



Ecosystem services based spatial planning decision making for adaptation to climate changes



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ABSTRACT

Climate change adaptation is a rising global issue and has become the primary issue for transnational organisations and EU institutions. Particularly in developing and dynamic cities like Istanbul, the pressure of rapid urbanisation, institutional and legislative uncertainties are expected to create new vulnerabilities in ecosystems and their services. Climate change can cause new vulnerabilities in ecosystem services (ESs) through events such as floods, heat-waves, and droughts brought on by rises in temperatures and changes in precipitation. These vulnerabilities may affect the well-being of inhabitants and interfere with the reaching of sustainable development goals in the future.

Istanbul has a unique geographical location for biological diversity when compared with other settlements in the region, and the urban development dynamics of the region play a significant role in the well-being of ecological units and biological diversity of the Istanbul Metropolitan Area (Özhatay, Byfield, & Atay, 2003; Tezer, 2005; Tezer et al., 2008). This paper aims to define which ESs are vulnerable due to both LCLU change caused by urbanisation and potential impacts of climate change. Particular importance is given to the result of the survey done with related stakeholders as it is used to define and to verify the existing and future vulnerabilities of ESs in Istanbul. Regarding the close relationship between ESs and LCLU, the impact of changes in LCLU on key ESs are evaluated by developing LCLU scenarios. Climate change scenarios are used in this paper to understand the possible future climatic conditions of Istanbul and their impact on LCLU and ESs. These two sub-results are prepared according to scenario analyses and are evaluated together to address the future vulnerabilities of ESs. Integration of ESs and climate change adaptation strategies into spatial planning (EEA, 2010) seems to be both necessary and urgent. Therefore, a spatial planning framework that is climate change adapted and ESs oriented is proposed as a key tool to achieve a climate resilient, sustainable development in Istanbul. The framework used in this paper can be used to develop relevant strategies and planning tools by considering climate change adaptive policies for other rapidly developing settlements.

In brief, this paper aims to integrate ecosystems and their services into spatial planning by using relevant mapping of ESs, which will be utilised for the climate adaptive spatial policy development process for the Istanbul case. This paper has been prepared under the auspices of The Scientific and Technological Research Council of Turkey (TUBITAK) Project No. 110K350.

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Introduction

Planning and urban designers are constantly trying to establish a better “nature” and “development” against the impact of rapid industrialisation and urbanisation. Ultimately, the need for a better interaction of urbanisation, nature and community is beyond

beautification efforts such as those proposed by Burnham and Olmsted at the beginning of the 1900s. UN (2008) defines today's spatial planning with its key role in promoting sustainable development not only considering economic and social issues in urban areas but also focussing environmental dimension with its impacts and benefits. Therefore environment (built and un-built space of urban areas) has been becoming the interest of spatial planning as a result of integration among the components of sustainable development. This kind of approach is an urgent necessity, especially with the growing concern over the impact of climate change which

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includes changes in temperature, precipitation, vulnerabilities in the hydrological cycle, food chain and land cover-land use (LCLU). These are expected to increase the existing vulnerabilities of urban areas, especially in developing countries and can be accepted as a new challenge for sustainability.

According to scientific research and the Millennium Ecosystem Assessment (MEA) report of 2005, climate change will have a major impact on Ecosystem Services (ESs) in the following 50–100 years and will be the direct driver that may complicate the management and assessment of ESs at all scales. Both LCLU change due to urbanisation and climate change may create impacts on key ESs such as water, flood control, food production, climate regulation, recreation, and primary production services. It is obvious that LCLU decisions and investments in land have the power to affect the sustainability of ESs. The heat island effect of built up areas is also a significant outcome of urbanisation and may increase the temperature in urban areas more than climate change (Cadenasso, Pickett, & Schwarz, 2007). It is difficult to predict the future impacts of climate change and urbanisation on the existing social, physical and economical vulnerabilities of urban areas, especially in developing cities. Therefore, scenario analyses are efficient prediction tools to better respond the future dynamics and changes in cities. Research based on the impact of climate change and its effect on cities shows the need to analyse LCLU and climate change scenarios together (Cabello, Velasco, Barredo, & Hurkmans, 2011; Lindley, Handley, Theuray, Peet, & McEvoy, 2006; Storch & Downes, 2011). Understanding the possible future vulnerabilities and addressing the role

of ESs for climate adaptation may be a less-costly and environmental tool in climate change adapted planning. Finally, integration of planning with climate change mitigation and adaptation strategies has vital importance in the attempt to reduce of the impact of climate change on the environment and human well-being (EEA, 2010).

Istanbul is a unique example among rapidly growing metropolitan cities. It covers 5344 km² and has a population of over 13 million, with an increase of 23% occurring between 2000 and 2010 (TurkStat, 2012). The urbanisation ratio is around 90%, and it has the third highest gross domestic product among 78 OECD metropolitan regions (OECD, 2008). Istanbul geographically sits at the junction of two continents, and is within the climatic regions of Mediterranean and the Black Sea (Fig. 1). Therefore, its location plays a very significant role in the natural structure of the city. The existing pressures on the ecological units and biological diversity of Istanbul are expected to increase in the near future as results of increasing urbanisation, population growth and rapidly emerging economic activities (Özhatay, Byfield, & Atay, 2003; Tezer, 2005; Tezer et al., 2008). In addition to urbanisation, climate change can be accepted as a new challenge for the Istanbul Metropolitan Area, and its impact may increase the existing vulnerabilities of LCLU and ESs.

This research has been conducted in the border of Istanbul Metropolitan Municipality where built and un-built environment taken into account to identify the impacts of urbanisation on ESs. The main aim is to address future vulnerabilities of ESs to climate

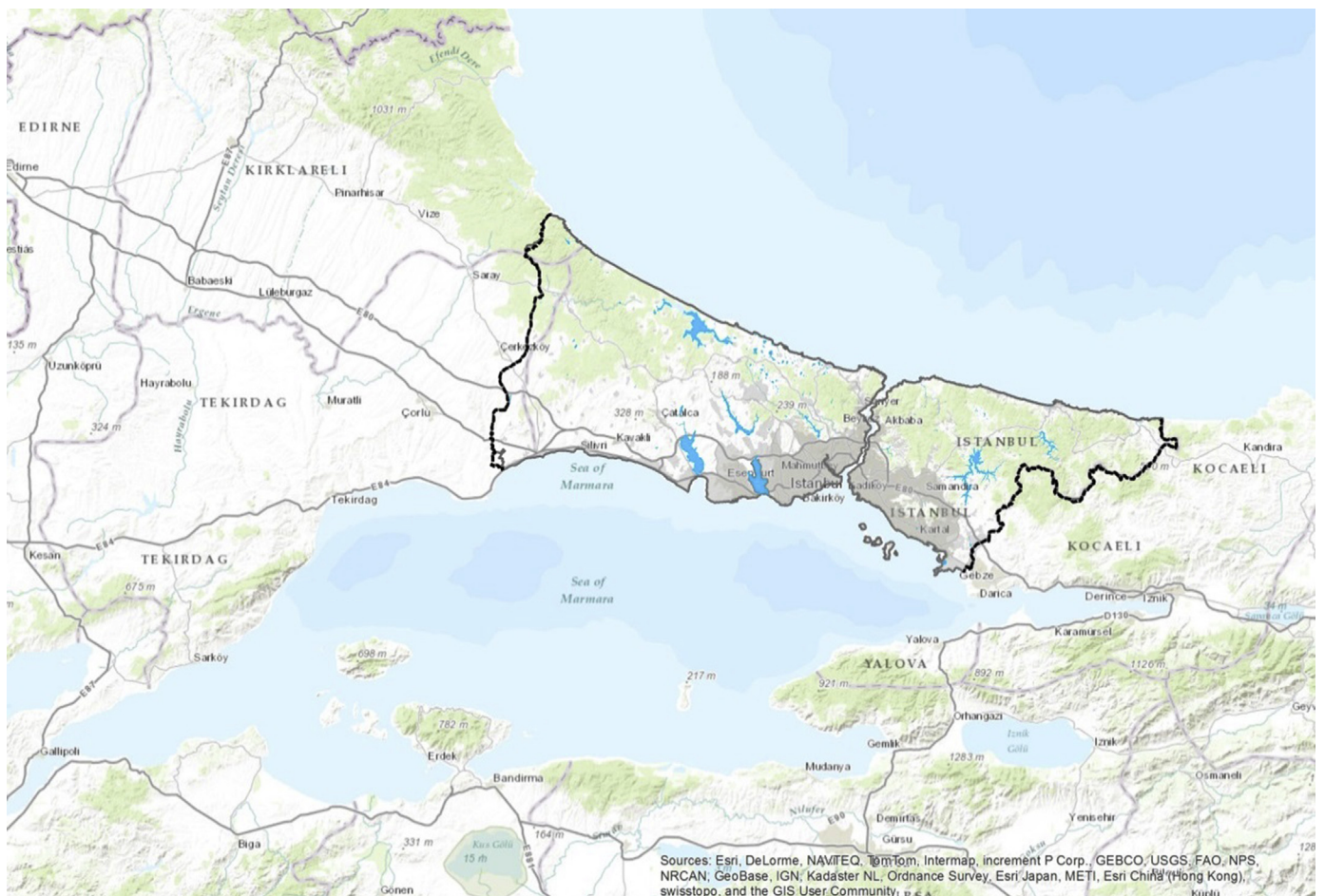


Fig. 1. Istanbul province – the study area.

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