this kind of studies is IMHEN et al. 2011). This study researched on Mekong Delta and considered geophysical, socio-economics, environmental and anthropogenic mitigation aspects. The vulnerability has been assessed of key sectors in each studied district, namely: population vulnerability, poverty vulnerability, agriculture and livelihoods vulnerability, industry, and energy vulnerability, as well as urban settlements and transportation vulnerability. These key sectors were selected using the Comparative Vulnerability and Risk Assessment (CVRA) methodology, which is based on the IPCC approach of assessments. The vulnerability level of each district for each of the 5 key sectors comprehends the comparative exposure (to other districts) and by respective sensitivity (of the parameters).

5.4.1.3.Indicators:

There is no single standardized unit of indicators available for quantifying coastal vulnerability. Therefore, the choices made by the assessors considering the spatial and temporal scale of the study, the focus of coastal area components and threats, data availability and selection, as well as the method used to combine vulnerability indicators have a major influence on the outcome and quality of the assessment method.

In order to be able to conceptualize, evaluate and map the 'dimensions of vulnerability', a widely accepted approach for ranking the exposure and sensitivity for both natural and human systems using a range of indicators. The selection of vulnerability indicators was based on an assessment of the secondary literature on social vulnerability (including national and regional indicators for population, poverty, and livelihoods), and a review of what data was available at provincial and district levels.

In the case of large amounts of highly correlated parameters are necessary for vulnerability assessments, it may be useful to initialize *parameter selection method* to avoid that certain processes or aspects are overrepresented compared to other processes. Statistical selection methods are widely used in coastal vulnerability assessment studies such as PCA (principal components analysis) (Cutter et al 2003) and PPC (projection pursuit cluster model) (Ge et al. 2013) which are popular statistical parameter selection methods. Statistical parameter selection methods have only been used by studies that use plenty of census data in the assessment. However, Boori et al. (2010), Thieler and Hammar-Klose (1999), Pendleton et al (2010) and Ozyurt and Ergin (2010) relied on previous assessment models in their vulnerability assessment, stakeholder and expert opinion was employed by the studies of DasGupta and Shaw (2015) and Torresan et al (2012).

The majority of studies in the literature have combined a small number of indicators from several or all of the various ecologic, social, and economic components of each coastal area depending on the data available or interests of the experts. The ecologic components are merely considered in coastal vulnerability assessments, as geophysical properties (a part of the ecologic component) of areas are the main determinant of the vulnerability in these studies. Studies such as Sánchez-Arcilla et al. (2008) and Rao et al. (2008), Marriner et al. (2013), Fatorić and Chelleri (2012), Frihy (2003), Frihy and El-Sayed (2013) and Boori et al. (2010) are highly focused on geophysical aspects of the ecologic component. These studies used indicators about erosion, wave height, tide range, land surface elevations, soil type, and sea level rise etc. As such, these are highly focused geophysical studies and few of these assessments considered other aspects such as the social and economic components, in the form of national or sub-national GDP and population density figures.

Some other studies incorporate a large amount of socio-economic parameters (20 or more), which are reduced to a more manageable number to avoid over-representation of particular phenomena, by means of Parameter Selection Methods.

The CVI method used by Gornitz (1991), Gornitz et al. (1994), and Thieler and Hammar-Klose (1999) is a popular method to assess vulnerability in coastal areas, and originally only includes geophysical indicators, Gornitz et al. (1994) emphasized the addition of social, and economic component related characteristics to reach better results via widening the scope of vulnerability. Considering more factors determining the vulnerability of coastal areas has been addressed by Thatcher et al. (2013) (amongst many others) by including a range of economic indicators pertaining to commercial and residential building values, public works locations, as well as social parameters such as urban pixel density and population density, combining them with geophysical parameters from the CVI from a previous coastal vulnerability assessment by Pendleton et al. (2010).

Other aspects of the ecologic component (i.e., not only geophysical aspects but also flora and fauna related aspects) are incorporated in few of assessment studies. For example, the study of Omo-Irabor et al. (2011) focused on the threats posed to mangrove forests in the Western Niger Delta with socio-economic indicators, such as population pressure, deforestation, poverty and civil conflicts, as well as environmental indicators such as carbon dioxide. The socio-economic indicators used were about socio-economic status, race, age, development density, renters, and health care institutions etc.

As a multi-component study, IMHEN et al. (2011) considered indicators related to geophysical (geomorphology, precipitation data, temperature, SLR, flooding events, storm surges, salinization, erosion, subsidence), socio-economics (land cover and land use, considering different crop types, fishing activities, industrial activities, energy supply, sewage disposal, water supply, infrastructure, population density, education and unemployment rates), environmental (type of natural area, biodiversity) and anthropogenic mitigation aspects (institutions, dykes, hospital capacity). Using the Comparative Vulnerability and Risk Assessment (CVRA) methodology, the most vulnerable districts were assigned.

5.4.1.4.Temporal scale:

While drawing of the general frame of an empirical study, the determination of *temporal scale* at which the coastal vulnerability of a study area will be analyzed is noteworthy. There are examples of studies that used different time frames. The current situation of an area, time scale determined in the past or vulnerability of a region at a period specified in the future are some examples utilized in existing models. Subsequent amount of study in the literature have been formalized based on the current moment vulnerability of specific area (Frihy 2003; Frihy and El-

Sayed 2013; Fatoric and Chelery 2012; Sanchez and Arcilla et. al. 2008; Panray et. al. 2009; Das Gupta and Shaw 2015; Gornitz et. al. 1990, 1994) whereas small number of studies likes Ge et al. (2013), Zhou et al. (2014) preferred the method that analyzes coastal vulnerability of an area at specified time periods comparatively.

5.4.1.5.Source of Data- Data Processing

In the process of vulnerability assessment study design, it is vital that the determination of the data will be used and this is decisive for the scope of the study. Besides choosing the right data sources are inevitable for the success of the vulnerability study, every data source inherently has strengths and weakness. Commonly used data types in the literature are in-situ field measurements, statistical data, earth observation data, consultations and household surveys. Surveys that were constituted mostly based on geophysical components (El Raey 1997; Gornitz et. al 1990; Ozyurt and Ergin 2010; Frihy and el-Sayed 2013 etc.), earth observation data and satellite images were preferably operated to reveal the physical structure of an area and risk factors via sensitive measurements. Whereas in empirical works that are formed in accordance with socio-economic criteria, it is apparently seen that census data were used more reliant and can be converted easily (Mahapatra et al. 2015). Also for specifying especially natural and anthropogenic effects and to constitute greater insight for the geophysical and land use induced properties on assessment area, in-situ field measurements (Boori et al. 2010; Torresan et. al. 2012; Frihy 2003; Sanchez and Archilla et. al 2008) are another data type frequently used in these studies.

There is no one literally accepted method for selection of the candidate parameters. Depending on nature of the specific area, its components and focal points, every researcher formalized different combinations of parameters. This stage comprises one or more of the steps of the selection of candidate indicators or parameters, standardization, weighing of variables, determination of relative importance of each variable as PCA (principle component analysis) method (as mentioned chapter 4) in the case of variable number is limited in number. The selection of variables as indicators for various dimensions was informed by the existing literature on vulnerability assessment and mapping (Cutter et. al. 2000, 2003; Preston et. al. 2008; Crick et. al. 2012) limited by the available data. On the other hand, expert guidance and statistical selection methods were used by some part of existing studies. Statistical selection methods were preferred rarely, PCA and PPC (projection pursuit cluster model) (as mentioned chapter 4) can be illustrated as an example for this method (Khan 2012; Ge et. al. 2013, Li and Li 2011; Thatcher et. al. 2013). For an effective application of this method there must be a plethora of census data but in the literature, in many of the studies due to lack available data statistical selection methods were not preferred (Rufat 2013, Eidswig et. al. 2014; Birkmann and Fernando 2008; Yoo et. al. 2011 etc.). Also, some other studies are relied on expert guidance or previous assessments' initially selected parameters without using any statistical method for determination of indicators (Zhou et. al. 2011; Torresan et. al. 2012).

All stages of the vulnerability assessment are not based on quantitative criteria; to be practical and applicable, quantitative indicators are supported by qualitative ones. These indicators sometimes are a single variable or in some cases, they can be a processed set of data (Birkmann 2012). Niemejer (2002) classified indicators as data-driven (inductive) and theory-driven (deductive): According to data-driven approach, within a wide range of classified indicator set related ones can be selected then expert judgement or statistical methods can be used to complete the process (Kaly et. al 1999; Vincent and Cull 2014). Furthermore, indicators can be weighing according to the degree of influence of overall vulnerability as well as the methods like Multi Criterion Decision Analysis. In the case of the data-driven indicators' operation, proxy variables are generally required because there is no such tangible element of vulnerability then testing may lose its reliability. Accordingly, application of alternative method may be suitable such as theory-driven (deductive) methods. In this context, using the advantage of existing theoretical insights related potential variables can be chosen. Even though testing of these variables is difficult because of limited data, utilization of deductive method can be appropriate because of the literally based and transparent character (Vincent and Cull 2014).

5.4.1.5.1. Methods Employed for Data Processing

Standardization:

Because the units of vulnerability indicators vary, it is necessary to make indicators dimensionless by *standardization.* This adjustment of the values measured on different scales to a common scale allows comparison of different indicators, processing of them and elimination of anomalies and aggregation. Many studies in the coastal vulnerability literature used this method via constituting a certain number of data ranges then assigned rates for each data range groups. For instance vulnerability scores were divided into very low, low, moderate, high and very high categories based on quartile ranges with vulnerability rates between 1 and 5 (Thieller-Hammar Klause 1999; Ozyurt and Ergin 2010); Crick et al. (2012), Ge et al. (2013), Thatcher et al. (2013), Sherly et al. (2015) standardized vulnerability index by using max and minimum values (value-min/max-min) and ensured that vulnerability values are ranged between 0 and 1.

Weighing:

When combining the non-dimensional parameters in a vulnerability index, assessments studies may choose to append an additional weight to specific parameters or indicators in order to emphasize or depreciate them. Using parameter weights is a controversial issue, as there is often no scientific underpinning to favor specific parameters over others (Cutter et al. 2003; Özyurt and Ergin 2010). However number of studies preferred to employ the method of indicator *weighing.* Rarely applied this method can be distinguished in the empirical works of Sherly et al. (2015) with Data Envelopment Analysis (DEA), Mahapatra et al. (2015) and Hossain et al (2012) with AHP and Orencio and Fuji (2013) with Delphi Technique. Because these techniques have various disadvantages, the majority of studies did not incorporate parameter weighing method. Determining appropriate weighting is a challenge in vulnerability assessment; subjective weights reduce confidence in the results. Extensive work of literature review indicated that there is not generally accepted method which denotes obvious superiority across indicators (Cutter et al. 2003; McLaughlin and Cooper 2010; Thatcher et. al 2013; Ge et. al. 2013; Zhou et. al. 2013 etc.).

Assessment Method-Indexing:

To be measurable and assessable; selected, arranged and rated parameters are required to be constituted in a form of an index then analyzing method will be determined. According to the components used, various indexes were employed in the literature. As it is mentioned in chapter 4 at "Methods Used" part in a broader way as, CVI method is firstly introduced and well-known method of coastal vulnerability assessment thus Gornitz (1991), Gornitz et al. (1994) and Thieller-Hammar Klause (1999) initially shaped this method on matters of geophysical parameters and physical effects of sea-level rise. Based on this method with incorporating the anthropogenic effects to coastal vulnerability assessment Ozyurt and Ergin (2010) applied CVI-SLR method on Goksu Delta and intended to depict the susceptibility of the delta to sea level rise. Tackling social dimensions with economic effects, some of the studies like Cutter (2003), Thatcher (2013), Ge et al. (2013), Eidsvig et al. (2013) preferred to use SVI or SoVI vulnerability index method. In these indexes, the main focus is on demographic characteristics, income structure and distribution, indicators about recovery after a hazard, education level, housing infrastructure and distribution of health services etc. Abrabo and Hassan (2015) used Urban Resilience Index for 18 urban coastal areas on Nile Valley. They applied indicators about infrastructure context that evaluates provision and quality of infrastructure and services, an institutional context that includes mobilization of sources and services mechanisms in case of hazard and environmental context that considers the exploitation of air, water, soil quality and natural resources together with the social context in their studies. Hossain et al. (2013) assessed the resilience of fishing communities and put forward natural resources in their SLA (Sustainable Livelihood Model). Hozzeman et al. (1993) carried out a common methodology of IPCC namely Global Vulnerability Assessment (GVA), within this they used indicators that proximate people at risk zone, the population at risk, coastal wetlands under threat of extinction because of development pressure. In the study of Mahapatra et al. (2014) they integrated Physical Vulnerability Index (PVI) and Social Vulnerability Index (SVI) according to assigned weights by the AHP method to compute Integrated Coastal Vulnerability Index (ICVI). Thus study area of South Gujarat Coast's (India) low to high-risk vulnerability categories was assessed.

Index calculation:

The last stage of coastal vulnerability assessment is *index calculation.* To calculate the vulnerability indexes traditional methods can be used such as simple aggregating or simple averaging as the easiest method on which all indicators are equally considered. Sherly et al. (2015) measured overall vulnerability by subtracting the overall value of adaptive capacity index from the sum of socioeconomic and infrastructure vulnerability indexes. Crick et al. (2012) developed a total vulnerability map by combining the indices of vulnerability to three selected climate-related hazards of extreme heat, extreme rainfall and coastal hazards in their empirical research. Turvey (2007) operated simple averaging method for four components namely coastal index, peripherality index, urbanization index, vulnerability to natural disasters index. Whereas in this method there is a possibility to obscure high vulnerability of one indicator with a low vulnerability of another may arise. To avoid this, Sherly et al. (2015) used the method of computed maximization operation to get vulnerability score.

Frequently applied another calculation method is square root of the geometric mean of the variables (Gornitz et al., 1990; 1994; Dwarakish 2009; Parthasarathy and Natesan, 2015) measured the CVI for their case area by using this method for the variables of coastal slope, geomorphology, shoreline erosion rate, mean significant wave height, mean tidal range, mean annual ice cover.

Thieller-Hammar Klause (1999) and Pendelton et al. (2010) are used simple aggregating and averaging technique with some weights of parameters. Mclaughlin and Cooper (2010) summed the numerical values of 3 distinct sub-indices namely coastal characteristics, coastal forcing and socio-economic attributions in GIS environment, and averaged them. Obtained scores were normalized according to the minimum and maximum results and grouped under 5 vulnerability level. Thacher (2013) operated the standardized CEVI results then summarized them by averaging the 1 km segments by a county for the Northern Gulf of Mexico coast.

In the case of specific statistical data was not suitable or assessment process did not base on this type of data such as qualitative indicators are mostly required to evaluate vulnerability. Torresan et al. (2012) took into account expert decision making perspectives, then index scoring may perform via indicators' consideration rate. In this study, they reached vulnerability score by means of the summation of each weighted vulnerability index values (Torresan et. al. 2012).

To achieve composite resilience score Das Gupta and Shaw (2015) employed weighted mean score of 5 dimensions (socio-economic, physical, institutional, coastal zone management and natural environment). Total 125 variables are constituted under these 5 dimensions, these variables ranked from 1- very poor to 5- very high according to the results of an interview with relevants, after weighing variables between 1 to 5, each weighted mean score will be calculated. By using weighted mean scores of each dimension composite resilience score will come out.

As another example, Li and Li (2011) reached composite resilience score by means of separately measured vulnerability scores of five sub-indexes (social economic index, land use index, eco-environmental index, coastal construction index, land disaster-bearing capability index) then square root between aggregated vulnerability scores of each index were calculated.

5.4.2. Coastal Vulnerability Assessment Model for Fethiye-Göcek SEPA

Based on several studies in the literature described above, I have defined an assessment model for Fethiye-Göcek SEPA as below.

5.4.2.1.Multidimensional concept- ICVA methodology and framework

Growing awareness of the complexity of climate system and the interaction with the human environment has resulted in the emergence of an "integrated" assessment approach, combining the biophysical and socio-economic perspectives to enhance understanding of climate change vulnerability. This type of systems-based method requires multidisciplinary, multiscale and multidimensional approach provides a comprehensive evaluation of the key features of a climate change vulnerability assessment and their reflections for spatial planning policy development.

The ICVA (Integrated Coastal Vulnerability Assessment) framework is a useful approach to presenting quantitative and qualitative estimates of the vulnerabilities that climate change poses, at both the regional and the local level. This approach considers inherent susceptibilities and resiliencies of both biophysical and social environments as an interrelated and interdependent human-environment system. However, it is important to understand the limitations of this method, such that the quantitative estimates are reliant on the quality of information available, while qalitative ones rely on the opinions and experiences of referenced experts. In addition to these, the ICVA is unavoidably uncertain as it does not take account of changes in non-climatic factors. These include future adaptation measures that will influence both the baseline exposure and their sensitivity to climate effects.

Climate change vulnerability assessment has been presented as an essential step toward predicting the impacts of climate change and assessing adaptive capacity within social, economic and ecological systems. This study intends to delineate the coastal vulnerability of Fethiye-Göcek SEPA based on an understanding of how climate and other changes will influence the different driving factors that control the interacting formation and reduction processes acting on this low-lying coast in the light of planning systems' contribution.

This conceptual framework analyzes key geographic areas and sectors particularly vulnerable to the combined effects of climate change and sea level rise, and particularly the impacts of flooding, inundation, salinity, and storm surge etc. The ICVA incorporates a range of vulnerability indicators that cover the important aspects of the social, economic, biophysical and development systems that lead to climate change vulnerability for estimating aggregate coastal vulnerability for four dimensions, these being: socio-economic; natural; built environment and infrastructure.

This concept recognizes the need to not only identify 'who' are the most socially vulnerable – but 'what' infrastructure and services are physically more exposed and vulnerable, and reflects the variation and complexity of both human and natural systems, and incorporates social dimensions such as population, poverty, income etc., as well as the bio-physical attributes of topography, natural resources, and physical infrastructure.

The integration of the numerous approaches has seen as both a necessary and practical means of analyzing and understanding the numerous threats that human and natural systems of the study area will face in the future as a result of climate variability and change, and also from non-climate hazards. Placing social vulnerability within the context of risk and viewing natural systems' vulnerability provides a framework for assessing both the comparative spatial and sectoral vulnerability on the Fethiye-Göcek SEPA.

Also, the integration of social, ecological, human and natural factors in overall vulnerability assessment significantly enhance our ability to understand the severity of a possible disaster and subsequently to prepare for it. It further helps to carefully plan and execute developmental activities before an occurrence of hazard in order to minimize the impacts of a future disaster. The desired endeavor of this particular study was to link the current socio-economic, environmental and ecological knowledge through an appropriate vulnerability assessment framework. Further, it also tried to incorporate experts' perspectives, identify the key functional areas to enhance disaster and climate resilience of the people living in Fethiye-Göcek SEPA. All these components are crucial in terms of framing spatial plans for this critically vulnerable coastal area.

Due to the data intensive nature of the adopted ICVA method, this study focused on developing a range of comparative baseline indicators for tourism and agriculture sector in order to provide a more detailed picture of the nature and extent of human settlements and infrastructure that are likely to be most vulnerable to future climate change, and to reveal the vulnerability level of study area that explicitly illustrate the comparative vulnerability for the years 2000 and 2016.

The proposed model assesses the level of ICV by ranking the vulnerability on a relative scale (1–5). The model defines criteria for assigning a score to every indicator, which may be a qualitative, semi-quantitative or quantitative parameter. The ranking approach and unambiguous score criteria make the model easy to use.

So this model is simple and permits the vulnerability evaluation at a local to regional scale.

Hereby, coastal vulnerability assessment model developed for research area has multiple sequential stages; determination of spatial level, assignment of dimensions, selection of parameters according to these dimensions, defining the temporal scale of a study, identification of data will be used, selection of test method and assessment of vulnerability.

SYSTEM MODEL DIAGRAM/ASSESSMENT FRAMEWORK

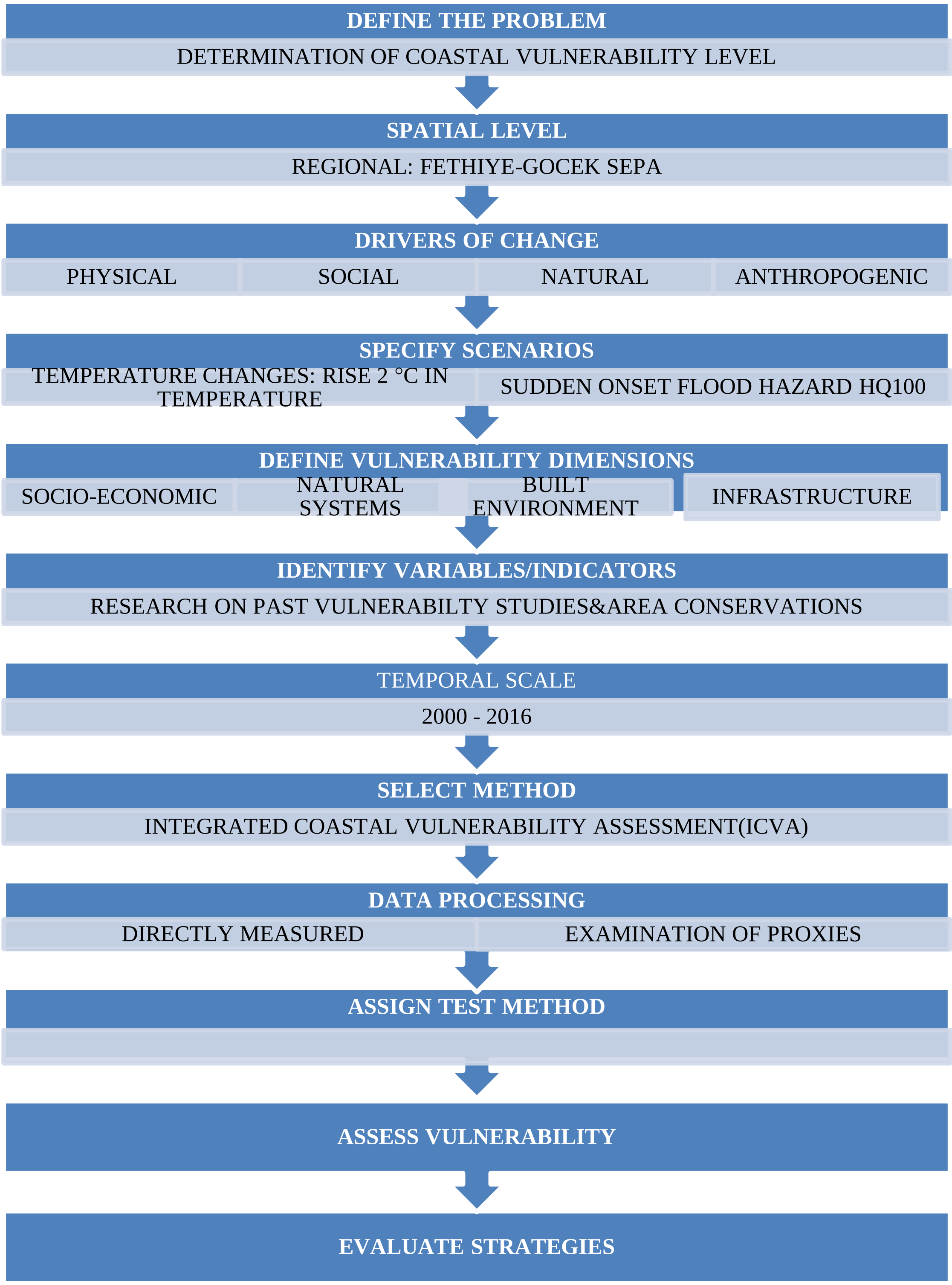

Figure 20: Coastal vulnerability assessment design of Fethiye –Göcek SEPA

5.4.2.1.1. Determination of study area and spatial level/Scope definition:

The first step of the coastal vulnerability assessment model is defining the spatial level of the study area. As a specifically declared protection area, there are a number of settlements having characteristics of urban and rural with specific spaces hosting many types of flora – fauna, and biodiversity, case area will be analyzed at the regional level.

5.4.2.1.2. Dimensions:

The vulnerability assessment model do not only be directly associated with physical factors that characterize the specific area but both spatial and social aspects of the vulnerability of an area and its driving factors should be focused (Cutter et. al. 2003, Panray et. al 2009), Wilhelmi and Morss 2013, Zhou et al 2014). In this study, beyond the effects of spatial and social characteristics, -being a specially protected area- ecological components have also be taken into consideration as several studies have already used (Hossain et. al 2013; Hercher 2015).

To devise a framework applicable to Fethiye-Göcek SEPA, a multidimensional method for assessing resilience and vulnerability was employed by using four key *dimensions* of coastal vulnerability namely: socio-economic, natural systems, built environment, and infrastructure and under each dimensions several indicators were framed.

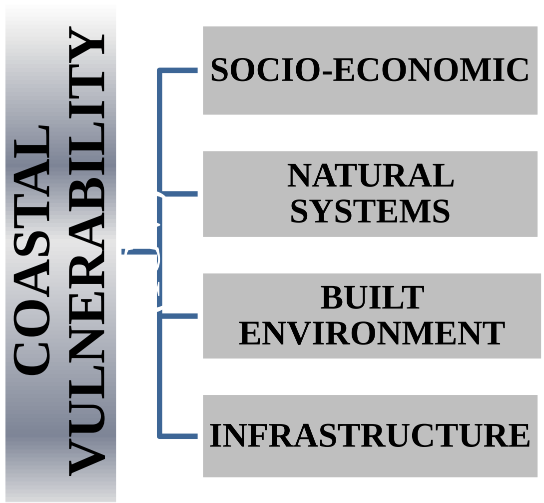

Figure 21: Dimensions of ICV Index

5.4.2.1.3. Indicators

To measure coastal vulnerability, an Integrated Coastal Vulnerability Index (ICVI) was designed that cover approximate vulnerability indicators especially reflecting the characteristics of the study area. With the extensive background literature survey, several *indicators* have been chosen to be used in the index applied to the area but some newly contributed indicators must be added to this list because of the unique nature of the study area.

Socio-economic vulnerability indicators

The social dimension encompasses population and community characteristics that render social groups either more vulnerable or more adaptable to hazards and disasters. This dimension is partially the product of social inequalities - those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond. In the study area, because the socio-economic conditions are not necessarily to be regarded apart from other geomorphological or physical factors of vulnerability, social vulnerability indicators related to population pattern, poverty, levels of education, employment, and dependency etc. are taken into consideration.

Demographic and the social characteristics of residents make some communities more vulnerable than others. The most widely accepted and most often used indicators of social vulnerability are age, gender, socio-economic status, special needs populations (Cutter 2008), poverty, disabilities, and limited employment (Dolan and Walker, 2006).

In this framework, indicators assigned to measure 'socio-economic vulnerability' of Fethiye-Göcek SEPA include "*old age dependency rate*", "*Population growth rate*", "*Population density", "Net migration rate", "Literacy rate" "Household size",* "*GDP per capita*", "*Employment loss/Unemployment",* "p*ercentage of rural farm population", "Scale of fishing sector" , "percentage of tourism population*" and "*number arrivals (international tourism) (arrivals/total population)"*.

Considering the *"old-age dependency rate"* indicator, as a number of studies have highlighted a greater vulnerability of elderly in floods or harm in that elderly population may need assistance or have special requirements to manage themselves and their resources during an emergency (Khan 2012; Cutter et al 2008b; Zhou et al., 2014; Zhang and You 2014), it is preferred to included to the vulnerability index in this study.

"Population growth rate", "*Population density" and "Net migration rate"* indicators were used in this study to reveal the density of population and its stress on a study area. More crowded and densely built regions are more complicated to evacuate and care for during emergencies (Cutter et al. 2003; Eidswig et. al 2014).

Regions experiencing rapid growth lack available quality housing, and the social services network may not have had time to adjust to increased populations thus increase vulnerability all of these affect residents' capacity to resist or recover from a disaster and can lead to further damage (Cutter et al. 2003; Ge et al 2013).

Population growth in coastal watersheds has also placed stress on habitats that will increase with a changing climate (Burkett and Davidson, 2012). Increasing pressure by humans on natural resources makes environment's capacity to provide essential services is being compromised worldwide thus vulnerability of communities increases, as they cannot rely on specific environmental resources to sustain their way of life, and allow them to minimize the impact or recover after a hazard (Renaud, 2012). All of the economically important sectors are dependent upon healthy and functioning coastal ecosystems to provide an environment that sustains natural habitats and resources for use by communities (Burkett and Davidson, 2012). As a continuously developing region, Fethiye-Göcek SEPA, indicators related to population growth pattern and household characteristics are incorporated to the vulnerability index to evaluate the pressure on the natural assets.

The indicator *"Literacy rate"* is introduced to vulnerability index because lower rates of literacy constrain the ability to understand warning information and access to recovery information (Cutter et al. 2003). Education can indicate to what extent people have a basic understanding of the processes, are able to understand and judge information material, and how they follow media and information flows.

As to the indicator of average "*household size"*; large families often have limited finances to outsource care for dependents and thus must balance work responsibilities and care for family members. Large family size may also reduce evacuation ability and resilience to natural hazards (Ge et al 2013).

Also when the communities like the study area are extremely dependent on natural resources, socio-economic and ecological resilience normally follows an interdependent way of relation with increasing effect to the overall vulnerability of a region. Species at risk from over-harvesting, pollution, or habitat degradation influence the economic vitality of communities dependent upon them for their livelihoods and thus incur an economic loss when nature's services are diminished (Cutter, 2008). Communities that rely on a single economic sector for their livelihoods, such as tourism, agriculture or fishing are more vulnerable than those communities with a diversified economic base. Rural populations who are dependent on the surrounding natural resources for their primary source of income: a singular reliance on one economic sector for income generation creates a form of economic vulnerability (Cutter et al. 2003; Eidswig et. al. 2014). Rural residents may also be more vulnerable because of lower incomes (Cutter et al. 2003). So, "p*ercentage of rural farm population", "Scale of the fishing sector", "percentage of tourism population*" and "*number arrivals (international tourism) (arrivals/total population)"* are employed in the index.

As a measure for resources for recovery, the crucial indicator is "*GDP per capita"* indicating the ability to absorb losses and enhance resilience to hazard impacts. Wealth enables communities to absorb and recover from losses more quickly due to insurance, social safety nets, and entitlement programs. (Cutter et al. 2003) Furthermore, because the wealthier regions have greater resources and often better services, they have the ability to absorb and recover from losses more quickly (Ge et al 2013).

Natural systems indicators

The environment is a provider of services to human beings, and it is the loss of capacity to satisfy human needs that are considered as a potential to increase the vulnerability of communities to external or internal stresses and human impacts on various ecosystems. Thus by its direct impact on vital resources (e.g. water, soil), environmental degradation increases the vulnerability of communities (Renaud, 2012).

In coastal areas like Fethiye-Göcek SEPA, natural systems represent the coping capacity of coastal areas to the hazards and natural protected areas such as wetlands and dunes offer a buffer against impending storm surges, while biodiversity enables the system to recover more quickly after a disturbance. Because of increasing pressure by humans on natural resources such as land and surface- and groundwater, the environment's capacity to provide essential services is being threatened. Hereby, this increases the vulnerability of communities, as they cannot rely on specific environmental resources to sustain their way of life, and allow them to minimize the impact or recover after a major hazardous event (Renaud, 2012). So, for the study area "*type of settlement/coastal landform*", *"length of coast"* "*presence of species to be protected", "size of undisturbed habitat (protected areas for biodiversity)", "size of forest areas", "land area where elevation is below 5 meters", "temperature rise projections", "CO_2 emissions*", *"consideration of flora have to be protected" "consideration of protection of estuaries(from urbanization, agriculture and tourism)", "creation of conservation zones for protection areas",* "*presence of restriction zones to fishing",* "*consideration of impacts of sand extraction",* and *"lighting and noise on sea turtles"* are assigned in 14 "natural system vulnerability" indicators.

The "*type of settlement/coastal landform*" is related that landforms and the material that compose coastal settlements reflect their relative responses to sea level rise since every type of landform offers a certain degree of resistance to coastal hazards, inundation, erosion etc. (Thieler and Hammar-Klose 1999). The rocky cliffs and wave-cut benches offer maximum resistance and therefore vulnerability level to sea level rise is very low, whereas the soft sandy and muddy forms such as dunes, mudflats, mangroves that offer the least resistance are extremely vulnerable (Mahapatra et. al., 2015).

The “*length of the coast”* may be introduced as an important indicator for the study area that puts forward the settlement’s exposure capacity to coastal hazards. On the other hand, the coastal slope is another factor that affects vulnerability in that the areas most susceptible to inundation refer primarily to fluvial plains which do not exceed slopes over 5 m. (Young and Nobre, 2012) so *“land area where elevation is below 5 meters”* is used as a proxy indicator for vulnerability.

Besides affecting the vulnerability of people, environmental degradation can contribute to the amplification or increase in the frequency of certain types of hazards. The IPCC report (2001) indicated that climate change could generate more extreme weather patterns in many parts of the world in the future. Temperatural changes are the primary effect of climate change for Mediterranean basin so temperature rise projections can be listed as an indicator for coastal vulnerability with its effect on various sectors. Because the study area has climatic characteristics of Mediterranean Basin, indicator pertinent to temperatual conditions (*temperature rise projections)* is incorporated to the vulnerability index to analyze coastal vulnerability level.

Also, carbon dioxide (CO_2) is the most important anthropogenic GHG and often is used synonymously with its contributions to climate change. The main sources of atmospheric “*CO_2 emmisions”* are from the burning of fossil fuels used in transportation, heating, and cooling of buildings, all of which are substantial activities in urban areas and contributing to global warming.

In addition to the effects of climate change, land use changes throughout the World have affected the characteristics and/or the likelihood of manifestation of some types of extreme events. For this reason “*consideration of protection of estuaries*” from urbanization, agriculture, and tourism pressures becomes important also for Fethiye-Göcek SEPA. Rapid urbanization frequently leads deforestation in some regions, which can increase erosion and decrease the infiltration capacity of soils, thus, generates more runoff and more local inundation creates more risky conditions for protection areas. *"Creation of conservation zones for protection areas"* indicator is included in the index because as a coastal protection area, for the study area, conservation zones must be kept and created to be more resilient.

In coastal areas, wetlands and dunes offer a buffer against impending storm surges, while biodiversity enables the system to recover more quickly after a disturbance (Cutter, 2008; Renaud, 2012; Gilmer and Ferdana, 2012; Abdrabo and Hassaan, 2015). Therefore, indicators related to range of actions taken for the management, conservation, and restoration of ecosystems (*"consideration of flora have to be protected"*, "*presence of species to be protected", "size of undisturbed habitat (protected areas for biodiversity", "size of forest areas")* that will help reduce the vulnerability and increase the resilience of coastal area are also considered in this study.

Especially for Fethiye-Göcek SEPA, another indicator namely "*consideration of flora and fauna"* is important determinator for the vulnerability of coastal parts. Thus to keep the sustainability of these kind of assets, *presence of "restriction zones to fishing"* and existence of preventive and preservative cautions for some species like sea-turtles with substantial consideration on areas they intensively exist are important indicators namely *"consideration of impacts of sand extraction"* from breeding and nutrition spaces and, lighting and noise control precautions on these areas.

Built environment indicators

Urbanization and built environment are outcomes of the human induced unsustainable development of coastal areas. Increasing development pressure for accommodation, commercial or recreational facilities inevitably motivate settlements will expand to the natural spaces. With increasing populations, land use patterns have been changing along the coast then many agricultural and previously undeveloped areas have been converted into residential, commercial, tourism and industrial uses. For the study area, coastal constructions and tourism developments are main factors that threaten resilience of coasts. Consequent sprawl and urbanization have affected coastal ecosystems and coastal vulnerability in various forms.

In this manner "*Rate of engineered frontage and constructed areas on coasts", "Yacht tourism pressure", "Average Coastal distance", "Rate of tourism developments on coasts"*, *"Impervious surface percent", "Urbanization rate", "Mixed use and compact development", "Green areas per capita (m)", "Disaster-resistant land use and building code", "Climatic regulations: cooling and heating effects; sensitive to sun and wind", "Rate of farmland/total size", "Irrespective of temperature rise and flooding", "Orientation to nature-based tourism, ecotourism, culture tourism", "Consideration of green building and green infrastructure standards"* and *"Consideration of green roofs- Installation of vegetative roofing materials"* was selected as indicators that represent "built environment" vulnerability.

Types of land use or land cover are significant factors in determining coastal vulnerability. Increasing pressures on coasts for development and recreation purposes will inevitably lead increasing vulnerability (Cutter et al. 2007, Dolan and Walker, 2006) with changing shoreline and increasing demand for living and recreational space such as yacht tourism. However, some of the vulnerability can be mediated by improving community resilience. So, planned adaptation (e.g. shoreline protection, dune restoration) can reduce built environment vulnerability by enhancing system resistance and resilience thereby increasing the likelihood of adaptation. Thus, at the indicator selection process in this study, besides factors controlling vulnerability of a Fethiye-Göcek SEPA, planning adaptation measures to decrease the effects of these vulnerabilty factors are considered in the same way. "*Rate of engineered frontage and constructed areas on coasts", "yacht* *tourism pressure", "rate of tourism developments on coasts"* as well as *"orientation to natüre-based tourism, ecotourism, culture tourism".*

When the impacts of coastal hazards are considered by the developments for housing, commercial facilities or tourism etc., their distance from the sea ("*average coastal distance)*" is another important factor that influences the coastal vulnerability. Birkmann and Fernando (2008) suggest that the 100-metre buffer 'risk zone': housing damage inside and outside the 100-metre zone: with regard to the aspect of exposure, significantly higher amount of intensive damage takes place inside the 100-metre zone. In the study area, main developments are taking place in the areas near the coastal zone; *"Average Coastal distance"* is selected as an indicator to measure the vulnerability level.

Alterations to land use for tourism and other development activities and natural inlets impact nutrient runoff, storm water management, and water quality; shoreline hardening and dredging changes coastal circulation patterns exacerbating shoreline erosion and the ability to attenuate flooding; and development that replaces land cover, disturbs habitats and species (Burkett and Davidson, 2012). Besides changing land uses and land cover trigger coastal storms, particularly in terms of coastal flooding that puts people and property at risk.

Changes in land use and land cover affect the magnitude-frequency relationship of runoff by reducing the infiltration capacity of the soils ("*impervious surface percent"* and *"rate of farmland/total size").* Urbanization changes the natural rainfall-runoff regime in such a way that large floods begin to occur more frequently and a stream's hydrologic regime becomes faster than normal range – peak discharges get larger (Young and Nobre, 2012). Urbanization process narrows the natural and green spaces, creates impervious surfaces, infiltration capacity of the land surface decreases and water is able to run off more quickly (Burkett and Davidson, 2012). *"Urbanization rate"* and *"Green areas per capita (m)"* are important indicators to relate to the vulnerability of the study area because the density of the built environment is another source of vulnerability. A high density of structures equates to more community assets in harm's way including commercial and industrial development and the residential housing stock.

On the other hand, the principle of *"mixed use and compact development"* for sustainable and resilient settlements is incorporated to the index of the study area as an indicator since this type of development helps to mitigate greenhouse gas emissions by reducing traveled distance and lessen the development pressures on natural spaces.

In fact, many argue the need to balance environmental and development issues while promoting safe and livable communities is the key to fostering resilience and this can only be done through hazard mitigation planning and managing local land use (Burby et al. 1999). Alteration in the viewpoint of planning respective of climate change effects such as temperature rise and flooding and considering tourism sector orientation to nature-based tourism, ecotourism or culture tourism needed to be taken into account for vulnerability context in the study area. From the perspective of the built environment, improvement in construction practices, architectural regulations, green infrastructure applications, building codes, retrofitting and elevating homes are all measures that enhance resilience as does the building of redundancy in some of the critical infrastructure. In this context, some indicators like *"disaster-resistant land use and building code", "climatic regulations: cooling and heating effects; sensitive to sun and wind", "rate of farmland/total size", "irrespective of temperature rise and flooding", "orientation to nature-based tourism, ecotourism, culture tourism", "consideration of green building and green infrastructure standards"* and *"consideration of green roofs-Installation of vegetative roofing materials"* are operated in the ICVI index in this study.

In brief, human-induced hazards namely land degradation, inappropriate development and encroachment and protection structures decrease (or temporarily increase) resistance thereby reducing resiliency of the system to respond and adapt (Dolan and Walker, 2006). In this context, analyzing the vulnerability factors resulted with urbanization process is noteworthy because the Fethiye-Göcek SEPA showing multiplicity of development patterns with rising trend of population. Accordingly, human-induced factors for development purposes on natural spaces are needed to be taken into consideration to measure the vunerability level.

Infrastructure indicators

Communities, be it rural or urban, depend on series of infrastructural facilities. Resilient infrastructure systems, particularly electricity, water; transportation and health services minimize the impacts of disasters and mainly an appraisal of community response and recovery capacity. In this context, potential indicators assigned for infrastructure vulnerability index are: "*Zero waste reduction and high recycling strategy", "Consideration Boat-yacht wastes", "Waste and storm water management", "Tourism formations' waste water treatment strategies", "Requirements for wind, solar, geothermal, or other renewable energy sources", "Energy efficiency and energy stars", "Total water consumption per capita(liter/person", "Renewable energy consumption"*, *"Electric power consumption", "Presence of alternative transportation strategies", "Density of the total road network", "Consideration of Pedestrian/resident-friendly, bicycle-friendly "number of cars per 1000 inhabitants", "Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle", "Climate proofing of transport infrastructure", "number of medical doctors per 100.000 inhabitants"* and *"number of hospital beds per 1000 inhabitants".*

Infrastructure provides key indicators for Fethiye-Göcek SEPA's response capacity (e.g. public safety structures, shelters, health care facilities), as well as the identification of critical infrastructure such as pipelines, roads and bridges, water treatment and storage, communications, and power transmission (Cutter 2008).

Coping with the growing water needs of settlements is one of the most pressing challenges of this time. Settlements rely on a steady supply of safe drinking water and in turn have a huge impact on freshwater systems. Moreover, to meet the growing demand, many cities are overexploiting their water resources as such; it is noteworthy for the study area that protecting natural ecosystems to secure its water supplies makes economic sense and increase the resilience. "*Total water consumption per capita", "Zero waste reduction and high recycling strategy", "Consideration boat-yacht wastes", "waste and storm water management", "tourism formations' waste water treatment strategies"* are identified as an indicator to state the water requirements as well as pressure on water resources and to the natural environment of the study area.

Furthermore, many forms of energy are the result of a service provided by species and ecosystems. Ecosystems are also key to helping meet the growing energy demand, that is why we need to enhance their quality and minimize the impacts of energy—even renewable energy and energy efficiency options—on ecosystems. Consuming less energy with green infrastructure can be introduced as an example to enhance energy security in settlements (Marton-Lef'evre 2012). Therefore, revealing the renewable energy capacity of Fethiye-Göcek SEPA with the selected indicators such as *"electric power consumption", "requirements for wind, solar, geothermal, or other renewable energy sources", "energy efficiency and energy stars"* and *"renewable energy consumption* is crucial to measure the vulnerability level of a region.

Public infrastructure and lifelines such as roads, water, bridges, or power are important sources of vulnerability; the loss of this infrastructure could place a large financial burden on smaller communities that lack the resources to rebuild after a destructive hazard. As McLaughlin and Cooper (2010) emphasized, *"density of the total road network"* is introduced to coastal vulnerability index of the study area so roads were noticed as vital lines of communication and the main medium for transport when we considered the vulnerability of settlement to the hazards.

Traditional car dependant transport and mobility systems emphasize the fast movement of people and goods by extensive networks of ever-expanding vulnerable highways and roads. Figuring out the reliance on walking and bicycling and transit systems in the study area is necessary because these systems are often more resilient in the face of natural disasters by means of lower levels of damage, quicker functioning and service, and having fewer negative environmental impacts. Also, pedestrian-friendly neighborhoods design and planning is an essential way to reach community resilience thus it is useful way to employ the proxy indicators namely *"Presence of alternative transportation strategies", "Consideration of Pedestrian/resident-friendly, bicycle-friendly", Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle"* to determine the vulnerability level of the study area.

Also, critical infrastructures can be defined as critical (care) facilities and lifelines that are important for the functioning of the society and have been shown to contribute to the impacts of natural hazards if located in the affected area. The quality of medical services and the access to hospital beds are inevitable for the population in case of large disasters (Eidswig et al. 2014). The indicators of *"number of medical doctors per 100.000 inhabitants"* and *"number of hospital beds per 1000 inhabitants"* are included for this purpose as hospitals and road network are necessary for the functioning of the society and dysfunctioning of them increases vulnerability and lengthen immediate relief and longer-term recovery from disasters (Cutter et al. 2003; Eidswig et al. 2014).

So, in table 9, four dimensions that constitute the proposed ICV index for Fethiye-Göcek SEPA and their proxy indicators takes place as a whole.

Table 8: Indicators that form the ICV index

INTEGRATED COASTAL VULNERABILITY INDEX			
Dimensions	**Category**	**Proxy Indicators**	**Data source**
SOCIO-ECONOMIC	**Population**	Old age dependency rate	Turkish Statistical Institute, Eurostat
		Population growth rate(‰)	*Turkish Statistical Institute, Eurostat
		Population density	Turkish Statistical Institute, Eurostat
		Net migration rate (‰)	Turkish Statistical Institute, Worldbank
		Literacy rate (‰)	Turkish Statistical Institute
		Household size	Turkish Statistical Institute, Eurostat
	Socio-econ status	GDP per capita(euro)	Turkish Statistical Institute, Eurostat
		Employment loss/Unemployment	Turkish Statistical Institute, Eurostat
		% rural farm population;	Report of 1/25.000 scaled Territorial Plans, Turkish Statistical Institute, Eurostat
		Scale of fishing sector	Expert opinions
		% tourism population: Tourism employment/total employment	Report of 1/25.000 scaled Territorial Plans, Eurostat, Fethiye Socio-Economic Report, *Tourism Statistics-AKTOB(2014)
		# of arrivals (international tourism) (arrivals/total population)	Worldbank, Muğla İl Kültür Turizm Müdürlüğü, Fethiye İl çevre Durum raporu (2007)
Total	**12**		
NATURAL SYSTEMS		Type of settlement / coastal landform(Coastal/river delta /Lateritic Plain area/Low cliffs /Medium cliffs/Rocky cliffed /Mountainous)	Expert opinions
		Presence of species to be protected	Expert opinions
		Consideration of caretta-caretta with coastal and terrestrial ecosystems	Expert opinions

Table 8 (continued)

		Size of undisturbed habitat(protected areas for biodiversity)%	1/25.000 scaled Territorial Plans, Eurostat
		Size of forest areas	1/25.000 scaled Territorial Plans, Ministry of Forestry and Water Affairs, World bank
		Length of coast/total acreage (m/km2)	Vikipedi CIA World Factbook, GDPNA
		Land area where elevation is below 5 meters (% of total land area)	Satellite maps**,** World bank
		temperature rise projections(RCP4.5 scenario)	Demircan et. al (2014),Akçakaya et. al (2013)
		Creation of conservation zones or protection areas	Expert opinions
		CO2 emissions (metric tons per capita)	World bank
		Consideration of Impacts of sand extraction, lighting and noise on sea turtles	Expert opinions
		Consideration of Protection of estuaries (from urbanization, agriculture and tourism)	Expert opinions
		Consideration of flora has to be protected (sığla….)	Expert opinions
		Presence of restriction zones to fishing	Expert opinions
Total	**14**		
BUILT ENVIRONMENT	**Coastal Constructions**	Rate of engineered frontage and constructed areas on coasts (Ports, marinas, boat service areas) m2/total coastal length	Satellite maps
		Average Coastal distance(m)	Fethiye Land Development Plan
	Tourism	Rate of tourism developments on coasts	Fethiye Land Development Plan
		Yacht tourism pressure	Expert opinions
		Orientation to culture or nature-based tourism, ecotourism	Expert opinions
		Irrespective of temperature rise and flooding	Expert opinions

Table 8 (continued)

	Agriculture	Rate of farmland/total acreage	1/25.000 scaled Territorial Plans, Turkish Statistical Institute,World bank
	City macro form	Impervious surface percent	1/25.000 scaled Territorial Plans, * World bank
		Urbanization rate	Turkish Statistical Institute, World bank
		Green areas per capita (m)	Fethiye Land Development Plan
		Mixed Use and compact development	Expert opinions
	Architectural details	Climatic regulations: cooling and heating effects; sensitive to sun and wind	Expert opinions
		Disaster-resistant land use and building code	Expert opinions
	Green infrastructure	Consideration of Green building and green infrastructure standards.	Expert opinions
		Consideration of Green roofs-Installation of vegetative roofing materials	Expert opinions
Total	**15**		
INFRASTRUCTURE	**Waste strategies**	Zero waste reduction and high recycling strategy	Expert opinions
		Waste and storm water management	Expert opinions
		Consideration Boat-yacht wastes	Expert opinions
		Tourism formations’ waste water treatment strategies	Expert opinions
	Renewable energy programs	Requirements for wind, solar, geothermal, or other renewable energy sources	Expert opinions
		Energy efficiency and energy stars	Expert opinions
		Renewable energy consumption (% of total final energy consumption	Expert opinions
	Energy	Total water consumption per capita(liter/person)	Turkish Statistical Institute, World bank

Table 8(continued)

		Electric power consumption (kWh per capita)	Turkish Statistical Institute, World bank
	Transportation policies	Presence of alternative transportation strategies	Expert opinions
		Density of the total Road network	Turkish Statistical Institute, Eurostat
		Consideration of Pedestrian/resident-friendly, bicycle-friendly	Expert opinions
		# of cars per 1000 İnhabitants	Turkish Statistical Institute, Eurostat
		Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle	Expert opinions
		Climate proofing of transport infrastructure	Expert opinions
	Health services	# of medical doctors per 100.000 inhabitants	Turkish Statistical Institute, Eurostat, OECD Health Data 2012
		# of hospital beds per 1000 inhabitants	Fethiye Strategic Plan 2015-2019, Turkish Statistical Institute, Eurostat
Total	**17**		
ICVI	**58**		

***data was adapted to the indicator or year.**

5.4.2.1.4. Temporal Scale:

To decide the *temporal scale* of vulnerability assessment, planning systems' contribution was evaluated in this study and the main purpose was to compare two time periods: year 2000 and year 2016. 1/25.000 scaled Territorial Plan of Fethiye-Göcek SEPA were declared at 1998 and revised at 2008 so to observe the effects of these plans form the perspective of coastal vulnerability can be useful for these years. These territorial plans were used as an input that provides required data to assign and compare the vulnerability rates of many indicators. Also these time periods do not reflect exact years of collected data because it was not possible to reach exact statistical data for every year and for every settlement level demanded. To get the accurate values for specific indicators proximate data had to be used in some cases.

5.4.2.1.5. Source of Data:

Availability of data is an important factor in the selection of variables to depict vulnerability at each scale. For the study area not all of the data for all variables had collected or prepared for all the time periods, and in many instances, there was a change in the definition of the variable. There were not available and qualified data at the county level; some variables simply were not collected in the earlier decades. In the case of suitable data cannot be attained it was also considered that data had to be extracted from larger datasets or secondary data was to be derived. For example, the exact value of "*CO_2 emissions (metric tons per capita)"* for 2016 is not available therefore 2011 year data for Turkey from World bank statistics; for "*household size*" indicator for Fethiye town the year 2013 Turkish Statistics Institute data was used to refer the aimed year. Alternatively, to figure the rate of "*Impervious surface percent (for heat island effects)"* indicator Eurostat statistics for European Union 2000 year data is inferenced from the 2012 and 2009 year data.

Table 9: Data sources used during the case study

Spatial Data and Maps	Reports	Statistics	Quantitative data
Fethiye-Göcek SEPA Territorial Plans 1/25.000 scaled	"Determination of Biodiversity of Coastal and Marine Habitats in Fethiye-Göcek Special Environmental Protected Area", Environmental Protection Agency For Special Areas (EPASA) 2009	Turkish Statistical Institute: population and demography household Labor force Municipal waste, water Income, Living, Consumption and Poverty	Ministry of Forestry and Water Management, Ministry of Energy and Natural Resources, Ministry of Culture and Tourism, Turkish State Meteorological Service
Fethiye Land Development Plan	"Economic Analysis of Fethiye-Göcek Special Environmental Protection Area", Ministry of Environment and Urbanization 2013	Eurostat: population, employment, environment, land use	
Göcek Land Development Plan	"The Report for Monitoring and Conservation of Sea Turtles *(Caretta Carreta, Chelonia Mydas)* Populations Within The Scope Of Fethiye-Göcek Specially Protected Area Monitoring Species And Habitat Project", Ministry of Environment and Urbanization 2013	World bank: poverty, environment, world development indicators	
Satellite maps	"The Report for Determination of Yacht Carrying Capacity of Gocek Bay", EPASA 2007	OECD health statistics	
	"The Report for Determination of Yacht Carrying Capacity of Fethiye Bay", Ministry of Environment and Urbanization, 2012		
	"Research Report on Fethiye- Göcek SEPA Socio-Economic, Historic and Cultural Values", EPASA, 2010.		
Base/ Topographic Maps	"Strategic Plan For Fethiye 2015/2019", Municipality of Fethiye		
	"Special Environmental Protection Zone of Fethiye-Gocek and Dalaman Bays Application of Procedures and Principles for Protection", EPASA, 2009		

For the vulnerability indicators namely *"creation of conservation zones or protection areas", "presence of restriction zones to fishing"* that cannot be valued by statistical data but necessitate special experience to decide the appropriate value and need subjective evaluations, it was preferred to seek an opinion of specialists and expert guidance (Li and Li 2011; Torresan et. al. 2012). Five rating classes are decided as corresponds to the answers of these experts in that "*exactly not=5; rarely concerned=4; attempts but no implementation=3; high attempts but not full implementation=2"* and "*fully considered=1*". So, qualitative measurements for specific indicators were finalized according to the expert evaluations.

Also generally accepted standards for some criteria are used to decide vulnerability rate of some indicators. For instance, located under the dimension of "*Built Environment*", for the indicator of "*green areas per capita*", the standard put forth by World Health Organization as minimum 9 m^2 and according to the Law of Development (year: 1985, law no:3194) this area should be minimum 10 m^2 used as a reference.

Indicators like "*Rate of farmland", "Impervious surface percent", "Size of forest areas", and "Size of undisturbed habitat"* and *"Average Coastal distance (m)* were measured by means of Territorial Plans of Fethiye-Göcek SEPA and Land Development Plans.

To measure the values of indicators namely "*Rate of engineered frontage and constructed areas on coasts*" and "*Land area where elevation is below 5 meters*" satellite images for 2004 and 2016 were used.

The data necessary for compiling a coastal vulnerability index are expressed in the qualitative and quantitative form, are frequently available at different scales, and are expressed in different units of measurement. Under the categorization of four dimensions total 58 indicators are framed and statistical measurements, spatial territorial plans' decisions; expert ratings and previous studies and reports were used to reach final rates of vulnerability indicators.

5.4.2.1.5.1.Standardization:

At the next stage of the assessment the exact values of each indicator are standardized to the processable values. To standardize final values of each indicators, all specific values for Fethiye-Göcek SEPA for each indicators compared with their reference values (generally for specific value of Turkey and for European Union, but in some cases according to the inavailability of data only for Turkey/EU or World average values) were divided into five classes depending upon the nature of each of these variables ranging between 1 to 5 from very low to very high vulnerable case adopted in earlier studies (Rao et al. 2008; Gornitz 1991; Thieler and Hammar- Klose 1999; Ozyurt and Ergin 2010). The scaling of 1 to 5 was used for every variable standardizes the scoring system and enables variables measured in different units to be combined mathematically. The vulnerability ranges were determined based on the distribution of available data related to each parameter. Ranking of variables is not entirely objective exercise thus the criteria by which they are ranked is clearly expressed below:

For indicators that need statistical data such as "*old age dependency rate", "percentage of rural farm population" and "urbanization rate*" etc. especially Turkish Statistical Institute, Eurostat, World bank and OECD statistics, several Turkish Ministries' special statistics were used as well as special reports' database on Fethiye- Göcek SEPA, City of Muğla, Aydın-Muğla-Denizli Region etc. To assign vulnerability rate of a region by using these statistical data, reference data was used to compare and scale statistical data for each specific indicator. Specific indicator's statistical values belonging to Turkey and the European Union - in some cases World -were used as reference data to compare with the specific value of a study area. So data was normalized according these reference data and special range intervals are introduced. To calculate the actual value of a specific indicator for study area principally the exact data for Fethiye-Göcek SEPA, in the absence, respectively at first data for the town of Fethiye, except secondly City of Muğla otherwise thirdly data for Aydın-Muğla-Denizli Region was used. For example, concerning the indicator of "*population density*", TSI database was used to get exact values of settlements in the study area for years of 2000 and 2015 and population densities (total population/total area) were calculated for these time periods. Then Turkey and EU data was used as the reference values; similarly TSI database was used for Turkey and Eurostat data was operated for EU for the years of 2003 and 2014 because of the availability of data.

As another example; for the *"employment loss/unemployment*" indicator, the exact value of Fethiye-Göcek SEPA could not be reached thus TR32 statistical region Aydın-Denizli-Muğla data was decided to use. Because the 2000 and 2016 data was not available, TSI data for 2006 and 2013 was preferred.

Furthermore, in the case of local value could not be reached or this kind of statistics have not been prepared such as "*CO2 emission (metric tons per capita)*", Turkey data was compared with EU and World average as reference values to standardize each indicator.

5.4.2.1.5.2.Weighing:

It is accepted in this study that every indicator will have the same weight as the study of Cutter et al. (2003); McLaughlin and Cooper (2010). Not all factors are equal, but determining appropriate weighting is a challenge in vulnerability assessment; subjective weights reduce confidence in the results. Extensive work of literature review indicated that there is not generally accepted method proving obvious superiority of one indicator to another so indicator weighing method do not preferred.

5.4.2.1.6. Index Calculation:

After deciding each vulnerability indicator rates, at the stage of index calculation; vulnerability dimensions of socio-economic, natural systems, built environment and infrastructure were figured out separately for years 2000 and 2016 was determined by calculating the average value of the sum of the each vulnerability value. These vulnerability dimensions were then aggregated by using a simple averaging technique (Das Gupta and Shaw 2015; Thieller-Hammar Klause, 1999; Turvey, 2007 and Pendelton et al., 2010) to calculate the overall vulnerability namely Integrated Coastal Vulnerability (ICV). This calculation method was preferred because this simple method of aggregation is transparent and easy to understand.

Based on statistical data, local physical data and expert ratings evaluated as "1" for the least vulnerable case and as "5" for the most vulnerable case, according to Özyurt (2007) and Kurniawan et al. (2016). Final vulnerability results are evaluated according to the following classification:

Table 10: ICVI classification for scores and classes

	Vulnerability class				
	Very low	Low	Moderate	High	Very high
Vulnerability index score	1	2	3	4	5
Vulnerability classification class	>1–1,5	>1.5–2,5	>2.5–3,5	>3.5–4,5	>4,5–5

As it is mentioned in the conceptual part of this study, there are two way relationships between coastal settlements and climate change. Introducing the effects of climate change on study area is the primary aim of this work so the general model is constituted to analyze this effect. To reveal the climatological effects on the coastal vulnerability of Fethiye-Göcek SEPA, some related indicators that can be measured were situated under the four vulnerability dimensions. "*Temperature rise projections*" and "*CO_2 emissions (metric tons per capita)*" under the "Natural Systems" dimension, *"irrespective of temperature rise and flooding*", *"impervious surface percent (for Heat island effects)*" and "c*limatic regulations: cooling and heating effects; sensitive to sun and wind*" under the "Built Environment" dimension, "*Climate proofing of transport infrastructure*" under the "Infrastructure" dimension can be demonstrated as some indicators to assess the climate change effects on vulnerability of study area.

CHAPTER 6

RESEARCH FINDINGS

Coastal vulnerability indicators in the study area were categorized under the dimensions of socio-economic, natural systems, built environment, and infrastructure vulnerability. The ICVI was determined by calculating the average value of the sum of the vulnerability dimensions temporally by the years of 2000 and 2016 so the temporal trend of the coastal vulnerability of Fethiye-Göcek SEPA is then drawn according to these dimensions.

The proposed method allows the comparison of vulnerability scores of different dimensions and this comparison of vulnerability scores is useful in order to interpret a single vulnerability score and to define the most critical components in terms of vulnerability. For instance, coastal vulnerability assessment of study area indicates descending temporal trend and more vulnerable in 2000 than in 2016. According to comparative vulnerability values of 2000 and 2016 years, socio-economic dimension is almost stable with little decrease, but still has moderate vulnerability level, dimensions of built environment and infrastructure vulnerability have the upward movement denoting that study area is more vulnerable especially regarding infrastructure dimension; while natural systems are becoming less vulnerable depending on low to moderate vulnerability ranking. Nevertheless, it is worth mentioning that vulnerability values could not diverge from moderate or moderate-high levels for each dimension.

Table 11: Final ICV index values

YEARS	SOCIO-ECONOMIC	NATURAL SYSTEMS	BUILT ENVIRONMENT	INFRASTRUCTURE	ICV
2000	3.75	3.50	3.73	4.12	3.78
2016	3.50	2.93	3.93	4.29	3.66

Based on the values of four dimensions, ICV assessment model of climate-induced coastal vulnerability is calculated for the study area. Results of vulnerability dimensions are from 2.93 to 4.29 for the years of 2000 and 2016. Higher values of built environment and infrastructure dimensions show us anthropogenic processes are the most significant factors that delineate the limits of the coastal vulnerability of Fethiye-Göcek SEPA.

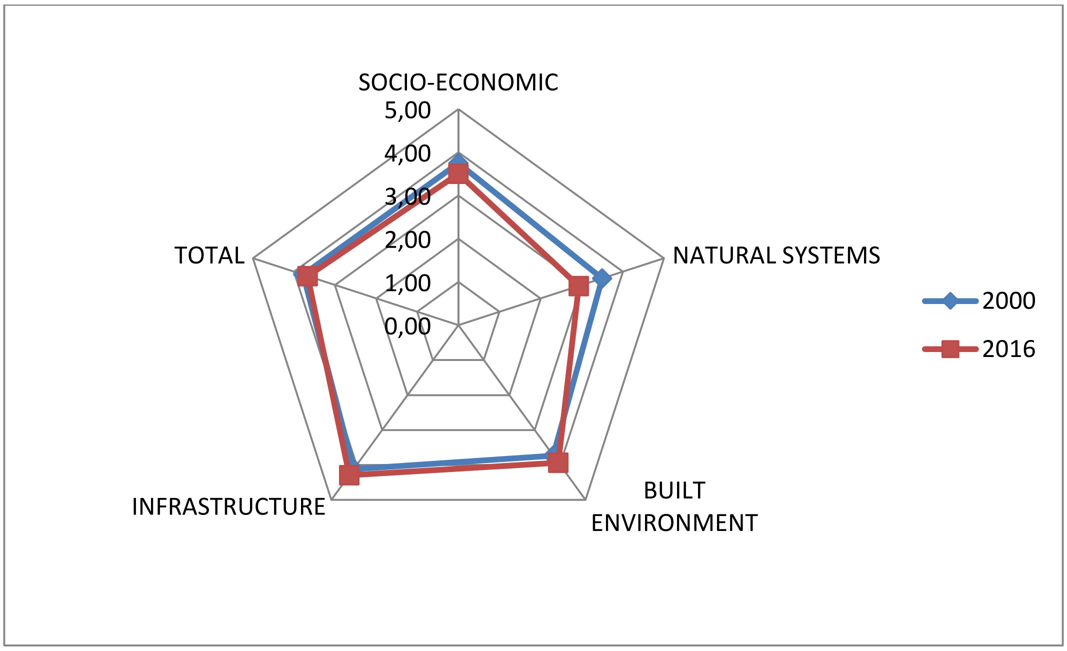

Figure 22: Coastal vulnerability dimension values for the years of 2000 and 2016 and their level of contribution to overall vulnerability.

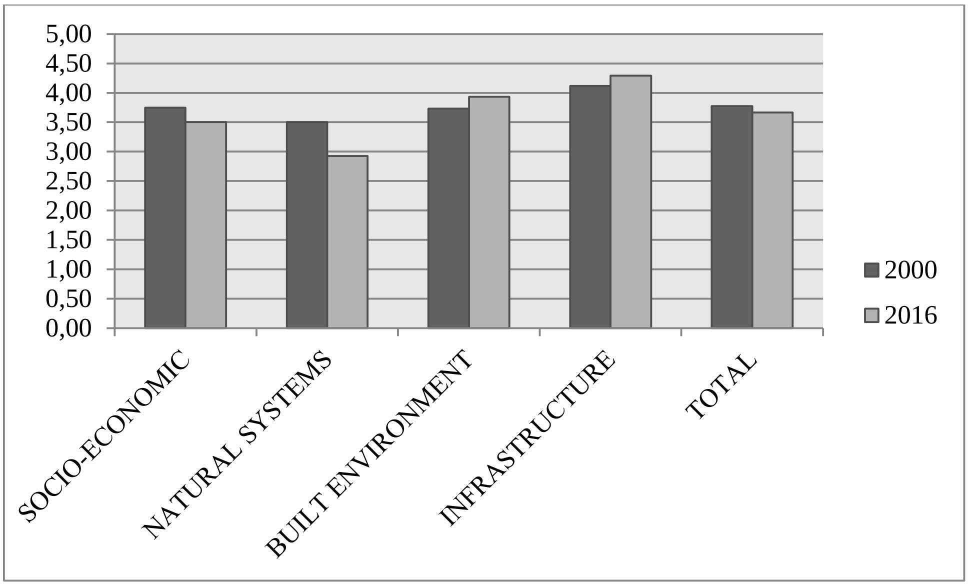

Figure 23: Coastal vulnerability dimension values according to the years of 2000 and 2016 and their level of contribution to overall vulnerability.

6.1.Socio-Economic Vulnerability Results

This dimension shows a stable trend for two time periods 2000 and 2016 with the values of 3.75 and 3.50 reflecting moderate to high-level vulnerability. Social vulnerability is often hidden, complex, and involves various human factors, so it is difficult to obtain direct empirical evidence about it. Therefore, this study can only compare and validate the index serving the basic framework about factors of socio-economic vulnerability. The principal factor that frames the socio-economic vulnerability is the sectors to which based on the study area's economy ans agriculture and tourism sectors are the main economic sectors that shape the economy of the Fethiye-Göcek SEPA. The number of people whose livelihood depends on these sectors is increasing according to this index (***rural farm population*** has risen from 40% to 55%, ***tourism population*** from 30% to 45%). These values are much higher than reference values of Turkey (34% for 2004 and 23.6% for 2013) and EU (28% for 2004 and 25.6% for 2013). On the other hand, another factor that specifies vulnerability values is population density because the rate of this indicator has risen from the moderate level of vulnerability to very high. The growth of tourism based population and intensive utilization of tourism activities are driving factors of coastal vulnerability. Also, tourism is a major source of stress to Fethiye-Göcek SEPA's ecosystem due to its direct damaging impact and reducing its environmental quality. Tourism potential of the study area can be seen as one of the main factors that impact socio-economic vulnerability and ICV via the indicator of ***number of tourism arrivals*** as well as the economic dependence of tourism sector as showing the very high level of vulnerability rates for both years of 2000 and 2016.

The indicator of ***old age dependency rate*** (Cutter et al 2008b, Zhou et al., 2014; Zhang and You 2014) are frequently used in vulnerability assessment literature under the dimension of socio-economic vulnerability. In the case of hazard, elderly population's dependency may at higher rates to recovery and need some assistance so they are more vulnerable than others during an emergency (Khan, 2012). Because the dependency rates are very high in EU via aging population, (23.3 for the 2000 year; 27.5 for the 2013 year), study area resulting rates stayed at low rates. Values of this indicator remained between that of reference values of EU and Turkey calculated so, in 2000 and for the year of 2013 vulnerability rate was 2(low).

Being at the forefront of the tourism investments, natural assets and potentials, coastal tourism capacity and agriculture-based economy, an indicator of ***population growth rate*** showed respectively very high values in the study area. While Turkey has the population growth rate value of %1.8 for the 2000 year and %1.34 for 2015, for EU countries these values are %0.41 for 2004 and %0.35 for 2015 because of the rapid decline of population growth rates of European countries. On the other hand, for the study area population growth rate is 11.1% between the years of 2012 and 2013. Most important factor that generates higher growth rates for case study area that whole city center of Fethiye within the boundaries of Fethiye-Göcek SEPA as showing greater development tendencies. Measured values are much higher for the study area comparatively than the reference values of Turkey and EU, values of which were considered in the rating calculation and standardization. Although the difference between values of population growth rate for the study area and reference areas very high, this indicator's contribution to overall vulnerability was limited to the highest rate of 5(very high) for both two temporal scale.

Related to ***population growth rate***, ***population density*** is another variable that had striking results. To reach the rate of indicator population per square kilometer was calculated based on TSI statistics, data for the study area was constituted from the settlements populations and the areas within the boundaries of the case. The value of study area for 2000 was 99.7, according to Eurostat statistics, the value of Turkey was (for 2003) 91.3, EU was 112.8. For the year 2015, this value reached 165.45 for the study area, 100.3 for Turkey, and 116.7 for EU. Increase in population density for approximately 15 years has a considerable share in the overall vulnerability of an area. Despite being a conservation area and strict development regulations, population rise concentrated especially at coastal settlements and city centers with newly developed areas mostly located at coastal parts have resulted in the increasing population density rates for Fethiye-Göcek SEPA.

To reveal the effect of the tourism sector to the population growth and rise in population density, the indicator of the ***percentage of tourism population*** aimed to present the tourism employment rates within the overall population. According to several types of researches and reports, this value is highly over the reference values of Turkey and EU. It is undeniable for this difference that reference values are based on the average values of all the parts of settlements but case area includes the important and developed centers of the tourism industry. Values of the year 2000 for Turkey and EU are %4.7 and %6.7(these values are inferred from 2004 and 2006 values) whereas for the study area is %30. The report of 1/25.000 scaled Fethiye-Göcek SEPA Territorial Plan reveals that for the year 2008 this value is approximately %45 (Directorate General for Preservation of Natural Heritage), as to the values of 2012, it is calculated as 4.9 for Turkey and 5.5 for EU. In this context for the 10 years period vulnerability rate of study area measured as 5 (very high). Another indicator that was examined under the tourism heading was the ***number of arrivals*** calculated by the proportion of total arrivals to the total population of Muğla province because the exact value of study area couldn't be reached. Then the result showed us the same vulnerability rate of 5 (very high) for two time periods (2000 and 2016).

As to the indicator of the percentage ***of rural farm population*** within the total population, results of the study area demonstrated that vulnerability rate is stable at the rate of 5(very high) with 40% for the 2004 year and 55% for 2009. The 2002 year value was constituted from the value of TR32 Nuts region (Aydın-Denizli-Muğla) and 2008 value obtained from the report of 1/25.000 scaled Fethiye-Göcek SEPA Territorial Plan. But the same trend couldn't be observed for the reference areas of Turkey and EU. For the year 2004, Turkey has the 34% and EU has 28%, these values fall to 23.6 for Turkey and 25.6 for EU in 2013. EU agriculture policies and measures in the cohesion process can be associated with this falling trend. On the other hand in the case study area, one of the main economic sectors is agriculture so agriculture population maintained its rising trend.

A number of vulnerability studies operated the GDP indicators to frame the income situation of an area (Adger 1999; Cutter et al., 2008b; Birkmann et al., 2012). This indicator shows the capacity of precautionary measures before a hazard and recovery potential of the household after a coastal hazard. In this study it was aimed to reach the comparative value of population rate under per capita income, because of the limited data, ***GDP per capita*** was accepted as the income-related indicator for an area. 2000 and 2011 year values were calculated for the province of Muğla and TR 32 Region (Aydın-Denizli-Muğla) because of the suitable database. Against the high values of reference areas, vulnerability rate of case area was stepped from 4 (high) to 5 (very high) from 2000 to 2011. For the year 2000, GDP per capita value of Muğla (3809 euro) was compared with reference values of Turkey (2654 euro) and EU (22.900 euro), then for 2011 this indicator value of TR 32 Region (6752 euro) was standardized with the reference values of Turkey (7201 euro) and EU (25.800 euro).

As an example of indicators that indicate the recovery capacity of an area, ***household size*** and ***illiteracy rate*** showed declining trend in the study area that was prevented the rise of overall socio-economic vulnerability rates. Household size has fallen from 4.5 for Muğla province at 2000 to 3.17 for Fethiye town at 2013. Reference values of Turkey and EU have shown same declining movement in that Turkey fell from 3.8 for 2006 to 3.5 for 2013, EU from 2.4 to 2.3 for the same time periods.

Table 12: Socio-economic vulnerability rates

	Socio-Economic Vulnerability	2000	2016
population	Old age dependency rate	2.00	2.00
	Population growth rate(‰)	5.00	5.00
	Population density	3.00	5.00
	Net migration rate (‰)	5.00	2.00
	Illiteracy rate (‰)	4.00	2.00
	Household size	5.00	4.00
socio-econ status	GDP per capita(euro)	4.00	5.00
	Employment loss/Unemployment	1.00	1.00
	% rural farm population;	5.00	5.00
	Scale of fishing sector	1.00	1.00
	% tourism population Tourism employment/total employment	5.00	5.00
	# of arrivals (international tourism) (arrivals/total population)	5.00	5.00
12	OVERALL SOC-ECO	**3.75**	**3.50**

6.2.Natural Systems Vulnerability Results

Among all the dimensions of a coastal vulnerability index, the only dimension showing remarkable tendency to decrease is natural systems' vulnerability. This dimension of coastal vulnerability delineates tendency to fall from the high level of vulnerability (3.5) to moderate (2.93) for approximately 16 years period. Natural systems are mentioned as resources that robust the bearing capacity of an area to climate-induced hazards (Cutter, 2008; Renaud, 2012; Gilmer and Ferdana, 2012; Abdrabo and Hassaan, 2015). On the other hand, with the existence of this kind of hazards, they will possibly be the most affected assets from the negative impacts of climate change.

A landform of settlement, distance to coast, land elevation from the sea, diversity of flora/fauna, the existence of wetlands, reserve areas and species under protection, related to this sensitivity of an area, climate change effects, air and water quality evaluated under this dimension. In addition to these, planning mechanisms' regulations about protection of these areas as well as flora and fauna, prevention of destruction on these areas and diminishing development requests and threats on these areas were studied. Different from the socio-economic dimension, indicators that cannot be measured statistically or compared reference values cannot be reached or there is no specific research on these subjects, were qualitatively assessed. Based on expert guidance indicators rated according to 5 levels scoring system. Also, some indicators for which evaluating the change for two time periods is meaningless or change rates are ignorable rating wasn't performed temporally and it was admitted that there was no change for 15 years period. ***The length of the coast, land area where elevation is below 5 meters, the landform of settlement*** and ***temperature rise projections*** can be represented as an example of these "timeless" indicators.

Geophysical conditions and human-induced destructions threatening environmental sustainability can be seen relatively at high levels of for 2000 but with the contribution of planning mechanisms' protection measures for example conservation zones, restriction zones for fishing, some policies about species that are under the threat of extinction this trend loosed its continuity. On the other hand, geophysical structure, biodiversity and temperatual conditions of the study area are major factors contributing to the alarming rates of vulnerability levels.

The landform of settlement/type of settlement represents the characteristics of the area such as coastal area, river delta, mountainous or plain area. According to the many authors, coastal river delta areas addition to the climate change effects, are mostly open to the threats of sea-level rise and inundations (Gilmer and Ferdana 2012; Torresan et al. 2012; DasGupta and Shaw 2015). Related to this, these risks will be lightening with an increase in elevation from sea level so it is expected that the vulnerability will decrease. Study area especially constituted by low-lying coastal areas and a considerable amount of population is living in the settlement that located at coasts. So indicator is rated with 5 (very high).

The indicator of the ***length of coast*** is one of the timeless variables in this study that was not assessed temporally and measured by the proportion of the total length of coast to total area. Comparison values of reference areas (Turkey and EU) determined the vulnerability rate intervals then Fethiye-Göcek SEPA's vulnerability rate was assigned according to these intervals. This value was 17.9 for EU (wikipedi), 9.4 for Turkey and 291.8 for the study area and this is equivalent to 5 (very high) vulnerability rates.

Topographic maps, digital elevation maps, and base maps were used to define the ***land area where elevation is below 5 meters*** indicator and calculated by using the formula of the share of these areas within the total area. Reference area values are constituted by using Word bank statistics. Because the values belonging to study area was very high with respect to the reference values then scored by 5 (very high).

Depending on climate change scenarios, risk factors that study area inherently holds owing to the temperature rises were studied in this work. Because there is no suitable data that specifically performed for this area, ***temperature rise projections*** for Aegean region was operated and reference areas were designated as EU and world average with the between 2013-2040, 2041-2070 and 2071-2099 time periods. So, especially for the long term 2071-2099 years period, temperature rise projection values were represented approximately 5°C (Demircan et. al. 2014) then assigned vulnerability was determined as 5 (very high).

Temperature rises have multidimensional effects on agriculture sector such as crop variousness owing to warming weather conditions, changing productivity depending on precipitation and rising temperature, and changes in water requirement for irrigation (EEA, 2012). In the context of the tourism industry, changes in tourism seasons like summer seasons' extension to spring and autumn months, negative effects on tourists' comfort perceptions and changes on destination points come out with rising temperatures (Gössling et al. 2006; Moore, 2010). On the other hand for the natural environmental areas, these changes cause threats of decreases in the number of species because of suitable habitats' disappearance and wetlands loss (IPCC, 2008; Torresan et al 2012).

In this study, for the indicator of ***CO_2 emissions (metric tons per capita),*** it was not possible to reach available data specifically prepared for the case area. Data for Turkey, EU, and World averages were used and vulnerability rate of case area was based on Turkey data. According to World bank data, value for Turkey and World average values were closed to each other (for the 2000 year Turkey's value was 3.4, World average was 4.1; for the 2011 year Turkey's value was 4.4, World average was 4.9) whereas EU values are much higher than these (for the 2000 year 8; 7.1 for 2011). Because of the EU's higher values of CO_2 emissions, study area takes the same rate of 1 (very low) for 2000 and 2011. Generally, all the reference values have rising trend because of the increase in the industrial productions and increase in fossil fuel usage rather than clean or sustainable energy resources related with industrial developments.

One of the most prominent characteristics that make study area special protection area is the existence of areas hosting many species that have to be protected and biodiversity reserves. These kind of sensitive spaces are significant for the mitigation of negative effects of climate change and reducing the vulnerability of a region thereby carrying various risk factors (McCarthy et al., 2001). These risk factors can be characterized as habitats' suffering from temperature changes and diminishing habitats because of inundation, overheating of sea water, evaporation and salt intrusion resulting in decreases in marine biodiversity etc. depending on climate change. In this context ***size of undisturbed habitat*** is important determinate for assessing the overall vulnerability. Concerning this variable, overall data for Turkey couldn’t be reached herewith Fethiye-Göcek SEPA and EU values were compared. For the study area, Territorial plans were used to measure overall undisturbed habitat area and Eurostat data for that of EU. 2003 value for EU was %13, for 1998 this value was %23. For Fethiye-Göcek SEPA, maquis and shrubbery areas and protection sites in the territorial plan which was declared at 1998 were included in this calculation and the resulted value was %23. To calculate the actual value for EU, 2013 year database was referred with the value of %18. Territorial plan declared at 2008 was used to reach the actual value for the study area and different from 1998 plan, protection sites were expanded and examined in a detailed manner such as protection zones, parks, special crop areas etc. The proportion of these areas to total area was calculated as %22. Despite the increase in the acreage of protection areas by plans approved in 2008, border expansion for Fethiye-Göcek SEPA in 2001 caused the decrease in the final value. If this calculation is performed via depending on the same boundaries, this value was raised to %28. In both cases final vulnerability rate of the study are considering the size of undisturbed habitat will be the same (1-very low) for two time periods.

When we view the indicator of the ***size of forest areas,*** forests provide a wide range of benefits and services and provide ideal habitats for a high number of plants, birds and animals, regulate water flows and reduce floods as an important agent for climate regulation via playing a key role in the long-term mitigation of and adaptation to climate change (EEA 2012). It was revealed that proportion of these areas is %57 in 1998 and %67 in the year 2008. Border expansion of SEPA region was not taken into consideration for this indicator because the expansion area was constituted mostly by forest areas. Consequently, according to reference values of Turkey and EU, vulnerability rate is calculated as 1(very low) for two time periods.

Some of the indicators which are about consideration of flora – fauna, natural environment and impacts on sea turtles were scored by the method of expert rating because of the unavailability of statistical or quantitative data. For various indicators such as ***consideration of caretta-caretta with coastal and terrestrial ecosystem, consideration of flora have to be protected, consideration of protection of estuaries (from urbanization, agriculture and tourism)*** expert ratings was performed by the evaluation of the existence of presently taken measures and specific precautions, spatial planning actions, carried special studies about these subjects. For instance, based on special research project about case area and subject, some protection standards can be developed and strict measurements and standards could take part in spatial plans about the sea turtles nesting and breeding considering lighting at shores, coastal uses like positioning of sunbeds or sand extraction (Başkale et. al 2012) and binding conservation and use principles for specified bays in study area (EPASA 2009). However, there were some measurements or inscriptive precautions considering the examined indicator, it was observed that measurements had not been fully implemented were rated at medium or high vulnerability levels.

Table 13: Natural environment vulnerability rates

Natural Environment Vulnerability	2000	2016
Type of settlement	5.00	5.00
Presence of species to be protected	5.00	5.00
Consideration of caretta-caretta with coastal and terrestrial ecosystems	3.00	2.00
Size of undisturbed habitat(protected areas for biodiversity)%	1.00	1.00
Size of forest areas	2.00	1.00
Length of coast/total acreage (m/km2)	5.00	5.00
Land area where elevation is below 5 meters (% of total land area)	5.00	5.00
temperature rise projections(RCP4.5 scenario)	5.00	5.00
Creation of conservation zones or protection areas	3.00	2.00
CO2 emissions (metric tons per capita)	1.00	1.00
Consideration of Impacts of sand extraction, lighting and noise on sea turtles	3.00	2.00
Consideration of Protection of estuaries (from urbanization, agriculture and tourism)	4.00	3.00
Consideration of flora has to be protected (sığla….)	3.00	2.00
Presence of restriction zones to fishing	4.00	2.00
OVERALL NATURAL	**3,50**	**2,93**

6.3.Built Environment Vulnerability Results

Spatial effects of urbanization, open areas' and green spaces' proportion within the whole area, construction structure, land use, and building code strategies were correlated with climate-induced hazard under this dimension. Overall built environment vulnerability stayed at high levels for two time periods: 3.73 for 2000 to 3.93 for 2016. Environmental depletion due to the coastal developments, increasing rates of coastal constructions and intensive economic activities (tourism, agriculture etc.) specifies this level of change. Although increasing rate of engineered frontage and constructed areas on coasts are important factors that influencing the vulnerability level but some reducing factors like urbanization rate weaken the rising score because urbanization rates in the study area are lagging behind the relatively high levels of Europe and Turkey. Planning decisions and policies proposed by spatial plans in the study area are principally taken into consideration and these policies are a significant factor for this frame. Although these efforts have given some kind of mitigating directions to the vulnerability of an area, they are still far from an implementation. On the other hand with respect to the indicators concerning green infrastructure implementations at building scale, the index denotes that there is no attempt to put forth practical efforts and to develop regulations for spatial planning instruments.

Urbanization rate is a significant indicator in that with rising rates of urbanized areas development demands will be sustained at natural spaces and agricultural areas so these spaces become highly vulnerable to development pressures bringing along possibility to suffering from climate-induced hazards (Cutter et al 2003; Ge et al 2013). This variable was examined at the scale of Fethiye town with relatively low rates with respect to reference values. For two temporal scales, study area had the rate of 1(very low) depending on the values of 37 for 2000, 43.01 for 2012. For Turkey and EU these values changed between 64 and 77.

As an indicator that could not be measured temporally, in other words, it was not possible to reach compared values of 2000 and 2016 years, ***green areas per capita*** were calculated for Fethiye town by using actual spatial plans. World Health Organization's (WHO) green space standard that represents the minimum value essential for human health (9 m^2) and Building Code Law's legislation that stipulate minimum green area per capita (10 m^2) were used as reference values to rate this indicator. The calculated value of this indicator shows that study area is not vulnerable in terms of green areas according to the value of approximately 24 m^2 green space per person.

A number of researchers mentioned that city macro form is a noteworthy indicator that reflects the vulnerability of an area to the negative effects of climate-induce hazards (Cutter et al 2008b; Tang et al. 2010; Warmsler et al 2013). Linear development or urban sprawl increases the vulnerability of region whereas compact development is a good condition for resiliency (Tang et al. 2010). ***Mixed use and compact development*** level were evaluated according to expert opinions, especially in Fethiye town, the city has developed via exploiting of agricultural spaces for residential purposes, therefore vulnerability of the study area was rated at moderate (2000) and very high(2016) levels for two temporal scale or planning periods.

Commonly referred in climate change literature and finding its place frequently in vulnerability and resilience studies, intensively developed areas bring about the increase of built-up areas and it relieves a heat island effect. High-density residential, tourism, industrial or commercial areas diminish natural surfaces that allowing flow and permeation of rain water as well as balancing surface temperatures. Climate-induced rising temperatures and precipitations cause heat island effect and growing influence of inundations because of narrowed permeable natural land surfaces (Cutter et al 2008b; Zahran et al 2008, Tang et al., 2010, Grimm et al., 2008). In this case, resiliency of a specific area will be affected negatively. Concerning the indicator of the ***impervious surface percent***, to measure the proportion of artificial land, planning measurements and land use decisions of spatial plans used but this value has not been prepared for Turkey statistically. According to the comparison based on EU data, the study area was rated at 5 (very high) with the value of 12% for 1998, then 3 (moderate) with the value of 8% for 2008 (According to the EU data this value is 4.3% for 2012; 4% for 2000). To calculate the impervious areas in the study area, settlement areas comprising residential and tourism usages, public building areas and educational areas were taken into consideration but 40% of these areas omitted because of parcels necessarily to be left as a natural land surface with native planting according to the planning decisions.

The rate of farmland is another variable that strongly affects the vulnerability of an area. Although study area has an economy strongly based on agricultural sector, the percentage of agricultural land was limited according to the calculation of areas by using 1/25.000 scaled Territorial Plans. For two planning periods - 1998 and 2008-, vulnerability rates of Fethiye-Göcek SEPA were determined as 5 (very high) depending on the farmland area of 14% and 6%. Reference comparison areas have higher values than study area, for instance, Turkey's agricultural land was more than half of the total area for the year of 2000 according to the World Bank data. Similar to Turkey, 47% of EU total area was left as an agricultural land for the 2000 year. These values are fallen to %30 for Turkey and 44% for EU at 2013. It was observed that there was an inverse ratio between the ratio of agricultural population, and agricultural land for the study area and reference areas. On the other hand boundaries of the study area are another factor for the emergence of this result because these were determined as to include mostly forests and various kinds of protection zones.

Another factor that determines coastal vulnerability is the ***average coastal distance*** between sea and built up areas. Densely settled areas along the shore endanger the species and habitats beside multiply the effects of sea level rise or inundation on these settlements with the population living in this zone. Considering this indicator, standard distance provided by Coastal Law (year: 1990, Law no: 3621) was selected as a reference value. This legislation has prohibition in shore strip which is the area starting from the coast edge line and stretching inwards with a horizontal width of 100 meters. The shore strip is made up of two parts; each one has 50 meters width. Policies in this Law restrict settling near from 50 meters from coast edge line; from this distance to land direction limited the type of buildings and usages. Accordingly, densely built areas generally located at the Fethiye town center so this area was examined to reach a final value of this indicator. Based on spatial plans and satellite maps actual rate of this indicator (for the 2016 year) was measured, the temporally comparison could not be performed because of limited data. Results demonstrated that more than half of the parcels in Fethiye town center settled closer than 50 meters from coast edge line. Therefore, vulnerability rate was determined as 5 (very high).

For an indicator of the ***rate of engineered frontage and constructed areas on coasts***, temporal analyses performed based on satellite images and proportion of constructed coastal length to total coastal length was measured. As a result of this measurement, it was observed that this proportion was increased 2 times between years of 2004 and 2013. Because available reference value for EU or Turkey about this variable could not be reached this observed increase on engineered frontage rate was approved as 2 (low) for 2004 and 4(high) for 2013.

As well as urbanization pressure, tourism industry’s pressure is noteworthy in the study area which threats especially agricultural areas. Thus effects of these usages to overall vulnerability were examined under the built environment heading.

Regarding the variable – the ***rate of tourism developments on coasts*** - 1998 and 2008 years did not illustrate the respectable difference with the values of %2.7 and %2.8 so the rate was approved as 2 (low) for two time periods.

Natural resources reserves and their intensive distribution at coastal parts conclude the high demands of yacht tourism in the study area. Damages on boat mooring spaces, wastes and other polluting effects of boats, various harms on species because of anchoring (Derinsu, 2009) negatively affect the coastal vulnerability of study area thus ***yacht tourism pressure*** was investigated in this part of the study. Increasing marina and yacht mooring spaces demands necessitated the scientific researches on Fethiye and Göcek Bays to investigate the boat carrying capacity without causing damages on natural structure (METU 2007, 2012). By contrast with the existence of these researches and their findings, it was figured out that this pressure couldn’t be relieved practically according to expert evaluations. So years of 2000 and 2016 vulnerabilities of the area get the scores of 4 (high) and 5 (very high).

On the other hand, planning mechanisms' consideration to what degree of ***orientation to nature-based tourism, ecotourism and culture tourism*** was also evaluated. Because in spatial plans and plan provisions this indicator was not taken into account as required, resulted in rates unavoidably at very high scores (5) for two time periods.

In the context of architectural details, with the effects of climate change architectural solutions and precautions to mitigate these effects, emphasis on green infrastructure standards, the degree of consideration and extend to which they were implemented, contributions to coastal vulnerability were handled in this study.

With respect to the green infrastructure criteria, ***consideration of green building and green infrastructure standards*** and ***consideration of green roofs- installation of vegetative roofing materials,*** there were no concrete regulations to arrange the green infrastructure mechanisms and concrete steps to apply these measurements, indicators were rated at 5 (exactly not considered) according to expert evaluations.

Assessment of ***disaster resistant land use and building code*** indicator regarded in this study planning attempts' determination of inundation areas and preventive policies, rehabilitation of streams, seismicity and measures considering earthquake, detailed studies on geology, and limitations on a number of floors because of protection status of an area. Spatial plans considering the study area has comprehended some arrangements via plan revisions so vulnerability rate of 4 (rarely concerned) for 1998 rose to the rate of 3 (attempts but low implementation) for plan revision was declared in 2008.

Also, indicator about ***climatic regulations cooling and heating effects; sensitive to sun and wind*** was evaluated in the architectural details concept. When structural plans and their implementations analyzed, it was identified that some provisional regulations were made about climate, heating, and cooling, building frontage materials, encouragement of climate sensitive material such as natural stone or wooden (1/1000 development Plans no: 2.17.9), windows and door proportions on building frontage, canopy usage because of hot climate characteristics, to relieve heat island effect and ensure the permeability of land 40% of parcel's keeping naturally by means of native plantation without any construction (1/1000 development plans clause no: 2.17.10) via plan revisions. So, assessment result for this indicator changed from 4 (rarely concerned) to 3 (attempts but low implementation).

Table 14: Built environment vulnerability rates

	Built Environment Vulnerability	**2000**	**2016**
Coastal constructions	Rate of engineered frontage and constructed areas on coasts (Ports, marinas, boat service areas)m2/total coastal length	2.00	4.00
	Average Coastal distance(m)	5.00	5.00
Tourism	Rate of tourism developments on coasts	2.00	2.00
	Yacht tourism pressure	4.00	5.00
	Orientation to nature-based tourism, ecotourism, culture tourism	5.00	5.00
	Irrespective of temperature rise and flooding	5.00	5.00
Agriculture	Rate of farmland: Farmland are/total acreage	5.00	5.00
City macro form	Impervious surface percent	5.00	3.00
	Urbanization rate	1.00	1.00
	Green areas per capita (m)	1.00	1.00
	Mixed Use and compact development	3.00	5.00
Architectural details & Green infrastructure	Climatic regulations: cooling and heating effects; sensitive to sun and wind	4.00	3.00
	Disaster-resistant land use and building code	4.00	3.00
	Consideration of Green building and green infrastructure standards.	5.00	5.00
	Consideration of Green roofs- Installation of vegetative roofing materials	5.00	5.00
15	OVERALL BUILT-ENV	**3.73**	**3.93**

6.4. Infrastructure Vulnerability Results

The last dimension that constitutes overall coastal vulnerability assessment of study area was infrastructure vulnerability. Vulnerability dimension that has the highest rank for both two time periods is the infrastructure vulnerability with high scores (4.12 for 2000, 4.29 for 2016). Waste strategies, energy efficiency, and energy stars, indicators concerning transportation policies, the density of road network and health facilities contribute to study area at alarming levels. On the other hand, it is worth mentioning that the noticeable amount of increase in the total road network for last ten years couldn't be able to change the overall vulnerability ratio (5 very high) of this indicator because these values are still very much below the road length values of EU.

Generally, in the study area, attempts focusing waste strategies and renewable energy applications could not be observed. For this reason, for the indicators of ***zero waste reduction and high recycling strategy*** and ***waste and storm water management*** high rates of vulnerabilities were specified for the two planning periods. Regulations on spatial plans limited to water pollution and waste water infrastructure management, such as waste water were not permitted to discharge into the sea, lake or river without purification, but there were no concrete steps oriented to the implementation.

Consideration of boat-yacht wastes indicator was evaluated especially for denser boat usages and marinas located at Göcek Bays. Legally declared principles prepared by Environmental Protection Agency for Special Areas - "*Göcek Gulf & Göcek Dalaman Bays Conservation and Use Principles"* **-** defines the purpose of the principles and procedures that apply to the Fethiye-Göcek Special Environment Protected Region. The objective is to protect the biological diversity, and environment with preventive measurements aimed to decrease pollution on these marine areas (EPASA 2009). These principals reflect crucial effort to decrease the vulnerability of study area with respect to this indicator. So based on these attempts final vulnerability rates were determined as 5 (exactly not) for 2000 and 2 (high attempts but not full implementation) for 2016. On the other hand, on the basis of the indicator about ***tourism formations' waste water treatment strategies*** some special rules were developed in spatial plans such as by the time central sewage system will be established, tourism institutions have to build their own waste water purification plants; tourism plants couldn't be permitted to build until having a certification presents these plants were built in a way without creating environmental degradation, etc. In the light of these measurements, indicator was rated as 4 (rarely concerned) for 2000 and 3 (attempts but low implementation) for 2016.

Under the heading of renewable energy programs, sustainable energy resources were examined such as the wind, solar and geothermal energy. 1/1000 scaled development Plans of Fethiye illustrated some requirements considering solar energy equipment's' positioning under roofing (clause no: 2.17.5.3), 1/25.000 scaled Territorial Plans contain provisions that giving guidance for meeting the demands of renewable energy production but there were not sufficient level of concrete and encouraging implementation suggestions. So vulnerability rates were determined as 5 (exactly not considered) for the indicator of ***requirements for renewable energy sources.***

Renewable energy consumption of an area was calculated by using the data of Turkey because there were no available data prepared for Fethiye-Göcek SEPA. EU and World average values were operated as reference comparison data. Especially for the 2012 year, EU showed a considerable amount of increase (percentage from 7.84 to 14.1) and Turkey was stay behind the values of EU (percentage from 17.29 to 12.8). The share of renewable energy within total energy consumption was increased in both EU and World (percentage from 17.42 to 18.1) according to World Bank statistics but Turkey could not show the same performance. So based on these reference values vulnerability rate was increased from 1 (very low) for 2000 to 5 (very high) for 2012.

As to the indicators that reflect the electric and water consumptions, data for Muğla province was compared with reference values of TR 32 region and Turkey. Compared to 2001 data ***total water consumption per capita*** for Muğla province was decreased at 2014 but vulnerability rate would be still with high scores (5 very high) for two time periods because of low values belonging to TR 32 region and Turkey. For an indicator of ***Electric power consumption (kWh per capita)*** Muğla Province values were compared with Turkey and EU. The 2000 year value for Muğla was not available so 2009 value was compared with 2012; for Turkey and EU 2000 and 2012 data was suitable. Final vulnerability results of study area fixed at the rate of 2 (low) for both years. EU values about this indicator were comparatively high with respect to other areas because electricity consumption strongly reflects the industrialization level of the country. Based on this assumption, as heavy industry plants were not located at Fethiye-Göcek SEPA, vulnerability levels expected to be lower than Muğla province in practice.

Transportation policies were examined under the dimension of infrastructure. A number of studies indicated that transportation systems based on cars and motor vehicles increase the carbon emissions that aggravate the climate changes effects on settlements (Tang et al 2010). This kind of transportation systems will destroy natural environment and create heat island effect via diminishing natural land surface and limiting permeability. On the other hand, in the condition of climate hazard existence of efficiently distributed transportation network are necessary for emergency responses. Dysfunction or destruction of these facilities worsens any crisis and hinders reconstruction (Cutter et al 2003; Rufat 2013; DasGupta and Shaw 2015). Accordingly, environment-friendly multi-modal transport systems, pedestrian-oriented transportation and usage of vehicles that minimize carbon emissions like bicycles lighten the negative impacts of climate change with decreasing vulnerabilities (Newman 2014). The indicator of the ***presence of alternative transportation strategies and transit-oriented community design*** was selected for this purpose but having transportation strategies based on motor vehicles, with the absence of multi-modal public transportation and railways resulted that study area was rated at 5 (very high) for both of temporal periods.

When we examine indicators about ***consideration of pedestrian/ bicycle-friendly transport***, ***minimum fuel efficiency standards for municipal fleets*** and ***climate proofing of transport infrastructure***; acquisition of alternatively fueled vehicle it was observed that planning mechanisms paid no attention concerning this variable and there were no specific regulations on this subject thus vulnerability rate was assigned as 5 (very high) for two time periods.

For the variable considering ***density of total road network,*** statistical data for Muğla province was used to calculate the proportion of the total length of roads to the total land area. Vulnerability rating was framed by accepting the assumption of road network would decrease the vulnerability of an area by facilitating emergency responses during a hazard. The proportion of Muğla was measured as 0.09 in 2004, this value boomed to 0.40 in 2013. Recent national policies regarding motorway based transportation can be showed as the reason for this rise so for Turkey not as much as Muğla province the rise was actualized between 2004 and 2013 from 0.44 to 0.50. Turkey was the only reference data because Eurostat database do not contain all the members of the union so this data is not reliable. Consequently, vulnerability rate of the study area was calculated as 5(very high) for two time periods.

A number of cars per 1000 inhabitants was analyzed as vulnerability indicator and statistical data for Muğla was used in this study. For Muğla province 2004 and 2013 years data was available and compared to 2000 and 2013 values of Turkey and 2000 and 2006 values for EU. According to TSI statistics, values of Muğla stayed between reference values of Turkey and EU. For 2004 this value for Muğla was 110 then rose to 177 in 2013. On the other hand, Turkey and EU have values respectively 65 and 423 in the year 2000. Based on this statistical data vulnerability rate was determined as 2 (low) both for 2004 and for 2013.

Lastly, health infrastructure and adequacy of services were analyzed in that crucial contribution to recovery potential of an area during a hazard. For the indicator of the ***number of hospital beds per 1000 inhabitants*** statistical data belonging Muğla Province was operated to decide the final vulnerability rate of the study area and because of the lower values compared to Turkey and EU, the study area was rated at 5 (very high) score for two time periods. As for the indicator of a ***number of medical doctors per 100.000 inhabitants*** vulnerability rate of Muğla province has risen from 1(very low) to 5 (very high). For Muğla and Turkey TSI statistics, for EU OECD health statistics were used to calculate this value. Muğla has almost the same values for 2002 (161.7) and 2014(160.3) whereas Turkey and EU have the rising movements concerning this indicator. From 2000 to 2013 this value is raised from 132.6 to 175.6 for Turkey. Concerning EU members, this value increased from 140 to 340 between the years 2000 and 2010.

Table 15: Infrastructure vulnerability rates

	Infrastructure Vulnerability	2000	2016
Waste strategies	Zero waste reduction and high recycling strategy	5.00	5.00
	Waste and storm water management	5.00	5.00
	consideration of Boat-yacht wastes	5.00	2.00
	Tourism formations' waste water treatment strategies	4.00	3.00
	Requirements for the wind, solar, geothermal, or other renewable energy sources	5.00	4.00
Renewable energy programs	Energy efficiency and energy stars	5.00	5.00
	Renewable energy consumption (% of total final energy consumption	1.00	5.00
	Total water consumption per capita(liter/person)	5.00	5.00
Energy	Electric power consumption (kWh per capita)	2.00	2.00
	Presence of Alternative transportation strategies	5.00	5.00
Transportation policies	Density of the total Road network	5.00	5.00
	Consideration of Pedestrian/resident-friendly, bicycle-friendly	5.00	5.00
	# of cars per 1000 İnhabitants	2.00	2.00
	Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle	5.00	5.00
	Climate proofing of transport infrastructure	5.00	5.00
	# of medical doctors per 100.000 inhabitants	1.00	5.00
Health services	# of hospital beds per 1000 inhabitants	5.00	5.00
17	OVERALL INFRA	**4.12**	**4.29**

CHAPTER 7

CONCLUSION

Coastal areas and their ecological, social, and economic components are highly dynamic systems exposed to and affected by numerous processes and threats arising from within the area itself, as well as from localities outside of the region. The rich biodiversity, land fertility, and the abundance of natural resources have attracted humans to coastal areas for centuries. Over time, humans gradually transformed coastal areas to suit their needs through socio-economic development, including the expansion of agriculture, tourism facilities as well as urbanization in some cases industrialization. Internal processes and threats such as urban sprawl accompanied by water-, air-, and soil pollution and resource extraction related ground subsidence, as well as the loss of biodiversity-rich habitats due to the expansion of agriculture, are just some examples of the processes impacting vulnerability, which arise from within the area. In addition to the large variety of processes impacting these localities, the extreme complexity and high dynamics of coastal areas, as well as their densely populated structure with their strategic economic importance, make them the hotspots of vulnerability.

The impacts of climate change on coastal regions are expected to be a major challenge over this century and possess a significant threat to many coastal areas and will likely have important impacts on socio-economic development in those regions. Global climate change is expected to affect coastal communities around the world, many of which are already considered vulnerable to ongoing climatic variability. These biophysical changes are expected to cause various socio-economic impacts including loss of land infrastructure and coastal resources as well as declines in associated economic, ecological, and cultural and subsistence values. These impacts are scale-dependent however, in that they will be unevenly distributed among and within nations, regions, communities and individuals as a result of differential exposures and vulnerabilities.

The vulnerability is a broad term that researchers and experts discussed, reformulated, and expanded upon for various applications in different disciplines. The vulnerability is not an independent concept and has a strong relationship with other terms, although which terms are related is also dependent on the various disciplines of the researchers as well as their interpretation of each concept. Since the main focus of this study is on vulnerability, the discussion is limited to the closely related concepts of resilience, coping capacity, and adaptive capacity. The understanding vulnerability is integral to a process of determining actions that facilitate adaptation, but how to characterize vulnerability in theory and practice is still widely controversial (Eakin and Luers 2006).

'Vulnerability' and 'resilience' are interrelated concepts in order to assess the sensitivity of coastal systems (DasGupta and Shaw, 2015). Both of these concepts serve as an effective tool for rapid decision making, action planning and mutually exclusive for example resilient systems are less vulnerable and vice versa (Norris et al. 2008; Miller et al. 2010, DasGupta and Shaw, 2015). The vulnerability is the pre-event, internal capacity or qualities of social systems that robust the capacities for various hazards or harm, resilience reflects the capacity of the social system to respond and recover from disasters, as well as the ability to absorb impacts and cope with an event. Basically, resilience is more proactive and positive expression of community engagement with natural hazard reduction (Cutter et al, 2008a).

As coastal areas' ecological, social, and economic components are vulnerable to a wide variety of natural and anthropogenic threats and sea level rise, climate variability and rapid socio-economic development exert pressure on the already highly dynamic regions; in the event of the rapid rate of change, widespread area and potential magnitude of these impacts, coastal vulnerability assessment has received significant international attention. To protect these areas and their components, it is necessary to assess the degree of vulnerability so that mitigation efforts can be recommended to stakeholders and policy makers.

Since the concept of vulnerability is multidimensional and often ill-defined, it is difficult – and perhaps even impossible – to define a universal measurement methodology or to reduce the concept to a single equation (Birkmann, 2006a) thus there is no common framework or understanding on how to measure and monitor community resilience or vulnerability (Cutter, 2008).

In light of the need for vulnerability assessments of climate-induced hazards, which will exacerbate the present pressures on coastal areas, different types of assessment methodologies with the different levels of requirement for data, resources, and technology are proposed. Most of these assessments focus only on the sea-level rise impacts on coastal evolution, such as inundation and coastal erosion, and do not include present and future human activities in the coastal areas. The impact of human activities can be felt in the disturbance of natural resources, such as the logging of coastal forest, the drainage of wetlands, and the redirection of the river water to name only a few examples. On the other hand, the implementation of adaptation measures is mostly controlled by national and local decision makers, who generally have limitations on available resources for these types of assessments. Furthermore, the coastal processes are very dynamic and complex, with important socio-economic consequences making the decision-making process much harder. A recent focus of climate change impacts on the coastal regions has moved towards to assessing their socio-economic and ecological vulnerability as well as the physical characteristics such as geomorphology, shoreline-erosion rate, tidal information, coastal topography, mean wave height, mean tidal range etc.

On the other hand, there is a strong and dynamic relationship between and within human and natural systems thus the ecologic component cannot be considered apart from the systems' vulnerability assessment. Human and ecological systems will have some capacity to respond to the effects of climate change which needs to be considered. An ecologic component including not only geophysical aspects, but also flora and fauna related aspects can be rarely seen in the assessment studies recently (Hossain et al., 2013; Hereher, 2015) but needed to be considered seriously. So there is a need for developing and operating an integrated coastal vulnerability assessment method that comprises various vulnerability factors comprehensively.

Drawing on the recent climate change impacts and vulnerability literature, the purpose of this research is defined twofold. First, it provides a discussion of how vulnerability has been characterized and how this has influenced current coastal vulnerability assessments. From this, a multi-scaled, integrated vulnerability framework is presented. This provides a methodological starting point that will be refined and applied as part of a larger study to assess the adaptive capacity to climate change and climate change impacts on Fethiye-Göcek SEPA. Second, to strengthen, the planning policies' pertinence and applicability, systems' vulnerabilities are needed to be evaluated and vulnerability level of coastal areas be revealed. Because the climate change issues have not been considered at the plan making processes both for Fethiye-Göcek SEPA and more generally for Turkey, the findings of this vulnerability assessment are expected to contribute both planning and policy formulation for the hazard mitigation and climate change adaptation and new insights for the planning provisions in the study area. Accordingly outcomes of this study embrace new contributions to the planning procedures and rules from regional planning level to the building and site level. The study achieved in this thesis defines the role of coastal vulnerability assessments' outputs and results that can contribute the spatial planning policies as a tool for maintaining resilient and sustainable environments.

Different from many other studies in the literature; in this study, proposed model for Fethiye-Göcek SEPA uses both physical and human factors on coastal processes affected by climate-driven changes as well as other internal impacts. Beyond that, as ecological systems and human factors have strong and dynamic nexus ecological components which are field specific and affecting the vulnerability of a region were articulated to the model. In this study, not only the existing level of vulnerability is defined, instead comparative vulnerability is designed for two time periods: the years of 2000 and 2016. This method yields to qualitative and quantitative results for the area and defines the range of vulnerability levels for both years using quantitative and qualitative data, including expert opinions. To measure coastal vulnerability of a study area, an Integrated Coastal Vulnerability Index (ICVI) is designed using several vulnerability indicators; some of these indicators are selected after an extensive literature survey that is commonly used to measure socio-economic, natural and physical vulnerabilities with internal and external climate impacts. Other indicators are the new ones showing unique nature of the study area such as natural assets and dominant economic sectors' specific impacts. The index allows the 58 qualitative and quantitative variables under four dimensions (socio-economic, natural systems, built environment, infrastructure vulnerability).

In order to define the levels of vulnerability, the proposed ICVI scores were developed in accordance with the categories based on the quartile ranges of compared reference data. Reference data constitute basically the values of- Turkey and EU for each indicator that enables to compare the value defined for the case area. The use of quartile ranges for determining the vulnerability categories also allows the comparison of the different indicators with different temporal scales. The proposed method ensures the comparison of vulnerability scores of different dimensions and presents the most critical components in terms of vulnerability. So, contrary to using available regional data, each parameter is assigned a vulnerability rank of very low to very high (1–5) within the developed integrated coastal vulnerability index to calculate vulnerability dimensions and the overall vulnerability index.

The outputs of the ICVI model for Fethiye-Göcek SEPA indicate that study area is more vulnerable at 2000 than 2016 concerning both internal exposures and external climate risks. An overall coastal vulnerability has a tendency to decrease but it is worth mentioning that vulnerability values are still at medium or medium-high levels for each dimension. According to the comparative vulnerability values of 2000 and 2016 years, socio-economic dimension shows almost stable with slight decrease, dimensions of built environment and infrastructure vulnerability have the upward movement; while the natural environment has the tendency to decline. The highest values of built environment and infrastructure dimensions point out those anthropogenic processes are the most significant factors that delineate the limits of the coastal vulnerability of Fethiye-Göcek SEPA.

Pressures from coastal constructions, negative impacts of economic activities such as tourism, agriculture, fishing etc. and extensive usages of rising population generate environmental depletion in the research area. Intensifying construction demand, especially at coastal part of an area, is a significant factor that influences the vulnerability level and needed to be seriously handled in the planning procedures. Planning decisions and policies proposed by spatial plans in the study area are principally taken into consideration and these policies are a significant factor for this result because these efforts have given some kind of mitigating directions to the vulnerability of an area but these are still away from practice. On the other hand with respect to the indicators concerning green infrastructure implementations at building scale, the index denotes that there is no attempt to put forth practical efforts and to develop regulations for spatial planning instruments.

Infrastructure is another component that increases the overall vulnerability level of the study area. Waste strategies, energy efficiency, and energy stars, indicators concerning transportation policies, the density of road network and health facilities contribute to study area's vulnerability at alarming levels. Regulations on spatial plans limited to water pollution and waste water infrastructure management and attempts focusing waste strategies and renewable energy applications are mostly not observed in the study area. Also concerning renewable energy programs, sustainable energy resources such as the wind, solar and geothermal energy, there are some regulations developed by planning decisions but remarkable and effective implementations have not be performed yet. Besides, transportation strategies are generally based on motor vehicles; multi-modal public transportation and railways, pedestrian/ bicycle-friendly transport systems are not at the desired levels especially compared with the reference values of EU.

Ecological values, natural assets, and biodiversity are the most important factors that are subject to the negative impacts of climate change. Research area has numerous natural assets reflecting its biodiversity and hosting many habitats of endangered and threatened species. To prevent the deterioration of natural, ecological, cultural and historical values that it owns, protection against environmental harms and to guarantee the natural and cultural values to be passed for future generations, this site was granted its marine and coastal conservation status as SEPA. This status represents its vulnerability with remarkable amount and quality of natural resources and biodiversity. As one of the most important protection areas in Turkey, Fethiye-Göcek SEPA's natural systems' vulnerability shows decreasing trend from a high level of vulnerability (3.5) to moderate (2.93) for approximately 16 years period.

As mentioned in the previous parts of this research, natural systems encapsulate resources that robust the bearing capacity of an area to the climate change driven hazards (Cutter, 2008; Renaud, 2012; Gilmer and Ferdana, 2012; Abdrabo and Hassaan, 2015). In relation to this with the existence of the negative climate impacts, these assets can possibly be exposed to the threat of these hazards. Considering this statement land form of settlement, distance to coast, land elevation from the sea, diversity of flora/fauna, the existence of wetlands, reserve areas and species under protection, related to the sensitivity of an area, climate change effects, air and water quality evaluated under the natural systems component. The contribution of planning mechanisms' protection measures for example (i) conservation zones, (ii) restriction zones for fishing, (iii) some policies about species that are under the threat of extinction resist the rising vulnerability rates. On the other hand, low-lying geophysical structure, biodiversity-rich nature of an area and temperatual conditions are major factors or indicators that are still keeping their higher rates of vulnerability.

Assessing vulnerability is a key part in the development of any kind of mitigation plan, but knowledge about present and future vulnerability are so crucial that it merits a separate treatment. Integration of climate change impacts on coastal areas, within spatial planning practices, can be performed through coastal vulnerability assessments methods. Planners need to have ready access to vulnerability data and need to be able to fully understand all the risks associated with coastal hazard zones. The issue here is simply to know where problems, such as flooding or storm surges, are occurring or are likely to occur in the future, who or what might be at risk in those areas, and how well they or it might be able to cope with the problems.

Especially for the study area existing rules and procedures defined from the regional level to the building or site level are still based on traditional methods of land-use rather than climate change measures despite the fact that an area is specially protected area and needs for special treatment and new areas of expertise. While the findings on climate change are clearly visible and scientifically proven, measures about climate change issues and climate-induced hazards have not be taken into account to the extend necessary to Turkey as well. In the light of these, findings of this study can be useful for planners and can also draw planners' attention to the climate-related matters in spatial planning scene.

Spatial planners and policymakers face a number of challenges to incorporate potential climate change impacts into their land-use strategies in Turkey. Many planners lack access to climate experts or climate models and tools and also lack competence on regional and local projections relevant for site-based planning. Additionally, much of the available climate data has a high level of uncertainty and is, therefore, challenging to interpret.

Planners or policymakers need more knowledge and information to support the development of mitigation and adaptation policies and strategies. In such cases, an integrated assessment, incorporating social, ecological, physical and economic impacts of climate hazards, can help identify the vulnerability of coastal habitats, species, and coastal people and resources.

City planners also lack guidance on how to identify and apply the most appropriate tools for assessing climate impacts. The ability to define policy approaches for protected areas and identify policy measures to protect ecosystems and species in the face of climate change should be improved. Spatial planners and policymakers need to understand and incorporate the ecological, biophysical, and socio-economic impacts of climate change into coastal planning and management. To achieve this, they need to understand how coastal ecosystems are likely to change in response to sea-level rise and how increasing sea-surface temperature and other climate-driven hazards. Assessing the vulnerability of these coastal ecosystems is an important first step in planning to maintain the goods and services that they provide.

Planners and policymakers are also increasingly concerned with the vulnerability of coastal habitats (e.g., *Posidonia oceanica*-seagrass meadows) and species (e.g., *caretta caretta* and *celonia mydas*) to sea-level rise. Vulnerability assessments of coastal ecosystems to sea-level rise are also useful to inform land-use and conservation planning. For example, spatial planners can prioritize the preservation of buffer zones adjacent to coastal ecosystems with high rates of sea-level rise to enable inland expansion. Planners could also prioritize areas likely to be less vulnerable to sea-level rise for protection or restoration. Restoration of coastal ecosystems can help buffer the coastline from sea-level rise, thus increasing the adaptive capacity of these ecosystems and associated human communities and these areas demonstrate a high degree of social resilience.

In order to improve the existing level of community resilience, several structural and non-structural measures are necessary and the policies that enable adaptation to climate change impacts can be integrated into the overall coastal spatial plans. Such measures may differ depending on the geographical location, natural characteristics, inherent capabilities and external threats and exposures etc.

As one of the regulative instruments for coastal areas, integrated coastal management which are prepared at province-level in Turkey, are aiming balanced and coherent utilization of coastal areas, holistic policy and decision-making process including all sectors. While one of the main subjects for these management plans are signified as the preparedness for the climate change effects and hazard management for coastal areas, generally speaking, these plans are quite far from this object.

The outputs of the vulnerability assessment study can be a useful tool for the integrated coastal management plans of the Muğla province including Fethiye-Göcek SEPA. Even though the Muğla province has not been having an integrated coastal management plan legally in force, this could be an advantage for to be newly designed plan procedures adequately considering the climate change impacts for the study area. These plans have not generally created in-dept policies and not designed on the basis of the vulnerabilities of an area. Protection and utilization procedures given by this management plans develop general guiding principles and strategies rather than focusing on vulnerable areas, sectors, populations and assets. For the study area, most vulnerable dimensions are detected as the infrastructure and built environment so specific policies and recommendations on these subjects considering the adverse effects of climate change needed to be mentioned in these plans in a detailed manner.

More specifically, for the case study area, a developmental process needs to be balanced with ecological consideration. An ideal adaptation model to enhance the community resilience should effectively integrate and optimize socio-economic resilience with physical and ecological resilience through comprehensive planning at regional and sub-regional level.

Coastal resilience will also require simultaneous action at a number of geographical or design scales. Because of the anthropogenic processes, especially from built environment and infrastructure components are critically effective for the overall vulnerability level of Fethiye-Göcek SEPA some measurements are needed to be taken into consideration of these vulnerabilities. At the level of building design, for example, more resilient, sewage collection and treatment for storm water management; design for edible energy usage, green rooftops and living walls for cooling and shading benefits and building facades. The local climate should be the starting point in understanding how buildings can be designed to incorporate fresh air and daylight, to minimize energy and resource demands, and to be livable following a storm or disaster event. At the city and regional levels, including land use planning that keeps development out of the riskiest high-inundation areas; preserving and restoring regional networks of green infrastructure, and planning for evacuation and sheltering can be some attempts to reach resilient coastal settlements.

Resilient coastal settlements implies, a profoundly new way of thinking about coastal planning such as, new neighborhood streets designed not just as infrastructure to convey car traffic, but rather reimagined to incorporate community gathering places perhaps places for meeting and staging before or after disaster events, as well as to collect and treat storm water and rain gardens, to provide shading and climate benefits, and perhaps even to produce power.

Considering ecological resilience and natural systems in the face of perturbations via climate change, in the research area, they have a positive role in enhancing the resilience of built environments and human communities. Ensuring sufficient wetlands buffers, permitting coastal wetlands to migrate landward in response to long-term sea level rise, protecting ecological systems and land area (landscape) sufficiently large and complex and diverse that any particular perturbation (storm, wildfire) will not cause irreversible harm (e.g., extinction of a species, complete loss of a biological community) might be some examples of planning actions that might be taken to ensure the ecological resilience. More specifically, because the natural assets are very important for the mitigating the effects of climate change, protective measures on species' habitats and sustainable usage policies guaranteeing these species' continuity are important for ensuring the resilience. With the determination of most vulnerable habitats and their alteration mechanisms resulted from temperature changes, regulative measures can also be developed to prevent these alterations.

Besides, through the establishment of networks of protected areas that are resilient to potential climate change, local and regional initiatives can protect marine and coastal resources and such efforts require spatial planners to incorporate climate change vulnerability into planning policies.

In brief, by considering the complex nature of coastal zone dynamics and the long-term implications of climate change, coastal policy and management require new broad-scale integrated assessment and management tools across a wide range of scales. Assessment at different scales provides useful information to coastal planning, and the results will be used for making policy decisions. A more detailed approach at the local and regional level is essential to understand and manage the complexities of a specific study area and allows the identification of vulnerable areas that could support policy decision making in the design of appropriate adaptation. But effective coastal resilience will require coherence at all scales from building to regional even at national level, ideally resulting in an interlocked and multiscale resilient region.

Despite its shortcomings, the results of ICVI method comprise a useful tool for policy makers and are considered as an essential first step in the development of climate change adaptation measures. Furthermore, vulnerability assessments can provide insights to policy makers across all sectors in terms of identifying the circumstances that put people and places at risk; vulnerability hotspots can influence policy determination for climate change adaptation in a range of sectors, including urban planning. Vulnerability hotspots can be useful to guide planning decisions in terms of the determination of spatial development areas and major assets, as well as the management of risks associated with existing settlements (Crick et al.2012). Actually, proposed assessment method in this research study gives some preliminary insights into vulnerable factors or vulnerability hotspots of the research area. Furthermore, with the help of some adjustments, the accuracy level of this method can be enhanced.

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APPENDIX A

CLIMATIC EVENTS

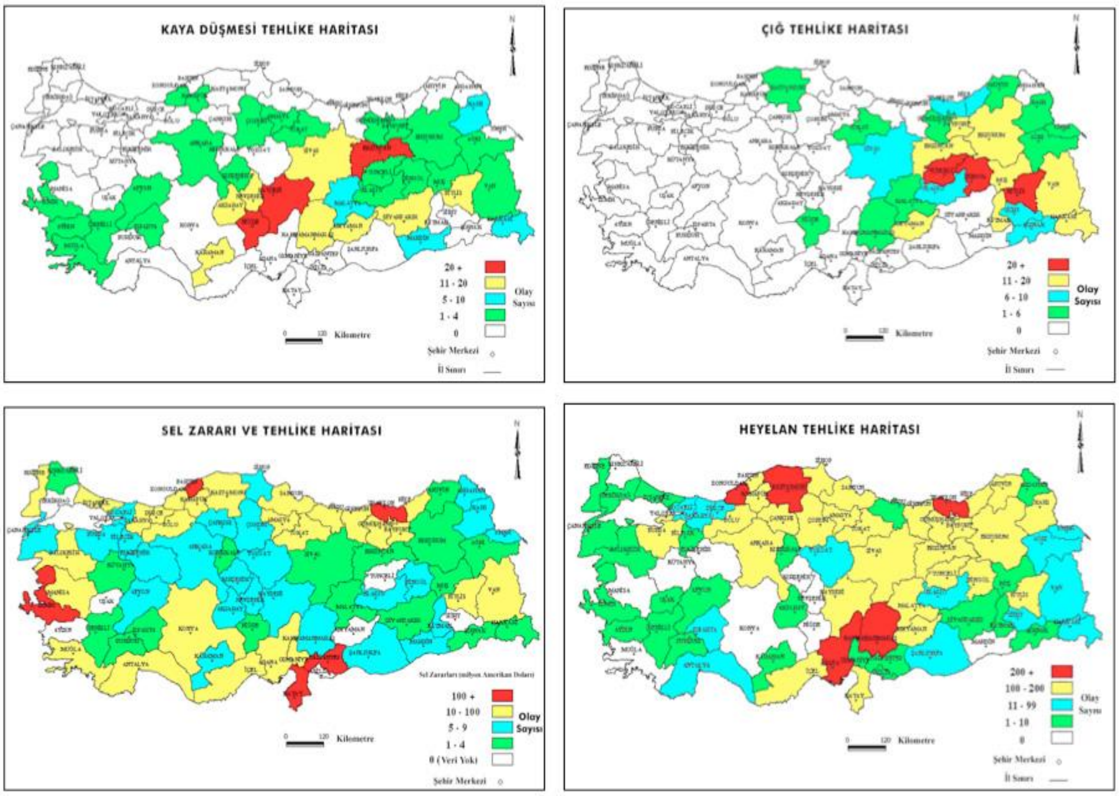

Figure A 1: Number of events based on hydro-meteorological threats (inundation) between 1958 and 2000, by Provinces (Kadıoğlu, 2012)

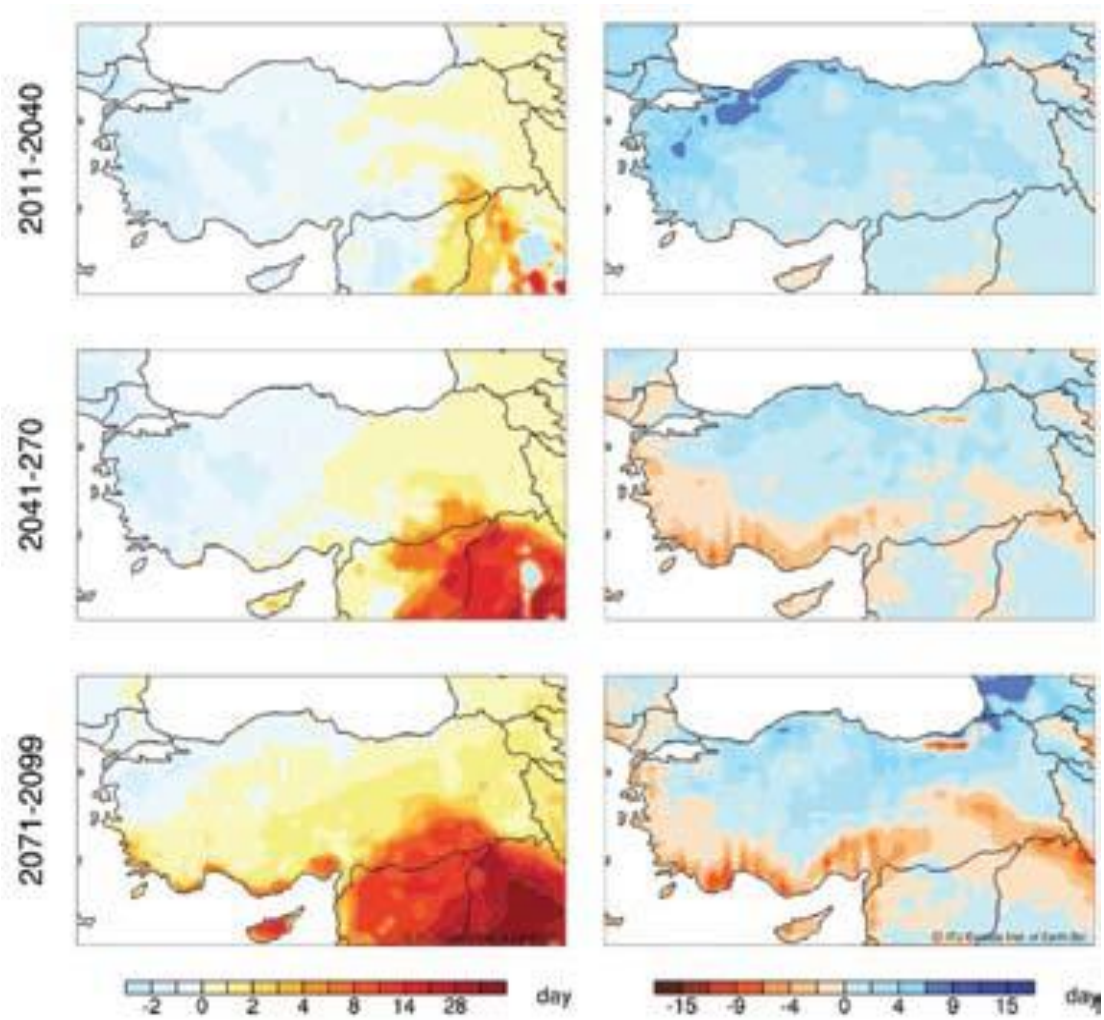

Figure A 2: Projected Annual Changes compared to 1961-1990 in Hot Spell (left column) and Heavy Rain (right column) Days (based on the A2 scenario simulation of the ECHAM5 general circulation model). (The Ministry of Environment and Urbanization 2013).

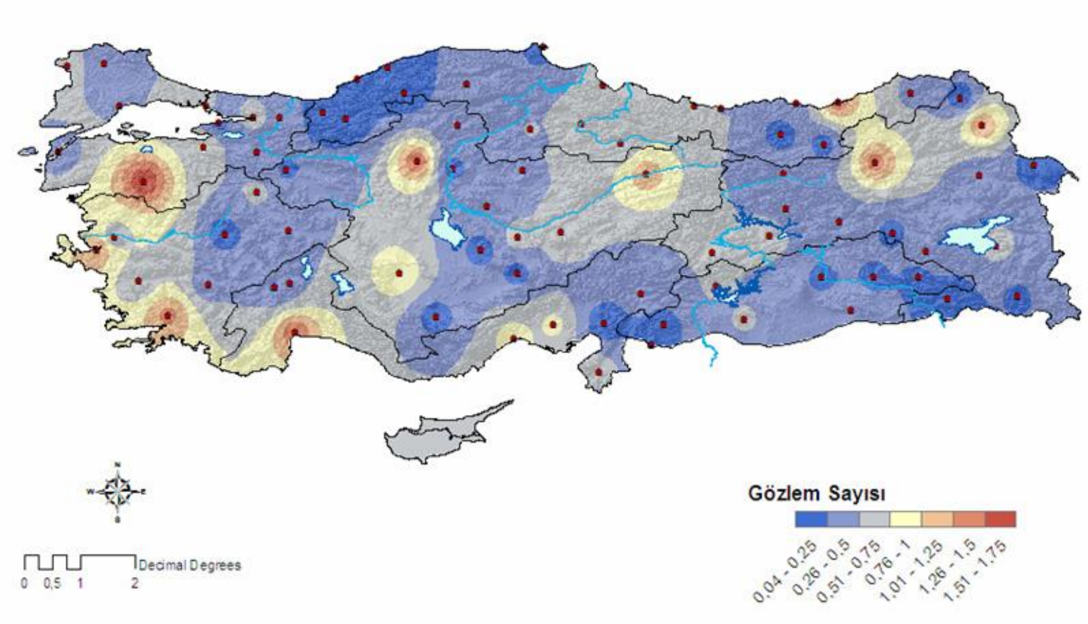

Figure A 3: Average inundation hazards in Turkey by provinces between 1940 and 2010
(Kadıoğlu, 2012).

APPENDIX B

INDICATORS

Table B 1: Vulnerability Indicators Commonly Used in Literature

INDICATORS			REFERENCE
SOCIO-ECONOMIC SYSTEMS	Dependent population: Age	% population under 5 years old; % population 65 or older; median age	Cutter et al (2008b) Zhou et al 2014, Zhang and You 2014
	Population	Population growth	Cutter et al 2003
		% rural farm population; % urban population	Adger (1999) Cutter et al (2008b)
	Socioeconomic status	Per capita income;	Adger (1999) Cutter et al (2008b), Birkmann et al 2012
	Employment	% of the civilian labor force unemployed; % civilian lab % females in civilian labor force or force participation	Cutter et al (2008b) Adger (1999)
		Employment loss	Cutter et al 2003
	Education	% population over 25 with less than high school education; Illiteracy rate	Cutter et al (2008b) Zhou et al 2014
	Household structure	% Average number of people per household families living in poverty; % female-headed households	Cutter et al (2008b)
	occupation	% employed in fishing, farming, forestry; % employed in transportation, communications, public utilities; % employed in service occupations	Cutter et al (2008b)
	housing	% housing units that are mobile homes; % renter-occupied housing units	Cutter et al (2008b)
	Special needs	% Social Security recipients; % migrants in last 5 years	Cutter et al (2008b)
NATURAL SYSTEMS	Size of undisturbed habitat-coastal(flora and fauna)		Cutter et al (2008b)
	Size of undisturbed habitat-sea(flora and fauna)		Cutter et al (2008b)

Table B-1 (continued)

	Average beach width	Cutter et al (2008b)
	Type of aquifer	Özyurt, (2007), Atalay (2014),
	Sediment supply/budget	Cutter et al (2008b), Özyurt, (2007), Atalay (2014),
	Erosion rates	Cutter et al (2008b) Frihy (2003),
	Wetland/habitat loss (% change from previous decade	Cutter et al (2008b)
	The area of beaches and wetland	Li and Li (2011)
	Annual temperature rise, annual precipitation, average monthly wind speed	Fatorić and Chelleri (2012
	coastal protection structures (groins, jetties, seawalls, revetments)	Cutter et al (2008b) Özyurt, (2007), Atalay (2014),
	Engineered frontage	Özyurt, (2007), Atalay (2014),
	# and size of storm water detention basins	Cutter et al (2008b)
	Water contamination (surface and ground)	Cutter et al (2008b)
	100-year and 500-year flood zones delineations	Cutter et al (2008b)
	Storm surge inundation zones	Cutter et al (2008b), Sánchez-Arcilla et al. (2008)
	Land cover classification	Cutter et al (2008b)
	Water depth and downstream	Özyurt, (2007), Atalay (2014),
	salinity intrusion	Sánchez-Arcilla et al. (2008)
	geomorphology, coastal slope, tidal range, significant wave height, rate of sea level rise	Gornitz (1991), Thieler and Hammer-Klose1 (1999) Özyurt, (2007), Boori et al. (2010), Atalay (2014),
	Area of mangroves	Li and Li (2011)
	Proximity to coast, type of aquifer	Özyurt, (2007), Atalay (2014),
	Carbon dioxide, Relative humidity, Temperature, Sea level rise, Precipitation, Alien invasive species, Pollutant input	Omo-Irabor et al. (2011)

Table B-1 (continued)

BUILT ENVIRONMENT & INFRASTRUCTURE	Residential	Median age of housing units, Housing units built before 1960, Density of housing units, Density of mobile homes, Number of building permits for new housing units, Value of all residential property	Cutter et al (2008b)
	Commercial and industrial development	# commercial establishments, # manufacturing establishments, Banking offices, Private non-farm business establishments, Hazardous materials facilities, # Small businesses, # marinas	Cutter et al (2008b)
	Coastal development	Coastal engineered area	Li and Li (2011)
		Density of coastal buildings	Li and Li (2011)
	Lifelines	Hospitals, Schools, Electric power facilities, Potable water facilities, Wastewater facilities, Dams, Police stations, Fire stations, Oil and natural gas facilities, Emergency centers, Number of hospital beds, Communications facilities	Cutter et al (2008b)
	Medical service	Number of beds per 10.000 people Number of phsicians per 10.000 people	Zhou et al 2014
PLANNING POLICY & MECHANISMS	Resources management Strategies: Open space and protected areas	Creation of conservation zones or protection areas	Tang et al., 2010.
		Conservation of parks, forest, and natural and protected areas, wetlands	Warmsler et al. 2013
	Regional forest management	Requirements for the protection of regional forest cover in proximity to urbanized areas	Stone et al. 2012
	Urban tree management	Municipal tree planting programs; requirements for tree protection ordinances	Stone et al. 2012
	Building energy efficiency	Minimum insulation values in building codes; efficient light fixtures and appliance	Stone et al. 2012
	Renewable energy programs	Requirements for wind, solar, geothermal, or other renewable energy sources	Stone et al. 2012, Tang et al., 2010.
		Energy efficiency and energy stars	Tang et al., 2010.
	Waste strategies	Zero waste reduction and high recycling strategy Waste and storm water management Landfill methane capture strategy	Tang et al., 2010.
	Land use policies	Disaster-resistant land use and building code	Tang et al., 2010, Cutter et al (2008b), (Habitat, 2011;
		Urbanization rate	Cutter et al 2003
		Population density	Tang et al., 2010.
		Mixed Use and compact development	Tang et al., 2010, Warmsler et al. 2013

Table B-1 (continued)

		Infill development and reuse of remediated brownfield sites	Tang et al., 2010; Habitat, 2011
		Green building and green infrastructure (i.e. urban forests, parks and open spaces, natural drainage systems) standards	Tang et al., 2010
		Impervious surface percent	Cutter et al (2008b)Zahran et al 2008, (Tang et al., 2010, Grimm et al., 2008)
		Zoning ordinances prohibiting development of high hazard areas	Cutter et al (2008b), Cutter et al 2012
		Coastal setbacks for development	Cutter et al (2008b) Tang et al., 2010.
	Transportation infrastructure & policies	Alternative transportation strategies	Tang et al., 2010.
		Transit-oriented development and corridor improvements	Tang et al., 2010
		Parking standards adjustment	Tang et al., 2010
		Pedestrian/resident-friendly, bicycle-friendly,	Tang et al., 2010; Stone et al. 2012
		transit-oriented community design, Ride sharing programs, Multimodal transportation strategies	Stone et al. 2012, Tang et al., 2010
		Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle	Stone et al. 2012
		Climate proofing of transport infrastructure	Habitat, 2011;
		Airports, Bus terminals, Ferry facilities, Fixed transit and network miles, Rail miles, Highway and rail bridges, Ports	Cutter et al (2008b)
		Length of railway,roads	Zhou et al 2014
		Densty of roads(the ratio between road mileage and land area)	Li and Li (2011)
	Architectural details	Building heights (increased)	Wamsler et al 2013
	Green infrastructure	Green building and green infrastructure standards.	(Tang et al., 2010; Hallegatte, 2009)
		Green roofs- Installation of vegetative roofing materials	Stone et al. 2012
	Community collaboration/ participation	Encourage community and stakeholder collaboration in development decisions	Wamsler et al. 2013
		Provision of risk/hazard information to the public	Cutter et al (2008b)

APPENDIX C

COASTAL VULNERABILITY INDEX

Table C 1: Integrated Coastal Vulnerability Index for Fethiye-Gocek SEPA

(AoT): Avarage of Turkey
(AoEu/World): Avarage of EU/World

INDICATORS			VULNERABILITY RATING				
					1 very low / 2 low	3 moderate	4 high / 5 very high
			Rate 2016 / 2000	Value Fethiye/Muğla/ TR32/ Fethiye-Göcek ÖÇKB	AoT	AoEu/ world	Special Range/standard
SOCIO-ECONOMIC	POPULATION	Old age dependency rate	2	**13.79** (2013) Fethiye (GEKA BÖLGE PLANI)	**11.1**(2013) Eurostat	**27.5**(2013) EU-28 Eurostat	0-11,1=1 11,2-15,2=2 15,3-19,3=3 19,4-23,4=4 23,5->27,5=5
			2	**11.09** MUĞLA TUIK,2000	**8.83** TUIK,2000 8.3 Eurostat, 2000	**23.3** EU-27 Eurostat, 2000	0-8,83=1 8.84-12,43=2 12,44-16,03=3 16,04-19,63=4 19,64->23,3=5
		Population growth rate(‰)	5	**%11.1** Fethiye-Göcek ÖÇKB TUİK ADNKS 2013-2012	**13.4**(2015)	**3.5**(2015)	0-3,5=1 3,6-5,975=2 5,976-8,45=3 8,46-10,925=4 10,926->13,4=5
			5	**30** Fethiye-Göcek ÖÇKB 2000-2007 (10 years average)	**18.78** (2000) Türkiye İstatistik Yıllığı, TÜİK, 2009	**4.1** EU-28 Eurostat, 2004	0-4,1=1 ->18.78=5
		Population density	5	**165.45** (133.248/805.37) Fethiye-Göcek ÖÇKB TUİK ADNKS 2015	**100.3** (2014)	**116.7** EU-28 (2014) Eurostat	0-100,3=1 ->116,7=5
			3	**99.7** Fethiye-Göcek ÖÇKB 2000 Türkiye İstatistik Yıllığı, TÜİK, 2009	**88** 2000 Türkiye İstatistik Yıllığı, TÜİK, 2009	**112.8** EU-28 Eurostat,2003	0-88=1 89-94,2=2 94,3-100,4=3 100,5-106,6=4 106,7-112.8=5

Table C-1(continued)

SOCIO-ECONOMIC	POPULATION	Net migration rate (‰)	**2**	4.9 2014-2015 21 2013-2014, TUİK **5.3** Muğla 2012-2013, TUİK ADNKS 2013	**26.7** 2.000.003/ 74.724.269 data.worldbank.org (2012)	**4.6** 2.324.066/ 504.060.345 data.worldbank.org (2012)	0-4,6=1 4,7-10,125=2 10,126-15,65=3 15,66-21,175=4 21,176->26,7=5
			5	**13.8** Muğla TUİK,2007-2008	**negative** 2008	**11.8** 5.884.417/ 498.300.775 (2007)	-11,8=1 ->11.8=5
		illiteracy rate (‰) Rate of illiterate people 6 age and over	**2**	**14.1** Fethiye TUIK 2015 ADNKS 18.3 Muğla TUIK 2015 ADNKS	**33.5** TUIK 2015 ADNKS	**8.9** 2010 over 15 age Male:99.3 Female:98.91 Average:99.11 UNESCO Institute for Statistics	0-8.9=1 9-15,5=2 15,6-21,2=3 21,3-27,35=4 27,36-33,5=5
			4	**41** 2009 TUIK	**64** 2009 TUIK	**12.4** 2000 over 15 age Male:99.0 Female:98.42 Average:98,76 UNESCO Institute for Statistics	0-12,4=1 12,5-25,8=2 25,9-38,7=3 38,8-51,6=4 51.7->64=5
		Household size	**4**	**3.17** (Fethiye, 2013)	**3.5** (2013) 3.5 (2015)	**2.3** (EU-28,2013) 2.3 (EU-28,2015)	0-2,3=1 2,4-2,6=2 2,7-2.9=3 3-3.2=4 ->3.5=5
			5	**4.50** Muğla (2000)	**3.8** (2006) 3.47 (2000)	**2.4** (EU-28, 2006)	0-2,4=1 ->3.8=5
	ECONOMIC						
		GDP per capita(euro)	**5**	8668 dolar=**6752 euro** TR32 Aydın-Denizli-Muğla(2011) TUİK seç gös muğla 2013	9244 dolar=**7201 euro** (2011) TUİK seç gös muğla 2013 7819 (2014)	**25.800 euro** 2011 (EU-28,2011) 27.500 (EU-28,2014) 26.300 (2015)	0-7201=5 ->25.800=1
			4	4253 dolar=**3809 euro** Muğla 2000 TUIK	2941 dolar=**2634 euro** 2000 TUIK	**22.900 euro** 2000 24400 euro 2004	0-2634=5 2635-7700=4 7701-12766=3 12767-17832=2 17833->22900=1

Table C-1(continued)

SOCIO-ECONOMIC		Employment loss/Unemployment	**1**	**7.3** Muğla, TUİK 2013	**9.7** TUİK 2013 10.3(2015)	**9.4** (EU-28-2015)	0-9,4=1 ->9,7=5
			1	**5.3** EUROSTAT-(TR32:Aydın-Denizli-Muğla 2006)	**9.9** 2006 6.5 İşgücü İstatistikleri TUİK, 2000	**8.3** EU-19 2006 9.3 EU-2004	0-8,3=1 ->9,9=5
	AGRICULTURE	% rural farm population;	**5**	**55** Fethiye-Göcek ÇDP raporu 39.8 (TR32:Aydın-Denizli-Muğla TUİK 2013)	**23.6** TUİK 2013	**25.6** data.worldbank.org (2013)	0-23,6=1 ->25.6=5
			5	**40** (TR32:Aydın-Denizli-Muğla TUİK 2004)	**34** İşgücü İstatistikleri TUİK, 2004 36 İşgücü İstatistikleri TUİK, 2000	**28** data.worldbank.org (20002004)	0-28=1 ->34=5
	FISHING	Scale of fishing sector	**1**				Small=1 Medium=3 Large=5
			1				
	TOURISM	% tourism population Tourism employment/ total employment	**5**	**45** Fethiye-Göcek ÇDP raporu	**4.9** 2012 AKTOB 1.206.000/ 24.819.300	**5.5** (EU-28,2012) 12.043.560/ 215.807.100	0-4.9=1 ->5.5=5
			5	**30** (5014/16380 2002 Fethiye Sosyo-Ekonomik Araştırma, 2010)	**4.7** 847000/17892000* 2004 değerinden 2000 yılına hesaplanmıştır. 2000-AKTOB	**6.2** (2000-2006)	0-4,7=1 ->6,2=5
		# of arrivals (international tourism) (arrivals/total population)	**5**	**3.7** 3.302.688/894.509 Muğla(2014) Muğla İl Kültür Turizm Müd.	**0,51** 39,811,000/ 77.695.904 data.worldbank.org (2014)	**0,90** 457,949,757/ 506.944.075 data.worldbank.org (2014)	0-0,51=1 ->0,9=5

Table C-1(continued)

SOCIO-ECONOMIC		**5**	**3.82** 2.925.440 Muğla(2005)/766.156 (2005) Muğla İl Kültür Turizm Müd.	**0,29** 20.273.000 (2005)/70.586.256 (2007 nüfusu) 10,783,000 data.worldbank.org (2001)	**0,74** 369.061.000 (2005)/ 494.598.322 336,061,384 data.worldbank.org (2001)	0-0,29=1 ->0,74=5
TOTAL SOCIO ECONOMIC		**3,50** 2016 **3,75** 2000				
NATURAL SYSTEMS	Type of settlement	**5**				Coastal/river delta=5, Lateritic Plain area=4 Low cliffs =3 Medium cliffs=2 Rockycliffed/Mountainous=1
	Presence of species to be protected: flora and fauna	**5** **5**				Yes=5 At significant rate=4 Certain amount=3 Insignificant=2 No=1
	Consideration of caretta-caretta with coastal and terrestrial ecosystems	**2** **3**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
	Size of undisturbed habitat(protected areas for biodiversity)%	**1**	**22** Fethiye-Göcek ÖÇKB (2008) Hassas zon, DKKA, Park, OMA,MF	-	**18** EU28-2013 **4,290,148km2** total 787,767 km^2 terresterial 251,565 km^2 marine	->18=1
		1	**23** Fethiye-Göcek ÖÇKB, (1998) MF, Sit.	-	**13** **3.944.260** km2 (EU-15 2003)	->13=1
	Size of forest areas	**1**	**%67** (Fethiye-Göcek ÖÇKB, 2008)	**%28** 21. 678.134 ha (total forest)/ 783562000 ha(total area) Orman ve su işl. Bk (2016)	**%38** (2015) data.worldbank.org	0-28=5 ->38=1

Table C-1(continued)

NATURAL SYSTEMS		**1**	**%57** (Fethiye-Göcek ÖÇKB, 1998)	**%27** 21.188.747 ha (2004) OGM Türkiye Orman Varlığı 2014	**%36.5** (2000)	0-27=5 ->36.5=1
	Length of coast /total acreage (m/km2)	**5**	**291.8** 235.000/805,37 Fethiye-Göcek ÖÇKB	**9.40** 8333 km Vikipedi CIA World Factbook	**17,9** Vikipedi CIA World Factbook	->17,9=5
	Land area where elevation is below 5 meters (% of total land area)	**5**	**14**	**0.5** (2010) data.worldbank.org	**2.6** (2010) data.worldbank.org	->2,6=5
				0.5 (2000)	**2.6** (2000)	
	temperature rise projections (RCP4.5 scenario)	**5**	2013-2040:1,5-2 °C 2041-2070: 2-3 °C 2071-2099: 5 °C (Aegean Region) (Demircan et al 2014)	2013-2040: 1.5-2 °C 2041-2070: 2-3 °C 2071-2099: 2-3 °C (EU)	2081-2100:1.4-3.1°C (world)Akçakaya, A. et al. MGM, 2013	<world average=1 >world average=5
	Creation of conservation zones or protection areas	**2**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		3				
	CO2 emissions (metric tons per capita)	**1**	**4.4** turkey (2011) data.worldbank.org	**7.1** eu (2011) data.worldbank.org	**4.9** world (2011) data.worldbank.org	0-4,9=1 ->7,1=5
		1	**3.4** turkey 2000	**8** eu 2000	**4.1** world 2000	0-4.1=1 ->8=5
	Consideration of impacts of sand extraction, lighting and noise on sea turtles	**2**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		3				
	Consideration of protection of estuaries (from urbanization, agriculture and tourism)	**3**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		4				

Table C-1(continued)

NATURAL SYSTEMS		Consideration of flora have to be protected(sığla.)	**2**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			3				
		Presence of restriction zones to fishing	**2**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			4				
TOTAL NATURAL SYSTEMS			**2,93**				
			3,50				
BUILT ENVIRONMENT	**COASTAL CONSTRUCTIONS**	Rate of engineered frontage and constructed areas on coasts (Ports, marinas, boat service areas)m2/total coastal lenght	**4***	**0,046** 10812 m/235 km			
			2*	**0,027** 6418 m/235 km			
		Average Coastal distance(m) on settlement areas	**5**	49 (Fethiye Merkez yerleşimi) Imar adalarının %69 u KKÇ ye 50 m den daha yakın (Fethiye İmar Planları,TVKGM			<50m=4 50m-100m=2 >100m=0
	TOURISM	Rate of tourism development on coasts	**2***	0.028 Fethiye-Göcek ÖÇKB, 2008)			
			2*	0.027 Fethiye-Göcek ÖÇKB, 1998)			
		Yacht tourism pressure	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			4				

Table C-1(continued)

BUILT ENVIRONMENT	**TOURISM**	Orientation to nature-based tourism, ecotourism, culture tourism	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Irrespective of temperature rise and flooding	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
	AGRICULTURE	Rate of farmland Farmland area/total acreage	**5**	**0.06** Fethiye-Göcek ÖÇKB, 2008)	23.810.672 ha/ 78.356.200 ha **0.30** TUİK, 2013	**0.44** (2013) data.worldbank.org	0-0,30=5 ->0.44=1
			5	**0.14** Fethiye-Göcek ÖÇKB, 1998)	0.53 (2000) data.worldbank.org	**0.47** (2000) data.worldbank.org	0-0,47=5 ->0,53=1
	CITY MACRO FORM	Impervious surface percent (for heat island effects) Artificial land	**5**	**%8** Fehiye-Göcek ÖÇKB, 2008-		**% 4.3** Eu (2012) Eurostat % 4.2(2009)	->4.3=5 <4.3=1
			5	**%12** Fehiye-Göcek ÖÇKB, 1998)		**% 4.0** (2000)* 2000 yılına indirgenerek hesaplanmıştır.	->4.0=5 <4.0=1
		Urbanization rate	**1**	**43.01** Fethiye 2012 TUİK ADNKS, (GEKA)	**77.28** 2012 TUİK ADNKS, (GEKA) 71.8 (2012) Worldbank.org 73.4 (2015)	**74.2** (2012) data.worldbank.org 74.8 (2015)	0-74.2=1 ->77,28=5
			1	**37** (2000) GEKA	**64.9** (2000) GEKA 65 data.worldbank.org (2000)	**72** data.worldbank.org (2000)	0-64,9=1 ->72=5
		Green areas per capita (m)	**1**	**24**			WHO:min 9 m2 3194 İmar Kanunu: <10m2=5 >10 m2=1

Table C-1(continued)

BUILT ENVIRONMENT		Mixed Use and compact development	5 3				Level of Compactness 1-5
	ARCHITECTURAl DETAILS & GREEN INFRASTRUCTURE	Climatic regulations: cooling and heating effects; sensitive to sun and wind	3 4				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		Disaster-resistant land use and building code	3 4				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		Consideration of Green building and green infrastructure standards.	5 5				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
		Consideration of Green roofs-Installation of vegetative roofing materials	5 5				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
TOTAL BUILT ENVIRONMENT			3,93 3,73				
INFRA STRUCTURE	WASTE	Zero waste reduction and high recycling strategy	5 5				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1

Table C-1(continued)

INFRA STRUCTURE	**STRATEGIES**	Waste and storm water management	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Consideration of boat-yacht wastes	**2**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Tourism formations' waste water treatment strategies	**3**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			4				
	RENEWABLE ENERGY PROGRAMS	Requirements for wind, solar, geothermal, or other renewable energy sources	**4**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Energy efficiency and energy stars	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Renewable energy consumption (% of total final energy consumption	**5**	***12.8** (2012) Türkiye data.worldbank.org	**14.1** (2012) eu	**18.1** (2012) world data.worldbank.org	0-14,1=5 ->18,1=1
			1	***17.29** (2000) Türkiye	**7.84** (2000) eu	**17.42** (2000) world	0-7,84=5 7,85-10,2=4 10,3-12,6=3 12,7-15=2 15.1->17,42=1
	ENERGY	Total water consumption per capita(liter/person) Kişi başına çekilen günlük su miktarı	**5**	**347** Muğla, TUİK, 2014	**258** Aydın-Denizli-Muğla 2014	**203** Türkiye TUİK, 2014	0-203=1 ->258=5
			5	**411** (2001)	**301** Aydın-Denizli-Muğla (2001)	**252** Türkiye (2001)	0-252=1 ->301=5

Table C-1(continued)

INFRA STRUCTURE	ENERGY	Electric power consumption (kWh per capita)	**2**	**2825** Muğla, TUİK, 2012	**2577** TUİK, 2012 2.789,2 (2013) data.worldbank.org	**6.034,4** eu (2013) data.worldbank.org	0-2577=1 2578-3441=2 3442-4306=3 4307-5170=4 5171-->6034,4=5
			2	*__2386__ Muğla (2009) TEDAŞ İstatistikleri	**1653** (2000)	**5827** (2000)	0-1653=1 1654-2670=2 2671-3741=3 3742-4785=4 4786->5827=5
	TRANSPORTATION POLICIES	Presence of Alternative transportation strategies transit-oriented community design, Ride sharing programs, Multimodal transportation strategies	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Density of the total Road network (Road length(km)/total area Km/km2)	**5**	**0.40** 949+4302=5251/12974 Muğla, TUİK, 2013	**0,50** 386.539 Eurostat 2013	**1.09** Eurostat 2013* Not all countries	0-0.50=5 ->1.09=1
			5	**0.09** 1162/12.974 Muğla (2004 il Çevre Durum Raporu)	**0.44** 347.553/783.562 (Eurostat 2004)	**1.11** Eurostat 2004)* Not all countries	0-0.44=5 ->1.11=1
		Consideration of Pedestrian/resident-friendly, bicycle-friendly transport	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		# of cars per 1000 inhabitants	**2**	**177** (8880 araç) 866.665 Muğla, TUİK, 2013	**121** TUİK, 2013	***455** (EU-27, 2006)	0-121=1 122-204,5=2 205-288=3 289-371=4 372-455=5
			2	**110** TUIK 2004	**65** (2000)	**423** (EU-27, 2000)	0-65=1 66-154,5=2 155-244=3 245-333.5=4 334->423=5

Table C-1(continued)

INFRA STRUCTURE	**TRANSPORTATION POL**	Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicle	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
		Climate proofing of transport infrastructure	**5**				Exactly not=5 Rarely concerned=4 Attempts but low implementation=3 High attempts but not full implementation=2 Fully considered=1
			5				
	HEALTH SERVICES	# of medical doctors per 100.000 inhabitants	**5**	**173.4**(EU, 2013) TR-32 160.3 (2014 TUİK) Muğla	**175.6** turkey (EU, 2013)	**340** 2010 OECD Health Data 2012	0-175,6=5 ->340=1
			1	**161.7** Muğla (2002) 1157/715328	**132.6** TUIK 2000	**140** 2000 OECD Health Data 2012	0-132,6=5 ->140=1
		# of hospital beds per 1000 inhabitants	**5**	**1.74** Fethiye Fethiye Stratejik Plan 2015-2019	**2.65** TUİK,2013	**5,26** (EU-28,2013)	0-2,65=5 ->5,26=1
			5	**2.2** 1998 Muğla	**2.7** 1998 2.12 2004	**5.92** EU-2004	0-2,7=5 ->5,92=1
TOTAL INFRASTRUCTURE			**4,29**				
			4,12				
INTEGRATED COASTAL VULNERABILITY			**3,66**				
			3,78				

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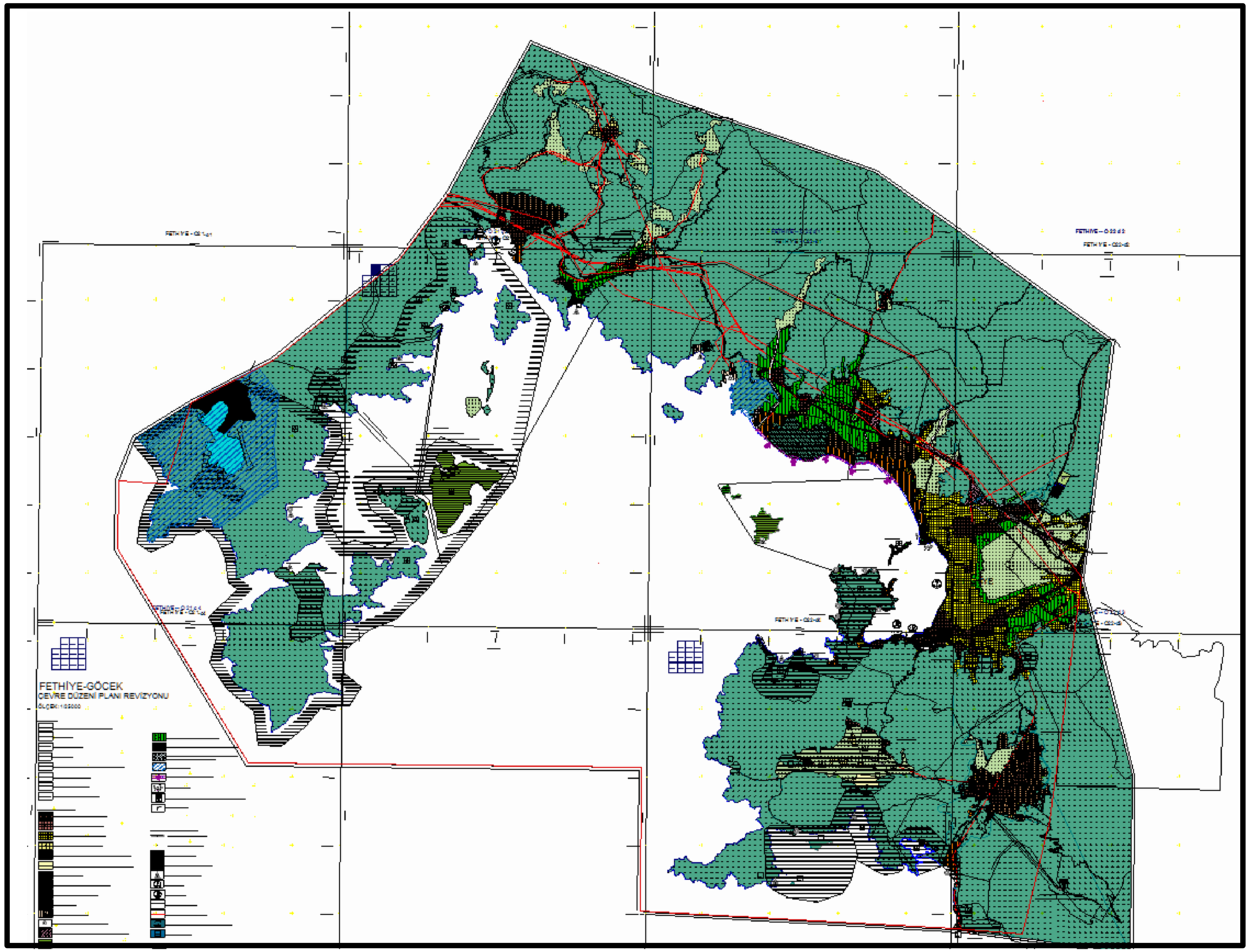
APPENDIX D

MAPS AND SPATIAL PLANS

Plan 1: Fethiye-Göcek SEPA 1/25.000 Scaled Territorial Plan (2008 Approved) Source: GDPNA, 2016



FETHİYE – GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ 1/25000 ÖLÇEKLİ ÇEVRE DÜZENİ PLANI REVİZYONU PLAN HÜKÜMLERİ

1. KAPSAM

BU PLAN BAKANLAR KURULU'NCA 12.6.1988 TARİH VE 88/13019 SAYILI KARARI İLE İLAN EDİLMİŞ DAHA SONRA 18.01.1990 TARİH VE 90-77 SAYI, 14.04.2000 TARİH 2000-580 SAYI, 08.11.2006 TARİH 2006-11266 SAYILI BAKANLAR KURULU KARARLARI İLE İLAVE VE DEĞİŞİKLİK YAPILMIŞ OLAN "FETHİYE-GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ"Nİ KAPSAMAKTADIR.

2. HEDEF

HARİTASINDA BELİRLENMİŞ SINIRLARI İÇERİSİNDE HAZIRLANAN BU ÇEVRE DÜZENİ PLANININ HEDEFİ;

2.1. BU ALANLARIN VE ÇEVRESİNİN DOĞAL GÜZELLİKLERİNİN, EKOLOJİK DENGESİ, TARİH, KÜLTÜR VE TABİAT VARLIKLARININ KORUNMASINI VE BUNLARIN GELECEK NESİLLERE İNTİKALİNİ SAĞLAMAK,

2.2. AKDENİZ BÖLGESİNDEKİ KÜLTÜREL MİRASIN VE DOĞAL KAYNAKLAR İLE DOĞAL ALANLARIN KORUNMASI AMACINA (AKDENİZ'DE ÖZEL KORUMA ALANLARI VE BİYOLOJİK ÇEŞİTLİLİĞE İLİŞKİN PROTOKOL, MADDE: 1) KATKIDA BULUNMAK,

2.3. 22.07.2002 TARİH VE 2002/4545 SAYILI BAKANLAR KURULU KARARIYLA ONAYLANAN MİLLETLERARASI "AKDENİZ'DE ÖZEL KORUMA ALANLARINA İLİŞKİN PROTOKOL"ÜN 7. MADDESİNDE BELİRTİLEN ÖNLEMLERİ ALMAK,

2.4. PLANLAMA ALANI İÇERİSİNDE KALAN VE DOĞAL YAPILARI İLE EKOLOJİK ÖZELLİKLERİ AÇISINDAN ÖNEM ARZ EDEN KESİMLERİN KORUMA AĞIRLIKLI KULLANIM DENGELERİNİN KURULMASINI SAĞLAMAK,

2.5. KISITLI VE KIYMETLİ NİTELİKTEKİ ÖZEL MAHSUL ALANLARINI KORUMAK,

2.6. ÜLKE ÖLÇEĞİNDE ÖNEMİ OLAN VE DOĞAL NİTELİKLERİ SEBEBİYLE TURİSTİK POTANSİYELE SAHİP BULUNAN ALANLARIN DENGELİ VE PLANLI BİR BİÇİMDE KULLANIMINI SAĞLAMAK,

2.7. MÜLGA KÜLTÜR VE TABİAT VARLIKLARINI KORUMA BÖLGE KURULUNCA BU PLANDAN ÖNCE TESPİT VE İLAN EDİLMİŞ BULUNAN VE İLGİLİ KÜLTÜR VARLIKLARINI KORUMA BÖLGE KURULU İLE TABİAT VARLIKLARINI KORUMA BÖLGE KOMİSYONU TARAFINDAN TESPİT VE İLAN EDİLECEK SİT ALANLARINI VE 383 SAYILI KHK'NIN 19. MADDESİ VE İLGİLİ BÖLGE KURULU VEYA KOMSİYONU TARAFINDAN TESPİT EDİLEN ŞARTLAR VE İLGİLİ MEVZUAT/İLKE KARARLARINA GÖRE KORUMAK,

2.8. YÖRENİN KÜLTÜREL VE DOĞAL MİRASI İLE MİMARI TARZININ MODERN VE ÇAĞDAŞ DÜZEYDE SÜRDÜRÜLMESİNİ SAĞLAYICI KARARLARLA, BÖLGE İÇERİSİNDEKİ YERLEŞMELER VE DİĞER GELİŞME ALANLARINDA ÇEVREYE UYUMLU YERLEŞME DOKUSU VE ÖZGÜN SİLÜETLERİN OLUŞMASINI TEMİN ETMEK,

2.9.DÜZENSİZ YAPILAŞMAYI ÖNLEMEK.

3.TANIMLAR

3.1. TOPLUMUN YARARLANMASINA AÇIK YAPI: MEVZUATA GÖRE TESPİT YA DA TASDİK EDİLMİŞ KURAL VE ÜCRET TARİFELERİNE UYGUN BİÇİMDE, GETİRDİĞİ KULLANIMDAN BELİRLİ KİŞİ YA DA TOPLULUKLARA AYRICALIKLI KULLANIM HAKKI TANIMAKSIZIN YARARLANMAK İSTEYEN HERKESE EŞİT VE SERBEST OLARAK AÇIK BULUNDURULAN VE KONUT DOKUNULMAZLIĞI OLMAYAN YAPILARDIR.

3.2. DENİZ KAPLUMBAĞASI KORUMA BÖLGELERİ: AVRUPA'NIN YABAN HAYATI VE YAŞAMA ORTAMLARINI KORUMA SÖZLEŞMESİ (BERN SÖZLEŞMESİ) ÇERÇEVESİNDE NESLİ TEHLİKEDE OLAN TÜRLER LİSTESİNDE YER ALAN DENİZ KAPLUMBAĞALARININ ÜREME ALANLARIDIR.

3.2.1. BİRİNCİL KORUMA BÖLGESİ: DENİZ KAPLUMBAĞALARI YUVALAMA ALANIDIR. KIYI ÇİZGİSİNDEN İTİBAREN 65M'LİK ALANI KAPSAR. KIYININ 65 M. DEN DAR OLMASI DURUMUNDA KIYI KENAR ÇİZGİSİNE KADAR OLAN ALANDIR.

3.2.2. İKİNCİL KORUMA BÖLGESİ: BİRİNCİL KORUMA BÖLGESİNİN BİTİMİNDEN İTİBAREN KIYI KENAR ÇİZGİSİNE KADAR OLAN ALANI KAPSAR.

3.2.3.TAMPON BÖLGE: KIYI KENAR ÇİZİGİNDEN İTİBAREN 100 M.LİK ALANI KAPSAR.

3.2.4. ETKİ ALANI: KIYI ÇİZGİSİNDEN İTİBAREN 1.000 M. LİK ALANI KAPSAR.

3.3. TABİAT PARKI : BİTKİ ÖRTÜSÜ VE YABAN HAYATI ÖZELLİĞİNE SAHİP, MANZARA BÜTÜNLÜĞÜ İÇİNDE HALKIN DİNLENME VE EĞLENMESİNE UYGUN TABİAT PARÇALARI OLUP, BU ALANLARDA 2873 SAYILI "MİLLİ PARKLAR KANUNU" HÜKÜMLERİNE UYULUR.

3.4. KAMU ARAZİLERİ: ÖZEL ÇEVRE KORUMA BÖLGELERİNDE YER ALAN DEVLETİN HÜKÜM VE TASARRUFU ALTINDAKİ ALANLAR, ORMAN, HAZİNE, 5737 SAYILI VAKIFLAR KANUNUNUN 12. MADDESİNDE BELİRTİLEN VAKIF MALLARINI KAPSAMAKTADIR.

3.5. TURİZM TESİS ALANI: TURİZM YATIRIMI KAPSAMINDA BULUNAN VEYA TURİZM İŞLETMESİ FAALİYETLERİNİN YAPILDIĞI VE YAPILACAĞI TESİSLERİN VE BUNLARIN AYRINTILARI İLE TAMAMLAYICI UNSURLARININ YER ALDIĞI VEYA ALACAĞI ALANLARDIR.

3.6. TURİZM TESİSİ: KÜLTÜR VE TURİZM BAKANLIĞI'NIN TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİĞİ'NE UYGUN TURİZM İŞLETME BELGESİ ALMIŞ OLAN YAPILARDIR.

3.7. BURADA BULUNMAYAN TANIMLARDA MER'İ MEVZUATTA BULUNAN TANIMLARA UYULUR.

4. GENEL HÜKÜMLER

4.1. PLANLA YENİ ARAZİ KULLANIM KARARI GETİRİLEN ALANLARDA 1/5000 ÖLÇEKLİ NAZIM İMAR PLANI VE BUNA DAYALI OLARAK HAZIRLANAN 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANLARI ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANIP KESİNLEŞMEDEN İMAR UYGULAMASI YAPILAMAZ.

4.2. BU PLAN İÇERİSİNDE İNŞA EDİLECEK TOPLU KONUT KOOPERATİFLERİ, TURİSTİK TESİSLER, KAMU KURUM VE KURULUŞLARINA AİT TESİSLER, YAPILACAK YAPILAR, KAMU HİZMET BİNALARI VB. YAPILARA AİT MİMARİ VE PEYZAJ PROJELERİ İLE REKREASYON ALANLARINA İLİŞKİN VAZİYET PLANLARI VE MİMARİ PROJELER ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ UYGUNLUK GÖRÜŞÜ ALINMADAN ONAMA İŞLEMİ YAPILAMAZ. YAPILARA RUHSAT VERMEYE YETKİLİ İDARELER PROJELERİN UYGULAMA İMAR PLANI VE HÜKÜMLERİNE UYGUNLUĞUNDAN VE YERİNDE UYGULAMASINDAN DOĞRUDAN SORUMLUDUR. İLGİLİ İDARELER HER HUSUSTA GEREKEN TÜM TEDBİRLERİ ALMAK ZORUNDADIR.

4.3. BÜTÜN TESİS VE YAPILARDA YAPI KULLANMA İZNİ VERİLMEDEN ÖNCE PARSEL İÇERİSİNDEKİ AÇIK ALANLARIN DÜZENLEME VE BİTKİLENDİRİLMESİ İŞLEMİNİN TAMAMLANMASI ZORUNLUDUR. TOPLU KONUT, TURİZM VE KONUT ALANLARINDA AÇIK ALAN (ÇEVRE) DÜZENLEMESİNDE PARSEL TOPLAMININ EN AZ % 40'I- KADAR BİR ALAN HİÇ BİR YAPAY MALZEME KULLANILMADAN DOĞAL TOPRAK ÖRTÜSÜ OLARAK BIRAKILACAK VE BU ALANDA BİTKİSEL DÜZENLEME YAPILACAKTIR. BİTKİLENDİRMEDE YÖREYE ÖZGÜ AĞAÇ TÜRLERİ İLE GÖRSEL OLARAK YAPIYI SAKLAYICI AMAÇLI DÜZENLEME ESASTIR. ANCAK PARSEL İÇERİSİNDE ZORUNLU OLARAK YAPILMASI GEREKEN OTOPARK İHTİYACININ HİÇBİR ŞARTTA (BODRUM KATLAR DAHİL) KARŞILANMAMASI DURUMUNDA SADECE OTOPARK ALANI OLARAK KULLLANILMAK ÜZERE PARSEL TOPLAMININ EN FAZLA %10U KADARI DA OTOPARK OLARAK DÜZENLENEBİLİR. BU DURUMDA BİTKİSEL DÜZENLEME YAPILACAK ALAN, PARSEL TOPLAMININ EN AZ %30'U KADARDIR.

4.4. BU PLAN İÇERİSİNDEKİ ALT ÖLÇEKLİ PLANLARDA PLAN KARARLARINA VE YAPILACAK İMAR PROGRAMLARI DOĞRULTUSUNDAKİ ARAZİ KULLANIMLARINA İLİŞKİN BELİRLENECEK TEKNİK ALT YAPI SİSTEMİ YAPILMADAN VE BU SİSTEM BÖLGESEL ÖLÇEKLİ BİR ŞEBEKEYE BAĞLANMADAN YAPI KULLANMA İZNİ VERİLEMEZ. BU PLAN İÇERİSİNDE YER ALACAK ALT YAPI TESİSLERİ İLE BAKANLIKÇA BELİRLENECEK ÖZELLİKTEKİ DİĞER YATIRIMLARA AİT PROJELER ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI, TARAFINDAN İNCELENEREK UYGUN GÖRÜŞ VERİLMEDEN UYGULAMA YAPILAMAZ.

BUNA GÖRE;

4.4.1. PLANLAMA ALANLARINDA GEREKLİ KAPASİTE VE SAĞLIK NORMLARINA UYGUN İÇME SUYU, PİS SU ŞEBEKESİ VE ARITMA TESİSLERİNİN YAPILMASI ZORUNLUDUR.

4.4.2. MEVCUT VE İNŞASI TAMAMLANAN YAPI VE TESİSLER ÇEVRESİNDE İHTİYACA CEVAP VEREBİLECEK ÖLÇEKTE VE SAĞLIK KURALLARINA UYGUN PİSSU KANALLARI AĞI (KANALİZASYON ŞEBEKESİ) VAR İSE, TESİSİN PİSSU KANALLARI BU AĞA BAĞLANIR. EĞER MEVCUT KANALİZASYON ŞEBEKESİ YOK İSE "LAĞIM MECRASI İNŞAATI MÜMKÜN OLMAYAN YERLERDE YAPILACAK ÇUKURLARA AİT YÖNETMELİK"DE BELİRTİLEN BOYUT, NİTELİK VE ŞARTLARA UYGUN OLACAK BİÇİMDE GENEL VEYA HER YAPI VE TESİS İÇİN BAĞIMSIZ SIZDIRMASIZ PİSSU ÇUKURU (FOSSEPTİK) YAPILIP, PİSSU KANALLARI BURAYA BAĞLANIR.

4.4.3. ATIK SU (ENDÜSTRİYEL VE EVSEL ATIK SU) SU KİRLİLİĞİ YÖNETMELİĞİNE GÖRE ARITILMADAN HİÇBİR ŞEKİLDE GÖL, AKARSU, KANAL, DERE VE TABİİ ARAZİYE DEŞARJ EDİLEMEZ.

4.5. UYGULAMA İMAR PLANI SINIRLARI İÇERİSİNDE BİR BÜTÜN OLARAK YA DA İLGİLİ İDARENİN PLAN BÜTÜNÜNDEKİ DÜZENLEME ORTAKLIK PAYI ORANI GÖZETİLEREK BELİRLEYECEĞİ ETAPLAR HALİNDE 3194 SAYILI İMAR KANUNU'NUN 18. MADDESİNE GÖRE PARSELASYON PLANI YAPILMADAN İNŞAAT İZNİ VERİLMEZ.

4.6. BU PLAN KAPSAMINDAKİ MUTLAK KORUMA ALANLARI DIŞINDA KALAN ALANLARDA İHTİYAÇ OLMASI HALİNDE GÜVENLİK, SAĞLIK, İLK VE ORTA DERECELİ EĞİTİM TESİSLERİ, BÜYÜK KENTSEL YEŞİL ALANLAR VB. GİBİ SOSYAL DONATI ALANLARI; ÇED YÖNETMELİĞİNİN EK-1 LİSTESİNDE YER ALMAYAN HER TÜRLÜ ARITMA TESİSLERİ, ULAŞIM ALTYAPISI GİBİ TEKNİK ALTYAPI ALANLARI İLE AKARYAKIT VE LPG İSTASYONLARI, YENİLENEBİLİR ENERJİ (GÜNEŞ, JEOTERMAL, BİYOGAZ VB.) ÜRETİM ALANLARINA İLİŞKİN İMAR PLANLARI İLGİLİ KURUM VE KURULUŞLARIN GÖRÜŞLERİ DOĞRULTUSUNDA ÇEVRE DÜZENİ PLANINDA DEĞİŞİKLİĞE GEREK OLMAKSIZIN YAPILABİLİR.

4.7. HASSAS ZON HARİCİNDE YENİLENEBİLİR ENERJİ (RÜZGAR, GÜNEŞ, JEOTERMAL) ÜRETİM ALANLARINA İLİŞKİN TALEPLER, İLGİLİ KURUM VE KURULUŞLARDAN ALINAN İZİNLER VE ENERJİ PİYASASI DÜZENLEME VE DENETLEME KURULUNCA VERİLECEK LİSANS KAPSAMINDA, ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ TALEP EDİLECEĞİ BİLİMSEL RAPOR DOĞRULTUSUNDA ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA DEĞERLENDİRİLECEKTİR. BU KULLANIMLARA YÖNELİK 1/25000 ÖLÇEKLİ ÇEVRE DÜZENİ PLANI DEĞİŞİKLİĞİNE GEREK KALMADAN, ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANACAK 1/5000 VE 1/1000 NAZIM VE UYGULAMA İMAR PLANLARI DOĞRULTUSUNDA UYGULAMA YAPILACAKTIR.

4.8. BU PLAN ALANI İÇERİSİNDE YER ALABİLECEK YÜKSEK GERİLİM HATLARI, ENERJİ NAKİL HATLARI, BORU HATLARI, TRAFO MERKEZLERİ, SULAMA, DEŞARJ VE KANAL PROJELERİ, KARAYOLLARI VE KÖY YOLLARI PROJELERİ GİBİ KAMU ALTYAPI YATIRIMLARI İLE KENTSEL ALTYAPI (İÇME VE KULLANMA SUYU, KANALİZASYON, ARITMA) PROJELERİNE UYGULAMAYA GEÇİLMEDEN ÖNCE BAKANLIKTAN UYGUN GÖRÜŞ ALINMASI ZORUNLUDUR.

4.9. KAMU HİZMETİ İÇİN KULLANILAN RESMİ BİNALARLA, İBADET YERLERİ, ÖZEL EĞİTİM VE SAĞLIK TESİSLERİ, SİNEMA, TİYATRO, MÜZE, KONFERANS SALONU GİBİ KÜLTÜREL BİNALAR, TERMAL OTELLER VE KÜR TESİSLERİ, KAPALI SPOR TESİSLERİ İLE ENTEGRE OLMAYAN TARIM VE HAYVANCILIK TESİSLERİ, ÇEKME MESAFELERİ İÇERİSİNDE KALMAK VE İNŞAAT EMSALİ AŞILMAMAK KAYDIYLA BİNA BOYU ARANMAZ VE Y ENÇOK DEĞERİ AŞILMAMAK KAYDIYLA; GİRİŞ KATI DİĞER KATLARDAN YÜKSEK TUTULABİLİR.

4.10. TURİZM TESİS ALANLARI, TİCARET ALANLARI VE KONUT DIŞI KENTSEL ÇALIŞMA ALANLARINDA BİNA CEPHE HATTI EN FAZLA 45 M.DİR. YUKARIDA BELİRTİLEN KULLANIMLAR DIŞINDA KALAN VE BİTİŞİK NİZAM VERİLMEMİŞ ALANLARDAKİ YAPILAR İÇİN İSE EN FAZLA BİNA BOYU 30M DİR.

4.11. KONUTLARDA ÇATILAR OTURTMA ŞEKLİNDE, BEŞİK YA DA KIRMA ÇATI TÜRÜNDE VE MİNİMUM %20, MAKSİMUM %40 EĞİMLE İNŞA EDİLEREK MARSİLYA, ALATURKA KİREMİT VEYA GÜNÜMÜZ KİREMİT TÜRLERİ İLE KAPLANACAKTIR.

4.12. BU PLAN KAPSAMINDAKİ KONUTLARDA YEREL MİMARİ TARZ VE ÖZELLİKLERİ İLE CEPHE ORANLARININ GÖZÖNÜNDE TUTULMASI MECBURİDİR. CEPHELER TUĞLA, BRİKET VEYA DİĞER GÜNÜMÜZ MALZEMELERİNDEN İSE SIVALI VE BADANALI, AHŞAP VEYA TAŞ DUVAR ŞEKLİNDE İSE SIVASIZ BIRAKILABİLİR.

4.13. BACALAR YÖRENİN MİMARİ KARAKTERİNİ YANSITACAK ŞEKİLDE VE GÜNÜMÜZ MALZEMESİ İLE YAPILACAKTIR. KONUT DIŞI YAPILARDA İSE BACALAR YÖRENİN MİMARİ KARAKTERİNİ YANSITACAK ŞEKİLDE GÜNÜMÜZ MALZEMESİ İLE YAPILABİLİR.

4.14. KENTSEL YERLEŞİM ALANLARINDA TAMAMI TİCARET ALANI OLARAK TANIMLANAN İMAR ADALARINDAKİ TİCARİ YAPILARA İLİŞKİN MİMARİ ÖZELLİKLER İMAR PLANLARINDA BELİRLENECEKTİR.

4.15. MADEN RUHSAT SAHASINDA İHTİYAÇ DUYULAN GEÇİCİ TESİSLER, MADEN İŞLERİ GENEL MÜDÜRLÜĞÜ'NDEN İZİN VE GEÇİCİ TESİS OLDUĞUNA DAİR BELGE ALINARAK ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ UYGUN GÖRÜŞÜ İLE YAPILABİLİR. GEÇİCİ TESİSLERİN KULLANIMI MADEN RUHSATININ VEYA MADEN REZERVİNİN İŞLETME SÜRESİ İLE SINIRLIDIR. BU TESİSLER, KULLANIM SÜRESİNİN BİTMESİ DURUMUNDA KALDIRILIR.

4.16. BU PLAN KAPSAMINDA KALAN FETHİYE-GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ İLANINDAN VEYA SINIR DEĞİŞİKLİĞİNDEN ÖNCE İLGİLİ KURUM VE KURULUŞLAR TARAFINDAN 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI ONAYLANARAK MÜLGA ÖZEL ÇEVRE KORUMA KURUMU BAŞKANLIĞI VEYA ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA UYGUN GÖRÜŞ VERİLMİŞ İMAR PLANLARINA GÖRE UYGULAMA SÜRDÜRÜLECEKTİR.

4.17. BU PLAN DAHİLİNDE YAPILACAK OLAN BİNALARIN SU BASMAN YÜKSEKLİĞİNİN DSİ TARAFINDAN 1 METRENİN ÜZERİNDE ÖNGÖRÜLMESİHALİNDE DSİ TARAFINDAN VERİLEN GÖRÜŞ DOĞRULTUSUNDA 1 METRENİN ÜZERİNDEKİ 2 METREYE KADAR OLAN DEĞER SAÇAK KOTUNA EKLENİR.

4.18. FETHİYE KÖRFEZ İÇİ YAT BAĞLAMA YERLERİNİN GÖSTERİM VE SAYILARI SEMBOLİK OLUP, 1/25.000 ÖLÇEKLİ ÇEVRE DÜZENİ PLANI DEĞİŞİKLİĞİNE GEREK KALMAKSIZIN FETHİYE-GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ DENİZ VE KIYI ALANLARININ BİYOLOJİK ÇEŞİTLİLİK TESPİTİ PROJESİ VE FETHİYE KÖRFEZİ YAT KAPASİTESİNİN BELİRLENMESİ PROJESİ İLE ALT ÖLÇEKLİ İMAR PLANLARIYLA BELİRLENECEKTİR.

4.19. KAMU ARAZİLERİNİN TAHSİS, KİRALAMA, SATIŞ İŞLEMLERİ

4.19.1.A) ÖZEL ÇEVRE KORUMA BÖLGESİ İLANINDAN SONRA DAHA ÖNCEKİ PLANLAR İLE VERİLEN KULLANIM KARARLARI HER NE OLURSA OLSUN MÜLGA ÖZEL ÇEVRE KORUMA KURUMU BAŞKANLIĞI TARAFINDAN VE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN ONAYLANAN PLANLAR İLE 'MUTLAK KORUMA ALANLARI' OLARAK TANIMLANAN ALANLAR: BU ALANLAR PLANDA YAPILAŞMA İZNİ VERİLMEDEN DOĞAL KARAKTERİNİN KORUNMASI, DEVAMI VE GELİŞTİRİLMESİ ŞEKLİNDE TANIMLANMIŞ OLAN AĞAÇLANDIRILICAK ALAN, YEŞİL ALAN, PARK SULAK ALAN, SAZLIK, BATAKLIK, ORMAN ALANI, HASSAS ALAN HABİTAT VE BİO GENETİK REZERV ALANI GİBİ KORUMA ALANLARI NİTELİĞİNDEKİ ARAZİLER

FETHİYE – GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ 1/25000 ÖLÇEKLİ ÇEVRE DÜZENİ PLANI REVİZYONU PLAN HÜKÜMLERİ

KESİNLİKLE YAPILAŞMAYA AÇILAMAZ. SATIŞA VE BAŞKA BİR AMAÇLA DİĞER BİR KAMU KURULUŞUNA DAHİ TAHSİSE, TAKASA, DEVİRE, KİRALAMAYA,İRTİFAK HAKKI VE ÜST HAKKI TESİSİNE KONU EDİLEMEZ.

B) BU ALANLARDA PLANDA BELİRTİLMEMESİNE RAĞMEN KAMU YARARINA YONELİK İHTİYAC DUYULABİLECEK KAMU HİZMETLERİ ALT YAPI TESİS ALANLARI (YOL GEÇİŞİ, ENERJİ NAKİL VE TELEFON HATTI, GÖLET, BARAJ, SULAMA KANALI, KUYU YERİ, SU DEPOSU) İLE TAŞ, ÇAKIL VE KUM OCAĞI İLGİLİ PLAN HÜKÜMLERİNE UYGUN OLMAK VE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI'NIN OLUMLU GÖRÜŞÜ ALINMAK KAYDI İLE TAHSİS, TAKAS, DEVİR, KİRALAMAYA İRTİFAK HAKKI VE ÜST HAKKI TESİSİNE KONU EDİLEBİLİR. ANCAK HİÇ BİR SURETLE KAMU YADA ÖZEL KİŞİ VE/VEYA KURUMLARA SATIŞI YAPILAMAZ.

C)PLANDA DOĞAL KARAKTERİ KORUNACAK ALAN, AĞAÇLANDIRILACAK ALANLAR, BÖLGE ÖZELİNDE NADİR, HASSAS, DOĞALLIK VE BİYOLOJİK ÇEŞİTLİLİK AÇILARINDAN ÖNEM ARZ ETMEMESİ, FLORADA BİYOLOJİK ÇEŞİTLİLİK KAYBINA YOL AÇILMAMASI AMACIYLA İSTİLACI AĞAÇ TÜRLERİNİN AĞAÇLANDIRMADA KULLANILMAMASI, AĞAÇLANDIRMADA MUTLAKA BÖLGENİN COĞRAFİ VE İKLİM ŞARTLARINA UYGUN YÖREYE HAS YERLİ TÜRLERİN KULLANILMASI VE ÇEVRE VE ŞEHİRÇİLİK BAKANLIĞININ OLUMLU GÖRÜŞÜNÜN ALINMASI KOŞULUYLA TARIM AMAÇLI AĞAÇLANDIRMA ÇALIŞMALARI YAPILMAK ÜZERE TAHSİS VE KİRALAMAYA KONU EDİLEBİLİR. ANCAK HİÇBİR SURETLE KAMU YA DA ÖZEL KİŞİ VE/VEYA KURUMLARA SATIŞI YAPILAMAZ

4.19.2 BU PLANLA KAMUYA AÇIK FONKSİYONLARIN (SPOR TESİSLERİ, DOĞA PARKI, BÖLGE PARKI, REKREASYON ALANLARI VE GÜNÜBİRLİK ALANLAR) YER ALACAĞI SINIRLI YAPILAŞMA İZNİ VERİLEN KULLANIM KARARLARININ GETİRİLMİŞ OLDUĞU HAZİNE ADINA TESCİLLİ ARAZİLER SADECE BU HİZMETLERİ GERÇEKLEŞTİRECEK BİR BAŞKA KAMU KURUMUNA TAHSİS VEYA KİRALAMAYA KONU EDİLEBİLİR. GERÇEK VE ÖZEL HUKUK VE TÜZEL KİŞİLERİNE SATIŞ, TAKAS, İRTİFAK HAKKI, ÜST HAKKI TESİSİNE, TAHSİS KİRALAMA, DEVİR VE TEMLİK İŞLEMLERİNE KONU OLAMAZ.

4.19.3 BU PLAN VE PLAN HÜKÜMLERİZNDEKİ KULLANIM KARARLARINA UYGUN OLMAK ŞARTIYLA 4.19.1 MADDESİNDE SÖZÜ EDİLEN ARAZİLER DIŞINDAKİ TAPULU KAMU ARAZİLERİ İLE HAZİNE ARAZİLERİ ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI'NIN UYGUN GÖRÜŞÜ ALINMAK KAYDIYLA BİR BAŞKA KURUM VE KURULUŞU İLE GERÇEK VE ÖZEL HUKUK TÜZEL KİŞİLERİNE SATIŞ, TAHSİS, KİRALAMA VE TAKAS İŞLEMLERİNE KONU EDİLEBİLİRLER.

4.19.4ÖZEL ÇEVRE KORUMA BÖLGESİ İLANINDAN ÖNCE TAHSİS İZNİ ALINMIŞ OLUP, ÖZEL ÇEVRE KORUMA BÖLGESİ İLANI SONRASI, MÜLGA ÖZEL ÇEVRE KORUMA KURUMU BAŞKANLIĞI VE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANAN PLANLARDA TAHSİS AMACI İLE AYNI KULLANIM KARARI BELİRLENMİŞ KAMU ARAZİLERİ, PLAN KARARLARININ GERÇEKLEŞTİRİLMESİNE YÖNELİK YAPILANMA KOŞULLARININ ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA AÇIKÇA BELİRLENMESİ KAYDI İLE TAHSİSE KONU EDİLEBİLİR.

4.19.5 MÜLGA ÖZEL ÇEVRE KORUMA BAŞKANLIĞI VE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN ONAYLANAN PLAN KARARLARINDAN FARKLI AMAÇLA, TAHSİS İZNİ ALINMIŞ/ALINACAK KAMU ARAZİLERİNDE; TAHSİS GEREKÇESİNİ GERÇEKLEŞTİRMEK AMACI İLE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINA İLETİLEN 'PLAN DEĞİŞİKLİĞİ' TEKLİFLERİNDE;

-MÜLGA ÖZEL ÇEVRE KORUMA BAŞKANLIĞI VE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN ONAYLANAN ÜST ÖLÇEK PLANLARDAKİ GENEL YAKLAŞIM, İLKELER VE PLAN HEDEFLERİNE UYGUN OLMASI,

-PLAN KARARLARI İLE PLAN DEĞİŞİKLİĞİNDE TEKLİF EDİLEN KULLANIM KARARI ARASINDA UYUM BULUNMASI,

-YAPILACAK TESİSİN NİTELİĞİ AÇISINDAN UYGUNLUĞUN BULUNMASI GEREKMEKTEDİR.

4.19.6. ANCAK MÜLGA ÖZEL ÇEVRE KORUMA BAŞKANLIĞI TARAFINDAN UYGUN GÖRÜŞ ALARAK TAHSİS KONUSU EDİLMİŞ VEYA ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN TAHSİSE KONU EDİLECEK TÜM KAMU ARAZİLERİNDE HER TÜR KULLANIM KARARI İÇİN İLGİLİ BÖLGENİN ÇEVRE DÜZENİ PLANINDA ÖNGÖRÜLEN SINIRLAR DAHİLİNDE ALT ÖLÇEK PLANLARDA VERİLMİŞ AZAMİ YAPILAŞMA KOŞULLARI HİÇBİR SURETLE AŞILAMAZ.

4.19.7. BU PLAN SINIRI İÇİNDE BULUNAN DEVLETİN HÜKÜM VE TASARRUFU ALTINDAKİ ALANLARA İLİŞKİN OLARAK "TABİAT VARLIKLARI VE DOĞAL SİT ALANLARI İLE ÖZEL ÇEVRE KORUMA BÖLGELERİNDE BULUNAN DEVLETİN HÜKÜM VE TASARRUFU ALTINDAKİ YERLERİN İDARESİ HAKKINDA YÖNETMELİK" HÜKÜMLERİNE UYULACAKTIR.

5. ÖZEL HÜKÜMLER

5.1. KONUT ALANLARI

5.1.1. KENTSEL YERLEŞME ALANLARI: BU ALANDA VARSA MÜLGA ÖZEL ÇEVRE KORUMA KURUMU BAŞKANLIĞI VE ÇEVRE VE ŞEHİRCİLİK BAKLANLIĞI TARAFINDAN ONAYLANMIŞ VE/VEYA UYGUN BULUNMUŞ OLAN 1/5000 ÖLÇEKLİ NAZIM VE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI VE HÜKÜMLERİ GEÇERLİDİR, ALT ÖLÇEKLERDE PLANI OLMAYAN KENTSEL YERLEŞME ALANLARINDA İSE HAZIRLANACAK ALT ÖLÇEKLİ İMAR PLANLARI BAKANLIKÇA ONAYLANMADAN UYGULAMA YAPILAMAZ.

5.1.2. KENTSEL GELİŞME ALANLARI: BU PLAN KAPSAMINDA BÖLGE İÇERİSİNDE KALAN İLÇELER VE BELDELERİN GELİŞME ALANLARI OLARAK BELİRLENMİŞTİR. ALT ÖLÇEKLİ İMAR PLANI OLMAYAN ALANLARDA İSE HAZIRLANACAK İMAR PLANLARI BAKANLIKÇA ONAYLANMADAN UYGULAMA YAPILAMAZ.

5.2. KIRSAL YERLEŞME VE GELİŞME ALANLARI:

PLANDA KIRSAL YERLEŞİM ALANI VE/VEYA KIRSAL GELİŞME ALANI OLARAK BELİRLENEN ALANLARI İÇERMEKTEDİR. KIRSAL YERLEŞİM ALANLARINA AİT İMAR PLANLARININ ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANIP YÜRÜRLÜĞE GİRMESİYLE, UYGULAMAYA YÖNELİK AŞAĞIDAKİ YAPILAŞMA ŞARTLARI PLAN NOTU DEĞİŞİKLİĞİNE GEREK KALMAKSIZIN YÜRÜRLÜKTEN KALKAR. KIRSAL GELİŞME ALANLARINDA NAZIM VE UYGULAMA İMAR PLANLARI YAPILMADAN UYGULAMA YAPILAMAZ.

ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA İMAR PLANLARI ONAYLANANA KADAR KIRSAL YERLEŞME ALANLARINA İLİŞKİN YAPILAŞMA ŞARTLARI;

5.2.1- TEVHİD YAPILABİLİR ANCAK İFRAZ YAPILAMAZ.

5.2.2- YAPILAR YÖRESEL MİMARİ TARZDA OLACAK, YAPILARDA CEPHELER TUĞLA, BRİKET VEYA DİĞER GÜNÜMÜZ MALZEMELERİNDEN İSE SIVALI VE BADANALI OLACAKTIR. TAŞ KULLANILMIŞ İSE SIVASIZ BIRAKILACAKTIR. PENCERE DOĞRAMALARI AHŞAP VEYA AHŞAP GÖRÜNÜMLÜ OLACAKTIR. YÖRE MİMARİSİNDE ÖNEMLİ YERİ OLAN ÇIPLAK (SIVASIZ) TAŞ DUVAR KULLANILMASINI TEŞVİK ETMEK, TAŞ DUVARIN TEKNİĞİ İTİBARIYLA İNŞAAT KAYIPLARINA SEBEP OLMAMAK ÜZERE, YAPI YAKLAŞMA SINIRLARINA UYMAK ŞARTI İLE DIŞ CEPHEDE 50 CM'E KADAR YAPILAN TAŞ DUVAR İNŞAAT ALANI HESABINA KATILMAZ. NORMAL İNŞAATLARIN İNCE TAŞ PLAKALAR İLE KAPLANMASI DURUMUNDA BU HÜKÜMLER GEÇERLİ DEĞİLDİR.

5.2.3- YÖRESEL YAŞAM BİÇİMİNDEN KAYNAKLANAN MÜŞTEMİLATLAR (ODUNLUK, KÖMÜRLÜK, GARAJ, DEPO, MUTFAK VE ÇAMAŞIRHANE VB. HİZMETLER İÇİN OLUP, MAKSADI DIŞINDA KULLANILAMAZ) O PARSELDE YAPILACAK KONUTA AİT YAPININ TOPLAM TABAN ALANININ %25'İNİ GEÇEMEZ. HER DURUMDA MÜŞTEMİLATIN TABAN ALANI 25 M^2. DEN BÜYÜK OLAMAZ. MÜŞTEMİLATIN TABAN ALANI, TOPLAM YAPI TABAN ALANINA DAHİL EDİLMEZ. MÜŞTEMİLATLAR, ÇATININ EN YÜKSEK NOKTASI TABİİ ZEMİNDEN İTİBAREN (2.50) M. DEN YÜKSEK OLMAMAK, ESAS BİNAYA (3.00) M.'DEN FAZLA YAKLAŞMAMAK ŞARTI İLE YAPILIR. MÜŞTEMİLAT YAPISININ YERİ VE NEVİ'NİN BELİRLENMESİNDE İLGİLİ İDARE YETKİLİDİR.

5.2.4- YAPIYA İZİN VERİLEBİLMESİ İÇİN YAPININ BULUNDUĞU PARSELİN TAPU KADASTRO VEYA TAPULAMA HARİTASINDAKİ KAMUYA AİT BİR YOLA CEPHESİNİN BULUNMASI ZORUNLUDUR.

5.2.5- YAPILARDA ARKA BAHÇE YAKLAŞMA SINIRI EN AZ H/2 OLACAKTIR. YOLDAN, YAPI YAKLAŞMA MESAFESİ 5 M., YAN BAHÇELERDEN 3M. OLACAKTIR. ANCAK MESKUN KIRSAL YERLEŞME DOKUSUNUN OLDUĞU YERLERDE YAPI YAKLAŞMA MESAFELERİNİN BELİRLENMESİNDE İLGİLİ İDARELER YETKİLİDİR.

5.2.6- YAPILARIN HER CEPHEDEN GÖRÜNEN KAT SAYISI 2 KATI, YÜKSEKLİĞİ 6.50M' Yİ GEÇMEYECEKTİR. EĞİMDEN KAT KAZANILAMAZ.

5.2.7- DÜĞÜN, TOPLANTI, SERGİ VB ÇOK AMAÇLI SALON, OKUL, SAĞLIK OCAĞI, İBADET YERİ, KARAKOL GİBİ KAMU HİZMETİNE YÖNELİK YAPILARIN YER SEÇİMİNE YÖNELİK ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ UYGUN GÖRÜŞÜ ALINMASI ZORUNLDUR.

DÜĞÜN, TOPLANTI, SERGİ VB ÇOK AMAÇLI SALON, OKUL, SAĞLIK OCAĞI, İBADET YERİ, KARAKOL GİBİ KAMUYA AİT YAPILARDA;

TAKS : 0.40
KAKS : 0.80
YENÇOK : 7.50 M (2 KAT)

ÇEKME MESAFELERİ YOLDAN 10M. YAN VE ARKA BAHÇELERDEN 5M., BİNALAR ARASI MESAFE 6 M. DİR.

5.2.8- BU ALANLARDA, PANSİYON, GÜNÜBİRLİK TESİS, TİCARET, TARIMSAL ÜRETİME DAYALI İMALATHANE VE İŞLETMELER GİBİ KULLANIMLAR YER ALABİLİR. BU YAPILARA AİT MİMARİ PROJELERE SİT ALANLARININ İÇİNDE OLMASI HALİNDE İLGİLİ KÜLTÜR VARLIKLARINI KORUMA BÖLGE KURULU İLE TABİAT VARLIKLARINI KORUMA BÖLGE KOMİSYONU'NUN UYGUN GÖRÜŞÜ ALINARAK YAPILAR İLGİLİ İDARECE RUHSATLANDIRILIR.

BU ALANLARDA YAPILAŞMA ŞARTLARI;
EMSAL : 0.40
YENÇOK : 6.50 M. DİR.

5.2.9. 5.2.7. NOLU PLAN HÜKMÜNDE BELİRTİLEN KAMU HİZMETİNE YÖNELİK YAPILARIN YAPILACAĞI PARSELLER HARİÇ OLMAK ÜZERE PARSELDE BİRDEN FAZLA YAPI YAPILMAK İSTENMESİ HALİNDE PARSEL ALANININ 425M2 YE BÖLÜNMESİNDEN ELDE EDİLECEK TAM SAYI KADAR YAPI YAPILABİLİR. YAPILAR ARASINDA EN AZ 6M. BULUNMALIDIR. PARSELDE, BİR YAPININ TABAN ALANI 85 M2 DEN DAHA BÜYÜK, 45 M2 DEN DAHA KÜÇÜK OLAMAZ.

5.2.10. BİR PARSELDE BİRDEN FAZLA BİNA YAPILMASI HALİNDE YAPILAR ARASINDA EN AZ 6M. MESAFE OLACAKTIR. YAPILARIN YERLERİNİN TESPİTİNE İLGİLİ İDARE YETKİLİDİR.

5.2.11. BU YAPILARIN İZİN İLE İLGİLİ İŞ VE İŞLEMLERİNDE 3194 SAYILI İMAR KANUNU VE İLGİLİ YÖNETMELİK HÜKÜMLERİNE UYULMASI ZORUNLUDUR.

5.2.12- PARSELDE FEN VE SAĞLIK KURALLARINA UYGUNLUĞU TESPİT EDİLMİŞ VE YASAL MÜKTESEPLİĞİ OLAN MEVCUT BİR YAPININ BULUNMASI HALİNDE MEVCUT YAPININ TABAN ALANI DAHİL OLMAK ÜZERE TOPLAM YAPI ALANI 170 M^2 Yİ AŞMAMAK KAYDIYLA 2. YAPI YAPILABİLİR. MEVCUT YAPIYA KAT İLAVESİ TALEBİ HALİNDE MEVCUT YAPI VE ZEMİN KAT İLAVESİNE UYGUN OLUP OLMADIĞINA İLİŞKİN TEKNİK RAPORUN İLGİLİ İDAREYE VERİLMESİ ZORUNLUDUR.

YAPILAR İLGİLİ İDARECE RUHSATLANDIRILIR. VERİLEN İZİN DOĞRULTUSUNDA PROJELERİN UYGULAMASINDAN FENNİ MESUL İLE PARSEL SAHİBİ SORUMLU OLACAKTIR.

5.2.13. MÜŞTEMİLATLAR, O PARSELDE YAPILACAK KONUTA AİT YAPININ TOPLAM TABAN ALANININ %25'İNİ GEÇEMEZ. HER DURUMDA MÜŞTEMİLATIN TABAN ALANI 25 M^2. DEN BÜYÜK OLAMAZ. MÜŞTEMİLATIN TABAN ALANI, TOPLAM YAPI TABAN ALANINA DAHİL EDİLMEZ. MÜŞTEMİLAT YAPISININ YERİ VE NEVİ'NİN BELİRLENMESİNDE İLGİLİ İDARE YETKİLİDİR.

5.2.14. PARSELDE FEN VE SAĞLIK KURALLARINA UYGUNLUĞU TESPİT EDİLMİŞ MEVCUT BİR YAPININ BULUNMASI HALİNDE MEVCUT YAPININ TABAN ALANI TOPLAM YAPI ALANINA DAHİL EDİLİR. MEVCUT YAPIYA KAT İLAVESİ TALEBİ HALİNDE MEVCUT YAPI VE ZEMİN KAT İLAVESİNE UYGUN OLUP OLMADIĞINA İLİŞKİN TEKNİK RAPORUN İLGİLİ İDAREYE VERİLMESİ ZORUNLUDUR.

5.2.15. III. DERECE ARKEOLOJİK SİT ALANINDA İLGİLİ İLKE KARARI DOĞRULTUSUNDA SONDAJ KAZILARI YAPILARAK HAZIRLANACAK SONDAJ RAPORU MUĞLA KÜLTÜR VARLIKLARINI KORUMA BÖLGE KURULU'NA İLETİLECEK, PARSELDE HERHANGİ BİR KÜLTÜR VARLIĞINA RASTLANMADIĞININ BELGELENMESİYLE BİRLİKTE MUĞLA KÜLTÜR VARLIKLARINI KORUMA BÖLGE KURULUNUN KARARINA GÖRE İLGİLİ İDARECE İŞLEM YAPILACAKTIR.

5.3. TURİZM ALANLARI :

PLANDA TURİZM TESİS ALANI, GÜNÜBİRLİK KULLANIM ALANI VE PANSİYON OLARAK GÖSTERİLEN ALANLARDA YANLIZCA TOPLUMUN YARARLANMASINA AYRILAN YAPI NİTELİĞİNDEKİ TESİSLER YAPILABİLİR. BU TESİSLERE İNŞAAT RUHSATI VERİLEBİLMESİ İÇİN YAPILACAK YAPININ BU NİTELİKTE OLACAĞININ TAPU KÜTÜĞÜNÜN BEYANLAR HANESİNE YAZDIRILMASI ZORUNLUDUR. TESCİL İŞLEMİ YAPILMADAN İNŞAAT RUHSATI VERİLEMEZ.

BU PLANDA TURİZM TESİS ALANI OLARAK GÖSTERİLMİŞ ALANLARDA TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK'TE TANIMLANAN TURİZM TESİS VE KULLANIMLARI, GÜNÜBİRLİK TESİS KULLANIMLARI İLE KENTSEL, SOSYAL VE TEKNİK ALTYAPI ALANLARI VE TİCARİ KULLANIMLAR YER ALABİLİR.

5.3.1. KENTSEL YERLEŞİK ALANLAR VE KENTSEL GELİŞME ALANLARI İÇERİSİNDE YAPILACAK TURİZM TESİSLERİNE İLİŞKİN YAPILANMA ŞARTLARI 1/5000 VE 1/1000 ÖLÇEKLİ İMAR PLANLARINDA BELİRLENECEKTİR.

5.3.2. İMAR PLANLARINDA VE TESİSLERİN MİMARİ PROJELERİNDE TOPOĞRAFYA VE DOĞAL BİTKİ ÖRTÜSÜ İLE ÇEVRE KARAKTERİSTİKLERİNE UYGUN ÇÖZÜMLER GETİRİLECEKTİR. JEOLOJİK ETÜDÜN İZİN VERDİĞİ DURUMLARDA EĞİMDEN KAYNAKLANAN VE ZORUNLU OLUŞAN EN FAZLA 2 BODRUM KAT AÇIĞA ÇIKABİLİR. ZORUNLU BODRUMLARIN OLUŞMASI HALİNDE SADECE BODRUM KATTA KULLANILMAK ÜZERE EMSALE 0,10 EKLENİR. HER DURUMDA EN FAZLA 2 BODRUM KAT YAPILABİLİR.

5.3.3. ASMA KAT, KAT ADEDİNDEN SAYILMAZ. EMSALE VE MAKSİMUM BİNA YÜKSEKLİĞİNE DAHİLDİR.

5.3.4. ONAYLI UYGULAMA İMAR PLANLARINDA BELİRTİLEN YAPILAŞMA KOŞULLARI GEÇERLİDİR. ÇEVRE DÜZENİ PLANINDA BELİRTİLEN YAPILAŞMA KOŞULLARINI GEÇECEK UYGULAMA İMAR PLANI DEĞİŞİKLİĞİ YAPILAMAZ.

5.3.5.OTELLER

3.000 M^2 YE KADAR OLAN İMAR PARSELLERİNDE;
EMSAL (E) : 0,40
$Y_{ENÇOK}$: 11,50 M. (3 KAT)

3.001 M^2 DEN 5.000 M^2 YE KADAR OLAN İMAR PARSELLERİNDE;
EMSAL (E) : 0,50
$Y_{ENÇOK}$: 11,50 M. (3 KAT)

5.001 M^2 DEN BÜYÜK OLAN İMAR PARSELLERİNDE;
EMSAL (E) : 0,60
$Y_{ENÇOK}$: 11,50 M. (3 KAT)

5.3.6.TATİL KÖYLERİ
5.000 M^2 YE KADAR OLAN İMAR PARSELLERİNDE;
EMSAL (E) : 0,30
$Y_{ENÇOK}$: 7,50 M. (2 KAT)

5.001 M^2 DEN BÜYÜK OLAN İMAR PARSELLERİNDE;
EMSAL (E) : 0,40
$Y_{ENÇOK}$: 7,50 M. (2 KAT)

5.3.7.MOTEL, APART OTELLER
EMSAL (E) : 0,30
$Y_{ENÇOK}$: 7,50 M. (2 KAT)

5.3.8.KAMPİNG ALANLARI

BU ALANLARDA, KARAVAN GİBİ TAŞINABİLİR ÜNİTELER VE EMSAL DAHİLİNDE KALMAK KOŞULUYLA ORTAK KULLANIMA AYRILAN DUŞ, TUVALET, ÇAMAŞIR YIKAMA, MUTFAK, DEPO, SERVİS, RESEPSİYONGİBİ YAPILAR YER ALABİLİR.

-KAPASİTE : 7 ÜNİTE 1000M^2
-EMSAL (E) : 0.08
-YENÇOK : 5,50 M. (1 KAT)

5.3.9. GÜNÜBİRLİK ALANLAR:

BU ALANLARDA SADECE GÜNÜBİRLİK KULLANIMA DÖNÜK SU VE KARA SPORLARINA İLİŞKİN TESİSLER İLE LOKANTA, BÜFE, ÇAY BAHÇESİ, PLAJ, KABİN, ÇÖP TOPLAMA, İSKELE V.B. TESİSLER YAPILABİLİR.

BU ALANLARDA YAPILACAK YAPILARIN KONUMU, ARAZİ ÜZERİNDE KAPLAYACAĞI ALAN VE YÜKSEKLİKLERİ, ARAZİNİN TOPOGRAFİK YAPISI, BİTKİ ÖRTÜSÜ VE EKOLOJİK NİTELİKLERİ GÖZÖNÜNE ALINARAK DÜZENLENECEKTİR.

ANCAK HER DURUMDA AŞAĞIDAKİ YAPILAŞMA KOŞULLARI AŞILAMAZ:

MİNİMUM PARSEL : 5000M2
EMSAL (E) : 0.08
YENÇOK : 4.50 M. (1 KAT)

ASMA KAT YAPILMASI HALİNDE TEK KATLI YAPILARDA YAPI YÜKSEKLİĞİ 5.50 METRE OLARAK UYGULANABİLİR.

5.3.10. NOKTA GÜNÜBİRLİK ALANLAR:

AĞIRLIKLI OLARAK DENİZ ULAŞIMI İLE ULAŞILABİLEN DENİZ KULLANIMINA YÖNELİK FAALİYETLERİN YER ALABİLECEĞİ ALANLARDIR. BU KULLANIMIN GÖSTERİLDİĞİ ALANDA YALNIZ BİR ADET TESİS YER ALABİLİR VE BU KULLANIMLAR YALNIZ KAMU ARAZİLERİNDE YAPILABİLİR, ÖZEL MÜLKİYETE KONU EDİLEMEZ. BU ALANLARDA SADECE TEKNELERİN RAHATÇA YANAŞMALARINA İZİN VEREN BİR İSKELE İLE 5.3.9. MADDESİNDE TANIMLANAN TESİSLER VE PLAJ TESİSLERİ (DUŞ VE SOYUNMA KABİNİ) BULUNABİLİR.

BU ALANLARDA PLAJ TESİSLERİ DIŞINDA (DUŞ VE SOYUNMA KABİNİ), TOPLAM İNŞAAT ALANI 250M2'Yİ, EN FAZLA YAPI YÜKSEKLİĞİ YENÇOK: 4.50 M' Yİ GEÇMEYEN TEK BİR YAPI VE ÇÖP TOPLAMA ÜNİTESİ OLACAK ŞEKİLDE YAPILANMA KOŞULLARI İLGİLİ MEVZUAT HÜKÜMLERİNE UYGUN OLARAK HAZIRLANACAK 1/5000 VE 1/1000 ÖLÇEKLİ NAZIM VE UYGULAMA İMAR PLANLARINDA BELİRLENECEKTİR.

5.3.11. YAT MOLA HİZMET NOKTALARI

GÖCEK KOYU VE GÖCEK KOYLARI İÇİN HAZIRLANAN "GÖCEK DENİZ ÜSTÜ ARAÇLARI TAŞIMA KAPASİTESİNİN BELİRLENMESİ PROJESİ" KAPSAMINDA HAZIRLANAN RAPORUN SONUÇ VE ÖNERİLERİNE UYULACAKTIR. GÖCEK VE KOYLARINI KAPSAYAN ALANDA YER ALAN VE ALACAK OLAN YAT MOLA HİZMET NOKTALARI, NOKTA GÜNÜBİRLİK ALANLAR, GÜNÜBİRLİK ALANLAR, İSKELE VE MARİNA VB. TALEPLER BU RAPOR KAPSAMINDA KURUMCA DEĞERLENDİRİLECEKTİR. PLANDA GÖSTERİLEN YAT MOLA HİZMET NOKTALARI VE NOKTA GÜNÜBİRLİK ALANLARIN YERLERİ SEMBOLİK OLUP, ARAŞTIRMA PROJESİ KAPSAMINDA DEĞİŞİKLİK YAPILABİLİR. YAT MOLA HİZMET NOKTALARI AĞIRLIKLI OLARAK DENİZ ULAŞIMI İLE ULAŞILABİLEN, DENİZ KULLANIMINA YÖNELİK FAALİYETLERİN YER ALABİLECEĞİ YAT MOLA HİZMET ALANLARIDIR. BU ALANLARIN YER ALDIĞI KOYLARDA TEKNELERİN RAHATÇA YANAŞMALARINA İZİN VEREN BİR İSKELE İLE BİRLİKTE LOKANTA, WC. DUŞ, PİS SU VE SİNTİNE BOŞALTMA İSTASYONU, ÇÖP TOPLAMA ÜNİTESİ BULUNAN TESİSLERDİR. GEREK YAPILARIN ARAZİ ÜZERİNDE KAPLAYACAĞI ALAN, GEREK İSKELENİN KONUMU, TİPİ VE BÜYÜKLÜĞÜNE İLİŞKİN PLANLAR VE/VEYA PROJELER ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA UYGUN GÖRÜLMEDEN UYGULAMA YAPILAMAZ.

BU KULLANIMIN GÖSTERİLDİĞİ KOYDA YALNIZ BİR ADET TESİS YER ALABİLİR VE BU KULLANIMLAR YALNIZ KAMU ARAZİLERİNDE YAPILABİLİR, ÖZEL MÜLKİYETE KONU EDİLEMEZ.

BU ALANDA YAPILACAK TESİSLERİN KIYI KENAR ÇİZGİSİNDEN UZAKLIĞI KARA YÖNÜNDE 50 M. DEN AZ OLAMAZ. BU ALANLARDA YAPILAŞMA KOŞULLARI;

EMSAL (E) : 0,05
EN FAZLA İNŞAAT ALANI : 250 M^2
YENÇOK : 3,50 M. (1 KAT)

5.4.TURİZM VE İKİNCİ KONUT YERLEŞME ALANLARI:

5.4.1. BU ALANLARDA YAPILACAK OLAN TURİZM TESİSİ AMAÇLI KULLANIMLARDA 5.3. MADDESİNDEKİ KOŞULLAR GEÇERLİDİR.

5.4.2. KONUT ALANLARINDA 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANLARINDA BELİRTİLEN YAPILAŞMA KOŞULLARI GEÇERLİDİR.

5.5. KENTSEL ÇALIŞMA ALANLARI
5.5.1. KONUT DIŞI KENTSEL ÇALIŞMA ALANI:

İÇERİSİNDE KONAKLAMA TESİSLERİ, LOKANTA, RESMİ VE SOSYAL KÜLTÜREL TESİSLER, ÇEVRE SAĞLIĞI YÖNÜNDEN TEHLİKE OLUŞTURMAYAN İMALATHANELER İLE PATLAYICI, PARLAYICI VE YANICI MADDELER İÇERMEYEN DEPOLARIN YAPILABİLECEĞİ KENTSEL ÇALIŞMA ALANLARIDIR. 1/5000 ÖLÇEKLİ NAZIM İMAR VE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANLARINA GÖRE UYGULAMA YAPILACAKTIR.

5.6. SOSYAL ALTYAPI ALANLARI

5.6.1. SPOR ALANI (SPOR VE OYUN ALANI)

SPOR VE OYUN İHTİYACI KARŞILANMAK, SPOR FAALİYETLERİ YAPILMAK ÜZERE İMAR PLANI KARARI İLE KENT, BÖLGE VEYA SEMT ÖLÇEĞİNDE AYRILAN AÇIK VE KAPALI TESİS ALANLARIDIR. BU ALANLARDA AÇIK VEYA KAPALI OTOPARKLAR İLE SEYİRCİ VE SPORCULARIN İHTİYACINA YÖNELİK BÜFE, LOKANTA, PASTANE, ÇAYHANE VE SPOR FAALİTELERİNE İLİŞKİN TİCARİ ÜNİTELER YER ALABİLİR. YAPILAŞMA ŞARTLARI 1/5000 VE 1/1000 ÖLÇEKLİ İMAR PLANLARIYLA BELİRLENECEKTİR.

5.6.2. BÜYÜK ALAN KULLANIMI GEREKTİREN RESMİ KURUM ALANLARI :

BU PLANA UYGUN OLARAK GELİŞTİRİLECEK 1/5000 VE 1/1000 ÖLÇEKLİ İMAR PLANLARINDA BELİRTİLECEK SOSYAL YERLEŞME VE GELİŞME ALANLARI VE RESMİ KURUM ALANLARI DIŞINDA KALAN VE ORTAYA ÇIKABİLECEK İHTİYAÇLAR SONUCUNDA AYRILMASI GEREKLİ GÖRÜLEN BÜYÜK ALAN KULLANIMI GEREKTİREN KAMU KURUM ALANLARI VE TESİSLERİNİN İMAR PLANLARI BU PLANDA DEĞİŞİKLİĞE GEREK OLMAKSIZIN, KURUM VE KURULUŞLARIN GÖRÜŞLERİNE UYULARAK HAZIRLANIR VE ONAYLANIR.

KIYI ÇİZGİSİNDEN KARA YÖNÜNDE KUŞ UÇUSU 1KM'LİK ALAN İÇERİSİNDE YAPILACAK KAMU TESİSLERİNDE O TESİSİN İHTİYACINI KARŞILAYACAK GEREKLİ ASGARİ HİZMET VE İDARE BİNASI DIŞINDA MİSAFİRHANE, EĞİTİM VE DİNLENME TESİSİ V.B. GİBİ KONAKLAMAYA ELVERİŞLİ YAPI YAPILAMAZ. BU 1KM'LİK ALAN İÇERİSİNDE VAROLAN DİNLENME VE EĞİTİM TESİSLERİNİN TURİZM AMAÇLI KULLANINA YÖNELİK PROJE TADİLATINA İZİN VERİLEBİLİR ANCAK İLAVE ÜNİTE YAPILAMAZ.

5.6.3. ÜNİVERSİTE KAMPÜS ALANLARI:

LİSANS, LİSANSÜSTÜ EĞİTİM, ARASTIRMA-BİLGİ ÜRETİM VE İLETİSİM MERKEZİ İSLEVLERİNİ YÜKLENEN VE İÇERİSİNDE TEKNOPARKLARIN DA YER ALABİLECEĞİ ALANLARDIR. YAPILAŞMA ŞARTLARI 1/5000 VE 1/1000 ÖLÇEKLİ İMAR PLANLARIYLA BELİRLENECEKTİR.

5.6.4. EĞİTİM SİTELERİ:

OKUL ÖNCESİ, İLK VE ORTA ÖĞRETİM İLE YÜKSEKÖĞRETİME HİZMET VERMEK ÜZERE KAMUYA VEYA GERÇEK VEYA TÜZEL KİŞİLERE AİT; EĞİTİM KAMPÜSÜ, GENEL, MESLEKİ VE TEKNİK EĞİTİM FONKSİYONLARINA İLİŞKİN OKUL VE OKULA HİZMET VEREN YURT, YEMEKHANE VE SPOR SALONU VB. TESİSLERDİR. YAPILAŞMA ŞARTLARI 1/5000 VE 1/1000 ÖLÇEKLİ PLANLARLA BELİRLENECEKTİR. ALANA İLİŞKİN HER TÜRLÜ PLAN VE PROJENİN ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANMASI ZORUNLUDUR.

5.7. AÇIK VE YEŞİL ALANLAR

5.7.1. AĞAÇLANDIRILACAK ALANLAR :

BU ALANLAR MEVCUT ORMAN ALANLARI İÇERİSİNDE OLUP, ORMAN NİTELİĞİNİ KAYBETMİŞ AÇIKLIKLAR OLMASI NEDENİ İLE AMENEJMAN PLANLARINA GÖRE AĞAÇLANDIRILMASI ÖNGÖRÜLEN ALANLARDIR. ÖZEL MÜLKİYETLERDE 5.8.1. NOLU PLAN HÜKMÜNDE BELİRTİLEN YAPILAŞMA KOŞULLARINA UYULUR.

5.7.2. PARKLAR VE KENTSEL YEŞİL ALANLAR

KENTTE YAŞAYANLARIN SPOR, DİNLENME, GEZİNTİ VE EĞLENME İHTİYAÇLARINI KARŞILAMAYA YÖNELİK KENTSEL AKTİF VE PASİF YEŞİL ALANLARDIR.

5.7.3. ORMAN ALANLARI:

ORMAN ARAZİLERİ ÜZERİNDE YAPILACAK HER TÜRLÜ ÜST VE ALTYAPI (MESİRE YERİ, KAMPİNG, ORMAN YOLU, YANGIN EMNİYET BANDI, BEKÇİ KULÜBESİ, GÖZETLEME KULESİ, SU, ELEKTRİK, ARAÇ PARKI, DEPO ALANI VB.) İÇİN ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI'NDAN GÖRÜŞ ALINMASI MECBURİDİR.

BU ALANLARDA 6831 SAYILI ORMAN KANUNUNDA BELİRTİLEN ORMANLARIN BAKIMI, KORUNMASI, GELİŞTİRİLMESİ VE İŞLETİLMESİ AMAÇLI TESİSLER VE YENİLENEBİLİR ENERJİ TESİSLERİ DIŞINDA HİÇBİR TESİS YAPILAMAZ. PLANDA ORMAN ARAZİSİ OLARAK GÖSTERİLEN ALANLARDAKİ ÖZEL MÜLKİYETE KONU ARAZİLERDE BU PLANIN 5.8.1. MADDESİNDE BELİRTİLEN YAPILAŞMA KOŞULLARI GEÇERLİDİR.

5.8. BUGÜNKÜ ARAZİ KULLANIMI DEVAM ETTİRİLEREK KORUNACAK ALANLAR

5.8.1. TARIM ALANLARI

BU ALANLARDA GIDA TARIM VE HAYVANCILIK İL MÜDÜRLÜĞÜNÜN OLUMLU GÖRÜŞÜ ALINMAK KAYDIYLA; TARIM VE HAYVANCILIK ÜRETİMİNİ KORUMA AMACIYLA, TOPRAK KORUMA VE SULAMAYA YÖNELİK ALTYAPI TESİSLERİ, ENTEGRE NİTELİKTE OLMAYAN BESİCİLİK VE SU ÜRÜNLERİ ÜRETİM VE MUHAFAZA TESİSLERİ İLE ZORUNLU OLARAK TESİS EDİLMESİ GEREKLİ OLAN MÜŞTEMİLATLAR, MANDIRALAR, ÜRETİCİNİN BİTKİSEL ÜRETİME BAĞLI OLARAK ELDE ETTİĞİ ÜRÜNÜ İÇİN İHTİYAÇ DUYACAĞI YETERLİ BOYUT VE HACİMDE DEPOLAR, DEĞİRMENLER, TARIM ALET VE MAKİNELERİNİN MUHAFAZASINDA KULLANILAN SUNDURMA VE ÇİFTLİK ATÖLYELERİ, SERALAR, YÖRESEL NİTELİK TAŞIYAN TARIMSAL ÜRÜNLERDEN, ÖZELLİĞİ NEDENİYLE, HASATTAN SONRA İKİ SAAT İÇİNDE İSLENMEDİĞİ TAKDİRDE ÜRÜN KALİTESİ VE BESİN DEĞERİNİN KAYBOLMASININ SÖZ KONUSU OLDUĞU ÜRÜNLERİN İŞLENMESİ VE DEPOLANMASI İÇİN KURULAN TESİSLER VE SOĞUK HAVA DEPOLARI YAPILABİLECEK OLUP YENÇOK DEĞERİ TEKNOLOJİK GEREKSİNİMLER DOĞRULTUSUNDA BELİRLENECEKTİR.

BU ALANLARDA AYRICA ÇİFTÇİNİN BARINMASINA YÖNELİK TEK YAPI İLE GIDA, TARIM VE HAYVANCILIK İL MÜDÜRLÜĞÜ TARAFINDAN TARIMSAL AMAÇLI OLDUĞU KABUL EDİLEN, ENTEGRE NİTELİKTE OLMAYAN TESİSLER YAPILABİLİR. TARIMSAL AMAÇLI YAPILAR KULLANIM AMACI DIŞINDA KULLANILAMAZ VE DÖNÜŞTÜRÜLEMEZ.

BU PLAN İLE VERİLMİŞ OLAN YAPILAŞMA KOŞULLARI AŞILMAMAK KAYDI İLE BELİRTİLMEYEN HUSUSLARDA PLANSIZ ALANLAR TİP İMAR YÖNETMELİĞİNİN 6. BÖLÜMÜNDE BELİRTİLEN YAPILAŞMA KOŞULLARINA UYULUR.

FETHİYE – GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ 1/25000 ÖLÇEKLİ ÇEVRE DÜZENİ PLANI REVİZYONU PLAN HÜKÜMLERİ

BU ALANLARDA YAPILACAK İFRAZLARDA 5403 SAYILI TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNU VE İLGİLİ YÖNETMELİK HÜKÜMLERİ UYARINCA İŞLEM YAPILACAKTIR.

BU PLANDA GÖSTERİLEN TARIM ARAZİLERİ, 5403 SAYILI TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNU VE İLGİLİ YÖNETMELİĞİNDE TANIMLANAN TARIM ARAZİLERİ SINIFLARINA AYRILMAMIŞ OLUP TARIM ARAZİLERİNİN SINIFLAMASI, İLGİLİ KURUM YA DA KURULUŞLARCA YAPILACAKTIR.

5.8.1.1. MUTLAK TARIM VE ÖZEL ÜRÜN ALANLARI

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

YAPILAŞMA KOŞULLARI;
EMSAL (E) : 0,05
YENÇOK : 6,50 M (2KAT)

ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;
EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK: 6,50 M (2 KAT)

5.8.1.2. DİKİLİ VE ÖRTÜ ALTI TARIM ALANLARI:

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

YAPILAŞMA KOŞULLARI;
EMSAL (E) : 0,10
Y ENÇOK : 6,50 M (2 KAT)

ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;
EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK: 6,50 M (2 KAT)

SERALAR İNŞAAT ALANINA DAHİL DEĞİLDİR. SERALAR YOLDAN EN AZ 5 METRE ÇEKİLEREK YAPILABİLİR.

5.8.1.3. MARJİNAL TARIM ALANLARI

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

YAPILAŞMA KOŞULLARI;
EMSAL (E) : 0,20
Y ENÇOK : 6,50 M (2 KAT)
ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;
EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK: 6,50 M (2 KAT)

KIRSAL TURİZMİ DESTEKLEMEK AMACIYLA BU ALANLARDA KADASTRAL YOLA CEPHELİ OLAN PARSELLER İÇİN İMAR PLANI YAPILMASI ŞARTIYLA ÇEVRE DÜZENİ PLANI İLE BELİRLENEN YAPILAŞMA ŞARTLARI AŞILMAMAK ÜZERE TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK'TE BELİRTİLEN YALNIZCA TOPLUMUN YARARLANMASINA AYRILAN YAPI NİTELİĞİNDEKİ TURİZM TESİSLERİ VE KAMPİNG KULLANIMLARI YER ALABİLİR. BU TESİSLERE İNŞAAT RUHSATI VERİLEBİLMESİ İÇİN YAPILACAK YAPININ BU NİTELİKTE OLACAĞININ TAPU KÜTÜĞÜNÜN BEYANLAR HANESİNE YAZDIRILMASI ZORUNLUDUR. AYRICA, TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK'TE BELİRTİLEN ŞARTLARA UYGUN YAPILMASI, YATIRIM VE İŞLETME BELGESİ ALINMASI GEREKLİDİR.

YAPILAŞMA KOŞULLARI;

- MİNİMUM PARSEL BÜYÜKLÜĞÜ : 5.000 M^2
- TAKS : 0.06
- EMSAL (E) : 0,10
- YENÇOK : 7.50 M. (2 KAT)
- MÜŞTEMİLATLAR İÇİN YENÇOK : 3.50 M. (1 KAT)

YAPI YAKLAŞMA SINIRI YOL CEPHESİNDEN EN AZ 10 METRE, DİĞER CEPHELERDEN 5 METREDİR.

5.8.1.4. ZEYTİNLİK ALANLARI

3573 SAYILI ZEYTİNCİLİĞİN ISLAHI VE YABANİLERİNİN AŞILATTIRILMASI HAKKINDA KANUN HÜKÜMLERİ GEÇERLİDİR. ZEYTİNCİLİK SAHALARI DARALTILAMAZ ANCAK BELEDİYE SINIRLARI İÇERİSİNDE BULUNAN ZEYTİNLİK SAHALARININ İMAR HUDUTLARI KAPSAMI İÇERİSİNDE ALINMASI HALİNDE ALTYAPI VE SOSYAL TESİSLER DAHİL, TOPLAM YAPILAŞMA ZEYTİNLİK ALANIN %10UNU GEÇEMEZ. BU SAHALARDAKİ ZEYTİN AĞAÇLARININ SÖKÜLMESİ GIDA TARIM VE HAYVANCILIK BALANLIĞININ FENNİ İZNİNE TABİDİR. BU İZNİN VERİLMESİNDE, GIDA, TARIM VE HAYVANCILIK BAKANLIĞINA BAĞLI ARAŞTIRMA ENSTİTÜTLERİNİN VE MAHALLİNDE ZİRAAT ODALARININ UYGUN GÖRÜŞÜ ALINIR. BU HALDE DAHİ KESİN ZARURET GÖRÜLMEYEN ZEYTİN AĞACI KESİLEMEZ VE SÖKÜLEMEZ.

EMSAL (E) : 0,10
YENÇOK : 6,50 M (2 KAT)

YAPI YAKLAŞMA SINIRI YOL CEPHESİNDEN EN AZ 10 METRE DİĞER CEPHELERDEN 5 METREDİR.
5000 M2NİN ALTINDAKİ PARSELLERDE EN FAZLA İNŞAAT ALANI: 75M2 (MÜŞTEMİLATLAR DAHİLDİR)
5000M2 VE 5000M2NİN ÜSTÜNDEKİ PARSELLERDE EN FAZLA İNŞAAT ALANI: 150M2 (MÜŞTEMİLATLAR DAHİLDİR)

5.8.2. SU ÜRÜNLERİ:

5.8.2.1. BÖLGE İÇERİSİNDE KIYI VE DENİZ YÜZEYİNDE SU ÜRÜNLERİ ÜRETİM VE/VEYA BESLEME TESİSİ KURULAMAZ.

5.8.2.2.YERLEŞİM ALANI DIŞINDAKİ KAMU VE/VEYA ÖZEL MÜLKİYETTEKİ ALANLARDA SU ÜRÜNLERİ YETİŞTİRİCİLİĞİNE YÖNELİK FAALİYETLERİ İÇEREN ENTEGRE OLMAYAN KULUÇKAHENESİZ SU ÜRÜNLERİ ÜRETİM VE YETİŞTİRME TESİSLERİ YAPILABİLİR.

5.8.2.3. BU ALANLARDA YAPILAŞMALAR İÇİN AŞAĞIDA BELİRLENMİŞ HÜKÜMLERİ GEÇERLİDİR.

5.8.2.4. PROJESİNE GÖRE TAHSİS EDİLECEK ARAZİ BÜYÜKLÜĞÜ HER BİR İŞLETME İÇİN EN AZ 10.000 M^2' DİR. HAVUZ TABAN ALANLARI ARAZİNİN % 50'SİNİ GEÇEMEZ.

5.8.2.5. BU TESİSLERİN İŞLETME, İDARE, BEKÇİLİK, DEPO HİZMETLERİ GİBİ KULLANIMLARI İLE İLGİLİ YAPILARI TOPLAM 250 M2, YENÇOK: 4.50 M'Yİ GEÇEMEZ. SÖZKONUSU YAPILAR RENGİ VE GÖRÜNÜMÜ İTİBARİYLE ÇEVREYE VE ARAZİYE UYUMLU OLACAKTIR.

5.8.2.6. BU ALANLARIN DÜZENLENMESİNDE ARAZİNİN DOĞAL YAPISI BOZULAMAZ. DOLGU VE HAFRİYAT YAPILAMAZ. AĞAÇLARA VE DİĞER BİTKİ ÖRTÜSÜNE ZARAR VERİLEMEZ.

5.8.2.7. BU TESİSLERİN KADASTRAL YOLA EN AZ 25 METRE CEPHESİ BULUNMASI ZORUNLUDUR. YOLA CEPHESİ BULUNMAYAN YERLERDE YOL GÜZERGAHI TALEBİNDE BULUNAMAZ. HERHANGİ BİR KAMU KURUM VE KURULUŞU ARAZİNİN TABİİ YAPISINI BOZUCU YOL DURUMU İLE İLGİLİ İZİN, İRTİFAK, TAKAS, TAHSİS, KİRA, SATIŞ GİBİ İŞLEME MARUZ BIRAKILAMAZ.

5.8.3. SİT ALANLARI:

SİT ALANLARI 2863 SAYILI"KÜLTÜR VE TABİAT VARLIKLARINI KORUMA KANUNU" UYARINCA TESPİT VE TESCİLİ YAPIMIŞ ALANLARDIR. BU ALANLARDA 2863 SAYILI KANUN VE 644 SAYILI KANUN HÜKMÜNDE KARARNAME HÜKÜMLERİ DOĞRULTUSUNDA UYGULAMA YAPILACAKTIR.

5.8.4.DOĞAL KARAKTERİ KORUNACAK ALANLAR:

BU ALANLAR TOPOGRAFYASI, FLORA VE FAUNASIYLA BUGÜNKÜ ARAZİ KULLANIMLARININ (MAKİ, FUNDA, ÇALILIK, SAZLIK VE BATAKLIK VB.) DEVAM ETTİRİLECEĞİ ALANLARDIR.

5.8.5.HASSAS ZON:

TAM KORUMA ALANLARIDIR. ÇEŞİTLİ HABİTATLARIN KORUNMASI İÇİN EKOSİSTEM BÜTÜNLÜĞÜNÜ BOZMAYACAK ŞEKİLDE, OTLATMA DIŞINDAKİ MEVCUT İNSAN FAALİYETLERİ SÜRDÜRÜLEBİLİR. ANCAK ÖZEL İZNE TABİ KULLANIM TALEPLERİ ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN DEĞERLENDİRİLECEKTİR.

5.8.6. SIĞLA ORMAN ALANLARI

PLANDA TANIMLANMIŞ OLAN "SIĞLA ORMAN ALANLARI" MUTLAK / TAM KORUMA (HASSAS ZON) ALANLARIDIR. BU ALANLARDA SIĞLA AĞACININ REHABİLİTASYON VE RESTORASYONU DIŞINDA HİÇBİR UYGULAMA YAPILAMAZ.

5.8.7. KUMSAL ALANLARI:

BU ALANLARDA 3621 SAYILI KIYI KANUNUNDA BELİRTİLEN KULLANIMLARDAN GÜNÜBİRLİK DENİZ AKTİVİTESİNE (BÜFE, WC) VE BİLİMSEL ARAŞTIRMACILARA HİZMET VERECEK, TEKNE TRAFİĞİNİ DÜZENLEYECEK VE KUMSALIN KONTROL VE GÜVENLİĞİNİ SAĞLAYACAK, DOĞAL ÇEVREYE UYGUN SABİT OLMAYAN TAŞINABİLEN YAPILAR DIŞINDA YAPI YAPILAMAZ. BU YAPILAR İÇİN ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ OLUMLU GÖRÜŞÜNÜN ALINMASI ZORUNLUDUR. 3621 SAYILI KIYI KANUNUNUN İLGİLİ HÜKÜMLERİNE UYULACAKTIR.

5.8.8. KAPLUMBAĞA ETKİ ALANLARI:

BU ALANDA YAPILACAK UYGULAMALARLA İLGİLİ OLARAK ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ GÖRÜŞÜ ALINACAKTIR.

5.8.8.1. BİRİNCİ DERECE KORUMA BÖLGESİ:

5.8.8.1.1. BU ALANDA 3621 SAYILI KIYI KANUNU'NUN 6.MADDESİ İLE KIYI KANUNU UYGULAMA YÖNETMELİĞİNİN 13. VE 14. MADDESİNDE TANIMLANAN (A, B VE C MADDELERİNDE BELİRTİLEN) YAPI VE TESİSLER YAPILAMAZ. 7. MADDE KAPSAMINDAKİ DOLGU VE KURUTMA YOLUYLA ARAZİ KAZANILAMAZ.

5.8.8.1.2. KUM ÇIKARTILAMAZ VE KUMULLARIN ŞEKLİ DEĞİŞTİRİLEMEZ.

5.8.8.2. İKİNCİ DERECEDE KORUMA BÖLGESİ:

BU ALANDA: BİRİNCİ DERECE KORUMA BÖLGESİNDEKİ ŞARTLAR GEÇERLİ OLUP, SADECE SABİT OLMAYAN VE KUMA ÇAKILMAYAN GÖLGELİK KULLANILABİLİR.

5.8.8.3. TAMPON BÖLGE:

5.8.8.3.1. BU ALANDA 3621 SAYILI KIYI KANUNU VE İLGİLİ HÜKÜMLERİ UYGULANIR.

5.8.8.3.2. İNŞAAT ÇALIŞMALARI ÜREME MEVSİMİ (1 MAYIS-31 EYLÜL) BOYUNCA SADECE GÜN IŞIĞINDA YAPILACAK, GECELERİ İNŞAAT ÇALIŞMALARI YAPILAMAZ.

5.8.8.3.3. YUMURTLAMA ALANINDA GÖRÜLECEK KARAYOLU KENARINDA VE OTOPARKLARDA MOTORLU ARAÇLARIN FARLARINDAN ÇIKAN IŞIKLARI ENGELLEMEK ÜZERE GEREKEN PEYZAJ DÜZENLEMESİ SURETİYLE IŞIKLARIN PERDELENMESİ SAĞLANACAKTIR.

5.8.8.3.4. BU ALAN İÇERİSİNDEKİ YAPILAŞMALARDA IŞIKLANDIRMA ASGARİ SEVİYEDE TUTULACAK, IŞIK KAYNAĞININ KUMSALDAN GÖRÜLMEMESİNİ SAĞLAMAK VE KUMSALIN AYDINLANMASINI ÖNLEMEK İÇİN, DIŞ IŞIKLARIN YERDEN İTİBAREN YÜKSEKLİĞİ 1.5M'DEN FAZLA OLMAYACAKTIR. ANCAK, CAN VE MAL GÜVENLİĞİ AÇISINDAN ZORUNLU HALLERDE MAHALLİ İDARENİN İZNİNE BAĞLI VE GEÇİCİ OLARAK YÜKSELTİLEBİLİR. BU DURUMLARDA GEREKLİ IŞIK PERDELEME İŞLEMLERİNİN YAPILMASI ZORUNLUDUR.

5.8.8.3.5. İÇ IŞIKLANDIRMA İSE, MEVCUT VEYA YAPILACAK TÜM YAPILAŞMALARDA YAPILARIN KUMSALDAN GÖRÜLEBİLEN BÖLÜMLERİNDE IŞIĞIN SIZMASINI ÖNLEYİCİ TEDBİRLER ALINACAKTIR. (PERDE, PANJUR, JALUZİ, RENKLİ CAM VB.)

5.9. DENİZYOLLARI

5.9.1.İSKELELER:

PLANDA KÜÇÜK ÇAPTA, KISA SÜRELİ YANAŞMALARA İMKAN TANIYAN YAT YANAŞMA İSKELESİ OLARAK TANIMLI ALANLARDIR.

5.9.2. YAT ÇEKEK YERİ:

BALIKÇI TEKNELERİ, KÜÇÜK TONAJLI TEKNELER VEYA YATLARIN BAKIM VE ONARIMLARININ YAPILMASI İÇİN KARAYA ALINMALARINA İMKAN SAĞLAYACAK KIYI DÜZENLEMELERİDİR. ÇEKEK YERİNDE GİRİŞ VE ÇIKIŞ KONTROLÜ İLE TEKNELERİN EMNİYETİNİN SAĞLANMASI, KARADA VE DENİZDE ÇEVRE KİRLİLİĞİNİ ÖNLEYİCİ TEDBİRLERİN ALINMASI GEREKİR.

5.9.3. YAT ÇEKEK VE İMAL YERİ:

5.9.2. MADDESİNDE BELİRTİLEN HUSUSLARA İLAVE OLARAK, BU ALANDA TEKNE İMALATI DA YAPILABİLİR.

5.10. SU-ATIKSU VE ATIK SİSTEMLERİ

5.10.1. ÇÖP TOPLAMA VE TASFİYE YERLERİ (KATI ATIK DEPOLAMA, GERİ KAZANIM VE BERTARAF TESİSLERİ)

BU ALANLARDA 1/5000 VE 1/1000 ÖLÇEKLİ İMAR PLANLARINA GÖRE UYGULAMA YAPILACAKTIR.

5.11. MADEN OCAKLARI :

BU PLAN İÇERİSİNDE KALAN;

-2863 SAYILI YASA KAPSAMINDA TESCİL EDİLMİŞ VE EDİLECEK OLAN "DOĞAL", "KENTSEL" VE "ARKEOLOJİK SİT ALANLARI" İÇİNDE,

-KIYI KANUNUNUN TANIMLADIĞI; "KIYI" VE "SAHİL ŞERİDİNDE", SAHİL ŞERİDİNDEN İTİBAREN KARA YÖNÜNDE ÖN GÖRÜNÜM BÖLGESİNDE,

-ONAYLI PLANLARDA TANIMLANAN "SULAK ALAN" SINIRI İÇİNDE VE BU ALANLARIN SINIRINDAN İTİBAREN 2500 M. MESAFEDE,

-ONAYLI PLANLARDA TANIMLANAN MUTLAK KORUMA, SINIRLI KORUMA, HASSAS BÖLGE, DOĞAL KORUMA VB. FLORA FAUNA, TÜR VE HABİTAT KORUMA ALANLARINDA,

-ONAYLI PLANLARDA BELİRLENEN ANA KARAYOLU GÜZERGAHI BOYUNCA ÖN GÖRÜNÜM BÖLGESİNDE; AÇIK İŞLETME YÖNTEMİ KULLANILARAK, (GALERİ AÇMA VB. YER ALTI İŞLETMESİ YAPILMAMASI HALİNDE);

-JEOLOJİK ARAŞTIRMALARLA TESPİT EDİLMİŞ SICAK SU KAYNAKLARI BİRİNCİ VE İKİNCİ DERECE KAYNAK KORUMA ALANLARINDA,

-ONAYLI PLANLARDA BELİRLENEN YERLEŞME, GELİŞME, TURİZM, SANAYİ VB. KULLANIM ALANLARINDAN İTİBAREN 1000 M. İÇİNDE,

-AKARSU YATAKLARINDA; MENDERESLERİN DIŞ KURPLARINA GELEN KESİMLERDE, YATAK ŞEY DİPLERİNDE, ŞEY DENGESİNİ TEHDİT EDEN DURUMLARDA, MEVCUT DERE YATAĞININ, AKIŞ REJİMİNİ ETKİLEYECEK NİTELİKTE GENİŞLETİLMESİ SURETİYLE, YATAK ÇEVRESİNDE MEVCUT TARIM ARAZİLERİNİ VE YERLEŞİM BİRİMLERİNİ TAŞKINA MARUZ BIRAKACAK ŞEKİLDE, AKARSU YATAĞI ÜZERİNDE MEVCUT KÖPRÜ, MENFEZ VE BENZERİ SANAT YAPILARININ EN AZ 1000 M. YAKININDA,

MADEN OCAĞI AÇILAMAZ.

5.11.1. ÖZEL ÇEVRE KORUMA BÖLGELERİNDE MADEN OCAKLARININ GÖRÜNTÜ KİRLİLİĞİNİN ÖNLENMESİ AMACIYLA TESİS VE ÇEVRESİNİN YEŞİL PERDELEME VB. UYGULAMALARLA GİZLENMESİ GEREKMEKTEDİR. MADEN OCAKLARINDA HAVA KALİTESİ STANDARTLARINI KARŞILAMAK ŞARTIYLA, İŞLETMEDE VE AÇIKTA DEPOLANAN MALZEME ÇEVRESİNDE, RÜZGARI KESİCİ SET OLUŞTURULARAK, BİTKİLER DİKİLECEK VE KORUYUCU ÖNLEMLER ALINACAKTIR.

5.12. ÖZEL ALANLAR:

5.12.1. MESİRE YERİ VE HAVA SPORLARI MERKEZİ :

BU ALANDA SİVİL HAVACILIK KURALLARI DOĞRULTUSUNDA, SPORTİF -TURİZM AMAÇLI, KONAKLAMA İÇERMEYEN FAALİYETLER YER ALABİLİR. BU AMACA YÖNELİK İHTİYAÇLAR VE TEDBİRLER ALT ÖLÇEKLİ PLANLARDA BELİRLENİR.

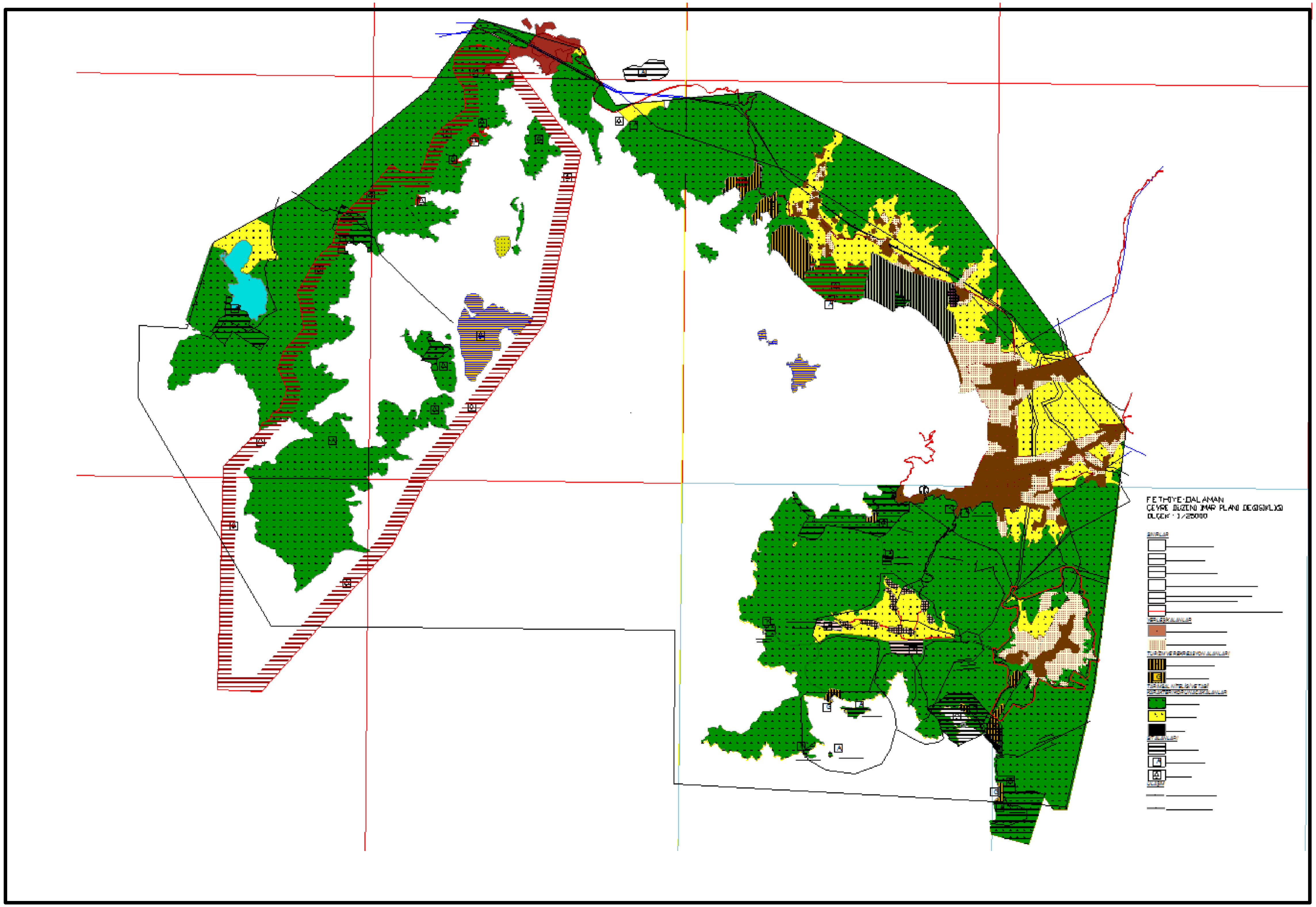
5.12.2. KAYAKÖY TARİH VE KÜLTÜR TURİZM ALANI

DÜNYA DOSTLUK VE BARIŞ KÖYÜ İLAN EDİLMİŞ BU ALANDA GÜNÜMÜZ YAŞAM KOŞULLARI GÖZ ÖNÜNDE TUTULARAK TARİHİ DOKUNUN VE DOĞAL DEĞERLERİN KORUNMASI, GELİŞTİRİLMESİ KAPSAMINDA ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI TARAFINDAN ONAYLANACAK 1/5000 VE 1/1000 ÖLÇEKLİ KORUMA AMAÇLI İMAR PLANLARI DOĞRULTUSUNDA UYUGULAMA YAPILACAKTIR.

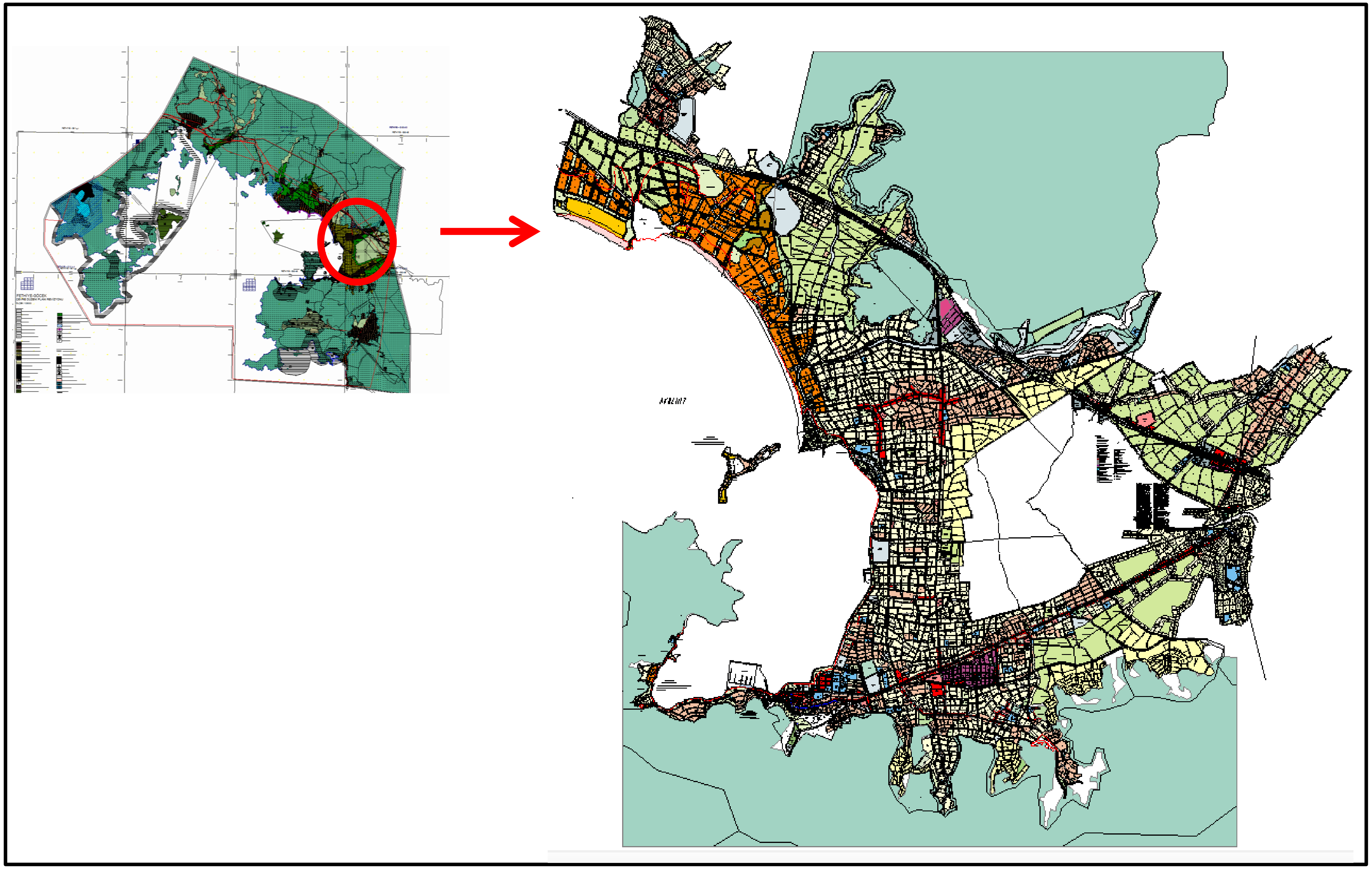
5.12.3. KUŞ CENNETİ

BU ALANDA YAPILACAK UYGULAMALARLA İLİGİLİ OLARAK ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ GÖRÜŞÜ ALINACAKTIR.

Plan 2: Fethiye-Göcek SEPA 1/25.000 Scaled Territorial Plan (1998 Approved). Source: GDPNA, 2016



Plan 3: Fethiye 1/1000 Scaled Land Development Plan. Source: GDPNA, 2016



FETHİYE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI PLAN HÜKÜMLERİ REVİZYONU

1. GENEL HÜKÜMLER

1.1. KADASTRO, HALİHAZIR HARİTA, KAMULAŞTIRMA HATTI İLE İMAR PLANI HATTININ UYUŞMAZLIĞINDAN KAYNAKLANAN 2 METRELİK UYUMSUZLUKLAR, YOLUN GENİŞLİĞİ VE GÜZERGAHI DEĞİŞMEMESİ KAYDIYLA PLAN DEĞİŞİKLİĞİNE GEREK KALMADAN DÜZELTİLEBİLİR.

1.2. UYGULAMA İMAR PLANI SINIRLARI İÇERİSİNDE BİR BÜTÜN OLARAK YA DA İLGİLİ İDARENİN PLAN BÜTÜNÜNDEKİ DÜZENLEME ORTAKLIK PAYI ORANI GÖZETİLEREK BELİRLEYECEĞİ ETAPLAR HALİNDE 3194 SAYILI İMAR KANUNU'NUN 18. MADDESİNE GÖRE PARSELASYON PLANI YAPILMADAN İNŞAAT İZNİ VERİLMEZ.

1.3. PLAN PAFTASI VE NOTLARINDA BELİRTİLEN İNŞAAT ALANI: PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNİN 16. MADDESİNİN 4. BENDİNDE BELİRTİLEN KAT ALANI KAT SAYISI (KAKS) EMSAL ALANIDIR.

1.4. EMSAL(JAKS); PLANLI ALANLAR TİP İMAR YÖNETMELİĞİ DOĞRULTUSUNDA NET İMAR PARSELİ BÜYÜKLÜĞÜ ÜZERİNDEN HESAPLANIR.

1.5. BU PLAN İÇERİSİNDE İNŞA EDİLECEK TOPLU KONUT KOOPERATİFLERİ, TURİSTİK TESİSLER, KAMU KURUM VE KURULUŞLARINA AİT TESİSLER VB. YAPILARA AİT MİMARİ VE PEYZAJ PROJELERİ İLE REKREASYON ALANLARINA İLİŞKİN VAZİYET PLANLARI VE MİMARİ PROJELER ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ UYGUNLUK GÖRÜŞÜ ALINMADAN ONAMA İŞLEMİ YAPILAMAZ. YAPILARA RUHSAT VERMEYE YETKİLİ İDARELER PROJELERİN UYGULAMA İMAR PLANI VE HÜKÜMLERİNE UYGUNLUĞUNDAN VE YERİNDE UYGULAMASINDAN DOĞRUDAN SORUMLUDUR. İLGİLİ İDARELER HER HUSUSTA GEREKEN TÜM TEDBİRLERİ ALMAK ZORUNDADIR.

1.6. BU PLAN ALANI İÇERİSİNDE YER ALABİLECEK YÜKSEK GERİLİM HATLARI, ENERJİ NAKİL HATLARI, BORU HATLARI, TRAFO MERKEZLERİ, SULAMA, DEŞARJ VE KANAL PROJELERİ, KARAYOLLARI VE KÖY YOLLARI PROJELERİ GİBİ KAMU ALTYAPI YATIRIMLARI İLE KENTSEL ALTYAPI (İÇME VE KULLANMA SUYU, KANALİZASYON, ARITMA, ÇÖP DEPONİ) PROJELERİNE İLİŞKİN, UYGULAMAYA GEÇİLMEDEN ÖNCE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI UYGUN GÖRÜŞÜ ALINMASI ZORUNLUDUR.

1.7. BU PLAN KAPSAMINDAKİ MİMARİ PROJELERDE TSE TEKNİK KURULUNCA BELİRLENEN ÖZÜRLÜ İNSANLARIN İKAMET EDECEĞİ BİNALARIN DÜZENLENMESİ KURALLARINA İLİŞKİN İÇ MEKAN MİMARİ STANDARTLARI GÖZ ÖNÜNE ALINMAK SURETİYLE BEDENSEL ÖZÜRLÜ İNSANLARIN YENİ YAPILACAK TURİZM YAPILARINI, RESMİ KURUM VE KURULUŞLARA AİT YAPILARI KULLANABİLMELERİNİ SAĞLAYACAK DÜZENLEMELERİN GETİRİLMESİ MECBURİDİR.

1.8. PLANLAMA ALANI İÇERİSİNDE KALAN HER TÜRLÜ YAPIYA İLİŞKİN MİMARİ PROJELERDE "DEPREM BÖLGELERİNDE YAPILACAK BİNALAR HAKKINDA YÖNETMELİK" VE "AFET BÖLGELERİNDE YAPILACAK YAPILAR HAKKINDA YÖNETMELİK" HÜKÜMLERİNE, ONAYLI İMAR PLANINA ESAS JEOLOJİK –JEOTEKNİK ETÜT RAPORLARINA UYULMASI ZORUNLUDUR.

1.9. DENİZ KIYISINDA TOPLUMUN YARARLANMASINA AÇIK BİLE OLSA İSKELE, RIHTIM, LİMAN, DAYANMA DUVARI, TERSANE, ÇEKEK YERİ, SU TAŞKINLARI BAKIMEVİ VE SERVİS İSTASYONU, KÖPRÜ, MENFEZ, BEKÇİ KULUBESİ, GÖLGELİK, TUZLA, DALYAN, TEKNİK ALT YAPI TESİSLERİ, DENİZ, GÖL VE AKARSU KIYILARININ KAMU YARARINA KULLANILMASINI SAĞLAMAK VE KORUMAK AMACINA YÖNELİK KAMU YAPILARI VE TESİSLER, HER TÜRLÜ SÖKÜLEBİLİR BİLE OLSA KULÜBELER, PLAJ KABİNLERİ, BÜFE, ÇAYHANE, KAHVEHANE, LOKANTA, VE BENZERİ YAPILAR VE KULLANIMLAR HAKKINDA ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ UYGUN GÖRÜŞÜ ALINMADAN, İMAR PLANLARI VE DİĞER PROJELERİ ÇEVRE VE ŞEHİRCİLİK BAKANLIĞINCA ONAYLANMADAN TESİS EDİLEMEZ.

1.10. BU PLAN DAHİLİNDE YAPILACAK TÜM TURİZM TESİSLERİ TEK BAĞIMSIZ BÖLÜM OLARAK DEĞERLENDİRİLİR. TURİZM TESİSLERİNDE BULUNAN YAPILAR; YANLIZCA TOPLUMUN YARARLANMASINA AYRILAN YAPI NİTELİĞİNDEKİ TESİSLER OLUP, AYRI AYRI VE BAĞIMSIZ OLARAK KAT MÜLKİYETİ, KAT İRTİFAKI VE DEVREMÜLK GİBİ ŞEHRE KONU ŞAHSİ HAKLARA KONU EDİLEMEZ. BU TESİSLERE RUHSAT VERİLEBİLMESİ İÇİN YAPILACAK YAPININ BU NİTELİKTE OLACAĞININ TAPU KÜTÜĞÜNÜN BEYANLAR HANESİNE YAZDIRILMASI ZORUNLUDUR. TESCİL İŞLEMİ YAPILMADAN İNŞAAT RUHSATI VERİLEMEZ.

1.11. BU PLAN HÜKÜMLERİNDE YER ALMAYAN KONULAR HAKKINDA YÜRÜRLÜKTEKİ 1/25000 ÖLÇEKLİ FETHİYE-GÖCEK ÖZEL ÇEVRE KORUMA BÖLGESİ ÇEVRE DÜZENİ PLANI İLE 3194 SAYILI İMAR KANUNU VE İLGİLİ YÖNETMELİKLER GEÇERLİDİR.

1.12. YAPILAŞMA ŞARTLARI

1.12.1. KOT VERİLMESİ:

BU PLAN KAPSAMINDAKİ YAPILARA KOT VERİLMESİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

1.12.2. BODRUM KATLAR

İMAR PLANLARINDA VE TESİSLERİN MİMARİ PROJELERİNDE TOPOĞRAFYA VE DOĞAL BİTKİ ÖRTÜSÜ İLE ÇEVRE KAREKTERİSTİKLERİNE UYGUN ÇÖZÜMLER GETİRİLECEKTİR. TOPOĞRAFYANIN EĞİMİNDEN KAYNAKLANAN VE ZORUNLU OLUŞAN EN FAZLA 2 BODRUM KAT YAPILABİLİR.

1.12.3. KATLARIN DÜZENLENMESİ VE YÜKSEKLİKLER:

A) İSKAN EDİLEN KATLARIN TABAN DÖŞEME KAPLAMASINDAN TAVAN ALTINA KADAR OLAN TEMİZ YÜKSEKLİĞİ 2,50 METREDEN AZ OLAMAZ.

B) KONUT ALANLARINDA İMAR PLANINDA AKSİ BELİRTİLMEDİĞİ TAKDİRDE; PLANDA VERİLEN YÜKSEKLİKLER +-0.00 KOTUNA GÖRE SON KAT TAVAN DÖŞEMESİ ÜST KOTUDUR. YAPILARIN YÜKSEKLİKLERİ 1 KATLILARDA Y Ençok: 3.50 METRE, 2 KATLILARDA Y Ençok: 6.50 METRE, 3 KATLILARDA Y Ençok: 9.50 METRE, 4 KATLILARDA Y Ençok:12.50 METRE, 5 KATLILARDA İSE Y Ençok:15.50 M. 'Yİ GEÇEMEZ.

C) KONUT DISINDA YAPILARDA İSE BİR KATLILARDA Y Ençok:4.50 M., 2 KATLILARDA Y Ençok:7.50 METRE, 3 KATLILARDA Y Ençok:10.50 METRE, 4 KATLILARDA Y Ençok:13.50 METREDİR.

D) OTEL ALANI OLARAK TANIMLI ALANLARDA ZEMİN KATTA LOBİ YA DA RESEPSİYON YAPILMASI HALİNDE YAPININ SAÇAK KOTUNA +1.00 METRE İLAVE EDİLİR.

1.12.4. BİNA BOYLARI:

A) RESMİ BİNALAR İLE İBADET YERLERİ, ÖZEL EĞİTİM VE SAĞLIK TESİSLERİ, SİNEMA, TİYATRO, MÜZE, KONFERANS SALONU GİBİ KÜLTÜREL BİNALAR, ALIŞVERİŞ MERKEZLERİ, KAPALI SPOR TESİSLERİ İLE ENTEGRE OLMAYAN TARIM VE HAYVANCILIK TESİSLERİ, ÇEKME MESAFELERİ İÇİNDE KALMAK VE İNŞAAT EMSALİ AŞILMAMAK KAYDI İLE BİNA BOYU ARANMAZ. SÖZ KONUSU YAPILARDA Y EN ÇOK DEĞERİ AŞILMAMAK KAYDIYLA; GİRİŞ KATI DİĞER KATLARDAN YÜKSEK TUTULABİLİR. ▪

B) TURİZM TESİS ALANLARI, TİCARET ALANLARI VE KONUT DIŞI KENTSEL ÇALIŞMA ALANLARINDA BİNA CEPHE HATTI EN FAZLA 45 M.DİR. YUKARIDA BELİRTİLEN KULLANIMLAR DIŞINDA KALAN VE BİTİŞİK NİZAM VERİLMEMİŞ ALANLARDAKİ YAPILAR İÇİN İSE EN FAZLA BİNA BOYU 30M DİR.

C) YENÇOK DEĞERİ AŞILMAMAK KAYDIYLA YAPILACAK TÜM YAPILARDA SU BASMAN KOTU +-0.00 KOTU İLE +1.00 M. KOTU ARASINDA İNŞAA EDİLEBİLİR.

D)BU PLAN DAHİLİNDE YAPILACAK OLAN BİNALARIN SU BASMAN YÜKSEKLİĞİNİN DSİ TARAFINDAN 1.00 METRENİN ÜZERİNDE ÖNGÖRÜLMESİ HALİNDE DSİ TARAFINDAN VERİLEN GÖRÜŞ DOĞRULTUSUNDA 1.00 METRENİN ÜZERİNDEKİ 2 METREYE KADAR OLAN DEĞER SAÇAK KOTUNA EKLENİR.

E)PARSELİN KONUMU, ŞEKLİ VE YAPININ PARSELİN İÇERİSİNDEKİ OTURMA ALANI NEDENİYLE ZORUNLU DURUMLARDA; BİNALAR EN FAZLA 110 DERECELİK AÇI YAPACAK ŞEKİLDE ÇİFT KOLLU OLARAK DÜZENLENEBİLİRLER. BU DURUMDA; HER İKİ KOL DA AYRI CEPHELER OLARAK KABUL EDİLECEK VE HER KOL İÇİN BİNANIN KIRILDIĞI DIŞ KÖŞEDEN İTİBAREN AYRI AYRI BİNA BOYU SINIRLAMASI HESAPLANACAKTIR.

AÇININ 110 DERECEDEN FAZLA OLMASI HALİNDE; HER İKİ KOL TEK CEPHE OLARAK KABUL EDİLECEK VE BUNA GÖRE CEPHE BOYU HESAPLANACAKTIR.

1.12.5. ÇATILAR

A) KONUTLARDA ÇATILAR OTURTMA ŞEKLİNDE, BEŞİK YA DA KIRMA ÇATI TÜRÜNDE VE MİNİMUM %20, MAKSİMUM %40 EĞİMLE İNŞA EDİLEREK ALATURKA KİREMİT VEYA MARSİLYA KİREMİT İLE KAPLANACAKTIR. KONUTLARDA TERAS KAT, ÇEKME KAT YA DA ÇATI KATI YAPILAMAZ. KONUTLARDA SON KAT ÇATI TABLİYE ALANININ %20'SİNİ GEÇMEMEK VE SAÇAK UCUNDAN EN AZ 2 METRE İÇERİ ÇEKİLMEK KAYDIYLA ÇATI ARASI PİYESLER ÖNÜNE TERAS YAPILABİLİR. AYRICA BEŞİK ÇATI ÇÖZÜMLERİNDE TERASLAR, KALKAN DUVARINA BİTİŞİK OLARAK DA DÜZENLENEBİLİR.

B) KONUT KULLANIMI DIŞINDAKİ TÜM YAPILARDA ÇATI ÖRTÜSÜ, MALZEMESİ VE BİÇİMİ SERBESTTİR. ÇATI YAPILMASI HALİNDE ÇATININ EĞİMİ %40'I AŞAMAZ.

C) GÜNEŞ ENERJİSİNDEN YARARLANILAN ISITICI AYGITLAR ÇATI ÖRTÜSÜ SİLÜETİNİ BOZMAYACAK ŞEKİLDE MÜMKÜN OLDUĞUNCA EĞİME UYARAK, ÇATI DÜZLEMİ ÜZERİNE YATIRILARAK VEYA ÇATI İÇERİSİNE GÖMÜLEREK, DİĞER SU DEPOLARI V.S. İSE ÇATI ÖRTÜSÜ ALTINA GİZLENMEK ŞARTI İLE YAPILABİLİRLER.

D) YAPILARDA SAÇAK ZORUNLULUĞU YOKTUR. ANCAK, SAÇAK YAPILDIĞINDA GENİŞLİĞİ 1.00 M'Yİ GEÇEMEZ. SAÇAKLAR YÖRENİN MİMARİ ÖZELLİKLERİ GÖZ ÖNÜNE ALINARAK DETAYLANDIRILACAKTIR. SAÇAK ÖNÜNE YÜKSEKLİĞİ 60CM GEÇMEYECEK ŞEKİLDE PARAPET YAPILABİLİR. TERS KİRİŞ UYGULAMASI İLE SAÇAK KOTU YÜKSELTİLEMEZ.

E) YAPILARDA ÇATI DÜZLEMİ ÜZERİNDE; TSE STANDARTLARINA GÖRE YAPILACAK ASANSÖR KULESİ VE DUMAN BACALARI İLE ÇATI EĞİMİNE PARALEL GÖRSEL ETKİYİ BOZMAYAN HAVALANDIRMA BACALARI VE ÇATI ARASI MEKANLARI AYDINLATMAK YA DA HAVALANDIRMAK AMACI İLE CEPHEDE YAPILMAMAK VE SAÇAK UCUNDAN EN AZ 2.00 METRE İÇERİDE ÇATI DÜZLEMİ ÜZERİNDE OLMAK ŞARTI İLE ÜÇGEN ALINLI DEKORATİF OLARAK ÇÖZÜLMÜŞ EN FAZLA 1.50/0.75 METRE ÖLÇÜSÜNDE PENCERELER, MAX %40 LIK ÇATI EĞİMİNİN GETİRDİĞİ MAHYA KOTUNU AŞMAYAN VE ÇATI ALANININ 1/5 İNİ GEÇMEYEN PROJESİ İLE UYUMLU "CİHANNÜMA" KARAKTERİNDEKİ HAVALANDIRMALAR YAPILABİLİR.

1.12.6. BACALAR:

KONUTLARDA BACALAR YÖRENİN MİMARİ KARAKTERİNİ YANSITACAK ŞEKİLDE VE KİREMİT ŞAPKALI OLARAK YAPILACAKTIR. BACALAR ÇATI DÜZLEMİ ÜZERİNDEN 50CM İLE 1 METRE ARASINDA YÜKSELTİLEBİLİR.

1.12.7. ÇIKMALAR VE TERASLAR:

AÇIK VE KAPALI ÇIKMALARA AİT TÜM DÜZENLEMELER PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE GÖRE YAPILACAKTIR.

BİRDEN FAZLA YOLA CEPHESİ OLAN PARSELLERDEKİ BÜTÜN YOL CEPHELERİ ÖN CEPHE GİBİ DEĞERLENDİRİLİR.

BİNA CEPHELERİNDE ZEMİN KAT GİRİŞ MERDİVENİ HARİÇ AÇIK MERDİVEN YAPILAMAZ SADECE TURİZM TESİSLERİNDEKİ BİNALARDA CEPHE İLE BÜTÜNLEŞMEK KAYDIYLA AÇIK MERDİVENLER YAPILABİLİR.

1.12.8.KAPI VE PENCERE:

KONUT KULLANIMINDAKİ ALANLARDA CEPHELERDEKİ KAPI PENCERE BOŞLUKLARI, TOPLAM CEPHE ALANININ %50 SİNİ GEÇEMEZ. DİĞER KULLANIMLAR İÇİN DOLULUK VE BOŞLUK ORANI ARANMAZ.

1.12.9. CEPHE ÖZELLİKLERİ:

A) BU PLAN KAPSAMINDAKİ KONUTLARDA YEREL MİMARİ TARZ VE ÖZELLİKLERİ İLE CEPHE ORANLARININ GÖZÖNÜNDE TUTULMASI MECBURİDİR. CEPHELER TUĞLA, BRİKET VEYA DİĞER GÜNÜMÜZ MALZEMELERİNDEN İSE SIVALI VE BADANALI, AHŞAP VEYA TAŞ DUVAR ŞEKLİNDE İSE SIVASIZ BIRAKILABİLİR. AYRICA CEPHELERLE SIVA, AHŞAP, TAŞ DIŞINDA BULUNDUĞU CEPHE ALANININ 1/5 İNİ GEÇMEMEK ÜZERE MİMARİ BÜTÜNLÜĞÜ KORUMAK KAYDIYLA SABUN TUĞLA VE /VEYA CAM TUĞLA KULLANILABİLİR.

KONUT DIŞI TÜM YAPILARDA CEPHE BİÇİMİ, ORANI VE MALZEMESİ SERBESTTİR.

B) YÖRE MİMARİSİNDE ÖNEMLİ YERİ OLAN ÇIPLAK (SIVASIZ) TAŞ DUVAR KULLANILMASINI TEŞVİK ETMEK, TAŞ DUVARIN TEKNİĞİ İTİBARİYLE İNŞAAT ALANI KAYIPLARINA NEDEN OLMAMAK ÜZERE, YAPI YAKLAŞMA MESAFELERİNE UYULMAK ŞARTI İLE DIŞ CEPHEDEKİ TAŞ DUVAR KALINLIĞININ 50 CM'LİK KISMI İNŞAAT ALANI HESABINA KATILMAZ. NORMAL İNŞAATLARIN İNCE TAŞ PLAKALAR İLE KAPLANMASI DURUMUNDA BU HÜKÜM GEÇERLİ DEĞİLDİR.

C)ALT KATINDA TİCARİ KULLANIMLARIN YER ALDIĞI YAPILARIN CEPHE BOYUNCA YÜKSEK KENARI BİNA CEPHESİNE BAĞLI OLMAK VE CEPHE TASARIMINA ENTEGRE EDİLMEK UZERE AHŞAP KONSTÜRÜKSİYONLU, ÜSTÜ KİREMİT ÇATILI SABİT GÖLGELİK-SAÇAK YAPILABİLİR. SAÇAK YÜKSEKLİĞİ EN ALÇAK NOKTADA 2.20 M'DEN AZ OLAMAZ. ÖN ÇEKME MESAFESİ 0.00 METRE OLAN YAPILARDA BU SAÇAK GENİŞLİĞİ KALDIRIM GENİŞLİĞİNDEN VEYA HER DURUMDA 2.00 METREDEN FAZLA OLAMAZ.

D)TİCARET ALANLARINDA GÜNÜMÜZ TEKNOLOJİSİNE UYGUN OLARAK ÜRETİLEN ÜSTÜ AÇILIR KAPANIR MEKANİK GÖLGELİK VE SUNDURMALAR, 2 M'Yİ GEÇMEMEK KOŞULU İLE YAPILABİLİR. TİCARET ALANLARININ BAHÇELERİNDE İSE BU TİP MEKANİK GÖLGELİKLER 25M2'Yİ AŞAMAZ. BU UYGULAMALAR PARSEL SINIRINA BİTİŞİK YAPILABİLİR. YOL CEPHESİNE BİTİŞİK OLAN TİCARET ALANLARINDA BU UYGULAMA 2 MDEN HER DURUMDA KALDIRIM GENİŞLİĞİNDEN FAZLA OLAMAZ.

E)CEPHE BOYUNUN YÜKSEKLİĞİNE ORANI 2.00'A ERİŞTİĞİ YA DA GEÇTİĞİ YAPILARDA CEPHE UZUNLUĞU ÇIKMA, BALKON, PENCERE VB. MİMARİ ELEMANLARLA KIRILARAK CEPHEYE HAREKETLİLİK GETİRİLECEKTİR.

1.12.10. PARSELDEKİ AÇIK ALANLAR

A) BÜTÜN TESİS VE YAPILARDA YAPI KULLANMA İZNİ VERİLMEDEN ÖNCE PARSEL İÇERİSİNDEKİ AÇIK ALANLARIN DÜZENLENME VE BİTKİLENDİRME İŞLEMLERİNİN TAMAMLANMASI ZORUNLUDUR. TOPLU KONUT, TURİZM VE KONUT ALANLARINDA AÇIK ALAN (ÇEVRE) DÜZENLEMESİNDE PARSEL TOPLAMININ EN AZ %40'I KADAR BİR ALAN HİÇ BİR YAPAY MALZEME KULLANILMADAN DOĞAL TOPRAK ÖRTÜSÜ OLARAK BIRAKILACAK VE BU ALANDA BİTKİSEL DÜZENLEME YAPILACAKTIR. BİTKİLENDİRMEDE YÖREYE UYGUN AĞAÇ TÜRLERİ İLE GÖRSEL OLARAK YAPIYI SAKLAYICI AMAÇLI DÜZENLEME ESASTIR. ANCAK PARSEL İÇERİSİNDE ZORUNLU OLARAK YAPILMASI GEREKEN OTOPARK İHTİYACININ HİÇBİR ŞARTTA (BODRUM KATLAR DAHİL) KARŞILANMAMASI DURUMUNDA SADECE OTOPARK ALANI OLARAK KULLLANILMAK ÜZERE PARSEL TOPLAMININ EN FAZLA %10 NU KADARI DA ZEMİN GEÇİRGENLİĞİNİ SAĞLAYACAK NİTELİKTE MALZEME KULLANMAK ŞARTIYLA OTOPARK OLARAK DÜZENLENEBİLİR. BU DURUMDA BİTKİSEL DÜZENLEME YAPILACAK ALAN, PARSEL TOPLAMININ EN AZ %30'U KADARDIR.

B) SÖZ KONUSU TOPRAK SAHANIN HER 20 M²'Sİ İÇİN YÖRESEL BİTKİ ÖRTÜSÜNE VE PEYZAJINA UYGUN BİR AĞAÇ DİKİLMESİ ZORUNLUDUR. EĞER PARSELDE MEVCUT AĞAÇLAR VARSA BUNLAR BİNANIN YERLEŞTİRİLMESİNDE GÖZ ÖNÜNE ALINIR VE GEREKLİ OLAN AĞAÇ SAYISINDAN DÜŞÜLÜR.

C) PARSEL SINIRININ BİNANIN BULUNMADIĞI BÖLÜMLERİNİN TÜMÜ BAHÇE DUVARLARIYLA ÇEVRİLİCEKTİR. BİTKİLENDİRME VEYA AHŞAP ÇİT İLE DE BAHÇE SINIRLAMASI YAPILABİLİR.

D) TOPLU KONUT KOOPERATİFLERİ, TURİSTİK TESİSLER, KAMU KURUM VE KURULUŞLARINA AİT TESİSLER, YAPILACAK YAPILAR, KAMU HİZMET BİNALARI VB. YAPILANMALAR İÇİN PEYZAJ PROJESİ YAPTIRILMASI ZORUNLUDUR. PEYZAJ PROJESİ OLMAYAN TESİSLERE İNŞAAT RUHSATI, PEYZAJ UYGULAMASI BİTİRİLMEDEN DE TESİSLERE YAPI KULLANMA İZNİ VERİLEMEZ. SÖZ KONUSU PARSELLERDE TOPRAK SAHANIN HER 40 M²'Sİ İÇİN YÖRESEL BİTKİ ÖRTÜSÜNE UYGUN AĞAÇ VE SÜS ÇALISI DİKİLMESİ ZORUNLUDUR.

2. ÖZEL HÜKÜMLER:

2.1.KONUT ALANLARI

2.1.1. MESKUN KONUT ALANLARI

(A-2), (A-3), (BL-2), (BL-3), (B-2), (B-3), [(BL-2)AK], (BL-2)D, [(BL-3) 0.30/0.90], (A-3) 0.30/0.90 VE (BL-4) OLARAK TANIMLANAN ALANLAR MESKUN KONUT ALANLARIDIR. BU ALANLARDA KONUT VEYA BELGELİ TURİZM TESİSİ YAPILABİLİR. YAPI NİZAMI PLAN PAFTALARINDA BELİRLENMİŞTİR.

YENİ YAPILACAK BİNANIN YER SEÇİMİ, YAPI YAKLAŞMA MESAFELERİ VE YAPI NİZAMI AŞAĞIDAKİ KOŞULLARA GÖRE İLGİLİ İDARESİNCE BELİRLENİR.

A)YAPI NİZAMI;

KOMŞU PARSELLERDE YAPILAŞMALARIN OLMASI DURUMUNDA;

KOMŞU PARSELDEKİ YAPILAŞMALAR DİKKATE ALINARAK AYRIK, BİTİŞİK VEYA BLOK NİZAM UYGULANABİLİR.

KOMŞU PARSELLERDE YAPILAŞMALARIN OLMAMASI DURUMUNDA;

KOMŞU PARSELLERİN BOŞ OLMASI HALİNDE İSE İMAR ADASI GENELİNDE YER ALAN YAPI NİZAMLARINA BAKILARAK İLGİLİ İDARE TARAFINDAN BELİRLENİR.

B)YAPI YAKLAŞMA MESAFELERİNİN BELİRLENMESİ;

KOMŞU PARSELLERDE YAPI BULUNMASI HALİNDE, MEVCUT YAPININ VEYA YAPILARIN YAKLAŞMA MESAFELERİ YENİ YAPILACAK BİNANIN YAKLAŞMA MESAFESİ OLARAK BELİRLENİR.

ANCAK, KOMŞU PARSELLERDEKİ YAPILAŞMALARDA ARKA VE ÖN YAPI YAKLAŞMA MESAFELERİNİN FARKLI OLMASI DURUMUNDA İSE İMAR ADASI BAZINDA ARKA VE ÖN YAPI YAKLAŞMA MESAFELERİNE BAKILARAK, ARKA BAHÇE EN AZ 3M, ÖN BAHÇE İSE İMAR ADASINDA YER ALAN MEVCUT BİNALARIN OLUŞTURDUĞU CEPHE HATTINA UYGUN OLARAK O VEYA 5M ARASINDA BELİRLENEBİLİR.

KOMŞU PARSELLERDE HİÇ YAPI BULUNMAMASI VEYA İMAR ADASI BÜTÜNÜNDE YAPI BULUNMAMASI HALİNDE;

PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNDE BELİRTİLEN ASGARİ BİNA BOYU VE BİNA CEPHESİ KOŞULLARININ SAĞLANMASI HALİNDE AYRIK NİZAM, BU KOŞULLARIN SAĞLANMAMASI HALİNDE İSE PARSEL SAHİPLERİNİN MUVAFFAKATI ALINMAK ŞARTIYLA BİTİŞİK VEYA BLOK NİZAM UYGULANABİLİR.

KOMŞU PARSELLERDE YAPILAŞMA OLMAMASI HALİNDE ARKA, YAN VE ÖN BAHÇE YAPI YAKLAŞMA MESAFESİNİN BELİRLENMESİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

ANCAK, KOMŞU PARSELLERDEKİ YAPILAŞMALARDA ARKA VE ÖN YAPI YAKLAŞMA MESAFELERİNİN FARKLI OLMASI DURUMUNDA İSE İMAR ADASI BAZINDA ARKA VE ÖN YAPI YAKLAŞMA MESAFELERİNE BAKILARAK, ARKA BAHÇE EN AZ 3M, ÖN BAHÇE İSE İMAR ADASINDA YER ALAN MEVCUT BİNALARIN OLUŞTURDUĞU CEPHE HATTINA UYGUN OLARAK O VEYA 5M ARASINDA BELİRLENEBİLİR.

KOMŞU PARSELLERDE HİÇ YAPI BULUNMAMASI VEYA İMAR ADASI BÜTÜNÜNDE YAPI BULUNMAMASI HALİNDE;

PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNDE BELİRTİLEN ASGARİ BİNA BOYU VE BİNA CEPHESİ KOŞULLARININ SAĞLANMASI HALİNDE AYRIK NİZAM, BU KOŞULLARIN SAĞLANMAMASI HALİNDE İSE PARSEL SAHİPLERİNİN MUVAFFAKATI ALINMAK ŞARTIYLA BİTİŞİK VEYA BLOK NİZAM UYGULANABİLİR.

KOMŞU PARSELLERDE YAPILAŞMA OLMAMASI HALİNDE ARKA, YAN VE ÖN BAHÇE YAPI YAKLAŞMA MESAFESİNİN BELİRLENMESİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

YAPI NİZAMI VE YAPI YAKLAŞMA MESAFELERİNİN BELİRLENMESİNDE, MEVCUT YAPILARIN YASAL DURUMU VE EKONOMİK ÖMRÜNÜ TAMAMLAYIP TAMAMLANDIĞI GÖZÖNÜNE ALINACAKTIR.

(A-2), (BL-2), (B-2), [(BL-2)AK], [(BL-2)D] İLE TANIMLANMIŞ VE YAPILAŞMA EMSALİ VERİLMEMİŞ MESKUN KONUT ALANLARINDA;

EN FAZLA T.A.K.S.= 0.40
EMSAL= 0.80
EN FAZLA YÜKSEKLİK (Y Ençok)=6.50 METRE OLACAKTIR.

(A-3), (BL-3), (B-3) İLE TANIMLANMIŞ VE YAPILAŞMA EMSALİ VERİLMEMİŞ MESKUN KONUT ALANLARINDA;

EN FAZLA T.A.K.S.= 0.40
EMSAL = 1.20
EN FAZLA YÜKSEKLİK (Y Ençok)=9.50 METRE OLACAKTIR.

(BL-4) İLE TANIMLANMIŞ VE YAPILAŞMA EMSALİ VERİLMEMİŞ MESKUN KONUT ALANLARINDA;

EN FAZLA T.A.K.S.= 0.25
EMSAL = 1.00
EN FAZLA YÜKSEKLİK (Y Ençok)=12.50 METRE OLACAKTIR.

BU ALANLARDA BİNA DERİNLİĞİNİN 7 METREDEN AZ ÇIKTIGI DURUMLARDA EMSAL(İAKS) DEĞERLERİNİ AŞMAMAK KAYDIYLA ARKA BAHÇE MESAFESİ EN AZ 2.00 METREDEN AZ OLMAYACAK ŞEKİLDE BİNA DERİNLİĞİ 7 METRE OLARAK UYGULANABİLİR.

TURİZM TESİSİ YAPILMASI HALİNDE;

İMAR PLANI VE PLAN HÜKÜMLERİNDE O ADA İÇİN BELİRLENMİŞ YAPILAŞMA ŞARTLARINA UYULUR.

2.1.2. GELİŞME KONUT ALANLARI
KONUT VEYA TURİZM TESİSİ YAPILABİLİR.

BU ALANLARDA BİNA DERİNLİĞİNİN 7 METRE'DEN AZ ÇIKTIGI DURUMLARDA MEVCUT EMSAL VE TAKS DEĞERLERİNİ AŞMAMAK VE ARKA BAHÇE MESAFESİ 2 METREDEN AZ OLMAYACAK ŞEKİLDE BİNA DERİNLİĞİ 7 METREYE KADAR ÇIKARILABİLİR.

T.A.K.S.= 0.25, İ.A.K.S=0.50 VE T.A.K.S.=0.25, İ.A.K.S.=0.75 OLARAK TANIMLANAN ALANLARDA;
ENAZ İFRAZ 500 M²
EN AZ PARSEL CEPHESİ 16 M

T.A.K.S.=0.15, İ.A.K.S.=0.30 OLARAK TANIMLANAN ALANLARDA;
EN AZ İFRAZ 1000 M²
EN AZ PARSEL CEPHESİ 20 METRE

T.A.K.S.=0.30, İ.A.K.S.=0.60 VE T.A.K.S.=0.30, İ.A.K.S.=0.90 OLARAK TANIMLANAN ALANLARDA;
ENAZ İFRAZ 400 M²
EN AZ PARSEL CEPHESİ 16 METRE ŞARTLARI UYGULANIR.

2.1.2.1. OTEL VE PANSİYON YAPILMASI HALİNDE;

T.A.K.S.:0.25, İ.A.K.S.:0.50 OLARAK TANIMLANAN KONUT ALANLARINDA TURİZM TESİSİ YAPILMASI HALİNDE;

EMSAL =0.60, (3 KAT)
ENAZ İFRAZ 1500 M²
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA=5M

T.A.K.S.:0.15, İ.A.K.S.:0.30 OLARAK TANIMLI KONUT ALANLARINDA TURİZM TESİSİ YAPILMASI HALİNDE ;

EMSAL =0.30, (3 KAT)
ENAZ İFRAZ 1500 M²
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA =5M

T.A.K.S.:0.25, İ.A.K.S.:0.75 OLARAK TANIMLI KONUT ALANLARINDA TURİZM TESİSİ YAPILMASI HALİNDE;

EMSAL =0.75, (3 KAT)
ENAZ İFRAZ 1500 M²
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA =5M ŞARTLARI UYGULANIR.

T.A.K.S.:0.30, İ.A.K.S.:0.60 OLARAK TANIMLI KONUT ALANLARINDA TURİZM TESİSİ YAPILMASI HALİNDE;

EMSAL =0.60, (3KAT)
ENAZ İFRAZ 1500 M²
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA =5M UYGULANIR.

T.A.K.S.:0.30, İ.A.K.S.:0.90 OLARAK TANIMLI KONUT ALANLARINDA TURİZM TESİSİ YAPILMASI HALİNDE;

EMSAL=0.90, (3 KAT)
ENAZ İFRAZ 1500 M²
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA =5M UYGULANIR.

PROJEDE BELİRTİLEN ARITMA TESİSİ FAALİYETE GEÇMEDEN DE YAPIYA İSKAN RUHSATI VERİLEMEZ.

2.2. KENTSEL ÇALIŞMA ALANLARI

2.2.1. TİCARET ALANLARI

PLAN ONAMA SINIRLARI İÇERİSİNDE TAMAMI MESKUN VE GELİŞME TİCARET ALANI OLARAK TANIMLANAN YAPI ADALARINDA ATEŞLİ VE GÜRÜLTÜLÜ OLMAYAN YANICI, PARLAYICI, PATLAYICI MADDELER İMALATHANE VE DEPOLARI İÇERMEYEN TİCARİ AMACA YÖNELİK ALIŞVERİŞ MERKEZLERİ SATIŞ VE SERGİLEME ÜNİTELERİ, DEPOLAMA ALANLARI, İŞ MERKEZLERİ, TOPLANTI VE DÜĞÜN SALONU, TURİZM TESİSİ VB. YAPILAR YAPILABİLİR. CEPHELERDE HAREKETLİLİK ŞARTI YOKTUR.

2.2.1.1. MESKUN TİCARET ALANLARI

MESKUN TİCARET ALANLARINDA ATEŞLİ VE GÜRÜLTÜLÜ OLMAYAN, ANCAK TİCARİ AMACA YÖNELİK YAPILAR YAPILABİLİR. TALEP EDİLMESİ HALİNDE TURİZM TESİSİ YAPILABİLİR. BU KULLANIMLAR İÇİN YAPILAŞMA ŞARTLARI PLANDA MESKUN TİCARET ALANLARINDA BELİRTİLDİĞİ GİBİDİR.

(A-2), (A-3), (B-2), (B-3), (B-4) VE (B-5) OLARAK TANIMLANAN MESKUN TİCARET ALANLARINDA; YAN BAHÇE YAPI YAKLAŞMA MESAFESİ; AYRIK NİZAMDA, MEVCUT OLUŞUMUNA GÖRE BİTİŞİK NİZAMDA ÖN BAHÇE 0 VEYA 5 METRE ARKA BAHÇE = YÜKSEKLİK/2 OLACAKTIR.

[(BL-2)AT] (0.40/0.80) OLARAK TANIMLANMIŞ MESKUN TİCARET ALANLARINDA

(BL-2), (0.35/0.70) OLARAK TANIMLANMIŞ MESKUN TİCARET ALANLARINDA,

(B-3), (0.40/1.20) OLARAK TANIMLANMIŞ MESKUN TİCARET ALANLARINDA,

FETHİYE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI PLAN HÜKÜMLERİ REVİZYONU

(A-3), (0.30/0.90) OLARAK TANIMLANMIŞ MESKUN TİCARET ALANLARINDA,

(A-3) (0.40/1.20), (B-3) (0.30/0.90), (B-2) (0.30/0.60) OLARAK TANIMLANMIŞ MESKUN TİCARET ALANLARINDA, YENİ YAPILACAK BİNANIN YER SEÇİMİ, YAPI YAKLAŞMA VE YAPI NİZAMININ BELİRLENMESİNDE 2.1.1. NOLU PLAN HÜKMÜNE UYULACAKTIR.

(BL-2) OLARAK TANIMLANMIŞ ANCAK YAPILAŞMA EMSALİ VERİLMEMİŞ MESKUN TİCARET ALANLARINDA TAKS: 0.35, EMSAL: 0.70'DİR.

MESKUN TİCARET ALANLARINDA ÜST KATLAR KONUT OLARAK KULLANILABİLİR.

BU ALANLARDA BİNA DERİNLİĞİ 7 METREDEN AZ CIKTIGI DURUMLARDA EMSAL (İAKS) DEĞERLERİNİ AŞMAMAK KAYDIYLA ARKA BAHÇE MESAFESİ EN AZ 2.00 METREDEN AZ OLMAYACAK ŞEKİLDE BİNA DERİNLİĞİ 7 METRE OLARAK UYGULANABİLİR.

2.2.1.2. GELİŞME TİCARET ALANLARI

EMSAL VE YAPI YAKLAŞMA MESAFESİ UYGULAMA İMAR PLANI ÜZERİNDE TANIMLANMIŞ "TİCARET ALANLARI", "GELİŞME TİCARET ALANLARI" OLARAK TANIMLANIR.

A) TİCARET ALANLARINDA ATEŞLİ VE GÜRÜLTÜLÜ OLMAYAN, ANCAK TİCARİ AMACA YÖNELİK YAPILAR YAPILABİLİR.

B) TİCARET ALANLARINDA EN AZ İFRAZ 400 M^2 VE EN AZ PARSEL CEPHESİ 10 METRE OLARAK UYGULANACAKTIR.

C) TAMAMI TİCARİ KULLANIM OLARAK BELİRLENEN YAPI ADALARINDA, İÇ MEKANDA KULLANILMASI AMACIYLA ARKAD GEÇİŞLER YAPILARAK İÇ AVLU DÜZENLEMELERİNE GİDİLEBİLİR. ARKAD GEÇİŞLERİNİN GENİŞLİĞİ 4 METREDEN, YÜKSEKLİĞİ 3 METRE DEN AZ OLAMAZ. ÖNDEN YAPI YAKLAŞMA MESAFESİ TANIMLANMAMIŞ TİCARİ ALANLARDA; YENİ YAPILACAK BİNANIN YAPI YAKLAŞMA MESAFESİ İÇİN, O ADADA OLUŞMUŞ CEPHE HATTINA UYULACAKTIR.

D) TİCARET ALANLARINDA BELGELİ TURİZM TESİSİ YAPILABİLİR. BU KULLANIMLAR İÇİN YAPILAŞMA ŞARTLARI PLANDA GELİŞME TİCARET ALANLARINDA BELİRTİLDİĞİ GİBİDİR.

E) BU ALANLARDA BİNA DERİNLİĞİ 10 METREDEN AZ ÇIKTIĞI DURUMLARDA EMSAL (İAKS) DEĞERLERİNİ AŞMAMAK KAYDIYLA ARKA BAHÇE MESAFESİ EN AZ 2.00 METREDEN AZ OLMAYACAK ŞEKİLDE BİNA DERİNLİĞİ 10 METRE OLARAK UYGULANABİLİR.

F) GELİŞME TİCARET ALANLARINDA ÜST KATLAR KONUT OLARAK KULLANILABİLİR.

2.2.1.3. TERCİHLİ TİCARET ALANLARI:

FETHİYE KENT BÜTÜNÜNDE KUZEYDEN GÜNEYE DEVAM EDEN 22 METRE (KISMEN 20 METRE) GENİŞLİĞİNDEKİ BULVARLARIN (MUSTAFA KEMAL VE ADNAN MENDERES BULVARLARI) KUZEYDE MURT DERESİNİ KESTİĞİ NOKTA İLE GÜNEYDE FETHİYE MERKEZ- KARAÇULHA YOLU'NA (20 METRE) KADAR OLAN KISMINDA YOLUN HER İKİ TARAFINDAN CEPHE ALAN VEYA YOLA BAKAN İMAR ADALARINDAKİ İLK BİNALARIN TAMAMI MEVCUT ONAYLI PLANLARDAKİ EMSAL VE Y ENÇOK DEĞERLERİNE UYULMAK ŞARTI İLE TİCARET AMACLI KULLANILMAK ÜZERE RUHSATLANDIRILABİLİR.

2.2.2. BELEDİYE HİZMET ALANLARI

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;
E:0.50 (3 KAT)
YENÇOK: 10.50 METRE
YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

2.2.3. RESMİ KURUM ALANLARI

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA ÇEKME MESAFELERİNİ AŞMAMAK KOŞULUYLA T.A.K.S: 0.40'TIR.

KAT SAYISININ İMAR PLANI ÜZERİNDE BELİRTİLMEDİĞİ DURUMLARDA YENÇOK: 10.50 METRE (3 KAT)'TIR.

K.A.K.S. DEĞERİ T.A.K.S. İLE KAT SAYISININ ÇARPIMINDAN HESAPLANIR.

YAPI YAKLAŞMA MESAFELERİNİN PLAN ÜZERİNDE BELİRTİLMEDİĞİ DURUMLARDA PLANLI ALANLAR TİP İMAR YÖNETMELİĞİ GEÇERLİDİR.

2.2.4. AKARYAKIT VE LPG SATIŞ İSTASYONLARI:

MUTLAK TARIM ARAZİLERİ, ÖZEL ÜRÜN ARAZİLERİ, SULAMA, DRENAJ, TOPRAK MUHAFAZA VE TOPLULAŞTIRMA GİBİ PROJELER KAPSAMINDA YER ALAN TARIM ARAZİLERİ İLE BU PLANDA HASSAS ZON OLARAK GÖSTERİLEN ALANLARDA AKARYAKIT-SERVİS-LPG İSTASYONLARI YAPILAMAZ.

BU KULLANIMLARA AYRILACAK ARAZİLERDE ÇEVRE VE ŞEHİRCİLİK BAKANLIĞININ OLUMLU GÖRÜŞÜ İLE BİRLİKTE;

-5403 SAYILI TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNUNUN 8. MADDESİNİ DEĞİŞTİREN, 5578 SAYILI "TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNUNDA DEĞİŞİKLİK YAPILMASI HAKKINDA KANUNDA BELİRTİLEN İZİNLERİN ALINMASI,

-KARAYOLLARI KENARINDA YAPILACAK YAPI VE TESİSLERE İLİŞKİN YÖNETMELİK İLE 5015 SAYILI PETROL PİYASASI KANUNUNUN İLGİLİ MADDELERİNDE BELİRLENEN ESASLARA UYULMASI GEREKMEKTEDİR.

BU ALANLARDA "SIVILAŞTIRILMIŞ PETROL GAZLARI (LPG) PİYASASI KANUNU" İLE İLGİLİ YÖNETMELİK HÜKÜMLERİ GEÇERLİDİR.

2.2.5. KÜÇÜK SANAYİ (KS) VE DEPOLAMA ALANLARI

KÜÇÜK ÖLÇEKTE SANAYİ İŞLETMELERİNİN YER ALDIĞI, DAHA ÇOK DOĞRUDAN KENTLİYE YÖNELİK HİZMET ÜRETEN, 1593 SAYILI "UMUMİ HIFZISIHHA KANUNU VE İLGİLİ YÖNETMELİKLERİ"NE UYGUN OLARAK, ÇEVRE VE SAĞLIK KOŞULLARI AÇISINDAN AYRILMALARI VE GRUPLAŞMALARI GEREKLİ GÖRÜLEN İŞ ÜNİTELERİNİN YER ALDIĞI ALANLARDIR.

BU ALANLARDA YAPILAŞMA, YAPI YAKLAŞMA SINIRLARI İÇERİSİNDE KÜTLE ŞEKLİNDE OLUŞTURULACAKTIR.

EN AZ PARSEL CEPHESİ : 20 METRE
EN AZ PARSEL ALANI : 1000 M^2 OLACAKTIR.
1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANINDA BELİRTİLMEDİĞİ DURUMLARDA; YAPILAŞMA ŞEKLİ (B-1) BİTİŞİK NİZAM 1 KAT, Y Ençok=6.50 METRE TOPLAM YÜKSEKLİĞİ AŞMAMAK KOŞULUYLA ASMA KAT YAPILABİLİR. ARKA ÇEKME MESAFESİ SIFIR (0) METRE OLARAK UYGULANABİLİR.

2.3. TURİZM YERLEŞME ALANLARI:

TURİZM TESİSİ YAPILMASI HALİNDE; TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK HÜKÜMLERİNE UYGUN OLMAK ŞARTIYLA PANSİYON VE BELGE ALMAK ŞARTIYLA OTEL YER ALABİLİR.

PLANDA TURİSTİK TESİS ALANI, GÜNÜBİRLİK KULLANIM ALANI VE TURİSTİK PANSİYON OLARAK GÖSTERİLEN ALANLARDA YANLIZCA TOPLUMUN YARARLANMASINA AYRILAN YAPI NİTELİĞİNDEKİ TESİSLER YAPILABİLİR. BU TESİSLERE İNŞAAT RUHSATI VERİLEBİLMESİ İÇİN YAPILACAK YAPININ BU NİTELİKTE OLACAĞININ TAPU KÜTÜĞÜNÜN BEYANLAR HANESİNE YAZDIRILMASI ZORUNLUDUR. TESCİL İŞLEMİ YAPILMADAN İNŞAAT RUHSATI VERİLEMEZ. BU ALANLARDA APART OTEL YAPILAMAZ.

İMAR PLANLARINDA VE TESİSLERİN MİMARİ PROJELERİNDE TOPOĞRAFYA VE DOĞAL BİTKİ ÖRTÜSÜ İLE ÇEVRE KARAKTERİSTİKLERİNE UYGUN ÇÖZÜMLER GETİRİLECEKTİR. TOPOĞRAFYANIN EĞİMİNDEN KAYNAKLANAN VE ZORUNLU OLUŞAN EN FAZLA 2 BODRUM KAT YAPILABİLİR. ZORUNLU BODRUMLARIN OLUŞMASI HALİNDE SADECE BODRUM KATLARDA KULLANILMAK ÜZERE EMSALE 0.10 EKLENİR. HER DURUMDA EN FAZLA 2 BODRUM KAT YAPILABİLİR.

E=0,60 OLARAK TANIMLANAN ALANLARDA;
EMSAL =0.60 (3 KAT)
ENAZ İFRAZ 1500 M^2
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA MESAFESİ =5 M

E=0,30 OLARAK TANIMLANAN ALANLARDA;
EMSAL =0.30 (3 KAT)
ENAZ İFRAZ 1500 M^2
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA MESAFESİ =5 M

İ.A.K.S.=0,90 OLARAK TANIMLANAN ALANLARDA;
(3 KAT)
EN KÜÇÜK İMAR PARSELİ 1500M^2
ENAZ İFRAZ 1500 M^2
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA MESAFESİ =5 M

T.A.K.S.=0.25 İ.A.K.S.=0.50 OLARAK TANIMLANAN ALANLARDA;
EMSAL =0.50 (3 KAT)
ENAZ İFRAZ 1500 M^2
EN AZ PARSEL CEPHESİ 25 M
KOMŞU PARSEL SINIRINDAN YAPI YAKLAŞMA MESAFESİ =5 M

BU TÜR TESİSLERDE, TURİZM TESİSLER YÖNETMELİĞİNDE BELİRTİLEN ŞARTLARA UYULMASI ZORUNLUDUR. PROJEDE BELİRTİLEN ARITMA TESİSİ FAALİYETE GEÇMEDEN DE YAPIYA İSKAN RUHSATI VERİLEMEZ.

GERÇEKLEŞTİRİLECEK TURİZM TESİSLERİNDE ATIK SU VEYA KANALİZASYON SİSTEMİ PROJENİN ÇEVRE KİRLİLİĞİ YARATMAYACAK ŞEKİLDE HAZIRLANDIĞI BELGELENMEDİKÇE İNŞAAT RUHSATI, PROJEDE BELİRTİLEN ARITMA TESİSİ FAALİYETE GEÇMEDEN YAPIYA İSKAN RUHSATI VERİLEMEZ.

2.3.1. MESKUN TURİZM TESİS ALANLARI

022D-08D-1C VE 022D-08D-4B PAFTALARINDAKİ 1995 VE 1996 NUMARALI YAPI ADALARI MESKUN TURİZM TESİS ALANLARIDIR. BU ALANLARDA YENİ YAPILACAK YAPILARDA İMAR PLANI ÜZERİNDE BELİRLENEN ÇEKME MESAFELERİNE UYULMASI ZORUNLUDUR. BU ALANLARDA YENİ YAPILACAK YAPININ YER SEÇİMİ, YAPI YAKLAŞMA VE YAPI NİZAMI 2.1.1. NOLU PLAN HÜKMÜNE GÖRE BELİRLENECEKTİR.

2.3.2. GÜNÜBİRLİK ALANLAR:

BU ALANLARDA SADECE GÜNÜBİRLİK KULLANIMA DÖNÜK SU VE KARA SPORLARINA İLİŞKİN TESİSLER İLE LOKANTA, GAZİNO, ÇAY BAHÇESİ, PLAJ, KABİN, ÇÖP TOPLAMA, İSKELE V.B. TESİSLER YAPILABİLİR.

BU ALANLARDA YAPILACAK YAPILARIN KONUMU, ARAZİ ÜZERİNDE KAPLAYACAĞI ALAN VE YÜKSEKLİKLERİ; ARAZİNİN TOPOGRAFİK YAPISI, BİTKİ ÖRTÜSÜ VE EKOLOJİK NİTELİKLERİ GÖZÖNÜNE ALINARAK DÜZENLENECEKTİR.

ANCAK HER DURUMDA AŞAĞIDAKİ YAPILAŞMA KOŞULLARI AŞILAMAZ:

ENKÜÇÜK PARSEL: 5000M^2
EMSAL (E): 0.08
YENÇOK: 4.50 M. (1 KAT)

ASMA KAT YAPILMASI HALİNDE TEK KATLI YAPILARDA YAPI YÜKSEKLİĞİ 5.50 METRE OLARAK UYGULANABİLİR.

2.4. BUGÜNKÜ ARAZİ KULLANIMI DEVAM ETTİRİLEREK KORUNACAK ALANLAR

2.4.1. TARIM ALANLARI

BU ALANLARDA GIDA TARIM VE HAYVANCILIK İL MÜDÜRLÜĞÜNÜN OLUMLU GÖRÜŞÜ ALINMAK KAYDIYLA; TARIM VE HAYVANCILIK ÜRETİMİNİ KORUMA AMACIYLA, TOPRAK KORUMA VE SULAMAYA YÖNELİK ALTYAPI TESİSLERİ, ENTEGRE NİTELİKTE OLMAYAN BESİCİLİK VE SU ÜRÜNLERİ ÜRETİM VE MUHAFAZA TESİSLERİ İLE ZORUNLU OLARAK TESİS EDİLMESİ GEREKLİ OLAN MÜŞTEMİLATLAR, MANDIRALAR, ÜRETİCİNİN BİTKİSEL ÜRETİME BAĞLI OLARAK ELDE ETTİĞİ ÜRÜNÜ İÇİN İHTİYAÇ DUYACAĞI YETERLİ BOYUT VE HACİMDE DEPOLAR, DEĞİRMENLER, TARIM ALET VE MAKİNELERİNİN MUHAFAZASINDA KULLANILAN SUNDURMA VE ÇİFTLİK ATÖLYELERİ, SERALAR, YÖRESEL NİTELİK TAŞIYAN TARIMSAL ÜRÜNLERDEN, ÖZELLİĞİ NEDENİYLE, HASATTAN SONRA İKİ SAAT İÇİNDE İŞLENMEDİĞİ TAKDİRDE ÜRÜN KALİTESİ VE BESİN DEĞERİNİN KAYBOLMASININ SÖZ KONUSU OLDUĞU ÜRÜNLERİN İŞLENMESİ VE DEPOLANMASI İÇİN KURULAN TESİSLER VE SOĞUK HAVA DEPOLARI YAPILABİLECEK OLUP YENÇOK DEĞERİ TEKNOLOJİK GEREKSİNİMLER DOĞRULTUSUNDA BELİRLENECEKTİR.

BU ALANLARDA AYRICA ÇİFTÇİNİN BARINMASINA YÖNELİK TEK YAPI İLE GIDA, TARIM VE HAYVANCILIK İL MÜDÜRLÜĞÜ TARAFINDAN TARIMSAL AMAÇLI OLDUĞU KABUL EDİLEN, ENTEGRE NİTELİKTE OLMAYAN TESİSLER YAPILABİLİR. TARIMSAL AMAÇLI YAPILAR KULLANIM AMACI DIŞINDA KULLANILAMAZ VE DÖNÜŞTÜRÜLEMEZ.

FETHİYE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI PLAN HÜKÜMLERİ REVİZYONU

BU PLAN İLE VERİLMİŞ OLAN YAPILAŞMA KOŞULLARI AŞILMAMAK KAYDI İLE BELİRTİLMEYEN HUSUSLARDA PLANSIZ ALANLAR TİP İMAR YÖNETMELİĞİNİN 6. BÖLÜMÜNDE BELİRTİLEN YAPILAŞMA KOŞULLARINA UYULUR.

BU ALANLARDA YAPILACAK İFRAZLARDA 5403 SAYILI TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNU VE İLGİLİ YÖNETMELİK HÜKÜMLERİ UYARINCA İŞLEM YAPILACAKTIR.

BU PLANDA GÖSTERİLEN TARIM ARAZİLERİ, 5403 SAYILI TOPRAK KORUMA VE ARAZİ KULLANIMI KANUNU VE İLGİLİ YÖNETMELİĞİNDE TANIMLANAN TARIM ARAZİLERİ SINIFLARINA AYRILMAMIŞ OLUP TARIM ARAZİLERİNİN SINIFLAMASI, İLGİLİ KURUM YA DA KURULUŞLARCA YAPILACAKTIR.

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI ÜZERİNDE BELİRTİLMEDİĞİ DURUMLARDA ÇEKME MESAFELERİ YOLDAN 10M YAN VE ARKA BAHÇEDEN 5M DİR.

2.4.1.1. MUTLAK TARIM VE ÖZEL ÜRÜN ALANLARI

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

YAPILAŞMA KOŞULLARI;
EMSAL (E) : 0,05
YENÇOK : 6,50 M (2KAT)

ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;

EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK : 6,50 M (2 KAT)

2.4.1.2. ÖRTÜ ALTI TARIM ALANLARI

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

EMSAL (E) : 0,10
Y ENÇOK : 6,50 M (2 KAT)

ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;
EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK: 6,50 M (2 KAT)

SERALAR İNŞAAT ALANINA DAHİL DEĞİLDİR. SERALAR YOLDAN EN AZ 5 METRE ÇEKİLEREK YAPILABİLİR.

2.4.1.3. MARJİNAL TARIM ALANLARI

BU ALANLARDA; TARIMSAL AMAÇLI YAPILAR İLE ÇİFTÇİNİN BARINABİLECEĞİ YAPI YAPILABİLİR.

YAPILAŞMA KOŞULLARI;
EMSAL (E) : 0,20
Y ENÇOK : 6,50 M (2 KAT)
ÇİFTÇİNİN BARINMASINA YÖNELİK YAPI İÇİN;
EN FAZLA (MÜŞTEMİLATLAR DAHİL) TABAN ALAN : 75 M^2
EN FAZLA (MÜŞTEMİLATLAR DAHİL) İNŞAAT ALANI : 150 M^2
YENÇOK: 6,50 M (2 KAT)

BU ALANLARDA İLGİLİ KURUM GÖRÜŞLERİ ALINMASI ŞARTIYLA YOLA CEPHESİ OLAN PARSELLERDE KIRSAL TURİZMİ DESTEKLEMEK AMACIYLA TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK'TE BELİRTİLEN YALNIZCA TOPLUMUN YARARLANMASINA AYRILAN YAPI NİTELİĞİNDEKİ TURİZM TESİSLERİ VE KAMPİNG KULLANIMLARI YER ALABİLİR. BU TESİSLERE İNŞAAT RUHSATI VERİLEBİLMESİ İÇİN YAPILACAK YAPININ BU NİTELİKTE OLACAĞININ TAPU KÜTÜĞÜNÜN BEYANLAR HANESİNE YAZDIRILMASI ZORUNLUDUR. AYRICA, TURİZM TESİSLERİNİN BELGELENDİRİLMESİNE VE NİTELİKLERİNE İLİŞKİN YÖNETMELİK'TE BELİRTİLEN ŞARTLARA UYGUN YAPILMASI, YATIRIM VE İŞLETME BELGESİ ALINMASI GEREKLİDİR. ÇEVRE DÜZENİ PLANI İLE BELİRLENEN YAPILAŞMA ŞARTLARI AŞILMAMAK ÜZERE 1/5000 ÖLÇEKLİ NAZIM VE 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI HÜKÜMLERİNE GÖRE UYGULAMA YAPILACAKTIR.

2.4.1.3. ZEYTİNLİK ALANLARI

3573 SAYILI ZEYTİNCİLİĞİN ISLAHI VE YABANİLERİNİN AŞILATTIRILMASI HAKKINDA KANUN HÜKÜMLERİ GEÇERLİDİR. ZEYTİNCİLİK SAHALARI DARALTILAMAZ ANCAK BELEDİYE SINIRLARI İÇERİSİNDE BULUNAN ZEYTİNLİK SAHALARININ İMAR HUDUTLARI KAPSAMI İÇERİSİNDE ALINMASI HALİNDE ALTYAPI VE SOSYAL TESİSLER DAHİL, TOPLAM YAPILAŞMA ZEYTİNLİK ALANIN %10 UNUN GEÇEMEZ. BU SAHALARDAKİ ZEYTİN AĞAÇLARININ SÖKÜLMESİ TARIM VE KÖY İŞLERİ BAKANLIĞI'NIN FENNİ İZNİNE TABİDİR. BU İZNİN VERİLMESİDE, TARIM VE KÖY İŞLERİ BAKANLIĞINA BAĞLI ARAŞTIRMA ENSTİTÜLERİNİN VE MAHALLİNDE ZİRAAT ODALARININ UYGUN GÖRÜŞÜ ALINIR.BU HALDE DAHİ KESİN ZARURET GÖRÜLMEYEN ZEYTİN AĞACI KESİLEMEZ VE SÖKÜLEMEZ.

ZEYTİNLİK ALANLARDA;

YAPI YAKLAŞMA SINIRI YOL CEPHESİNDEN EN AZ 10 METRE DİĞER CEPHELERDEN 5 METREDİR.

EMSAL (E) : 0,10
Y Ençok : 6,50 M (2KAT)

5000 M2NİN ALTINDAKİ PARSELLERDE EN FAZLA İNŞAAT ALANI: 75M2 (MÜŞTEMİLATLAR DAHİLDİR)
5000M2 VE 5000M2NİN ÜSTÜNDEKİ PARSELLERDE EN FAZLA İNŞAAT ALANI: 150M2 (MÜŞTEMİLATLAR DAHİLDİR)

2.4.2. PLAJ VE KUMSAL ALANLARI

BU ALANLARDA 3621 SAYILI KIYI KANUNU VE İLGİLİ YÖNETMELİKLERİNE GÖRE UYGULAMA YAPILACAKTIR.

2.4.3. TAŞKIN ETKİ ALANI:

TAŞKIN ETKİ ALANI İÇERİSİNDE KALAN ALANLARDA DSİ BÖLGE MÜDÜRLÜĞÜ'NÜN UYGUN GÖRÜŞÜ ALINMAKSIZIN UYGULAMA YAPILAMAZ.

2.5. SOSYAL ALTYAPI ALANLARI

2.5.1. EĞİTİM ALANLARI (EĞİTİM TESİSLERİ, MESLEKİ VE TEKNİK ÖĞRETİM ALANLARI)

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;
E:0.50
YENÇOK: 10.50 METRE (3 KAT)
YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

2.5.2. SAĞLIK TESİS ALANLARI

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;
E:0.50
YENÇOK: 10.50 METRE (3 KAT)

YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

2.5.3. SOSYAL KÜLTÜREL TESİS ALANLARI

BU ALANLARDA PLANDA BELİRTİLEN ŞARTLARA UYULMAK ÜZERE TİYATRO, KÜTÜPHANE, SİNEMA, TOPLANTI, HUZUREVİ, REHABİLİTASYON MERKEZİ, GÜÇSÜZLEREVİ, YETİŞTİRME YURDU GİBİ TESİSLER YER ALABİLİR.

PLAN ONAMA SINIRLARI İÇERİSİNDE YER ALAN SOSYAL KÜLTÜREL TESİS ALANLARINDA PLAN ÜZERİNDE BELİRTİLEN YAPILAŞMA ŞARTLARI GEÇERLİDİR. YAPILAŞMA ŞARTLARI BELİRTİLMEYEN SOSYAL KÜLTÜREL TESİS ALANLARINDA AŞAĞIDAKİ YAPILAŞMA ŞARTLARINA UYULUR.

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;

E:0.50
YENÇOK: 10.50 METRE (3 KAT)

YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

2.5.4. SPOR ALANI (SPOR VE OYUN ALANI)

SPOR VE OYUN İHTİYACI KARŞILANMAK, SPOR FAALİYETLERİ YAPILMAK ÜZERE İMAR PLANI KARARI İLE KENT, BÖLGE VEYA SEMT ÖLÇEĞİNDE AYRILAN AÇIK VE KAPALI TESİS ALANLARIDIR. BU ALANLARDA AÇIK VEYA KAPALI OTOPARKLAR İLE SEYİRCİ VE SPORCULARIN İHTİYACINA YÖNELİK BÜFE, LOKANTA, PASTANE, ÇAYHANE VE SPOR FAALİTELERİNE İLİŞKİN TİCARİ ÜNİTELER YER ALABİLİR.

1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;
EMSAL : 0.50
YENÇOK : 12.50 M (2 KAT)

YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

2.5.5. İBADET YERLERİ;

YAPI YAKLAŞMA MESAFESİ ARANMAZ. YAPININ ÖZELLİĞİNDEN DOLAYI ÇEKME MESAFELERİ VAZİYET PLANI İLE BELİRLENİR. 1/1000 ÖLÇEKLİ UYGULAMA İMAR PLANI İLE BELİRLENMEDİĞİ KOŞULLARDA YAPILAŞMA KOŞULLARI;

E:0.50
Y Ençok: SERBEST

2.6. AÇIK VE YEŞİL ALANLAR

2.6.1. PARK, ÇOCUK BAHÇESİ, OYUN ALANLARI;

İMAR PLANI İLE BELİRLENMEK VE MEVCUT AĞAÇ DOKUSU DİKKATE ALINARAK TABİİ ZEMİN VEYA TESVİYE EDİLMİŞ TOPRAK ZEMİN ALTINDA KALMAK ÜZERE, AĞAÇLANDIRMA VE BİTKİLENDİRME İÇİN YETERLİ DERİNLİKTE TOPRAK ÖRTÜSÜ OLMASI VE STANDARTLARI SAĞLAMASI KAYDIYLA OTOPARK VE HAVUZ İLE AÇIK SPOR VE OYUN ALANI, UMUMİ HELA, 1 KATI, H=4,50 M.'Yİ VE TABAN ALANI KAT SAYISI TOPLAMDA 0,03'Ü GEÇMEMEK, SÖKÜLÜP TAKILABİLİR MALZEMEDEN YAPILMAK KAYDIYLA; AÇIK ÇAY BAHÇESİ, BÜFE, PERGOLE, KAMERİYE, MUHTARLIK, GÜVENLİK KULÜBESİ, SPORCU SOYUNMA KABİNLERİ, TAKSİ DURAĞI, TRAFO GİBİ TESİSLERİN YAPILABİLDİĞİ, KENTTE YAŞAYANLARIN YEŞİL BİTKİ ÖRTÜSÜ İLE DİNLENME İHTİYAÇLARININ KARŞILANDIĞI ALANLARDIR. BU ALANLARDA KULLANIMA ÖZGÜ DÜZENLEMELER VE WC'LER DIŞINDA UYGULAMA PROJESİ BELEDİYESİNCE ONAYLANMADAN YAPI YAPILAMAZ.

2.6.2. REKREASYON ALANLARI

KENTİN AÇIK VE YEŞİL ALAN İHTİYACI BAŞTA OLMAK ÜZERE, KENT İÇİNDE VE ÇEVRESİNDE GÜNÜBİRLİK KULLANIMA YÖNELİK VE İMAR PLANI KARARI İLE BELİRLENMİŞ; EĞLENCE, DİNLENME, PİKNİK İHTİYAÇLARININ KARŞILANABİLECEĞİ LOKANTA, KAHVEHANE, ÇAY BAHÇESİ, BÜFE, OTOPARK GİBİ KULLANIMLAR İLE, TENİS, YÜZME, MİNİ GOLF, OTOKROS GİBİ HER TÜR SPORTİF FAALİYETLERİN YER ALABİLECEĞİ ALANLARDIR.

BU ALANDA YAPILAŞMA KOŞULLARI AŞAĞIDAKİ GİBİDİR;

3621 SAYILI KIYI KANUNU VE İLGİLİ YÖNETMELİK DOĞRULTUSUNDA DOLGU İMAR PLANI İLE ONAYLANAN REKREASYON ALANLARINDA;
EMSAL: 0,03
YEnçok:4.50 METRE (1 KAT)

YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

UYGULAMA İMAR PLANI KARARI TESPİT EDİLEN REKREASYON ALANLARINDA;
EMSAL: 0,05
Y Ençok:4.50 METRE (1 KAT)

ASMA KAT YAPILMASI HALİNDE TEK KATLI YAPILARDA YAPI YÜKSEKLİĞİ 5.50 METRE OLARAK UYGULANABİLİR. YAPI YAKLAŞMA MESAFELERİNDE PLANLI ALANLAR TİP İMAR YÖNETMELİĞİNE UYULACAKTIR.

Plan 4: Special Environmental Protection Zone of Fethiye to Gocek and Dalaman Bays Application of Procedures and Principles for Protection. Source: GDPNA, 2016

SPECIAL ENVIRONMENTAL PROTECTION ZONE OF FETHIYE TO GOCEK AND DALAMAN BAYS
APPLICATION OF PROCEDURES AND PRINCIPLES FOR PROTECTION

Purpose:

Article 1 defines the purpose of the principles and procedures that apply to the Fethiye-Göcek Special Environment Protected Region. The objective is to protect the biological diversity, and environment within the Gulf of Göcek Göcek-Dalaman Bays by the prevention of pollution within these areas.

Scope:

Article 2 - The scope of these measures within the Fethiye-Göcek Special Environment Protected Region,located in the Gulf of Göcek and Göcek - Dalaman Bays, covers the areas specified in the attached map.

Basis:

Article 3 - The legal framework for the measures is provided within the provisions of the 2872 Amendment Act 9 and 21, and the measures have been prepared in accordance with the provisions of Decree Law 383.

Definitions:

Article 4 - The following definitions apply for the implementation of the measures;

Ministry: Ministry of Environment and Forests
Organization: Special Environmental Protection Agency
Anchoring: Any mooring not attached to mooring facilities ashore.
Waste (foul) Water: black water, bilge water, ballast water, and any sludge contained within the hull.
Connecting Location: coastal facilities available, such as a pier, dock, etc.. binding site with the facilities do not exist in place of the land done by the bollard,
Anchoring: Holding the boat at sea with any device to the sea bed,
Ship: A vessel, regardless of name, purpose, tonnage and use or means of propulsion, other than a rowing boat propelled only by oars.
Gocek Bay and Göcek - Dalaman Bays: Fethiye and Göcek Special Environment Protected Region includes both the waters adjacent to the islands and mainland, and is defined by the coordinates set out below, and on the map attached.
Grey water: All water originating from bathroom, kitchen and sink, but isolated from black water systems.

Excursion Boat Trip: A journey by boat for the purposes of travel, sports, entertainment and tourism, commencing from and terminating in the same harbour on the same day. The vessel to be licensed for seaworthiness.
Solid waste: As defined by MARPOL 73/78 Annex V, solid waste resulting from domestic and operational activity, e.g. cartons, bottles, cans, oil cans, filters.
Coastal structures (plants): land-based structures to provide services to ships and vessels, including piers, quays, etc.
Dirty Ballast: Ballast which when discharged contains oil or petroleum or other products that may cause a slick on the surface, discoloration of the water or adjoining shore, or forming suspended solids / emulsion.
Waste Water: In general, the black water and grey water,
Bilge: The lower part of a vessel, where water and oily waste, originating from engines, auxiliary machinery, sub-tanks, coffer dams, holds etc. may accumulate.
Bilge Water: Any liquids that accumulate in the bilges.
Sludge: Sediments which may accumulate within fuel tanks or cargo tanks of oil tankers.
Water vessell: outside the ship, floatingwater that can be allocated and used in accordance with the purpose, all kinds of vessels tools and structure
Commercial Vessels: Vessels in excess of 250.000 tons (dwt)
Yacht: A vessel used for travel, sports and entertainment suitable for use in commerce for the purpose of sea tourism, having a cabin, toilet and kitchen, excluding freight vessels, passenger vessels and fishing boats.
Yacht harbour: A harbour providing a secure mooring for a yacht, with direct access on foot from ashore, having sufficient depth of water, and protected from the effects of wind and sea, licensed by Undersecretariat of the Prime Minister, with the technical and social infrastructure, management, support, maintenance and repair services.

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Principles:

Article 5 - The Gulf of Gocek, Dalaman and Göcek bay and pollution to the protection of the general principles of prevention are:

a) The measures applying to Fethiye-Göcek Special Environment Protected Region for biodiversity and environmental protection, pollution prevention, are to be observed by everyone.

b) The costs of preventing, limiting and recovering the effects of pollution and other environmental costs will be borne by the persons causing the pollution. In accordance with the Environmental Law and the Gulf of Göcek Göcek-Dalaman Bays, Law 6183, regarding the necessary expenditure and of the Debt Collection Procedure No. Amme.

c) Vessels without tanks for the storage of waste water are not allowed in the Gulf of Göcek and Göcek - Dalaman.

d) Vessels entering the Gulf of Göcek and Göcek - Dalaman must moor to an approved mooring, e.g. yacht harbor, pier, bollard, etc

d) Vessels with Gulf of Gocek, Dalaman and Göcek bays must adhere to the Regulation on Noise Pollution whereby music broadcast is prohibited.

e) Cooking on deck or ashore is prohibited with the Gulf of Gocek, Dalaman and Göcek coves.

f) Ships intending to enteri the Gulf of Göcek must complete the exchange of ballast water before entering the Aegean Sea.

g) Dirty water and oily waste may not be discharged within the Gulf of Gocek, Dalaman and Göcek Bay. Crude Oil, bilge water and ballast water contaminated with the waste of partners must be dischared to waste reception facilities and / or waste vessel..

h) Waste water discharged from ships within the Gulf of Göcek Göcek-Dalaman Bays will be recorded on the (Blue Card) chip initiated by the Muğla Provincial Directorate of Environment and Forests. The chip card will be made available for inspection by officials during inspections.

ı) Amateur and commercial vessels within the Gulf of Göcek Göcek - Dalaman will comply with Fisheries Law No. 1380 regulations regulating fishing.

GÖCEK KÖRFEZİ, GÖCEK-DALAMAN KOYLARI
KORUMA KULLANMA ESASLARI METNİNİN HARİTA EKİDİR