MULTI-LEVEL WIND ENERGY TRANSITION IN THE TURKISH CONTEXT: SOCIO-SPATIAL SENSITIVITIES AND NUDGING CONDITIONS

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ABSTRACT

MULTI-LEVEL WIND ENERGY TRANSITION IN THE TURKISH CONTEXT: SOCIO-SPATIAL SENSITIVITIES AND NUDGING CONDITIONS

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Renewable energy development claims a contribution to sustainable living within the context of climate change and locally emerging environmental degradation problems. However, some existing practices lead to public opposition. The socio-spatial consequences of wind energy development taking place in the form of high-tech mega wind turbines within large-scale wind farms create unsustainable conditions in societies. This, in turn, requires a shift in the way it is practiced. By adopting a sociotechnical perspective, the study explores the public opposition context of wind energy transition in the case of İzmir. Accordingly, it discovers that wind energy development in the Turkish context is a long, intricate, bureaucratic, top-down, and multi-actor process carried out solely as a licensing issue. To overcome this, the thesis suggests the adoption of an inclusive spatial planning system integrating local level niche solutions and responding to local sensitivities. Nudging theory may guide the construction of such a mechanism involving and constructively activating all actor groups at all levels while maintaining a fair development. Additionally, socio-spatially sensitive site selection criteria should also be developed. The study confirms that environmental, economic, sensory, and technological sensitivities exist in İzmir and shows that participants do not prefer wind farms in their vicinity, and natural life, noise, and number of wind turbines are the most salient sensitivities. Assuming that socio-spatial sensitivities co-exist by affecting each other, even only one area is salient at more than 1km indicates that wind farms should be located in a distance above 1km from settlements, natural and culturally valuable areas, socio-economic activity areas.

Keywords: Wind Energy, Socio-spatial Sensitivities, Socio-technic Theory, Nudging Theory

ÖZ

TÜRKİYE BAĞLAMINDA ÇOK DÜZEYLİ RÜZGAR ENERJİSİNE GEÇİŞ: SOSYO-MEKANSAL DUYARLILIKLAR VE DÜRTME ŞARTLARI

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Yenilenebilir enerji gelişimi, iklim değişikliği ve yerel olarak ortaya çıkan çevresel bozulma sorunları bağlamında sürdürülebilir yaşama katkı sağladığı iddiasındadır. Ancak mevcut bazı uygulamalar toplum tepkisiyle karşılaşmaktadır. Halihazırda, yüksek teknolojili mega rüzgar türbinlerinin yer aldığı büyük ölçekli tesisler şeklinde gelişen rüzgar enerjisi geçişinin sosyo-mekansal sonuçları toplumda sürdürülemez koşullar yaratmakta ve mevcut uygulama biçiminde bir değişikliğe ihtiyaç duymaktadır. Sosyoteknik bir bakış açısı benimseyen çalışma, İzmir örneğinde rüzgar enerjisine geçiş sürecinde ortaya çıkan toplum tepkisini araştırmaktadır. Buna göre, Türkiye bağlamında rüzgar enerjisi gelişiminin oldukça uzun, karmaşık, bürokratik, yukarıdan aşağıya ve sadece lisanslama meselesi olarak yürütülen çok aktörlü bir süreç olduğu görülmektedir. Bu durumu aşmak için tez, yerel düzeyde niş çözümleri bütünleştiren, yerel duyarlılıklara yanıt veren kapsayıcı bir mekansal planlama sisteminin benimsenmesini önermektedir. Dürtme teorisi, adil bir gelişmeyi sürdürürken dürtme alanlarını olumlu bir şekilde harekete geçirerek, her düzeydeki aktör gruplarını içeren bir mekanizmanın inşasına rehberlik edebilir. Buna ek olarak, rüzgar enerjisi tesisleri için sosyo-mekansal duyarlılıklar çerçevesinde yer seçim kriterleri de geliştirilmelidir. Çalışma, İzmir için çevresel, ekonomik, duyusal ve teknolojik duyarlılıkların geçerli olduğunu ortaya koymakta; katılımcıların çevrelerinde rüzgar santrallerini tercih etmediklerini; doğal yaşam, gürültü ve rüzgar türbin sayısının en belirgin duyarlılık alanları olduğunu göstermektedir. Sosyo-mekansal duyarlılıkların birbiriyle etkileşimde olduğu varsayıldığında, 1km ve üzeri bir mesafede tek bir duyarlılık alanının dahi öne çıkması, rüzgar enerjisi tesislerinin yerleşim yerlerine, doğal ve kültürel açıdan değerli alanlara, sosyo-ekonomik aktivite alanlarına 1km ve üzerinde bir mesafede konumlandırılmasını gerektirmektedir.

Anahtar Kelimeler: Rüzgar Enerjisi, Sosyo-mekansal Duyarlılık, Sosyo-teknik Teori, Dürtme Teorisi

To my little army of *B*s…

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ABBREVIATIONS

CWEAEM: Canadian Wind Energy Association and Evironmental Monitor

dBA : Decibels A

DA : Development Agencies

DEADP : Department of Environmental Affairs – Cape Town

DWTMA : Danish Wind Turbine Manufacturers Association

EC : European Commission

EEA : European Environmental Agency

EIA : Environmental Impact Assessment

EİGM : General Directorate of Energy Affairs

EMMI : Energy Markets Management Incorporation

EMRA : Energy Market Regulatory Authority

EPA : Environmental Protection Act

IEA : International Energy Agency

IPCC: International Panel on Climate Change

İZKA : İzmir Development Agency

MD : Ministry of Development

ME: Ministry of Economy

MENR : Ministry of Energy and Natural Resources

MEUCC : Ministry of Environment, Urbanism and Climate Change

MFA : Ministry of Foreign Affairs

MIT : Ministry of Industry and Technology

MW : Mega Watts

NGO : Non-Govermental Organization

NUTS : Nomenclature of Territorial Units for Statistics

NIA : Northern Ireland Assembly

NIMBY : Not In My Backyard

SBB : Presidency of Strategy and Budget

SNH : Scottish Natural Heritage

SPO : State Planning Organization

TEA : Technical Interaction Analysis

TEIAŞ : Turkish Electricity Transmission Corporation

TÜİK : Turkish Statistical Institute

TÜREB : Turkish Wind Energy Association

UNFCCC : United Nations Framework Convention on Climate Change

US EPA : United States Environmental Protection Agency

VOR : Very High Frequency Omni-Directional Range

WHO : World Health Organization

YEGM : General Directorate of Renewable Energy

YEK : Renewable Energy Source

YEKA : Renewable Energy Resource Areas

YEKDEM : Renewable Energy Resources Support Mechanism

CHAPTER 1

INTRODUCTION

This chapter introduces the aim of the study and the rationale. It provides the research questions and a brief presentation of the methodological framework used in this research. Finally, it discusses the significance and contributions of the study.

1.1 Aim of the Study

The thesis takes a departure from the assumption that renewable energy development is beneficial, inevitable and contributing to sustainable living, and yet develops around a discussion that existing renewable energy development practices lead to public opposition and within such practices, socio-spatial precautions can diminish this opposition. In this assumption, the underlying acknowledgement is that the existing political-economic (capitalist) system and the solutions (products and processes) produced in this system will continue. In the case of wind energy development, this takes place as an outcome of multi-national and/or national partnerships and holdings and in the form of high-tech mega wind turbines within large-scale wind farms.

Research shows that existing practices have socio-spatial consequences that require a shift in the way in which wind energy development should take place. Wind energy development may still be inevitable but the way it is practiced creates unsustainable conditions in societies. This study claims that there are two reasons underlying these conditions. One refers to the lack of handling wind energy development not only as a technical but also as a social issue. The other refers to the lack of coping with the wind energy transition as a multi-level issue. These issues are interlinked in the sense that while the technical aspect of wind energy development takes place at the global scale, the social aspect emerges when the development is implemented locally.

The partnership between academia and industry promotes the technological advancement of wind energy. Consequently, a number of specializations about the mechanics (e.g. aerodynamics, electromechanics, structure and material design) of wind turbines and a system for storing and transmitting the energy has grown. Available funds of national and international organizations also support this (e.g. European Comission renewable energy financing mechanisms,TÜBİTAK Priority Research Development Innovation Topics: energy focus). However, the implementation of this technology creates a major impact at where the technology is installed. Local societies do not always benefit from a large-scale wind energy development system that provides electricity in other regions while causing accumulated nuisances and disturbances for the locality. Societies are not always taken into consideration in the planning process of wind energy development. The social dynamics behind the technical deployment are disregarded. Wind energy development does not only create the technology for transforming wind power to electricity, but it also impacts societies and their relationships with energy production. What is socio-culturally and cognitively constructed is actually beyond what is technically seen in reality. And this has collective emotional associations that in fact generate saturation, and in turn, translate into public opposition. This does not actually target the implementation of the system details, but it becomes a collective act against the whole existing system. This, therefore, makes wind energy development both a technical and a social issue that requires handling both together.

Furthermore, technological advancements are often supported via global networks by universities, research centers, and the private sector. The nations adopt existing legislations and regulations to support that. Consequently, local plans are developed in synch with legal implications of such global practice. This often takes place in a hierarchical manner although in some countries like Germany (Ohl and Eichhorn, 2010) and Sweden (Lauf et al., 2020) wind energy planning is initiated at the local scale, in others like Turkey existing local plans are changed once wind energy licensing by investors is taken at the central level. Wind energy technological development and its planning lack coordination and dialogue with localities. It is often taken with a top-down approach yet not as a process for consensus-building across local, national, and global.

One way can be an amelioration of the planning process into becoming more inclusive and a change in the planning system that relies on stronger coordination and dialogue within the hierarchy of existing plans (neighborhood, urban, regional, national). This provides clues mainly on two issues: 1) site selection; 2) public participation in planning. Another way calls for a deeper understanding of the social dynamics behind the technical deployment of wind energy.

The wind energy technology developed globally leads the formation of an enabling legislative and regulative basis for wind energy development. This, thereby, guides the development of wind-prioritized plans to be implemented locally. Since legislative regulations consider wind energy as a technical issue and focus on its expansion from an energy production perspective, the direct impact of the physical presence of wind energy installations on societies remain out of the agenda. However, while the technological transmission of wind energy is hierarchically imposed from global to local, the impact of the technological aspect of wind energy is felt at the local.

Within this context, wind energy development calls for a socio-technical approach to be applied in a multi-level manner. Respectively, this study defines *wind energy transition as a socio-technical process*. It also claims that wind energy transition should be moderated through *multilevel thinking*.

By adopting a **socio-technical perspective**, the study searches a way to integrate local specific (contextual) *social* issues at the local level with the *technical* ones at national and international levels about wind energy deployment. To do that, first, the study aims at **identifying and examining socio-spatial sensitivity issues in wind energy transition** at a local scale. It takes the Province of İzmir as a case area, being the most concentrated wind energy development region while receiving high public opposition. Second, the study aims at **deciphering the wind energy development process** in the Turkish context to explore the gaps in legislation amending an inclusive planning process so that plans become socio-spatially sensitive to wind energy development. It also aims at **understanding the possible conditions nudging involved actors in wind energy transition** and explaining the underlying reasons for the social dynamics of public opposition.

The problem statement and research questions (RQ) are posed as follows:

Problem statement: Top-down wind energy development decisions that often have no consideration of the localities in which decisions are implemented lead to crisis among actor groups at multiple levels (actor groups taking place at the central - institutional level during the planning process and the contextual local actor groups taking place at the contextual level during the implementation and post-implementation process) (Figure 1.1).

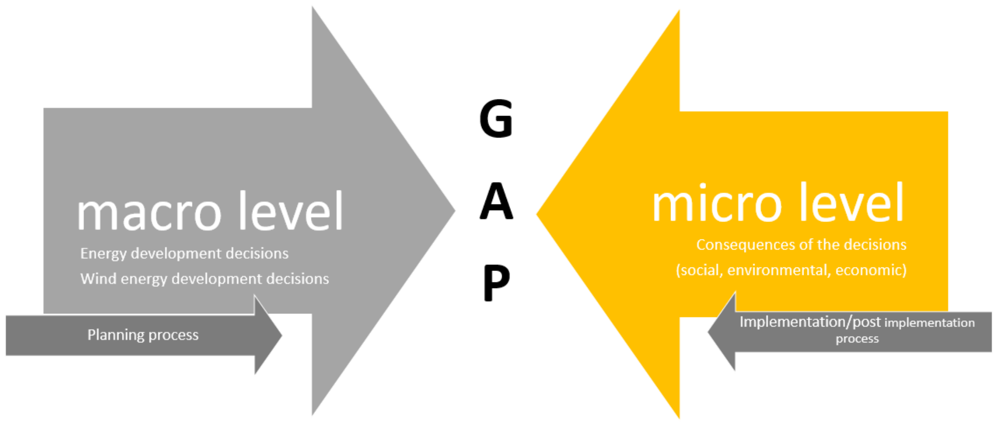

Figure 1.1. Macro and micro level relation

Main Research Question: How does wind energy transition lead to public opposition?

Sub-research questions:

SRQ1. How does wind energy transition take place in planning process?

SRQ2. What are the underlying socio-spatial sensitivity issues for public opposition within the context of İzmir case?

SRQ3. What may be the conditions nudging involved actors in wind energy transition within the context of İzmir case?

Responses to these research questions revealed two issues that call for further research. One is about the politics in power relations among actor groups in the existing wind energy development system. The other calls for focusing on explaining the conflictual situation regarding the "collectively constructed opposition against wind energy development" within a multi-level context.

This thesis will further elaborate on the second issue and develop possible explanations based on the "theory of nudging" benefiting from the research findings on social sensitivity. The first will be a topic of another research. Following Figure 1.2 illustrates the conceptual theoretical framework developed for the study.

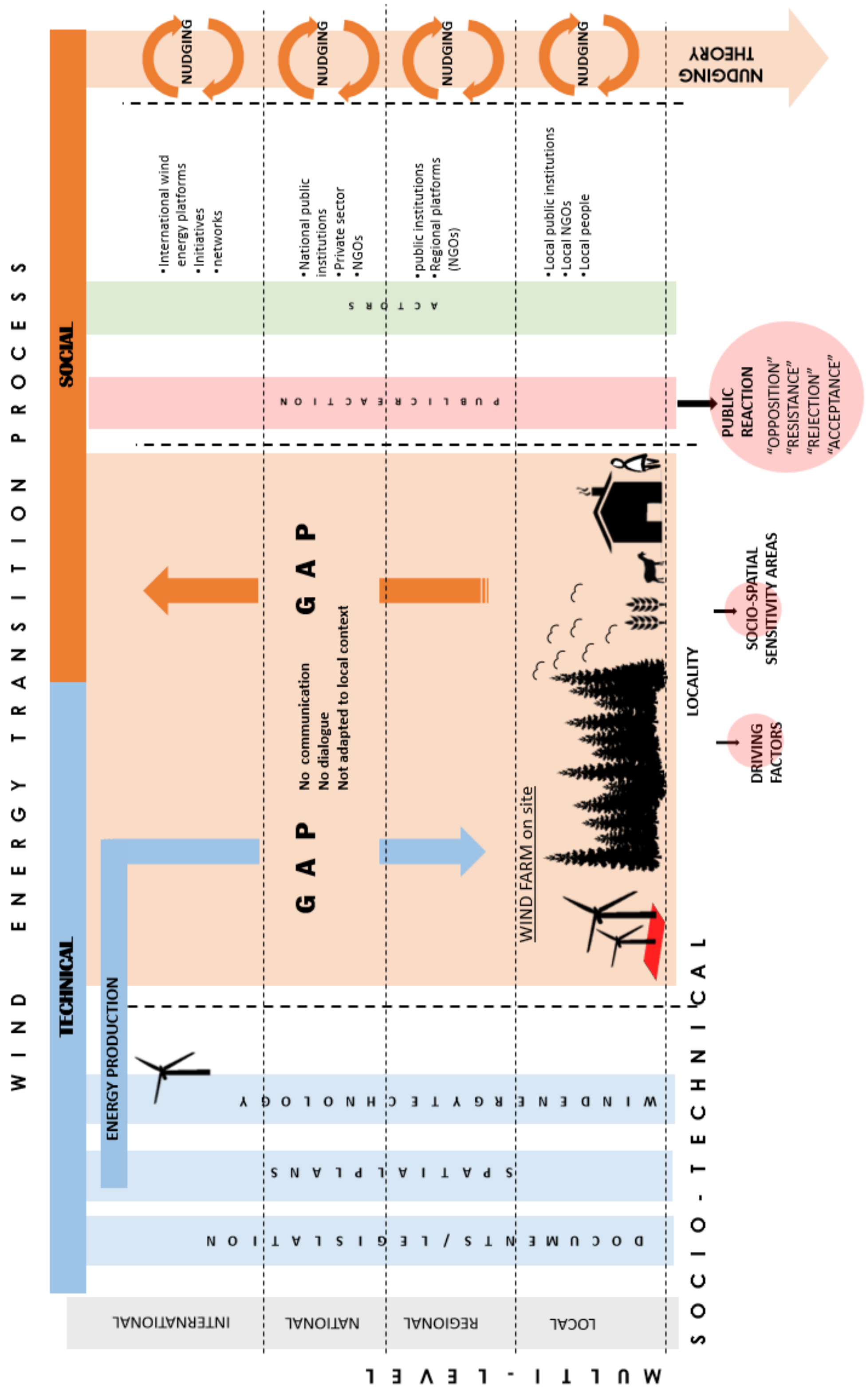

Figure 1.2. Conceptual framework for the theoretical structure of the thesis

1.2 Rationale of the Study

Research since the 1970s indicate that the world is encountering with major issues such as global warming and environmental problems. In other words, the world is exposed to a "human driven climate change with global mean surface temperature increasing since the late 19^{th} century" (Tatchley et al, 2016, p.1) due to the tremendous industrial growth experienced along with urbanisation and population. The potential ecological, social and economic impacts of these changes are profound and widespread. Research since the 1980's clearly shows that the two-third of the causes of global warming is related to energy consumption (IEA, 2015) which has nearly doubled itself from the 1970s until 2013 (Yanıktepe et al, 2013). Today the rate of fossil fuels in total primary energy supply has reached to 80% (IEA, 2021). Therefore, it is essential to consider long-term solutions to human energy problems immediately.

Turkey does not show a very different picture than this either. Turkey's current energy profile heavily relies on unsustainable foreign resources (fossil fuels). TEIAŞ (2015) (Turkish Electricity Transmission Corporation) documents that approximately 70% of the energy production in 2014-2015 was based on fossil fuels (natural gas/coal/petrol). However, such resources are quite limited in Turkey. For instance, the consumption rate of production of all these three resources has remained below 10% in 2008 (MENR, 2010). MFA (2015) report illustrates that Turkey imports nearly 99% of the natural gas it consumes and around 89% of its oil supplies.

Both these global and national energy related problems call for a vital behavioral change on energy production. At this point "sustainability" becomes significant as an umbrella strategy. Different actors in various countries try to realize the "sustainability condition" through adopting different types of interventions at different scales (Tekeli, 2016). In this respect, renewable energy transition becomes one of the areas to pursue in order to limit the scale and impacts of global climate change (Tatchley et al, 2016). This brings out the potentiality and the necessity of wind energy use that is and will be available as long as the natural life cycle continues.

The cost of converting such renewable energy resources to electricity is relatively low, and this makes them attractive and highly marketable for industrial development (Gunnarsson and Gunnarsson, 2002; Ragnarsson et al., 2015).

Wind energy is one of the key renewable energy sources for the electricity generation identified by the Ministry of Energy and Natural Resources (MENR, 2010). MENR (2015) aimed at doubling the existing installed capacity for wind energy in 2019 (reaching 10000 MW) in order to achieve the government's target of maximizing the amount of national renewable energy resources within the Turkish energy production system and delivering 30% of the consumed energy from renewable energy resources by 2023.

Such wind energy developments raise not only technological considerations but they also have social, environmental and economic dimensions. Overlooking these dimensions can lead to public opposition. Research focused on public attitudes towards wind energy is crucial, since significant body of literature (Aitken, 2010; Bell, Gray & Haggett, 2005; Ellis et.al 2009, Haggett & Toke, 2006) shows that the perception of such attitudes are key to planning outcomes and can be a barrier to installations.

Numerous reactions against wind energy transition have occurred in the past in varying localities in the world such as NIMBY (not in my backyard) movements (Gipe, 1995; Krohn & Damborg, 1999; Simon, 1996; Wolsink, 1998), movements related with environmental degradation concerns (Woods, 2003). This situation puts attention on the necessity of designing wind energy development as a social process as well as a technical and bureaucratic process. Such processes should take into account experiences and preferences of the general public and ensure the participation of interested groups and their shared action towards a socially acceptable development.

The local context where a "technology" is deployed may affect the success or failure of that technology (Guy and Karvonen, 2011). In other words, not only technology but also the inhabitants or end users are significant for the success of new technologies (Brown and Sovacool, 2011). Technology has a wider meaning in this regard, ranging from such technologies associated with sustainable development as solar panels, wind generators to artefacts used in daily lives. As Guy (2013) indicates, "the critical concern here is that the contingent complexities of sustainability becomes ignored by focusing on superficially universalized systems of measurements as a guide through cultural diversity" (cited in Peker 2016, p. 81). Guy (2013) indicates that 'forms of local knowledge' and 'particular local conditions' are ignored due to this 'standardization'. Technology is a product of not only scientists and engineers but also a variety of other actors such as policymakers and users. In this respect, "in order not to fall fallacy of technological determinism" embracing a 'co-constructivist' approach is appropriate for a better technology and society relationship (Guy and Karvonen, 2011, Peker, 2016, p, 81).

Within this respect, wind energy transition process requires an interpretation as a socio-technical system in which local people and wind energy technologies interrelate through the political, cultural and economic realities of the urban daily life apart from wind energy technology itself.

1.3 Importance of the Study

Whilst there is an established international body of literature relating to social dimensions of renewable energy developments, studies in Turkish context are inadequate. Given the Turkish Government's commitments to increasing deployment of wind energy combined with increasing localised public opposition to proposed developments, there is a pressing need for social science research to examine and address social dimensions of renewable energy development in the Turkish context and to build on and contribute to the established international literature. This study represents a timely exploration of social sensitivity factors relating to wind power developments in Turkey in order to develop appropriate and socially just development of wind power in Turkey. On the other hand, the study will also contribute to the national and international literature by introducing an alternative perspective inspired from the theory of nudging in order to explain the collectively constructed negative emotion against wind energy development.

1.4 Contribution of the Study

This study aims at making a **scientific contribution** in a number of ways. First, since there is a lack of studies relating to the Turkish context, this study represents one of the first studies which connects the social issues to wind energy in Turkey. The Turkish government set a goal within a prioritized public interest framework to increase wind energy production applications and to improve incentives for the private sector. This, however, often results in neglect of societal priorities and public opposition, and, in turn, calls the need to investigate the areas of improvement towards publicly more sensitive applications in wind energy transition. Such public responses show that there is a need to view wind energy development as a social process. Taking this as a point of departure, the proposed study determines social sensitivity areas associated with wind energy development in a systematic manner, taking account of contextual characterizations and the differences among interest groups. In Turkey, wind energy development is a multi-dimensional and a multi-actor process and the society plays a relatively small role in it. As a result, the process consists of reactional dynamics rather than compromises. Therefore, it is important to understand the process actors' active citizenship and self-managing capacity, their movement range and forms on the basis of the context in which they are in and the way these factors affect their social sensitivities towards wind energy development. This study will determine Turkish specific social sensitivity areas and contribute to the international scientific literature in terms of associating the findings with the contextual characteristics.

On the other hand, as experience in other countries has shown, public support may be crucial for the realisation of renewable energy targets (Aitken et al, 2016). Moreover, given that local communities often experience a range of impacts from energy developments it is important to include such individuals in planning processes to ensure that adverse impacts are minimised, that affected individuals are compensated and that local communities can benefit from energy developments in their vicinity. In this respect, this study will evaluate the current application of Habermas' theory on communicative rationality in practice regarding the participatory planning processes as a way of realizing communicative rationality (1984). It elaborates its appropriateness and adequacy of the communicative rationality theory within the context of a wind energy development process in a Turkish case.

This study also makes a **practical contribution**. Turkey does not have spatial regulations such as wind farm's minimum distance to the residential areas, its cumulative effect, and land use. The study findings can be used to develop guidelines for constructing a policy towards that end.

The study is conducted in pursuit of a methodological framework that allows meaningful and valid interpretation to address its aims both for theory and practice. The study is designed to adapt a mixed-use of objective, subjective, and dialogue-based methods and techniques for the first two research questions. For the third research question, the study designs a analytical framework from the theory to draw conclusions from the documents and practical experiences in wind energy development The combination of various research approaches constitutes the **methodological contribution** of the study. The methodological framework jointly uses the methods and tools with different pros and cons so that the validity of the results are consistent. This curbs the risk of limitations in the results which could be unavoidable if a solitary approach was used. The methodology, in pursuit of a mixed-use approach, is commonly used in social studies but no study has been recorded that used it before in the Turkish context to investigate the social sensitivity areas associated with wind energy development.

1.5 Content of the Study

Thesis is composed of six main chapters apart from introduction and conclusion. Introduction chapter presents the research focus and the rationale for the thesis. Later chapter draws a theoretical framework with respect to the socio-technical approach and introduces the joint perspective to better understand the interrelation across multi-level dimensions and issues of wind energy transition.

Chapter three is dedicated to the fundamental concepts regarding the relationship between wind energy and society. This chapter, firstly, introduces theoretical discussions on the social dimension of wind energy development process with respect to NIMBY phenomenon; secondly, focuses on the socio-spatial sensitivity areas emerged during wind energy production process.

Chapter four presents the theoretical context of the nudging theory with respect to multilevel wind energy transition in order to better understand the behavioral aspect of public opposition against wind energy developments. This chapter presents the possible impact of nudging on achieving or preventing wind energy deployment.

The following chapters concentrate on the research methodology, and the findings of the study. Chapter five introduces the methodological framework of the study including the research approaches, fieldwork process, socio-spatial and nudging variables, data gathering and data analysis techniques. Chapter six presents the research findings of the study regarding the wind energy development process in the Turkish context including national legislations, incentive mechanisms, and local level planning processes benefitting from the documents reviewed, in-depth interviews and focus group studies conducted with national and local public authorities, representatives of the wind energy investors, consultants and civil society organizations. The chapter also introduces the case study area İzmir and the selected research sites.

Seventh chapter presents the findings about the socio-spatial sensitivity areas and the multi-level nudging framework for the wind energy transition. This chapter, firstly, introduces the research findings of the site survey carried out with the inhabitants of the selected settlements and reveals the inhabitants' insightful descriptives of the socio-spatial sensitivity areas. The later sections present the analysis of the multi-level nudging context of wind energy transition with respect to NIMBY attitude.

Finally, in the conclusion part the evaluation of the findings and suggestions for new perspectives on wind energy generation integrated with the society are given.

CHAPTER 2

UNDERSTANDING WIND ENERGY TRANSITION THROUGH A SOCIOTECHNICAL PERSPECTIVE

This chapter introduces the sociotechnical approach that this study has adopted in the exploration of the socio-spatial sensitivity areas in wind energy transition. The study defines wind energy transition as a sociotechnical process considering the social issues taking place at the local level such as individual and collective human responses/sensitivities, public opposition, as well as the technical issues such as planning process, requirements of wind energy technology, legislations regulating the relations between all these aspects, taking place at the national and international levels. Thus, it adopts a joint perspective to better understand the interrelations across multi-level dimensions through multi-actor aspects of wind energy transition.

This chapter presents the theoretical framework of this perspective, the Multi-Level Perspective, which also constitutes the theoretical ground of this thesis. It is developed based on sociotechnical system thinking, thus this chapter investigates existing discussions on that. It also introduces current studies on the multi-actor environment in relation with the multi-level structure within the context of sociotechnical systems.

2.1 Sociotechnical Perspective

In contemporary cities, humans are in great interaction with a wide range of technologies in their everyday lives including the most basic ones including feeding and shelter, as well as large scale urban infrastructures such as transportation, communication, and energy. According to Tarr and Konvitz (1987, p.195), “urban infrastructure provides, what may be called, the vital technological sinews of the modern city: its road, bridge and transit networks; its water and sewer lines and waste disposal facilities; and its power and communication systems. These sinews permit urban functioning and facilitate urban economic development". This stresses on the inevitable relationship between humans and technology in which 'cultural, social, and political implications are intimately tied' (Guy and Karvonen, 2011).

Urban energy production is one of the activity areas in which the society meets the technology. When considered wind energy transition in the urban energy production systems as an inevitable consequence of the requirements of current challenges and socio-political circumstances in cities (e.g. carbon reduction in face of climate change issues), it becomes essential to understand the underlying social and technical dynamics and their relationships. Guy and Karvonen (2011) emphasize that technological development is strongly intertwined with and influenced by social changes. Many scholars (Bijker et al., 1987; Latour, 1993; MacKenzie and Wacjman, 1999a,b; Misa et al., 2003) also highlight the mutual relationship between technology and society. When this understanding is applied to a spatial context through the disciplines of architecture, urban planning and geography, the definition of technology is also taken from a broader perspective. It includes the technological artefacts along with 'the knowledge required to construct and to use these artefacts, as well as the practices that engage them" (Guy, 2009, p. 232; Guy, 2010).

Within this framework, Guy and Karvonen (2011) suggest the sociotechnical research approach as lenses allowing the understanding of the city's complexities through the configuration of people, nature, and technology. According to them, there are four common perspectives of urban technologies including 'contextuality', ' contingency', 'obduracy', and 'unevenness' (2011, p. 123,124). These are defined as follows:

1) Contextuality: ***"****Technological development processes are contextually based. While it is possible to transfer techniques, skills and knowledge between different* *places, processes of translation and interpretation dictate the success or failure of technologies in particular locale…"*

2) Contingency: "*Technological development is a contingent process. This refers to the wide variety of actors and contextual factors that shape technologies, and, in the process, create multiple pathways or alternative routes by which technologies are realized..."*

3) Obduracy: "*Urban technologies are long lived and they are embedded in a complex array of material realities, social habits and institutional standards…"*

4) Unevenness: "*Process of sociotechnical development are often uneven. Technologies can replicate and exacerbate existing hierarchies and class distinctions, creating interstices and recesses of partial or no service rather than a level playing field for all urban residents."*

The performance of urban technologies is not only about the technical aspects but also related with the social contexts (Guy and Karvonen, 2011). This situation highlights the importance of the users/inhabitants and the social actors besides the technical expertise. Therefore, in order to avoid the technological determinism, this puts forward the need for adopting a 'co-constructivist' perspective (Guy and Karvonen, 2011) that argues for an ongoing construction of things through a mutual relationship and exchange between technology and society. In this respect, instead of 'standardization' (Guy; 2013) which disregards local knowledge; the 'forms of local knowledge' and 'particular local conditions' need to specifically be taken into consideration. The sociotechnical approach allows one to "explore the ebbs and flows of urban change, the subtleties and ambiguities of human choice, and the plasticity and obduracy of urban form" (Law, 2004, p. 9).

Taking this as a point of departure, this thesis argues that wind energy transition cannot be considered only as a task to be done by technical experts, namely planners, designers and engineers, but it should also be seen as a process of development and management under the guidance of 'non-technical' actors. This, then, makes salient not only the technology but also the society who is an important component in the construction of this phenomenon.

In order to define a sociotechnical perspective for the transition of wind energy production, the following part introduces a discussion on sociotechnical system thinking, the development of this concept, and the dynamics related with the co-construction of technology and society.

2.2 Sociotechnical System Thinking

The sociotechnical system concept was introduced to emphasize the mutual interaction between social (people) and technical systems (Ropohl, 1999). It was first coined within the field of organizational management that focused on the social and the technical aspects of work life. This provides a theoretical basis today suggesting that technical and social systems can function efficiently as long as they are handled with a joint understanding (Peker, 2016).

Considering the technological transition processes, Geels (2002, p.1257) states that there are not only 'technological changes, but also changes in elements such as user practices, regulation, industrial networks, infrastructure, and symbolic meaning". Moreover, he argues that technology can only perform its duties in cooperation with human action, social structures, and organizations. Sociotechnical systems are, in fact, the outcome of human activities, they are embedded in social groups with shared characteristics such as roles, responsibilities, norms, perceptions (Geels, 2004, p.901).

Geels (2002) exemplifies and conceptualizes the sociotechnical configuration for land-based personal transportation which includes both social and technical elements (Figure 2.1). In such a configuration, a variety of internal and external elements are interlinked in order to accomplish the transportation function. Internal elements are directly related with the technical side of the vehicle/artefact itself. These internal elements consist of the 'drive train' including engine, transmission, and wheels;

‘suspension’; the ‘body’ with material and structural configurations; as well as accessories and control systems covering brake and steering systems. External elements are composed of a wide range of socio-institutional frameworks including culture and symbolic meanings such as freedom and individuality; economic issues regarding finance rules, interest rates, and insurance premiums; legal frameworks such as regulations and policies related with traffic rules, environmental standards, car taxes and parking fees; markets and user practices in terms of mobility patterns and driver preferences; physical urban structure concerning road infrastructure and traffic systems; as well as other personal transportation-related economic sectors including industrial structure covering car manufacturers and suppliers; maintenance and distribution networks (repair shops, car sales and showrooms); fuel infrastructure including petrol stations and oil rafineries.

The wind energy transition can also be explained as a sociotechnical system. The sociotechnical configuration of energy production from wind energy primarily includes wind turbine as the technical artefact. Wind turbine itself consists of such technical elements as aerodynamic, structural, electromechanical design aspects as well as the systems regarding infrastructural integration (grid integration); grid system infrastructure; wind farm/wind energy installation design covering topographical analysis and micro-siting; maintenance (repair services); industry structure including turbine manufacturers. Its social elements refer to a legal framework regarding regulations and policies related with wind farm site selection, environmental standards; financial issues such as funding mechanisms and tax regulations; socio-cultural frameworks including inhabitants/users’ preferences and perceptions.

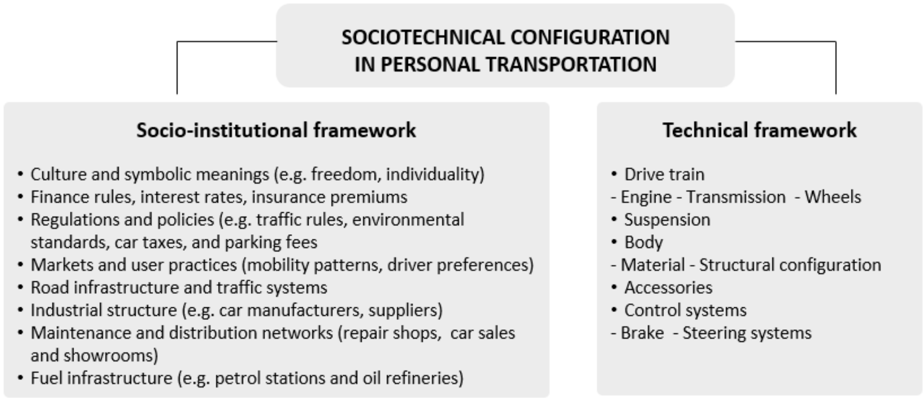

Figure 2.1. Elements of the sociotechnical configuration in personal transportation (adapted from Geels, 2002, p.1258)

Within this framework, Geels (2004) considers sociotechnical systems composed of sub-functions such as production, diffusion, and use of technology. He indicates that many specialized social groups are related to these sub-functions via certain roles and responsibilities, and they are in a dynamic interaction with each other (Figure 2.2).

According to Geels's (2004) representation, production sub-function is about the production of the technology and carried out mainly by technical actor groups as designers, engineers, producers regarding firms and industries as well as research institutes (e.g. universities, laboratories). Diffusion sub-function is related with the distribution of the produced technology, and includes of national and international networks (e.g. national governments, World Trade Organization) as the actor groups. Final sub-function is about the use of technology, and includes societal groups of consumers as individual users along with civil society organizations.

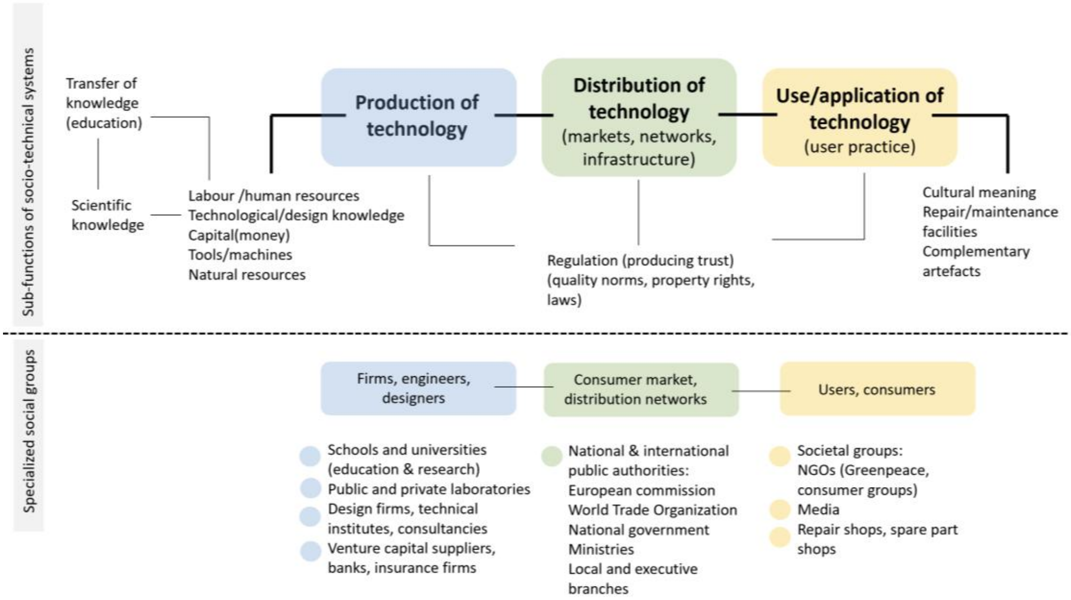

Figure 2.2. Sub-functions of sociotechnical systems and related specialized social groups (adapted from Geels, 2004)

This perspective is often applied to manufacturing processes in industrial structures, commonly defined as a set of firms producing similar or substitute products (Porter, 1980). It claims that although firms and industries represent salient actors in production; other groups such as users, societal groups, public authorities, and research institutes should also be taken significantly into account. There are linkages between different social groups creating 'stability' within the sociotechnical configurations of a production process. The activities of different groups taking place in such sociotechnical configurations are aligned to each other and coordinated. This perspective brings about two issues. One is the "multi-level" aspect of any such processes, referring to the idea that each social group's activity takes place at a different level. The other consists of the interactions between social groups.

Respectively, coping with wind energy transition processes also requires a perspective that does not only looks from a technical eye but also considers the social environment emerging at multi-levels across multi-actors. Within the context of wind energy transition, the implementation of wind energy technology cannot be considered as a solely technological innovation act. As Long and Long (1992) assert, it should be dealt as an on-going transformational process in which different actor interests and struggles are integrated and socially innovative solutions are sought.

2.3 Multi-Levelness

Long-term and large-scale changes in technology require a wider perspective to take into account the impact of all components within a network of sociotechnical processes. These components take place at different levels while interacting and constructing new emergences at and across these levels. There are numerous studies that recognize this and adopt a multi-level framework to their work (Kemp, 1994; Schot et al., 1994; Rip and Kemp, 1998; Kemp et al., 1998; Van den Ende and Kemp, 1999; Rip, 2000; Geels and Kemp, 2000; Kemp et al., 2001). One of the most widely referred one is Geels' (2002) study. He (2002, p.1259) introduces 'different levels' as "analytical and heuristic concepts to understand the complex dynamics of sociotechnical change". Focusing on the relationships between the elements in the network configuration, he emphasizes three different levels "as a nested hierarchy": *niches*, *patchwork of regimes* and *landscape*. According to him, "the nested character of these levels, means that regimes are embedded within landscapes and niches within regimes".

The activities of a variety of groups are coordinated within a nested context of a series of rules and regulations in different levels both during the production process and in the use of products. Geels (2002) explains the multi-level perspective starting from the formation of the "technological regimes", which stand at the meso-level of his conceptualization. They are "the outcome of organisational and cognitive routines" creating stability and guiding innovative activities. Technological regimes are influenced by the relations between a variety of actors such as users, policy makers, societal groups, suppliers, scientists, and capital banks, which take place at both upper and lower levels. In this respect, by locating sociotechnical regimes at the meso-level, he argues that the stability of these regimes is provided by the “sociotechnical landscape” at the ‘macro-level’ setting structural rules and regulations to coordinate and orient the activities of actors/social groups. At the ‘micro-level’, radical innovations emerge in niches. Niches “provide locations for learning processes and space to build the social networks which support innovations” (Figure 2.3). In other words, innovative developments take place in niches at the local level and influence the processes in the patchwork of technological regimes at the upper level. Thus, this interaction initiates a transformation and creates a pioneering regime that breaks the robust macro-level landscapes and ends up with a new regulation.

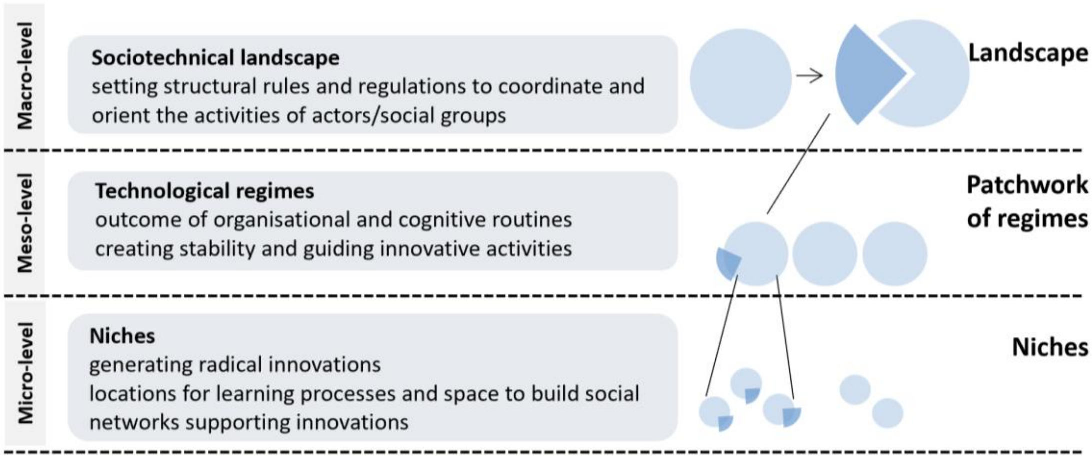

Figure 2.3. Multiple level framework conceptualization as a nested hierarchy adapted from Geels, 2002

Geels (2002, p. 1261) summarizes the importance of this multi-level perspective as follows:

> *The nested character of these levels, means that regimes are embedded within landscapes and niches within regimes. Novelties emerge in niches in the context of existing regimes and landscapes with its specific problems, rules and capabilities. Novelties are produced on the basis of knowledge and capabilities and geared to the problems of existing regimes. New technologies are initially developed within the old framework (Freeman and*

Perez, 1988). Niches are crucial for TT [technological transition], because they provide the seeds for change.

From this point of view, niches become the key element in the complex configuration of a technological transition. They provide an appropriate medium for the development of innovations especially at the micro-level in terms of integrating real-world experiences in solutions “as a reaction or a solution to a specific life experiment” (Peker, 2016, p.88), and thus, help trigger changes in the processes of sociotechnical regimes. This may further stimulate new reconfigurations to generate at the landscape level. Furthermore, activities of specialized actors at different levels may also initiate the generation of reconfigurations (Geels, 2002; 2005). “Breakthroughs of innovations depend on processes on the level of regimes and landscapes, and thus, they are context-dependent. It is because of this aspect that the multi-level perspective is useful for analysing TT [technological transition]” (Geels, 2002, p.1272).

According to Carvalho (2015), niche experimentation is fundamental to foster sociotechnical change and the introduction of new technologies in society. He refers to the policies of *transition management* (Rotmans, 2005) and *strategic niche management* (Kemp et al., 1998; Hoogma et al., 2002) as the tools used by different actors such as industry managers, policymakers, or citizen groups, for testing or developing new or existing technologies. Niche-based approaches are based on the development of two key processes: (i) learning, and (ii) societal embedding (Truffer et al. 2002).

Learning refers to the discovery, testing and fine-tuning of new insights about the technologies at stake, their variants and the conditions for success in real-life environments. **Societal embedding** means the progressive interaction between new technologies/solutions and the social, cultural, political and governance dimensions that structure their use. Societal embedding involves three interrelated processes

(Carvalho, 2015): (i) network building; (ii) infrastructure matching; (iii) expectation building.

Accordingly, first, ‘network building’ is the creation of constituency and coalitions of public and private supporters of the technology (potential producers, users, regulators) and resource pooling (e.g. money, expertise). Second, ‘infrastructure matching’ consists of the adjustment of new technologies to an existing sociotechnical environment of regulations, standards, business models and physical artefacts. Finally, ‘expectation building’ means the development of favourable expectations and visions about the advantages of new technologies for the society, (international) attention and legitimacy for continuing experimentation.

Furthermore, Carvalho (2015) emphasizes the significance of the use of niche-based approaches in the deployment of “sustainability-related transitions” such as the redesign of mobility, energy, health, and waste systems, often through very concrete and localized experiments in cities.” This means that local practices, in fact, find niche solutions. This, in turn, feeds global attempts that impact wider terrains.

The sociotechnical approach to wind energy transition processes that take place at multiple levels also incorporates activities of numerous and various actor groups with diversified roles and responsibilities. This requires developing an understanding about the multi-actor environment of sociotechnical transitions, an analysis of the relations and an identification of the dynamics between these actors. The following section focuses on the multi-actor environment of sociotechnical approaches.

2.4 Multi-actor Environment

Sociotechnical systems include a variety of actors in the production of the 'material' technology in an industrial and artefact context as well as within an institutional and human context. It does that to maintain and change the system by setting rules and guiding actors' perceptions and activities. Geels (2004) asserts that many actors take place in the fulfillment processes of the sociotechnical sub-functions including production, diffusion and the use of technology (Figure 2.2). As illustrated in Figure 2.4, interrelated actor groups take place both in the technical production and social user/application side of a sociotechnical system. This conceptualization represents the coordination of actor groups according to their either institutional or technical/social categories. Each group has its own characteristics yet works in coordination and aligns with each other.

Actor groups may be classified into three main groups: (i) public sector, (ii) private sector, and (iii) civil society. Public sector regulates both the production and user sides and includes actors including national and international institutions/organisations (e.g. European Commission, World Trade Organisation), national governments, and ministries. Private sector covers mainly the technical production side and consists of actor groups such as design firms, technical institutes, consultancies; financial actors as venture capital suppliers, banks and insurance firms; as well as repair shops, spare part shops. Civil society includes users and civil society organisations (NGOs), whose activities lead niche developments at the micro-level. There are two other actor groups supporting the sociotechnical processes, namely academia (schools, universities, laboratories, research units) working for the development of techno-scientific knowledge; and media (newspapers, magazines, radio, TV, internet) assisting the production of cultural and symbolic meanings.

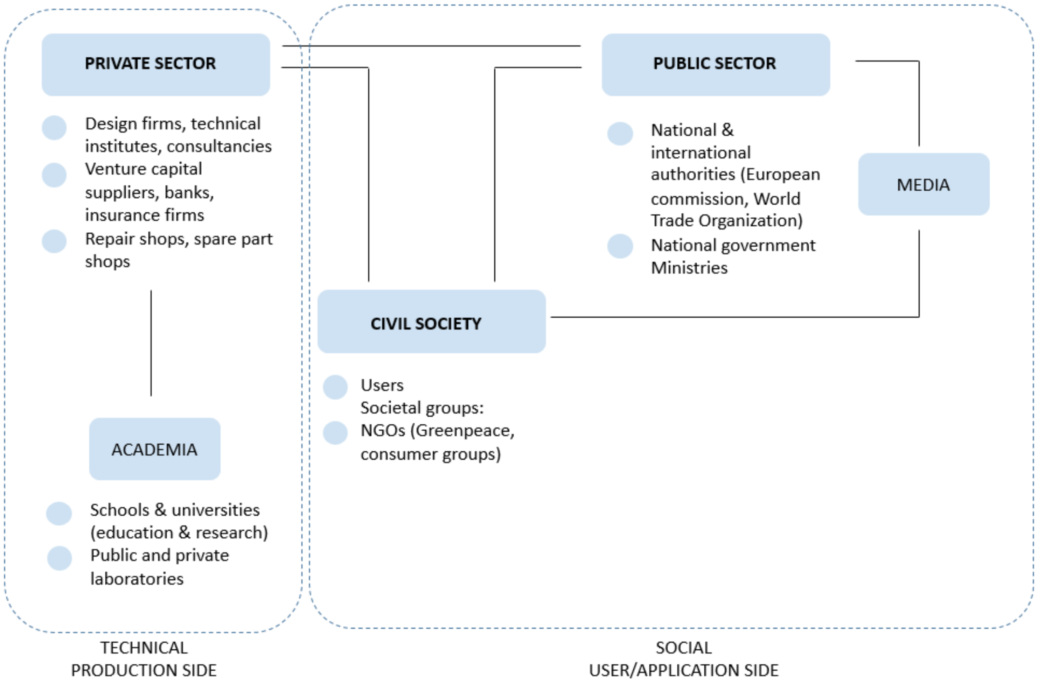

Figure 2.4. Interrelated actor groups taking place in the technical production and social user/application side of a sociotechnical system, Adapted from Geels, 2004, p.901

Transition to a new technology requires "learning and adjustment" at the user and institution sides, in terms of learning about the product (cognitive work) and integrating it into daily life experiences (symbolic and practical work) (Lie and Sørensen, 1996). In this regard, institutions orient the human actors' actions by setting rules and regulations. Benefitting from the actor-network theory (Latour, 1987, 1991, 1992; Callon, 1991; Akrich, 1992), Geels (2004) defines six types of interactions that are constructed between three analytic dimensions. The three analytic dimensions are: (i) the sociotechnical systems; (ii) institutions and rules; and (iii) human actors, organizations, social groups. The six types of interactions emerging between these three dimensions refer to the dynamic and mutual structure of the user-technology environment. The Figure 2.5 illustrates the interactions arising as a result of the three analytical dimensions (sociotechnical systems, rules/institutions and organizations/people) conditioning each other.

The first type of interaction (1) represents the reproduction of sociotechnical systems by the involvement of human actors and organisations' activities. The second type of interaction (2) illustrates the context of rules that constrain the interaction of the actors and sociotechnical systems. On the other hand, against these structured top-down guiding rules, the third type of interaction (3) signifies the reproduction of rules by the actors. The fourth type of interaction (4) represents the composition of a context for the human actions within the framework of the sociotechnical systems and structuring the human actors' perceptions, considering the material nature of modern societies (being surrounded by technology). Subsequently, the fifth type of interaction (5) denotes the constitution of rules and regulations also for the operation of the artefact within the sociotechnical system. This may include embedded political strategies that may "enable or constrain human relations as well as relationships between people and things" (Geels, 2004, p.903). The final interaction type (6) presents the 'hardness' character of the technologies regarding their material/technical/scientific and economic conditions (e.g. sunken costs) that limits their adaptation capability to the required changes.

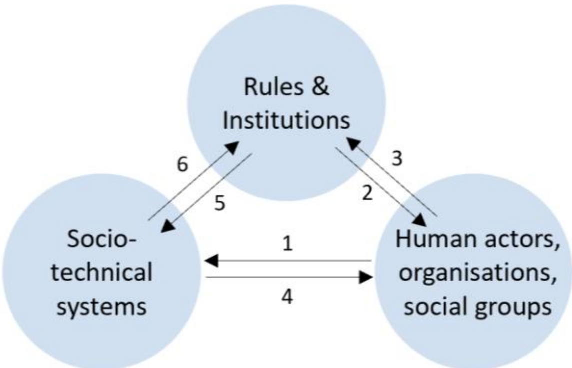

Figure 2.5. Three interrelated analytic dimensions and interactions, adapted from Geels, 2004, p.903

While analyzing the interactions between institutions, actors, and sociotechnical systems, it is also essential to identify how these relations are coordinated. To better understand how this coordination takes place, this section investigates the types of rules that may allow this coordination. It is based on the assumption that different social groups (e.g. political, scientific, designer, engineer, community) engage in relations with different institutional actors (e.g. public authorities, universities, NGOs) in pursuit of their special and interrelated rules that they set up through the construction of those relations. According to Geels (2004), community-based societal groups can be problematic due to their lack of institutional and organizational capacity, and thus, they encounter problems in coordinating between individual members.

Scott (1995) and Geels (2004) suggest three types of rules. These are regulative, normative, and cognitive. Regulative rules are clear and specific. They are also formal, limiting and controlling the actions and behaviors. Normative rules provide the "values, norms, role expectations, duties, rights, responsibilities" that are incorporated through group interactions. Finally, cognitive rules define the world as well as the formation of the meaning attributed to the objects and actions that are shaped by symbols such as words, concepts, myths, signs, and gestures (Geels, 2004).

The operation of regulative rules is based on a coercive structure defined by legally binding instruments; while normative rules work within a social obligation (normative pressure) context that is morally governed along with the 'being part of a group' approach. On the other hand, cognitive rules are taken for granted and based on the culturally produced shared ideas that are learned and pursued by imitation (Scott, 1995). In this respect, considering the limited cognitive capacities of human beings, scientists (e.g. Simon 1957) emphasize the use of 'schemas, frames, cognitive frameworks or belief systems' in selecting and processing the information.

Various technological, scientific, political, socio-cultural, or user/market regimes may set different regulative, normative, and cognitive rules. Regulative rules for technological regimes may be exemplified with technical standards or product specifications (e.g. emissions, weight) (Christensen, 1997). Normative rules for the technological regimes include the values of companies and internal procedures set up for testing. Cognitive rules in technological regimes may refer to the search of heuristics; routines and exemplars of engineers (Dosi, 1982; Nelson and Winter, 1982). Science regimes may include regulative rules as governmental research programs or rules for government subsidies; normative rules as procedures for publication, norms for citation, academic values, and norms (Merton, 1973). Some examples for cognitive rules for the science regimes may include criteria and methods of knowledge production. Regulative rules for policy regimes may be exemplified by administrative regulations that are structuring legal procedures; normative rules by policy goals and cognitive rules by problem agendas. Socio-cultural regimes may have regulative rules that are shaping the production and dissemination ways of cultural symbols (e.g. media laws). On the other hand, societal norms and values determining user-company interactions may refer to the normative rules for socio-cultural regimes. Cognitive rules for the socio-cultural regimes may include technologies' symbolic meanings and ideas about their influences as well as cultural categories. Users/market regime incorporates regulative rules in terms of laws and regulations guiding the market construction for both producer and user sides (e.g. property rights, product quality laws, liability rules, market subsidies, tax credits to users, competition rules, safety requirements). Normative rules of user/market regime include the relationship developed between firms and users, reciprocal perceptions, and expectations. Cognitive rules for the user/market regimes may be exemplified by the users' practices, preferences, and beliefs.

Although regimes and rules appear to stay independently, they exist in an interrelated framework aligning with each other. There is also a dynamic interaction between these *rules, regimes,* and *actors* (Geels, 2004). The sociotechnical system perspective enables analyzing this dynamic interaction within a holistic framework. Geels' (2004) detailed analysis places human actors at the center. In this regard, he discusses the "agent-structure dilemma" where the conception of human actors' activities can be made in two ways. The first way emphasizes the significance of the 'agency' as the main trigger of social changes incorporating the free actions of individuals. The second way highlights the impacts of 'social structures' where individuals solely follow the specified rules or roles, yet, are not able to initiate any social change.

Actors belonging to a social group obey predetermined and collectively generated rules that are regulating their activities. Such rules are the 'outcome of earlier (inter)actions' as well as (re)produced in local practices creating patterns of activities. These patterns may show similarities across different localities. However, the presence of members with different rule systems may cause variations in local practices. In this respect, two strategies may work in developing actions against the effects of changing social actions: (i) actor structuring and (ii) social learning. *Actor structuring* indicates a learning process that involves reorganizing strategies, goals, and preferences through self-assessment. *Social learning* refers to reshaping the collective social rule system in other words, the institutional setting, according to the user feedback, or technical expertise. Social learning is a long-term application since the articulation of user preferences or new technical search heuristics may take longer periods of time such as the development and acceptance of new technologies (e.g. wind turbines: Garud and Karnøe, 2003). However, actor structuring is a mere short-term application since developments take place between actors' positions and relations (e.g. strategic games, strategic coalitions).

Geels (2004), uses a "game" analogy regarding the dynamic interactions between actors and systems. He conceptualizes sociotechnical systems as a framework for the actions of actors. These 'moves' (actions) of the players (actors) (firms, public authorities, users, scientists, suppliers) such as making an investment or an R&D decision, introducing a new technology to the market, developing new rules and regulations, public reactions, rearrange the sociotechnical system.

He also emphasizes that 'playing games' conceptualization may represent an unbalanced interaction environment in terms of 'power and strength' of actors.

There may be disadvantageous actor groups in terms of access to ‘resources (e.g.money, knowledge, tools) and opportunities’ to achieve their goals and have an impact on social rules and regulations. Such a context is open to ‘conflict and power struggles’. Present technologies are developed, or new technologies are introduced and thus, sociotechnical systems are changed by these games taking place within and between groups. With the reactions of users, technologies may improve or change, and policy makers may develop new regulations in turn. As a result, elements of sociotechnical systems co-evolve.

2.5 Multi-level Perspective in Sustainability Transitions

The growing climate crisis and its concomitant severe problems leading the loss of biodiversity, and resource depletion can be challenged by fundamental systemic changes within the context of sustainability. This may be called “sociotechnical transitions”. Transportation, energy, agriculture and food production systems are among such sociotechnical systems requiring structural changes (Elzen et al., 2004; Van den Bergh and Bruinsma, 2008; Grin et al., 2010). The sociotechnical transitions introduce an adjustment of technology development through both its use and production processes including a variety of social (e.g. policy, culture) and technical (e.g. science, industry) elements as well as multiple actors (e.g. firms, governmental bodies, users, policy makers, special interest groups and civil society actors) (Geels, 2002; 2004; Geels and Schot, 2007). Additionally, multilevel perspective provides a framework for the analysis of a sociotechnical transition at three levels: niches, regimes, and landscape.

Geels (2011) argues that sustainability transitions require a sophisticated approach rather than historical transitions. Sustainability transitions differ in several terms such as: they are “goal-oriented” to challenge various environmental problems to reach a common good (sustainability), instead of being “emergent” and providing direct benefits for the users. Furthermore, sustainability transitions are specifically required in “empirical domains” such as transportation, energy, agriculture and food production; where "large firms" with high levels of manufacturing expertise, scientific knowledge and networks dominate the systems (Geels, 2011, p.25)

In terms of renewable energy transition, Garud and Karnøe (2003) study the development of wind turbine technology in Denmark and the US, emphasizing the impact of "human agency" in shaping technological paths within a social constructivist approach. This approach focuses on the micro processes taking place between various actors (distributed or embedded) involved in the development of a technology. According to this study, the distributed wind turbine actors (producers, users, evaluators, regulators) in Denmark adopt modest, low-tech approaches that are leading them gradually to the market leader position. On the contrary, the wind turbine development process in the US pursues a rather aggressive and top-down approach that focuses on scientific knowledge (engineering) (e.g. production of large-scale turbine capacities: 1.5 MW) and lacks the collaboration between actors. This, in turn, is documented as a failure of the US wind turbine firms against Danish counterparts. In case of Danish wind turbine development process, the technological path is shaped in terms of practices and regulations with the involvement and provision of information of the collaborative network of actors. Garud and Karnoe (2003, p. 283) indicate that:

> *"Users' inputs shaped producers' designs, producers' 'low-tech' capabilities shaped approaches pursued by the test station, the test station's approval procedure shaped the minimum load paradigm for producers, regulators shaped policy such as placing a restriction on investments by private users when wind installations began to grow too fast."*

The social constructivist approach observed in Danish wind turbine case lies in the very early stages of the development process of the industry. The ownership of the first, small scale wind turbines belong to individual users and cooperatives. This enables the establishment of a community network in terms of sharing knowledge and experiences with each other and the manufacturers. Garud and Karnoe (2003) argues that such 'micro-learning processes' emerging between various actors specifically the ones with the local knowledge provide an appropriate medium for technological transitions. They also highlight the importance of these processes especially in such complex technological systems as wind turbines. Disregarding the human agency in technological transitions fails to achieve public acceptance and thus, wider deployment.

The German wind energy development process also indicates a similar technological path with Danish case that became successful (Hesse, 2021). Hesse (2021) states that the wind energy development takes place as an environmental friendly, small scale, collectively constructed energy production attempts within the context of the environmentalist's orientation towards a decentralized energy system in the 1970s. However, on the other hand, in the 1980s, the German government supported a large wind turbine project, GROWIAN. It is basically a technologically focused large scale (3MW), centralized wind turbine development project which remained idle due to its technical issues, and thus, created a public perception that the integration of wind energy into the central energy system failed. This, in a way, sustained the existing energy production system in Germany. Later, in the first decades of the 2000s, Germany initiated a repowering process for the existing wind power plants which replaced the small scale turbines with the larger ones having minimum two-three times higher capacities and taller heights (Ohl and Eichhorn, 2010). These repowerments provided access to better wind conditions and resulted in less number of turbines and, thus, smaller facility surface areas in existing wind energy development fields. However, replacing smaller turbines with larger ones came with causing an increase in some external effects of wind energy developments such as audial and visual (Ohl and Eichhorn, 2010).

The multiple level perspective is also used in analyzing the sustainability transitions. Since such transitions are subject to social, political, and cultural processes apart from technical and financial aspects; the multilevel perspective provides appropriate mediums for "niche innovations" to better understand the complex, non-linear context of these transitions (Geels et al., 2017). According to Geels et al. (2017, pp.463,464) energy transitions lack the "representation of the involved actors" (needs for wider range of actors such as civil society groups, the media, local residents, city authorities, political parties, advisory bodies, and government ministries); a consideration of socio-cultural adaptations (e.g. equity, social acceptance issues), and political struggles (negotiations among state level objectives and local level constraints).

The case of the German energy transition analyzed by Geels et al. (2017) illustrates the complex structure of sustainability transitions in terms of socio- cultural, political, and economic aspects. According to this analysis, existing energy production regimes in Germany, mainly dependent on fossil and nuclear resources, are challenged by various external *landscape* events such as oil crisis in the 1970s, Chernobyl accident in 1986 and Fukushima accident in 2011.Such kind of external impacts negatively influenced the existing energy production regimes (e.g. nuclear phase-out), and triggered the transition to renewable energy technologies (e.g. wind and solar photovoltaics) through niche innovations (e.g. small scale decentralized wind energy facilities, individual solar panels). These niche developments stimulated the development of supportive policies and regulations regarding the renewable energy deployment (e.g. feed-in-tariffs). Despite its description as a smooth iterative sustainability transition process; Geels et al. (2017) highlight the conflictual and challenging aspects of the transition process in terms of the interactions among the multiple actors (e.g. a variety of lobbying activities and pressures of private sector companies, environmentalists, political parties).

Devine-Wright et. al (2017) study the social acceptance of renewable energy infrastructures by analyzing the roles of actors taking place at multiple levels. These actors are composed of the ones taking place in socio-political (national) and community (local) levels (Wüstenhagen et al., 2007), as well as ‘middleactors’ (Parag and Yanda, 2014) who are crucial in changing the development paths of the technological systems in positive and negative ways. According to Devine-Wright et.al (2017), the representation of local insights enables better understanding the social acceptance issues and development of related policies. In this respect, it becomes essential to develop an interdisciplinary research mechanism including social sciences apart from engineering and economics for a smooth transition to low carbon systems.

On the other hand, although multiple level perspective is used in sustainability transitions literature, it has been criticized in diversified contexts. The multiple level perspective has been criticized for having a bias with bottom-up models and focusing heavily on the ‘green’ niche-innovations (Meadowcroft, 2011; Smith et al., 2005) while excluding the landscape and regime elements for change. Meadowcroft (2011) emphasizes the impact of regimes to stimulate change in a transition. Smith et al. (2005) introduce multiple transition pathways. Multilevel perspective is also criticized for lacking a consideration of politics and power relations within such transition processes (Smith et al., 2010; Weber and Rohracher, 2012; Patterson et al., 2017). In this respect, scholars emphasize the importance of better understanding and including the political (e.g. policy regimes, elections, wars) (Markard et al., 2016; Geels, 2014) and cultural (e.g. social acceptance issues influenced by media, discourse and narratives; grassroots innovations) (Roberts and Geels, 2018; Lounsbury and Glynn, 2001; Hargreaves et al., 2013; Seyfang; 2014) dynamics in the sense of how they influence the multilevel perspective through modifying the community perception and, thus, the deployment of technologies. Accordingly, Smith et al. (2005) indicate that policymakers should be in dialogue with other actors during transition processes to gain the knowledge and experience on niche innovation. To do that, Kivimaa and Kern (2016) suggest benefitting from the “policy mix” approach to trigger ‘green’ innovations while destabilizing existing regimes.

Consequently, it is obvious that, renewable energy transition process is a complex, conflictual and a non-linear process within a sociotechnical transition perspective. On the other hand, the wind turbine technology is growing in favor of larger scale wind turbines. In this respect, when considered wind energy transition within a sociotechnical transition process, it becomes unclear that the development of wind energy technologies is, in fact, influenced by social processes (e.g. impacts of wind energy facilities on human and environment) or by technical processes (e.g.

technological advancements in terms of electromechanical, aerodynamic, structural designs for higher levels of energy productions). The European (e.g. Denmark, Germany) cases highlight the importance of integrating social processes into the technological development as a synthesis of local wind energy knowledge and experience along with the cooperation capacities of local people within the wind energy industry through grassroots innovations such as decentralized locally owned energy cooperatives for the success of renewable energy deployment in the face of climate emergencies.

CHAPTER 3

WIND ENERGY DEVELOPMENT AND SOCIO-SPATIAL ASPECTS

In reference to this study's definition of wind energy transition as a socio-technical process, this chapter presents a theoretical discussion on the adopted social perspective of the wind energy development process. The chapter firstly introduces studies on the social attitudes and opposition towards wind energy. Its later sections focus on socio-spatial sensitivity areas emerged in communities in wind energy production processes.

3.1 The Relationship Between Wind Energy and Society

Growing global warming and climate change problems due to the increasing population, and industrial development, together with today's fossil fuel-based living conditions inevitably lead to widespread ecological, social, and economic impacts as well as accelerating energy demands. In this respect, renewable energy transition comes forward as a long-term solution to this growing energy need. Wind energy is one of the renewable energy resources that is relatively more efficient in terms of energy capacity and economic benefits than other renewable energy sources (Kılıç et. al., 2017). Having said that, wind energy development is mainly considered as a technical process. Big targets are set for renewable energy deployment both national and regional scales. Moreover, there is a strong tendency to direct society towards accepting this type of energy production. Public acceptance issues are not questioned.

However, it is a process which confronts people with ecology and nature, and many studies support the significance of social aspects in wind energy transition to support (Aitken, 2010; Kılıç et.al., 2017).

Wind energy development decisions that do not take into account societal concerns create a legitimate basis for social reactions. Such kind of decisions and implementations turn into a disappointing, unhappy, and unsatisfactory experience for the public; and eventually lead them to object to the development of wind energy. Top-down wind energy development decisions imposed on humans and the environment lies at the heart of such objections/oppositions/reactions. Nevertheless, exposure to the wind energy development process causes an emotional societal reaction through injustice discourses (DuPont, 1981; Short, 2002; Wolsink, 2000).

Studies focusing on the social aspects of the wind energy development process put emphasis on the "tension" or "acceptance" issues taking place at the local level as a result of wind energy development (Kılıç et.al., 2017). In this respect, on the one hand, there are studies discussing local movements/reactions such as NIMBY (Not In My Backyard) movements (e.g. Burningham, 2000; Devine-Wright, 2005a; Swofford and Slattery, 2010) and the ones exploring the reasons differentiating individual/societal responses to wind energy (Gipe, 1995; Simon, 1996; Krohn and Damborg, 1999; Wolsink, 1988). On the other hand, there are studies discussing the social areas affected by wind energy development with an analytical approach (Devine-Wright, 2007; Wolsink, 2012; Wüstenhagen et.al., 2007).

Both these studies emphasize that the installation of wind energy facilities results in *local reactions,* and respectively investigate the *drivers* of these reactions (such as energy preferences, proximity, information, economic benefits, individual characteristics), and to determine their *direction* (such as positive and negative) and *strength* (such as acceptance, resistance, opposition, rejection). This helps reveal the *socio-spatial sensitivity areas* emerged as a result of communities' interaction with wind energy facilities. This calls drawing a connection between the technological development of wind energy as an artefact and its social aspects regarding the community and locality (Figure 3.1).

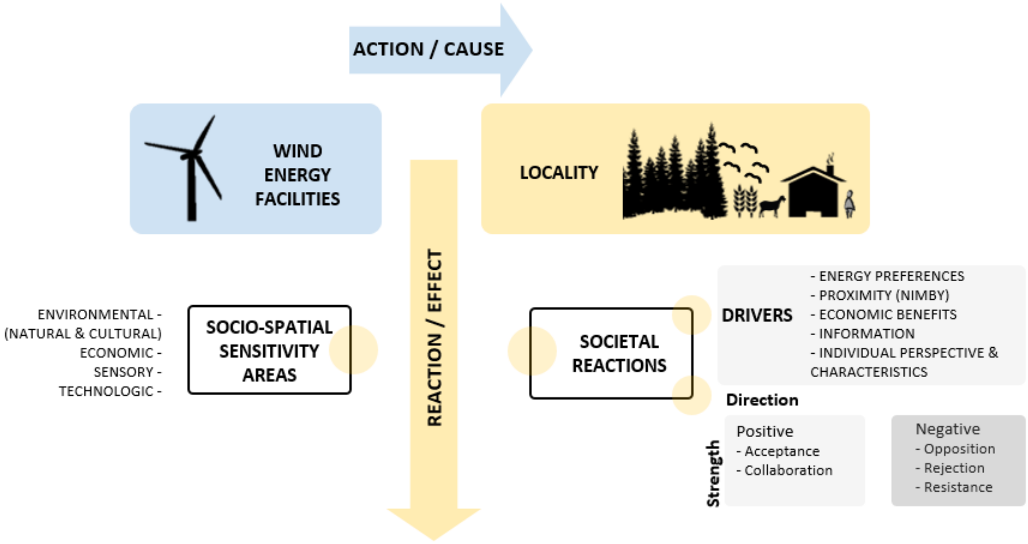

Figure 3.1. The conceptual theoretical framework of the studies focusing on the social aspects of the wind energy development process in terms of the interaction between wind energy facilities and localities

In reference to this framework, the following sections introduce two groups of studies focusing on the social aspects of wind energy development. The first group includes studies about the attitudes and reactions of societies towards wind energy and presents the main drivers of these reactions. The second group contains studies focusing on the areas that societies are affected by wind energy development.

3.1.1 Social Attitudes and Reactions Towards Wind Energy and the Main Drivers

Literature on social attitudes and reactions towards wind energy focuses on four main drivers regarding how social support for wind energy development occurs or how the level of discomfort about wind energy development changes. These are: (i) preferences: comparison of wind energy with other energy resources; (ii) proximity:

distance to a wind energy facility, (iii) public engagement: having economic benefits from wind energy development; and being informed about the wind energy facility, (iv) perspectives and characteristics: demographic structure, education, occupation, income status, ideological and political view of effected individuals affecting the attitude towards wind energy development.

3.1.1.1 Comparison of Wind Energy with Other Energy Resources

The first group of studies about social attitudes and reactions cover research focusing on society's wind energy development preferences and support. This section discusses these studies in a comparison of wind energy with other renewable energy sources and fossil fuels. In this respect, literature mainly relies on survey studies conducted in various countries, mainly in Europe and North America searching for the respondents' tendency of preferring renewable energy against other energy sources.

Widely referenced Krohn and Damborg's (1999) study examines the surveys conducted in the UK, the US, Canada, Sweden, Germany, Holland and Denmark during the 1990s to reveal the public's attitude towards wind energy. Krohn and Damborg's (1999) study illustrates that renewable energy is a preferred energy resource by the public. Breglio's (1995) study introduces significant results on people's preferences of renewable energy resources over fossil fuels in the US. According to this study, 42% of the Americans see renewable energy funding by the federal budget as the most prioritized issue while fossil fuels and nuclear energy, the main energy resources, rank at the last places with respectively 7% and 9%. Similarly, public attitude towards renewable energy is found positive in Denmark (DWTMA, 1993). Every four of five Danish mention the significance of renewable energy use in energy policies. Only 9% does not agree with this. Canadians show a parallel view, 79% argue that energy providers should prioritize wind energy supply (CWEAEM, 1995). In line with this, according to the Attitude Survey (Holdningsundersogelse) conducted by DWTMA (1993), 82% of Danes think that

Denmark should set more effective strategies to benefit more from wind energy. Gipe's (1995) study documents that 80% of the Dutch prefers wind energy; while 5% rejects and 15% stays neutral. In the UK, 13 studies conducted between 1990 and 1996 demonstrate that every eight persons out of 10 support the use of wind energy (Simon, 1996).

Research conducted in New South Wales (NSW) Australia, in the 2000s, with more than 2000 residents and 300 businesses indicate that 85% of respondents support the presence of wind energy facilities in NSW; and 80% in their hometowns (AMR Interactive, 2010). Another survey conducted in 23 countries from all around the world, including Turkey, reveals that renewable energy sources (solar and wind energy being more preferred than hydroelectricity) are supported more than fossil fuels and nuclear energy with respective proportions ranging between 50% and 70% (IPSOS, 2010). The energy support survey of IPSOS (2012) repeated after the Fukushima Nuclear Facility accident reveals that renewable energy sources are favored as before against fossil fuel and nuclear energy. A recent research conducted in Poland in 2020 (Milaszewicz, 2022) introduces a similar renewable energy attitude framework like in other European countries (EIB, 2022). The Polish survey indicates that more than three fourth of Poles (81%) support renewable energy, more than half of Poles (58%) believe that governments should rely more on renewable energy sources, and 64% of Poles think that governments should introduce policies to change citizens’ behavior in order to deal with the climate crisis. The recent survey conducted by European Investment Bank (2022) also illustrates that Europeans merely focus on individual habitual change (52%) rather than technological innovation (e.g., renewable energy development) for challenging the climate change. On the other hand, American and Chinese respondents emphasize the technological innovation (e.g., renewable energy development) as an answer to stop or drastically limit climate change. All countries agree on and stress the urge of transiting to renewable energy sources (EU 63%, US 50%, China 60%). %). However, changing global and local circumstances may result in changes in renewable energy perspectives of the society. For instance, the effects of the ongoing Russia-Ukraine war lead European and Asian countries to re-structure their energy perspectives (e.g. Germany's conversion to coal; China’s power supply cuts) (IEA, 2022). On the contrary, the growing effects of climate change call for urgent change in energy production frameworks toward renewable energies for net-zero emissions (UNFCCC, 2022). IEA (2022) emphasizes the wider use of clean energy sources in order to manage the growing energy crisis.

3.1.1.2 Being Whether Near a Wind Energy Facility

The second group of studies focus on the attitude changes according to being near a wind energy facility. There is a difference between people's views on when wind energy is an idea and the ones when it is applied. This attitude is called “Not in my backyard” (NIMBY). NIMBY in simple terms describes people's opposition to the establishment of a facility in their locality while recognizing that it is necessary (Kılıç at.al., 2017; Swofford and Slattery, 2010). It is generally seen in infrastructure and energy projects. NIMBY attitude towards wind energy facilities is defined as the difference between general community support and active local resistance (Devine-Wright, 2005a; Kraft and Clary, 1991; Van der Horst, 2007). While individuals support wind energy when it is an abstract concept, they reject the idea when it starts becoming a reality. Kılıç et.al. (2017) state that on the one hand NIMBY attitude is related with the spatial proximity to the wind energy facility, and on the other hand it changes according to the differentiating expectations and cost sharing mechanisms among the individuals and communities at the local level.

NIMBY attitude has a complex and dynamic structure. Interrelations of investors, decision makers, local administrations, civil initiatives and their dialogue with the local community as well as the bureaucratic processes taking place at national and local levels constitute the complex framework of the attitude. However, gaps within the dialogue development processes and the skepticism as a result of this disconnection may lead to public reactions as oppositions.

Freudenberg and Pastor (1992) present a three-fold characterization of the NIMBY attitude of the public: (i) ignorant and irrational responses due to lack of knowledge; (ii) rational but selfish responses based on a search for individual interests; (iii) rational and prudent responses shaped by well-grounded concerns about the impacts of new developments. All perspectives focus on the local actors and look for their main motivation behind such oppositions. It is essential to focus on the broader system creating this attitude and reactions (Burningham, 2000; Freudenberg and Pastor, 1992).

According to Wolsink (2007) the problems that have to be dealt with during decision making processes on the siting of wind energy facilities are usually referred to as mere ‘communication problems’. However, public attitudes towards wind power are fundamentally different from attitudes towards wind energy facilities. Wolsink (2007) argues that many variables, including the misunderstanding of the studies on this subject, change the degree of reliability among the public and practitioners. There are also studies criticizing the NIMBY attitude as being manipulative, damaging social consensus, simplifying the opposition, and being narrow-minded (Evans et al., 2011; Wolsink, 2007; Krohn and Damborg, 1999). In some cases, the NIMBY attitude is not even found valid. Warren and Birnie (2009) indicate the existence of a reverse NIMBY attitude in Scotland and Ireland, arguing that those who live close to wind turbines are more supportive than those who live far away. In support to this, according to Wolsink (2000), residents' opposition with NIMBY attitude is also not based solely on proximity concerns.

3.1.1.3 Having Economic Benefits From and Being Informed About the Wind Energy Facility

The third group of studies focuses on how social attitude changes towards wind energy when individuals engage in wind energy development through having economic benefits from and information about its facilities. Research shows that information about facilities at the vicinity during both planning and construction phases as well as economic benefits received as a result of wind energy development such as becoming a member of publicly owned wind energy cooperatives positively ameliorate individuals' attitudes towards wind energy facilities (Krauss, 2010; Bohn and Lant, 2009; Breukers and Wolsink, 2007; Walker et.al., 2007; Devine-Wright, 2005a; Toke, 2005b; Pasqualetti et.al.,2002; Krohn and Damborg, 1999; Gipe, 1995).

Gipe's (1995) study conducted in Holland, shows that informing the public during the planning and construction of the wind energy facility has a positive impact on the attitude towards the project. Similarly, Krohn and Damborg (1999) report that people in the city of Sydthy with a 12000 population and electricity supplied 98% by wind energy, have more constructive views on wind energy and are also less affected by the wind energy transition. According to this study, people who have more knowledge on wind energy are not affected by the distance to a wind turbine. Additionally, it is also emphasized that the number of turbines seen at the vicinity does not have a negative impact on people's attitudes.

Furthermore, 58% of the existing wind turbines are owned by the local community of Sydthy. This kind of community-owned wind cooperative eases the public acceptance of having wind energy facilities at the vicinity. This also points out the development of a positive attitude towards wind energy facilities in general by rural inhabitants due to economic benefits gained through the land. On the contrary, the same study (Krohn and Damborg, 1999) reveals that instead of seeing wind turbines as an economic source, urbanites have negative attitudes because of their romantic aesthetic concerns for a wind turbine view. Yet, in rural communities where wind energy is translated into an economic resource, such concern loses its significance.

Many studies emphasize that providing an economic benefit through local community-owned wind energy cooperatives has a positive impact on public attitude towards wind energy (Warren and McFadyen, 2010; Slattery et.al., 2011; Mulvaney et.al., 2013). In line with this, other studies also support this by indicating that the ownership structure of a project has a significant impact on public acceptance and attitudes (Haggett and Toke, 2006; Sonnberger and Ruddat, 2017). They further confirm that wind energy development projects are more easily applied when they are owned by local energy cooperatives than by a large energy company or a foreign investor.

Apart from energy cooperatives, Munday et.al. (2011) introduce other wind energy facility-related economic contributions. These include rental income, contracting services, employment, financial aid to local communities, landscape development, road construction, and educational visits. In parallel to this, many studies illustrate that wind energy facilities enable the development of various tourism activities (Aitchison, 2004; Aitchison 2012; Starling, 2006; Young, 1993).

However, it is also emphasized that rural communities with limited capabilities cannot be employed in wind energy projects' construction sites and maintenance works (May and Nilsen, 2015; Slattery et al., 2011). In line with this, Baxter et. al.'s (2013) research illustrates that although economic benefits are significant for communities; they are not the consistent predictors of community support for wind energy development.

3.1.1.4 Individual Perspective and Characteristics

The fourth group of studies concentrates on how the level of discomfort about wind energy development changes according to individual perspectives and characteristics. Studies in literature investigate variables such as demographic structure, education, occupation, income status, ideological and political views determining the individual perspectives (Aitken, 2010; Bishop, 2002; Bishop and Miller, 2007; Cavallaro and Ciralo, 2005; Daugarrd, 1997; Devine-Wright, 2007; Torres-Sibille et.al., 2009; Tsoutsos et.al., 2009a; Tsoutsos et.al., 2009b; Wang et.al., 2009; Warren and McFadyen, 2010). For example: (i) Pre-judgement determine the affective response to nearby wind energy facilities; (ii) females tend to prefer smaller wind energy facility size; (iii) the findings on age significance are inconsistent; (iv) democrats tend to support renewable energy development.

General wind energy perspectives of individuals determine their positive and negative individual views on wind energy. Wolsink and Sprengers' (1993) study conducted in Denmark, Netherlands, and Germany claims that noise disturbance only affects a few people. However, the disturbance of those affected is not related to the actual noise level but to their negative thoughts about wind turbines. Simon's (1996) study conducted in England reveals that positive and negative biased considerations, influenced by general individual wind energy perspectives, constitute a similar differentiation. Positive and negative expressions are as follows. On the positive side, respondents state that renewable energy is an alternative to other energy sources, does not pollute the environment, is not limited, and should be taken into account within the context of climate change. On the negative side, respondents argue that wind energy cannot solve energy problems, is expensive, turbines are unreliable, noisy, and ruining the landscape. In parallel, Wolsink (1988) emphasizes that whether turbines enhance or ruin the landscape depends on individual tastes; while the price of wind energy is expensive or cheap depending on personal values and beliefs on climate change.

Krohn and Damborg (1999) study the impact of gender on preferences. They claim that women prefer a group of 2 to 8 wind turbines near them rather than a single turbine or large scale wind energy facility incorporating more than 8 turbines. On the other hand, men prefer a group of 10 to 50 wind turbines and compared to women men find wind turbines noisier. Recent research conducted in Poland in 2020 also illustrates that more women support renewable energy than men (Milaszewicz, 2022). EIB's (2022) Climate Survey results also correspond with this finding that women (62%) are more likely to support renewable energy sources than men (54%).

Relation with other demographic issues and wind energy perspectives is also studied (Yuan et.al, 2015; Krohn and Damborg; 1999). In this respect, educated, high-income and over 40 years old people mainly tend to support wind energy development. People over 60 years old tend to approach wind turbines more critically, reluctantly, and conservatively than other age groups. Despite this, the Polish Climate Survey results indicate that renewable energy is supported by all age groups. However, older age groups are more supportive than younger age groups (Milaszewicz, 2022; EIB, 2022). Milaszewicz (2022) relates this with higher lifetime experiences of the older age groups that are leading them to take the problem of climate change seriously into account. Additionally, further renewable energy developments are highly supported both by higher (60%) and lower-income (57%) groups (Milaszewicz, 2022; EIB, 2022).

The literature also presents evidence regarding the correlation between the wind energy perspectives of individuals and their ideological and political views. According to Devine-Wright (2007), political views affect the social acceptance of low-carbon technologies and the related investment commitments of political parties. Harper et al. (2019) exemplify the 2015 general election of the UK, where more than 85% of Labor and Liberal Democratic Party supporters supported renewable energy development, while only 62% of Conservative Party supporters supported it. In this regard, Conservative Party is known to take an anti-wind stance. Milaszewicz’s (2022) study also finds individual political party preferences are statistically significant in terms of their renewable energy perspectives. In this respect, the study indicates that respondents supporting renewable energy are supporting left-wing parties.

Within the framework of all the above discussions, it is obvious that there is an attitude or reaction developed by individuals and communities against wind energy transition. This attitude differentiates according to subjective or societal variables and eventually brings about the fact that societies are affected and developed sensitivities in certain areas during the wind energy transition process.

3.1.2 Socio-Spatial Sensitivity Areas Emerged During Wind Energy Transition

Studies focusing on the social aspects of wind energy development primarily highlight the emergence of a social reaction against the wind energy transition. Along with these social reactions, the social impact of wind energy facilities is felt in relation to space. They appear as socio-spatial areas and become subject to a number of studies, (i) environmental, (ii) economic, (iii) sensory, and (iv) technologic. In this respect, research indicates that (i) the destruction of ecological environments may lead to habitat loss; (ii) the economic impact differs contextually; (iii) wind turbines have negative visual impact on the landscape leading to public opposition; shadow flicker effect creates disturbance on humans; wind turbine noise negatively affects humans, yet wind turbine related ground vibrations do not have a detectable effect on humans, health impacts of wind energy facilities are inconsistent; (iv) electromagnetic field of a wind turbine may have an adverse impact on the aircraft landing and take-off corridors, security signals and radar systems, power transmission lines. The following sections introduce each sensitivity in detail.

3.1.2.1 Environmental Sensitivity Areas and Variables

Literature puts a strong emphasis on environmental concerns regarding wind energy developments. Adverse environmental impacts of wind energy developments may lead to a backlash from local residents (Enevoldsen and Sovacool 2016; Kaldellis et al. 2016; Leung and Yang 2012). Studies cover the impacts of wind energy developments on natural areas such as forests, wetlands, water resources, watersheds/basins, and bird migration routes (Cavallaro and Ciralo, 2005; Drewitt and Langston, 2006; Kaya and Kahraman, 2010; NWCC, 1999; Telleria, 2009; Wang et.al., 2009).

Within this framework, a number of studies indicate that benthic resources, fisheries, marine, and forest-based species in ecologic areas taking place within or near wind energy facility sites undergo change (Lee et.al. 2020; Aydın et.al., 2013; Baban and Parry, 2001; EEA, 2009; Haugen, 2011; IFC and WBG, 2007; IPCC, 2012; NIA, 2013; Yue and Wang, 2006). Additionally, it is observed that wildlife and ecological environments are destructed; and wildlife animals move away from their feeding areas due to wind energy developments (Bergström et al. 2014; Lindeboom et al. 2011; Wang et al. 2015).

The development of wind energy facilities also has adverse effects on bird and bat lives regarding their collision with wind energy structures. Studies assert that wind turbines may result in habitat loss or changes and that the affected bird and bat habitat structure in terms of species and age groups is different therefore long-term impact of wind energy developments should be seriously taken into account (Hoover and Morrison,2005; Barrios and Rodriguez, 2004), however, there is also evidence that human-related bird or bat fatalities are considerably higher than the wind energy related ones (Rydell et.al, 2011). Another aspect to be considered during the wind energy development process is bird migration routes and bird stop-over sites (Morkune et. al., 2020). Apart from collision, birds and bats may also change their flying direction during migration due to the visual, noise, and vibration effects of wind turbines (Morkune et. al., 2020; Aydın et.al., 2013; Dai et.al., 2015; Haugen, 2011; IFC and WBG, 2007; Klepinger, 2007; Premalatha et.al., 2014; Pearce-Higgins et.al., 2012; Schaub, 2012; US EPA, 2013; Toja-Silva et.al., 2013; Zahedi, 2012; Clarke, 1991).

In addition to the impact on the ecological/natural environment, a number of scholars also put emphasis on the impact of wind energy developments on historical and cultural heritage sites (Fast et.al, 2016; Haugen, 2011; Tertra Tech EC Inc. et al. 2008). Studies focus on the visual impact of wind turbines in a cultural heritage area and accordingly show how the public experience changes and leads to opposition. In this respect, they suggest that specific attention should be paid to cultural and historical heritage sites during the wind energy transition.

3.1.2.2 Economic Sensitivity Areas and Variables

Wind energy development creates a significant impact on local communities' socio-economic lives (Krauss, 2010; Bohn and Lant, 2009; Breukers and Wolsink, 2007; Walker et.al., 2007; Devine-Wright, 2005a; Toke, 2005a,b; Pasqualetti et.al.,2002). Baxter et. al. (2013) indicate that wind energy facilities can have both positive (e.g., employment) and negative (e.g., property values) impacts on communities.

Positive impact is defined as the economic development against local economic decline through generating employment and land value profit within wind energy development sites. However, Devine-Wright (2005b) criticizes such large-scale wind energy developments especially in rural areas as being "asocial development ethos". Positive impacts can be regarded merely as a bribery against negative impacts (Cass et.al., 2010). Since so called economic benefits are defined intersubjectively within localities; scholars highlight the development of a context-specific understanding (Cass et.al., 2010; Cowell, 2010; Pedersen and Persson-Waye, 2007).

According to Baxter et.al. (2013), the impact of wind energy developments on property values can neither be evaluated as negative or positive. Heintzelman and Tuttle (2012) indicate a negative impact in terms of a decline in property values due to wind turbines while, other studies do not reveal such a causal effect (Sampson et.al., 2020; Hoen et al., 2011; Sims et al., 2008). Additionally, Hoen et al. (2011) also argue that the major impact on property values takes place at the proposal stage of a wind energy development.

Kılıç et.al. (2017) discuss the impact of construction and transportation works taking place during installation of wind energy facilities. They assert that these work negatively affect the forest, pasture and agricultural areas where forestry, animal husbandry and farming activities are carried out. Accordingly, such facilities cause a division in so called areas and thus reduces the local economic activities. This is also supported by the study of Mikolajczak et al. (2013) on the effects of wind energy installations on geese. Their study reveals that while the weight of the geese decreases; the cortisol hormone level, which reduces the effectiveness of the immune system in the blood, increases. This causes a behavioral deterioration in the geese living in the coops located 50 to 500 meters away from the turbines. On the contrary, some scholars indicate potential positive effects of wind energy related with provision of a more beneficial weather (Li et al., 2018) and accordingly leading an increase in crop yields (Chen, 2019; Kaffine, 2019).

3.1.2.3 Sensory Sensitivity Areas and Variables

A large body of literature focuses on the sensory and health related sensitivities emerged with the impact of wind energy development especially on humans. Sensory sensitivities include visual aesthetic concerns, vibration and shadow flicker effect. Health problems are related with the noise disturbances and annoyance impacts.

Numerous studies indicate that both on-shore and off-shore wind energy facilities are found to be aesthetically unpleasant (Premalatha et.al., 2014; Zahedi, 2012; Haugen, 2011; Bishop and Miller, 2007; Wolsink, 2007; Baban and Parry, 2001; Wolsink, 2000; Daugarrd, 1997; Nguyen, 2007; Voivontas et.al., 1998). Wolsink (2007) stresses the importance of visual aesthetic concerns regarding the negative visual impact of wind turbines on the landscape leading to public opposition. Although this is a subjective issue that can change according to the individuals' environmental landscape perceptions and their personal wind energy perspectives such as concerns on turning environmental landscape into an industrial one (Johansson and Laike, 2007; Thayer and Freeman, 1987); the visual impact problems should be taken into consideration. According to Bishop's (2002) study wind turbines can be recognized even from 30 km away during days with clear skies, and incrementally growing number of wind energy facilities can cause larger public oppositions (IPCC, 2012).

Thayer and Freeman's (1987) study reveals that people who are closer to the wind energy facility and more acquainted with the original landscape tend to have more visual aesthetic concerns. The majority of people favor seeing wind turbines that are neutral in color, larger in size, but with lower number of turbines. Torres-Sibille et al. (2007) also introduce an objective method to measure wind energy facilities' visual impacts on landscapes. They suggest an indicator involving the visibility, the color, the fractality, and the continuity of a wind energy facility.

Wind energy facilities located within scenic spots, local topographies, and landscapes can have more intensified visual impact (Katsaprakakis, 2012). People are more likely to perceive a wind turbine as visual pollution if it is located within a scenic site or an archaeological area. The visual aesthetic impact is amplified if the wind energy facility is built in a constrained or enclosed space, such as a valley (Katsaprakakis, 2012). Similarly, wind energy facilities taking place at the hills can have direct visual impact, yet with a lower intensity due to the higher elevated viewpoints (Magoha, 2002). Bishop and Miller's (2007) simulation study also illustrates that intensity of the visual impact decreases from a greater distance in any visibility and weather condition. Thus, wind energy facilities should not be located within the areas with greater perceived visual qualities (e.g coastal areas) (Dai et. al., 2015).

On the other hand, a wind turbine appears to be abandoned when it is not in use. Studies show that working wind turbines have lower negative visual impacts (Katsaprakakis, 2012; Bishop and Miller, 2007). Additionally, the number of wind turbine blades and their rotating directions can also create a visual impact of a wind energy facility on the surrounding settlements (Hurtado et.al., 2004). Sun et al.'s (2008) study reveals that wind turbines with three blades (providing a higher sense of balance) are more preferable than with two blades for the people who are sensitive to visual impacts. Moreover, wind turbine blades moving counterclockwise results with a disturbing viewer experience.

The layout of the wind energy facility is influential on the visual aesthetic impact. Regular layouts such as a grid are more preferable than chaotic irregular layouts. Although regularity provides consistency, intensity of the visual impact can differ according to the viewers’ movements and observation of the turbines from varying elevations throughout the landscape (SNH, 2017).

Shadow flicker effect is another sensory sensitivity creating a disturbance on humans (Haugen, 2011; Klepinger, 2007; Kılıç et.al., 2017; Lima et.al., 2013; Premalatha et.al., 2014). It occurs due the movement of the wind turbine blades through the sunshine. Its’ intensity varies depending on the one’s distance from turbine, operational hours of the turbine, and interactions with the sunlight (Harding et.al.,2008). Haac et.al.’s (2022) recent research conducted in the US illustrates that shadow flicker annoyance is higher when one's distance to the turbine increases and one moves in after the wind energy facility was built. They also emphasize that shadow flicker annoyance is a subjective response. Although one is not directly exposed to shadow flicker, his/her wind energy related aesthetic concerns, as well as his/her annoyance to other anthropogenic sounds, level of education, and age influence the shadow flicker disturbance levels. Haac et.al. (2022) suggest keeping shadow flicker exposure less than 8 h per year referring to a prototypical EU regulatory threshold.

Similarly, the noise impact of wind energy facilities has adverse effects on the quality of life and the health of people living at the vicinity (Aydın et.al., 2013; Bakker et.al., 2012; Bishop and Proctor, 1994; Haugen, 2011; Ramirez-Rosado et.al., 2008; Tester et.al., 2005; Toja-Silva et.al., 2013; Yue and Wang, 2006). Wind turbines produce various types of noise and their combination generates the final wind turbine noise (Pantazopoulou, 2010). These are (i) aerodynamic noise, (ii) mechanical noise, (iii) tonal noise, and (iv) broadband noise.

Aerodynamic noise is produced during wind turbine blades’ movement through the air. This noise can vary according to the size of the wind turbine, wind speed and the blade rotation speed. Mechanical noise emanates from the internal mechanical parts of a wind turbine taking place within the turbine nacelle (e.g., gears, generator) that rotates the blades. Wind turbines especially without adequate insulation can create more irritating noise (Alberts, 2006). Along with mechanical noise, tonal and broadband noise are also generated due to the rotation of wind turbine blades. Tonal noise is composed of a variety of frequencies ranging from 20 Hz to 100 Hz that are produced by the nonaerodynamic instabilities and unstable airflows over holes, slits, or a blunt trailing edge of a wind turbine. Infrasound is a category of tonal noise that is below the human perception with frequency below 20 Hz. Infrasound can travel far distances due to its long wavelength and accordingly takes place in everyday lives. Broadband noise is composed of non-periodic frequencies over 100 Hz and emanated from the wind turbine blades' interaction with the atmospheric turbulence. It is the characteristic "swishing" or "whooshing" sound. Mechanical noise is also a broadband noise.

The noise level of wind energy facility is related with the number of turbines it incorporates and its distance from a locality (Dai et.al,2015). According to Sun et.al.'s (2008) study, noise level in a house 500 meters away from a single wind turbine range from 25 to 35 dBA. At the same distance, the noise level produced during the operation of 10 wind turbines range from 35 dBA to 40 dBA. There are additional factors affecting the noise propagation and attenuation. Air temperature, humidity, barriers, reflections, and ground surface materials are influential on the attenuation of noise (Alberts, 2006). Apart from these, background noise (ambient noise) is also influential on the noise propagation and attenuation. In this respect, at the nighttime, when human-made background noise is lower and the atmosphere is stable, wind turbine noise can be perceived with increased intensity (Ellenbogen et.al., 2012).

Van den Berg's (2004) study shows that people living at the 500 meters distance from a wind energy facility strongly reacts to wind turbine noise during quiet nights. Noise annoyance is even felt by the residents living in the range of 1900 meters from the wind energy facility. Moreover, in a quite night, one's perception of wind turbine noise from 1.5 km distance is like an "endless train". On the contrary, wind energy facilities located at seashores with loud wind and wave background noise, cause less noise annoyance for surrounding inhabitants. Thus, background noise should be taken into consideration when analyzing the wind turbine noise (Dai et.al., 2015).

On the other hand, Pedersen and Persson-Waye (2004) state that wind turbine noise is more annoying to people than traffic noise. Additionally, individuals' noise annoyance can increase due to the aesthetic and visual impacts of wind turbines on the environment.

Governments set minimum distances and dBA value limits according to the medical institutions' recommendations to control the noise level. Following Table 3.1 introduces the distance and dBA value limits among different countries and regions. The *L90* in the table means the level of noise gone beyond during 90% of the time. It signifies the noise level one can hear when there is little background noise in the late evening or at night (Kamperman and James, 2008). L90 helps reducing the background noise effects masking the wind turbine noise (EPA, 2021; Rogers et.al., 2006). Such limitations are set for all wind energy facilities and all terrain types; however, specific noise is perceived at a certain wind energy facility. In this respect, context specific noise evaluations can be adopted (Hansen and Hansen, 2020).

Table 3.1 Recommended Wind Energy Facility Set-Back Distances and Noise Limits in Different Countries and Regions Source: Adapted from Dai et.al., 2015, pp.914-915

Country/Region	**Distance limits (m)**	**Noise limits**
England (U.K.)	350	40 dBA (day) and 43 dBA (night) or L90 + 5 dBA
Scotland (U.K.)	2000	-
Wales (U.K.)	500	-
Belgium	350 in theory (developers making it no closer than 500)	49 dBA (day) and 39 dBA (night)
Denmark	4 x the total height	40 dBA
France	1500 (in practice 500 seems minimum observed)	L90 + 5 dBA (day) and L90 + 3 dBA (night)
Germany	Between 300 and 1500	50 dBA (day) and 40 or 35 dBA(night)

Table 3.1 (continued)

Country/Region	**Distance limits (m)**	**Noise limits**
Italy	Between 5 x the height or 20 x the height (not specified if mast or total height)	-
Netherlands	4 x the height of the mast	40 dBA
Northern Ireland	10 x rotor diameter (with a minimum distance of 500)	-
Portugal	-	55 dBA (day) and 43 dBA (night)
Romania	3 x height of the mast	-
Spain	Between 500 and 1000	-
Switzerland	300	-
Sweden	500 (in practice)	40 dBA
Australia	-	L90 + 5 dBA or 35 dBA
Western Australia	1000	-
Manitoba (Canada)	550	-
Prince Edward Island (Canada)	3 x the total height	-
Ontario (Canada)	-	45 dBA (in urban and suburban areas) and 40 dBA (in rural areas)
British Columbia (Canada)	-	40 dBA
Alberta (Canada)	-	50 dBA (day) and 40 dBA (night)
Quebec (Canada)	-	40 dBA
Illinois (U.S.)	3 x the total height of the tower + the length of one blade	Octave frequency band limits about 50 dBA (day) and 46 dBA (night)
Kansas, Butler County (U.S.)	304.8	-
Kansas, Geary County (U.S.)	457.2 m	-
Maine (U.S.)	-	55 dBA (day) and 45 dBA (night)

Table 3.1 (continued)

Country/Region	Distance limits (m)	Noise limits
Massachusetts (U.S.)	1.5 x total height	-
Minnesota (U.S.)	At least 152.4 and sufficient distance to meet state noise standard	-
Michigan (U.S.)	-	55 dBA
New York (U.S.)	1.5 x total height or 457.2 m	50 dBA
Oregon (U.S.)	1000	36 dBA
Door County, Wisconsin (U.S.)	2 x total height and no less than 304.8	50 dBA
Portland, Michigan (U.S.)	2 x total height and no less than 304.8	-
North Carolina (U.S.)	2.5 x total height	55 dBA
Dixmont, Maine (U.S.)	1609	
China	200 for a single wind turbine, 500 for a large wind farm	55 dBA (day) and 45 dBA (night)

Although there is a paucity of literature regarding the direct impact of wind turbine noise on human health, it is evident that noise can cause sleep disturbance, hearing loss, headaches, irritability, fatigue, constrict arteries and weak immune systems as well as annoyance or dissatisfaction (Rogers et.al., 2006; WHO, 2009). Shepherd et. al. (2011) explore wind turbine noise impact on health and well-being of the people living within 2 km distance to a wind energy facility in New Zealand. Findings of the study indicate that wind turbine induced noise can reduce individuals' health-related quality of life and amenity. Thus, proper and sensitive wind energy facility site selection should be adopted.

Wind turbine generated vibration is another impact taking place in literature creating sensitivity among humans. In general, wind turbine related ground vibrations do not have a detectable effect on humans (Hansen and Hansen, 2020). The seismic vibration induced by wind turbines is unlikely to be perceived by the residents living more than 2 km from or even in closer distances to the closest wind energy facility (Nguyen et.al., 2019). However, vibration impact can interfere with military establishments or seismic monitoring stations (e.g., set up for testing atomic bombs, earthquakes or volcanos) and thus, wind energy facilities need to be located away from these stations (Marcillo and Carmichae, 2018). There are also studies relating wind turbine generated seismic vibrations with infrasound effect of wind turbines (Gortsas et.al., 2017). Although Nguyen et al. (2019) object this claim, they introduce a correlation between vibration levels on the windows of dwellings and the wind energy facilities' acoustic signature (not the ground vibration).

Some scholars directly link wind energy facilities with negative health problems (McMurtry, 2011; Pierpont, 2009). Apart from wind turbine induced noise impact on quality of life and psychological wellbeing, wind turbine related physical symptoms are also emphasized (McMurtry, 2011). Pierpont (2009) calls these symptoms in terms of "wind turbine syndrome". Such symptoms are sleep disturbance, headaches, dizziness, nausea, fullness in the ears, heart problems, as well as loss of concentration and memory. Other studies also support that there is a link between wind turbines and elevated cortisol levels, lower sleep quality and diminished mental capacity (Nissenbaum et al.,2012; Persson Waye et al.,2003). Although there is a growing discussion on health impacts of wind energy facilities, literature is still limited and inexplicit that is in need for further investigation.

3.1.2.4 Technological Sensitivity Areas and Variables

Impact of wind energy development on technological sensitivities include wind energy facilities' interference with security signals and radar systems taking place in roads, railways, radio communication centers and aircraft landing and take-off corridors as well as power transmission lines (Burleson, 2009; Toja-Silva et.al., 2013; Haugen, 2011; Tetra Tech EC Inc. et.al., 2008).

Although the electromagnetic field of a wind turbine itself is low and influential in a limited area (Katsaprakakis, 2012), wind turbine blades can still affect TV and radio waves by periodically modulating electromagnetic fields through reflection, absorption and scattering (Toja-Silva et al., 2013; Randhawa and Rudd, 2009). Similarly, wind turbine towers can also be an obstacle and interfere with wireless services (Dai et.al., 2015). The material of the wind turbine tower and blades can also affect the electromagnetic radiation (e.g., steel materials are more reflective, while synthetic materials minimize reflection) (Katsaprakakis, 2012; Ofcom, 2009). On the other hand, Jackson (2007) study reveals that wind energy facilities have a negative effect on radar system components and on overall performance of the system (e.g., both air traffic control and air defenses radars). In this regard, setting setback distances for siting wind turbines at a locality with certain necessities is at high importance.

Haugen’s (2011) study examining the international wind energy investments in terms of setback distances exemplifies Denmark in terms of flight safety and wind turbine interaction. In Denmark wind turbines over 150 m in size and wind turbines over 100 m in size that are located at the vicinity of airports and near the flight corridor of aircrafts should be illuminated. Study also indicates that for safety reasons, wind turbines should be located at minimum 50 to 120 m distance from roads, railways, radio communications and power transmission lines.

In line with these studies, it is evident that the tremendous growth of the wind energy industry throughout the world necessitates a comprehensive understanding of wind energy development adopting a perspective that takes the social attitudes, drivers and socio-spatial sensitivities into account. Table 3.2 presents the summary of the socio-spatial variables identified from the literature and explained in detail previously.

Table 3.2 Social Context of Wind Energy Development Identified From The Literature: Attitudes, Reactions and Socio-Spatial Sensitivities

Categories	Content	References
Social attitudes and reactions		
Main drivers	-energy preferences (comparison of wind energy with other energy sources) -proximity to wind energy facility (NIMBY) -economic benefits -having information -individual perspective and characteristics: - demographic structure - education - occupation - income status - ideological and political views	Krohn and Damborg, 1999; DWTMA, 1993; Breglio, (1995); Gipe,1995; Simon, 1996; AMR Interactive, 2010; IPSOS, 2010, 2012; Devine-Wright, 2005a,b; Kraft and Clary, 1991; Van der Horst, 2007; Kılıç et al. 2017; Wolsink, 2000, 2007; Evans et.al., 2011; Warren and Birnie, 2009; Aitken, 2010; Bishop, 2002; Bishop and Miller, 2007; Cavallaro and Ciralo, 2005; Daugarrd, 1997; Devine-Wright, 2007; Torres-Sibille et.al., 2009; Tsoutsos et.al., 2009a; Tsoutsos et.al., 2009b; Wang et.al., 2009; Warren and McFadyen, 2010
Socio-spatial sensitivities		
Environmental	impacts on: -forests -wetlands -water resources -watersheds/basins -bird migration routes -local wildlife -historical and cultural heritage sites	Cavallaro and Ciralo, 2005; Drewitt and Langston , 2006; Kaya and Kahraman, 2010; NWCC, 1999; Telleria 2009; Wang et.al., 2009; Aydın et.al., 2013; Baban and Parry, 2001; EEA, 2009; Haugen, 2011; IFC and WBG, 2007; IPCC, 2012; NIA, 2013; Yue and Wang, 2006; Clarke, 1991; Dai et.al., 2015; Klepinger, 2007; Premalatha et.al., 2014; Pearce-Higgins et.al, 2012; Schaub, 2012; US EPA, 2013; Toja-Silva et.al., 2013; Zahedi, 2012; Tertra Tech EC Inc. et.al., 2008

Table 3.2 (continued)

Socio-spatial sensitivities		
Economic	impacts on -local economic activities (forestry, animal husbandry and farming) -employment -property values	Krauss, 2010; Bohn and Lant, 2009; Breukers and Wolsink, 2007; Walker et.al., 2007; Devine-Wright, 2005a; Toke, 2005a,b; Pasqualetti et.al.,2002; Kılıç et.alç, 2017; Mikolajczak et.al., 2013; Baxter et. al., 2013; Heintzelman and Tuttle, 2012; Sampson et.al., 2020; Hoen et al., 2011; Sims et al., 2008; Li et al., 2018; Chen, 2019; Kaffine, 2019
Sensory	impacts on -visual and aesthetic issues -shadow flicker -vibration -acoustics (noise) -health	Haugen, 2011; Baban and Parry, 2001; Bishop and Miller, 2007; Daugarrd, 1997; Nguyen, 2007; Premalatha et.al., 2014; Voivontas et.al., 1998; Zahedi, 2012; Klepinger, 2007; Kılıç et.al., 2017; Lima et.al., 2013; Premalatha et.al., 2014; Bishop and Proctor, 1994; Yue and Wang, 2006; Tester et.al., 2005; Aydın et.al., 2013; Ramirez-Rosado et.al., 2008; Bakker et.al., 2012; Toja-Silva et.al., 2013; Pierpont, 2009; Johansson and Laike, 2007; Thayer and Freeman, 1987; Torres-Sibille et al., 2007; Katsaprakakis, 2012; Dai et. al., 2015; Sun et al., 2008; Klepinger, 2007; Harding et.al.,2008; Haac et.al., 2022; Alberts, 2006; Ellenbogen et.al., 2012; Van den Berg, 2004; Pedersen and Persson-Waye, 2004; Kamperman and James, 2008; Hansen and Hansen, 2020; Shepherd et. al., 2011; Nguyen et.al., 2019; Marcillo and Carmichae, 2018; Gortsas et.al., 2017; McMurtry, 2011; Nissenbaum et al.,2012; Persson-Waye et al.,2003

Table 3.2 (continued)

Socio-spatial sensitivities		
Technological	impacts on -aircraft landing and take-off corridors -security signals and radar systems (in roads, railways and radio communication centers) -power transmission lines	Burleson, 2009; Toja-Silva et.al., 2013; Haugen, 2011; Tetra Tech EC Inc. et.al., 2008; Katsaprakakis, 2012; Randhawa and Rudd, 2009; Dai et.al., 2015; Ofcom, 2009; Jackson, 2007

CHAPTER 4

UNDERSTANDING WIND ENERGY TRANSITION AS A MULTI-LEVEL "NUDGING" PROCESS

The public opposition against wind energy developments connects masses to common decisions, and eventually leads them to joint action and interrupt the technical process of the wind energy transition. In order to understand the behavioral aspect of public opposition against wind energy developments, this research focuses on Thaler and Sunstein's (2008) Nobel prized "theory of nudging" as an appropriate tool corresponding with the social aspect of the socio-technical approach that the study adopts.

This chapter presents the theory of nudging and its possible impact on achieving or preventing wind energy deployment. The chapter firstly focuses on decision making processes in order to define the context of the nudging theory, continues with the theory of nudging, its development process and types. The later sections introduce how nudging is used in other studies such as health, education, finance, energy, and environment; and finally conclude with the nudging in the wind energy transition.

4.1 Heading Decision Making Process Perspective

There are numerous studies in social sciences literature focusing on "decisions" and "choices" in such disciplines including politics, sociology, psychology, economics, and management. Various models have been developed in line with rational (e.g., Von Neumann and Morgenstern 1944; Simon 1960, 1977; Tversky and Kahnemann, 1991) and intuitive approaches (e.g., Sinclair and Ashkanasy, 2005; Dane and Pratt, 2007; Akinci and Sadler-Smith, 2012). Recent studies adopt a co-evolutionary perspective in which decision making evolves towards an integrated approach including both ‘intuitive’ and ‘rational’ elements acknowledging the complex structure of the real world (Abatecola et al., 2018; Cristofaro, 2019; Adinolfi, 2021).

The prominent rational decision-making models in social sciences take place within the domains of psychology and economics. The Expected Utility Model (Von Neumann and Morgenstern, 1944) in economics constitutes an inspiring framework for most of the decision-making models. It focuses on one’s utility maximization aim during decision-making. Simon’s (1955) Bounded Rationality approach is another pioneer model that introduces a process oriented approach questioning the rationality concept. His framework focuses on a satisficing decision rather than an optimizing one. The Prospect Theory (Kahneman and Twersky 1979) developed within the psychology discipline also provides a rational decision-making model yet similarly questions the idea of rationality. In this model despite the failures of human decision-makers to behave rationally, they eventually choose the relatively best alternative according to their self-interests.

According to Sauter (1997, p.3) “good decision-making” is based on the choices related with the available proper and useful ‘information’. By using information, a decision-making process, composed of a number of stages, can be realized. Simon’s (1960) widely acknowledged decision-making model includes three main phases: *intelligence*, *design*, and *choice*. Additional phases including *implementation* and *monitoring* are added later (Simon, 1977). As shown in Table 4.1, intelligence refers to the problem definition phase of the decision-making process. Design phase implies creating solution alternatives within the limits of one’s available time and resources. Choice phase is the most important phase where a decision is made among different alternatives. After choosing an alternative, one develops a strategy to take action during the implementation phase. Finally, the monitoring phase takes place which works as an intelligence phase including the assessment of the decision made.

Table 4.1 Simon's Phases of The Decision-Making Process

Phase	**Content**
Intelligence	identifying problems or opportunities (may also include monitoring process of a previously completed decision-making)
Design	understanding the problem and creating alternative solutions through values and experiences gained in the intelligence phase
Choice	Making up a decision from the alternative in the design phase and following a specific action
Implementation	putting the choice into work through activating all the necessary tools to realize the solution (this is the stage where change is started)
Monitoring	assessment and feedback processes of the decision made

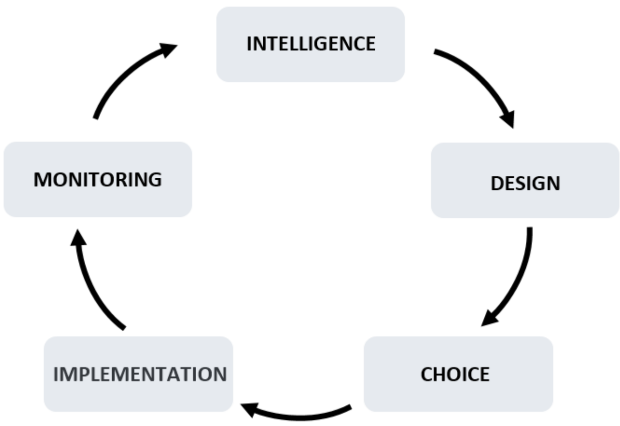

Figure 4.1. Cyclical movement between Simon's phases of the decision-making process

The model suggests a cyclical movement between the phases as represented in Figure 4.1. However, the movement may not be working in proper order. It may include "loopbacks", and "ignorance or repetition" through the phases (Bilgin Altınöz, 2002, p.21).

While making a decision, experiences also play an important role in addition to information. In this respect, Daniel Kahneman (2011) who is a leading scholar in behavioral economics with a psychological background, refers to the concept of "two selves". "Two selves" signify the "experiencing" and "remembering" selves representing the perspectives in an individual's decision-making process. Decisions differentiate according to the perspective from which one is looking. Kahneman and Riis (2005) first coin the term as "two perspectives on life". 'Experiencing self' exists in the present moment and is subject to disappear soon. 'Remembering self' is the relatively permanent one that is assessing and keeping the memory of the experience. In other words, 'remembering self' controls the final form of the memory collected within an individual's life. Whether positive or negative, however, 'remembering self' also conveys the potential of "cognitive illusion" (Kahneman and Riis, 2005, p.286). They state that although the overall experience is positive, the entire experience will be remembered as a negative memory with a bad ending to that experience. This reflects the power of the negativity bias of the brain.

Kahneman and Riis (2005) indicate that the remembering self is the one that evaluates and reaches a conclusion. And in this respect, they (2005, p.289) state that:

> *Evaluation and memory are important on their own, because they play a significant role in decisions, and because people care deeply about the narrative of their life. On the other hand, an exclusive focus on retrospective evaluations is untenable if these evaluations do not accurately reflect the quality of actual experience.*

However, although it is capable of erring, behavioral sciences argue that the behavior (decision /choice) is shaped by the humane and emotional brain as well as influenced by the contextual setting within which decisions are made (Kahneman 2011; Thaler and Sunstein 2008). The human brain works heuristically during the process of making up the decisions, yet the mental patterns that simplify the decision-making process may channel the one into predictable systematic biases and errors (Kahneman 2003; Kahneman and Tversky 2000). In fact, these so called biases and errors misleading people may also be used to help them make better choices (Loewenstein et.al, 2007).

Moreover, according to Thaler and Sunstein (2008), a better understanding of how humans make decisions would help find ways to influence choices. They argue that this can be done by taking into consideration the context within which their decisions are made. They call this changing the “choice architecture”. Choice architecture, in parallel to the traditional architecture, is about influencing the final decisions of individuals through interfering the way of the choices are constructed and presented.

4.2 Theory of Nudging – Changing the Choice Architecture

Thaler and Sunstein (2008) introduces the “theory of nudging” that holds a behavioral economic approach about decision making. It relies on the idea that decision making is realized through changing the “choice architecture” of individuals. Nudging, in this respect, comes forward as a means to influence that. It is considered an “innovative governance intervention” tool providing “low-cost solutions” for policymakers against traditional approaches (Kosters and van der Heijden, 2015, p.278). EU Commission (2013) reports that “nudge theorizing allows policy-makers to better understand and influence people's behavior”. In this regard, the theory is widely applied by the US and UK governments as well as some European countries (US: Office of Information and Regulatory Affairs in the Obama administration, 2009, UK: Behavioural Insight Team (BIT), 2011; EU: establishing teams and units in Germany, Italy, Netherlands and European Commission, Behavioural Studies for European Policies Program in 2010) (Halpern and Sanders, 2016).

According to Thaler and Sustein (2008), the economic theory generally falls short in foreseeing individuals’ behaviours. In fact, this view is not novel. In the 19^{th} century, John Stuart Mill introduced the idea that individuals are not ‘homo economicus’ . Individuals’ “behavioral insights” are a key to develop economic theories. This inspired many scholars from various disciplines. Simon's (1955) theory of "bounded rationality" argues that individuals lack the potent of making "economically optimal decisions" since they are not capable enough to get and process all the necessary economic information. In response to that, in the early 2000s, the scholars of behavioral science (Kahneman, 2011; Cialdini, 2009; Ariely, 2008) introduced the notions of "bounded willpower" and "bounded self-interest". Bounded willpower means that "people do things that are not in their own best interest even when they are aware of this" and bounded self-interest is that "people do so because they consider benevolent behaviour as more fair than selfish behaviour" (Kosters and van der Heijden; 2015, p.278).

Understanding the "behavioral insights" aim to predict the behavioral response of individuals to legal rules (Jolls et al., 1998). One step further, the nudging theory focuses mainly on shaping that behavior (Thaler and Sustein, 2008). In other words, Thaler and Sunstein intend to use behavioral insights to change the "choice architecture" of individuals, and thus, to achieve more effective governance and a more contented community. They (2008, p.6) define "nudge" as follows:

> "A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not."

The term "choice architecture" is defined with a physical architectural design analogy as "the context in which people make decisions" (Thaler and Sunstein, 2008, p. 3). By making a particular arrangement of the options through a variety of mechanisms such as incentives and defaults, one can influence what and how people will choose and behave, and thus, one can *nudge*.

Hollands et al. (2013) provide another definition of nudging in terms of interventions on choice architecture in health behaviours. They focus on the automatic processes in terms of the “minimal conscious engagement” including the reflective processes as well. They propose following definition (2013, p.3):

> “Interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions are implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously, and are not targeted or tailored to specific individuals.”

This definition includes “altering small-scale physical and social environments (e.g., spaces such as restaurants, workplaces, homes, and shops)” that provoke reflective “informed choice” (Vlaev et al, 2016, p.551).

Behavioral insight is an umbrella term incorporating and considered together with the concepts of libertarian paternalism, choice architecture, and nudging. All these three concepts may be used interchangeably. While “liberal paternalism” includes governmental nudges; and non-governmental implementations are defined with “choice architecture”; eventually the concept of nudging covered all forms of implementations (Özdemir, 2019). According to Sunstein (2015) “choice architecture” is inevitable since nudges exist naturally in life. Governments and private sector naturally adapt to this process.

Nudging applications make a difference in practice, rather than in theory. Maintaining one’s freedom of choice is critical in decision-making (Özdemir, 2019). According to Thaler and Sunstein (2008) nudging can be used as a goal-achieving governance instrument substituting the conventional coercive interventions such as command and control regulation. In this regard, a variety of actors can implement nudges, in a variety of forms to achieve a variety of outcomes. Table 4.2. introduces the possible actors, interventions, and outcomes. For instance, governments can nudge citizens to increase their personal savings by changing pension saving rules; business can nudge consumers by giving feedback about their energy use relative to other neighbors; and individuals can nudge themselves to quit smoking by saving a given amount of money for a specific period of time and only get the money if a test for nicotine is passed; otherwise the money is donated to charity (Halpern and Sanders,2016; Kosters and van der Heijden; 2015).

Although there is not a specific behavioral insight or nudging methodology due to the differences in the legislative and executive activities and government systems of the countries, the main purpose of nudges is to guide the citizens to the common good in the public sphere. More efficient and human welfare-enhancing results can be obtained by designing options in accordance with the expected behavior (Özdemir, 2019) (e.g., provision of more effective and efficient government services; transition to clean energies; achieving equal opportunities in education and healthier life).

Table 4.2 Actors, Interventions and Outcomes Adapted from Thaler and Sunstein (2008) and Kosters and Van Der Heijden (2015, p.279)

Actors	**Interventions**	**Outcomes**
● Government ● Business ● Individuals	● Financial incentives ● Providing information ● Actively blocking an inappropriate choice	● provoke a single response ● prompt a more long-lasting behavioral change ● both

4.3 Theoretical Framework of Nudging – Dual Process

The theoretical framework establishing the foundation of nudging is the "dual process theory." It is introduced by the Nobel prized psychologist Daniel Kahnemann (2011) in his book "*Thinking, Fast and Slow*". The dual process theory is based on the two distinct ways of human brain thinking in terms of judgment, decision-making, and reasoning. Kahnemann refers to these two distinct systems as *System 1* and *System 2,* and he adopts from the works of the psychologists Keith Stanovich and Richard West.

System 1 covers the intuitive and automatic way of thinking; and system 2, the reflective and rational way of thinking. Thaler and Sunstein respectively call these modes of thinking as automatic and reflective. The automatic thinking is fast, instinctive, and mainly associated with activities, uncontrolled, effortless, and unconscious. The reflective thinking is labeled as slow, effortful, and controlled. It is associated with the deliberate and conscious processing of information. It needs concentration, self-awareness and the experience of agency (Kahnemann,2011; Hansen and Jespersen, 2013).

The dual process theory argues that behavior derives from either mode of thinking. Hansen and Jespersen (2013) exemplify breathing, as an automatic action, taking place in one's body. Yet when reflective thinking is employed, this bodily activity is controlled in the way of deciding to hold the breath when a bad smell occurs. It is the automatic thinking that informs the reflective thinking to stop holding the breath and start breathing again. Thus, there is an interaction between automatic and reflective thinking. Kahnemann (2011, p.21) states that the outcomes of System 1 in terms of impressions and feelings represent the "main sources of the explicit beliefs and deliberate choices of System 2".

Mainly, the automatic thinking becomes the one determining the final behaviour since it requires less effort compared to the reflective thinking. This, however, may result in inconsistencies with one's long-term goals and instant automatic behaviors. For example, one can have a long-term goal of losing weight but keep the unconscious unhealthy snacking habit at the same time (Weijers et al., 2021).

The theory of nudging primarily assumes to accept the inadequate rationality of the System 1 and use this in a positive way (Weijers et al., 2021). Benefitting from these deficiencies, Thaler and Sunstein (2008) suggest making small changes in the environment, which they call nudges, to change individuals' behaviors. These nudges are intended to guide people towards improved decisions without limiting options or significantly changing economic incentives.

4.4 Types of Nudges

Sunstein (2014, pp.585-587) proposes ten important nudge types according to psycho-social needs and the association to the outside world and to the past. These are defaults, simplification, uses of social norms, increases in ease and convenience, disclosure, warnings, precommitment strategies, reminders, eliciting implementation intentions and informing people of the nature and consequences of their past choices. These can be explained as follows (Sunstein, 2014, pp.585-587).

Defaults are the automatic enrollment rules taking place in health, education and savings programs (e.g., automatically enrolling to a retirement plan and increasing savings). Simplification works for the reduction of the complexity of the forms and regulations in order to increase peoples' involvement to various health, education, finance programs. Using social norms in terms of stressing the others' positive behaviors in order to promote the expected behavior change, is one of the most effective nudging types (e.g., emphasizing that nine out of ten hotel guests reuse their towels). Another type of nudges is to make the expected behavior/choice economically and visibly accessible (e.g., low-cost and visible healthy foods). Disclosure nudging type is about sharing economic and environmental costs information of one's choices such as their energy use. Private or public warnings are one of the nudge types focusing on triggering people's attention and divert them into the preferred behavior (e.g., warnings on cigarette packages about the health hazards of smoking). On the other hand, committing to a specific course of action (such as committing to a smoking cessation program) works better for the achievement of the goals through reducing the procrastination. Reminder type of nudges can also be influential on engaging one in a certain action (e.g., taking pills or paying bills). Prompted choice is an alternative approach within this context. In that case, people do not need to make a choice but rather they view the options (e.g., whether they want to be organ donors). People tend to take actions when their intentions are elicited (e.g., asking whether they are going to vote) or their identity is emphasized ("you are a voter, as your past practices suggest"). Final type of nudges is about informing people of the nature and consequences of their past choices. Having information about their behaviors (such as energy uses, electric bills, health care expenditures) can lead to a change in the way they behave.

Alternatively, a framework for the types of nudges is also developed by Hansen and Jespersen (2013) for the responsible use of nudging in public policy. They distinguish the type of a nudge from the transparency of a nudge, and suggest four categories of nudges, namely as (i) “Type 1” and (ii) “Type 2”, and (iii) transparent and (iv) non-transparent nudges.

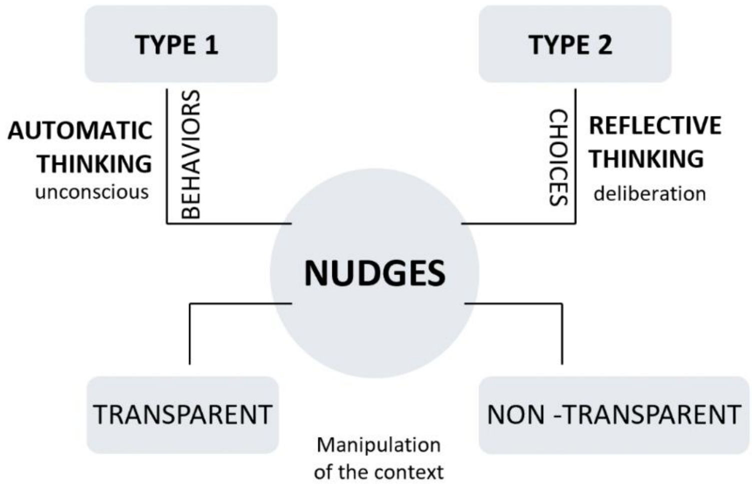

Figure 4.2. Types of nudges and how they operate with each other according to Hansen and Jespersen’s (2013) conceptualization

“Type 1” and “Type 2” nudges, follow Thaler and Sunstein’s (2008) distinction between (i) System 1 – automatic thinking and (ii) System 2 - reflective thinking. According to Hansen and Jespersen (2013), both Type 1 and Type 2 nudges focus on influencing automatic thinking. In this respect, the main attention of Type 1 nudges is on changing the behavior that is operated by automatic thinking. Type 1 nudges aim at assisting individuals to make choices that are in their own best interest while not involving reflective thinking (e.g., changing the default options: saving more for retirement via choosing the right insurance plan (Thaler and Sunstein, 2008); reducing plate sizes so that reducing calorie intake (Wansink, 2004). Type 2 nudges aim at triggering reflective thinking within an automatic thinking process, and subsequently, change the behavior towards a desired end. This is framing the nudge by changing the definition of a problem in a context to affect decision making processes and reflective choices (Kahneman and Tversky, 1984) (e.g., Thaler and Sunstein's (2008) "fly-in-the-urinal" nudge where the fly is working as an attraction for the automatic system to initiate a reflective response making one focus on the act of urinating and pay attention or even aim to reduce spillage). Although both types of nudges are working through automatic thinking and changing behaviors eventually; Type 1 nudges benefit from unconscious, unpremeditated actions while Type 2 nudges benefit from actions involving deliberation, judgment, and choice.

Hansen and Jespersen (2013, p.17) criticize Thaler and Sunstein's stronger transparency approach in terms of 'visibility' and 'the possibility of monitoring' for the acceptability of using the nudge approach to behavior change as being "insufficient as guidelines for the responsible and acceptable use of the nudge approach to behavior change by public policy makers". They provide another distinction for the 'transparency' of nudges namely as transparent and non-transparent. Transparent nudges are apparent to the individuals being nudged in terms of the intentions behind and means by which the behavioral change is pursued (e.g., Thaler and Sunstein's (2008) "fly-in-the-urinal" nudge, traffic light labeling nudge signaling unhealthy content in products: green labelling on healthy products, red labelling on unhealthy products and orange labelling on products that are neither (Emrich et al. 2017). Non-transparent nudges are invisible to the individuals being nudged. The main intention or the means for the behavior change cannot easily be recognized. (e.g., plate size reduction to lower calorie intake (Wansink, 2004); framing the nudge by setting the context in a way that may change the choices and decisions (Kahneman and Tversky, 1984); changing defaults from opt-in to opt-out to register for organ donation (Thaler and Sunstein,2008).

Transparency provides a decisive criterion for evaluating the effectiveness of nudges. While some scholars claim that non-transparent nudges work best (Bovens, 2009; Grüne-Yanoff, 2012), there are also studies indicating that transparency does not have an impact on the effectiveness of nudges (Bruns et al., 2018; Steffel el al, 2016). According to Hansen and Jespersen (2013), decreased effectiveness occurs only in the case for Type 2 nudges aiming at changing the behavior of a person although she/he does not agree with. Additionally, the notion of transparency works as an appropriate tool for addressing the manipulation concerns of nudging (Hansen and Jespersen, 2013, p.18). Manipulation is defined as the intend to change one's perception and accordingly behaviors and choices through various strategies (Braiker, 2004). In this respect, nudging can work as a manipulation strategy to influence one's choice through choice architecture regarding introduction of the options to him (Bovens, 2009). Hansen and Jespersen (2013) suggest a matrix of four categories of nudges as illustrated in Figure 4.3.

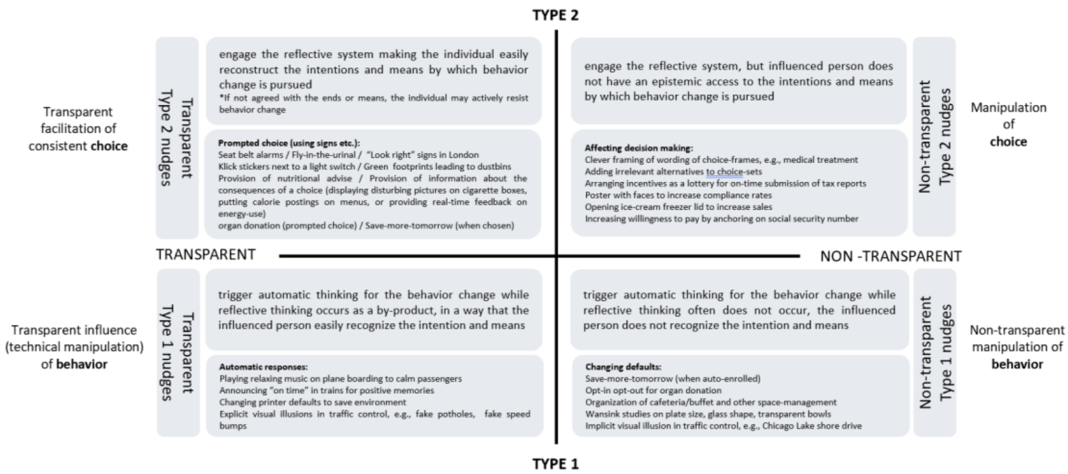

Figure 4.3. Matrix of the four categories of nudges and how they affect choices and behavior (adapted from Hansen and Jespersen 2013)

According to Hansen and Jespersen (2013), "transparent type 2 nudges" engage the reflective system in the process that makes the individual easily recognize the intentions and means by which behavior change is pursued. The individual may actively resist behavior change if she/he does not agree with the ends or means. Examples of the interventions under this category include transparent facilitation of consistent choice such as "look right" signs in London, fly-in-the-urinal, provision of information about the consequences of a choice (displaying disturbing pictures on cigarette boxes, putting calorie postings on menus, or providing real-time feedback on energy-use). On the contrary, “transparent type 1” nudges trigger automatic thinking for the behavior change while reflective thinking occurs as a by-product, in a way that the influenced person easily recognizes the intention and means. This kind of nudges are exemplified by creating automatic responses through transparent technical manipulation of behavior such as playing relaxing music on plane boarding to reduce chaos, using explicit visual illusions in traffic control and slow down the vehicles, e.g. fake potholes, fake speed bumps.

“Non-transparent type 2” nudges engage the reflective system in the process, but the influenced person does not epistemologically recognize the intentions and means by which behavior change is pursued. Hansen and Jespersen (2013) claim this type of interventions affects the decision making of individuals and aims to manipulate their choices. Examples of this category include clever framing the wording of choice-frames e.g., concerning medical treatment; adding irrelevant alternatives to choice sets. “Non-transparent type 1” nudges work with automatic thinking for the behavior change while reflective thinking often does not occur, the influenced person does not recognize the intention and means. Examples of the interventions under this category include non-transparent manipulation of behavior through changing defaults such as providing opt-in opt-out for organ donation; automatically enrolling the save-more-tomorrow program, organization of cafeteria/buffet and other space-management for lowering calorie intake.

4.5 Implementation of Nudges

As exemplified by Thaler and Sustein (2008), nudging may be used in a variety of fields in governmental and private sectors as well as by individuals. Health, education, finance, energy, and environment are the so-called fields where nudging applications find room. The main aim is to provide better options in order to ease the way for decision-makers for a better and healthier choice. Nudge emerges as an important public policy tool used in different ways such as implementing default or simplified complex options, enacting the power of social norms, altering the profiles of different choices, and providing information for influencing choices (Bonell et al, 2011; Aldemir and Kaya, 2020).

The provision of the “default option” is a nudging policy commonly used in financial policies. Many countries provide the default option for savings plans and lead individuals to make savings plans. In the USA, and New Zealand individuals sign up automatically into the savings system via the default option. They know that they can easily exit the program if they wish, but most individuals do not withdraw their participation in savings plans. Studies reveal that savings rates significantly increased (Madrian, 2014; Toder and Khitatrakun, 2006). In order to increase the savings rate, a similar policy is implemented in Turkey by The Ministry of Economy (2018) within the private pension system project. Another default option policy example is organ donation. Donations are increased by around 25-30% through auto-enrollment in most countries where organ donation is set as default (Abadie and Gay, 2006).

Public health is also a significant implementation area for nudging (Hallsworth, 2016; Madrian, 2014; Matjasko et al.,2016). Thaler and Sustein (2008) suggest nudges that simplify decision-making in the American insurance system Medicare. John and Stoker (2020) argue that it is important for governments to influence the citizens’ behavior rather than relying on hard-to-enforce laws, and they draw attention to the necessity of a "nudge" approach in such cases. Similarly, various studies reveal that the theory of nudging can lead to positive results when effectively used within the context of the Covid-19 challenge (Bavel et al., 2020; Aldemir and Kaya, 2020). Other health related nudging examples refer to altering the profiles of different choices such as placing healthy food prominently in the canteen; and provision of information in terms of the benefits of climbing stairs instead of using elevators (Burger et al. 2010; Wryobeck and Chen, 2003).

The application of simplified options is exemplified within the field of education. Research from the Charlotte-Mecklenburg region in North Carolina, USA, shows that compiling, sorting, and simplifying the information presented to the parents during the school choice eased the process for parents of school selection and thus children's enrollment in the schools with better education (Hastings and Weinstein, 2008).

Using the power of social norms is another policy tool adopted to nudging. In this respect, an energy saving experiment involving 300 families in California indicates that social norms are influential in energy saving (Schultz el al., 2007). When informed about the energy use of other families, research findings show that the ones with higher energy use tend to reduce their energy use. Additionally, emotional messages were given to families via facial expressions (those who used energy above-average were given an unhappy face, and those who consumed energy below-average were given a happy expression), and even families that consume below the average did not increase the energy consumption and thus the desired policy target was achieved. The power of social norms is also used in a forestation project in Turkey coordinated by the Ministry of Agriculture and Forestry (ME, 2018). Through sending seeds to public by mails signed by the President, Ministry of Agriculture and Forestry aimed to make public participate in achieving a greener Turkey ("Daha Yeşil Bir Türkiye'yi Birlikte İnşa Edelim" Seferberliği, ME, 2018).

4.6 Nudging in the Renewable Energy Transition

Considering that a variety of actors can implement nudges, in various forms to achieve diversified outcomes (Thaler and Sunstein, 2008) nudging emerges as an appropriate policy tool for promoting or restraining the sustainability/green transition in terms of renewable energy as well. These policy tools about sustainability related topics may work with social, technological or both ends (Hess and Sovacool, 2020). As far as indicated, nudges can be implemented through formal regulatory tools such as laws and legislation, or through various actors and organizations at different levels in positive or negative ways (Tomazic, 2020). Developing an organizational framework including incentives and promotion of renewable energy transition; energy justice issues; and pro-environmental information provision are common subjects discussed within the context of nudging.

Tomazic (2020) introduces the existence of a multi-level nudging process in terms of renewable energy in case of Slovenia. He emphasizes the positive effect of nudging as a soft paternalist approach instead of traditional regulation in order to reach the desired goals. However, although nudging is to be differentiated from legislative activities, it has to stay within the bounds of material law. In this respect, governments should have an adequate "organizational framework" for their implementations work successfully (Tomazic, 2020, p.538).

In terms of local level nudging for the renewable energy, Tomazic (2020, pp.551) presents three main organizational structures that should work cooperatively: (i) using the existing political order at the local-level; (ii) "creating local energy organizations either at the level of an individual municipality or at a collective level, in intermunicipality terms"; (iii) regulating the energy providers' activities at that specific local through legislation (bylaws, decrees etc.). Besides, local level renewable energy context plays key role in the implementation of nudging policies both by the local level authorities and organizations. Although nudging is a soft paternalist approach, various legal concerns should be addressed in order to realize the desired nudging policy at all level ranging from state level authorities, to energy providers to individuals such as constitutional and human rights consideration (Tomazic, 2020, 551). Tomazic (2020) proposes to define renewable energy defaults for energy suppliers at the locality by local administrations as well as individually informing inhabitants at the locality about the possible renewable energy related developments.

Nudging in green transition is used in terms of reshaping individuals' energy consumption. Since green technologies have a major impact on reducing the impact of the building sector on climate change, there is a growing need for new (niche) technologies creatively destructing the traditional/old technologies (Kivimaa and Kern, 2016; Johnstone et al, 2020).

Colasante et al.'s (2021) study search for the potential of using nudging policy in case of solar energy transition. They aim to find suitable tools to nudge people for switching to alternative solar technologies to produce and consume their own energy. Findings illustrate that the main motivation for such a transition is economic rather than environmental concerns.

Respondents with environmental concerns such as reducing their environmental footprint were less influenced by the economic subsidies, yet respondents also declared that use of green energy must be rewarded (Colasante et al., 2021, p.6).

Colasante et al. (2021) propose a policy mix for the green transition in Italy in case of solar energy prosumer process. Policy tools include organization of "information campaigns" to better communicate the new technology and its economic and environmental advantages, while restraining the incumbent technology by highlighting its downsides. Another policy is about monetary and non-monetary incentives. Since economic returns are significant for the individuals switching to green technologies, in this respect existence of a balanced energy demand-supply within an energy mix including green resources is critical. This will address the environmental improvements as well. The final policy tool is about the community based green transitions. Community solar energy initiatives are proposed as a practical approach for creating self-sufficient territorial units. Following table 4.3 introduces the potential tools to be used for nudging promoting green energy transition.

Table 4.3 Potential Tools for The Policy Makers Promoting a Green Energy Transition (Adapted from Colasante et al., 2021)

Policy makers promoting a green energy transition		
Tools	**Actions**	**Aim**
Information campaign	Using social media youth involvement in schools and universities conferences organized by municipalities (actions to reach out a broad audience)	To stimulate consumers to switch to a prosumer role
Nonmonetary & monetary incentives	Subsidy for self-consumption Community based developments	To change individual perception about renewable energy The monetary incentive will be of assistance in changing their consumption habits To implement self-sufficient territorial units

Nudging also takes place in energy justice discussions regarding the concerns for the vulnerable social groups during the energy transition processes. DellaValle and Sareen's (2020) study focuses on enhancing energy justice through behavioral economics and the ethical use of nudging. They argue that nudging may be used both for the energy demand and supply side. However, there are issues to be addressed for proper operation of nudging in terms of unfair distributional patterns, varying individual capabilities, recognition and participation. In this respect, energy justice is challenged by such problems as having proper information about individuals' goals; problems regarding the sufficiency of cognitive skills and motivation of individuals to recognize the intention and means of the error-prone and benevolent policymakers who are implementing nudges. DellaValle and Sareen (2020) discuss these problems in three groups: (i) information problem; (ii) multidimensional problem; (iii) political economy problem.

Nudging approach works properly when policymakers have precise knowledge about individuals' goals. Nudging may be used to get information about individuals' needs and problems. On the other hand, individuals' cognitive skills and motivations may be insufficient to analyze and express their needs and relate appropriately with resources. Benevolent governments may benefit from nudging to respond the needs of vulnerable individuals. On the contrary, non-benevolent approaches may exploit the vulnerable people's lacking cognitive capacities and make them pay for services they are not able to use (Shah et al, 2012; Caskey, 1994). Public policy makers and so the institutional setting may also lack in cognitive capacities and fail in their assumptions. Thus, they may provide toxic choice environments for the individuals (Rebonato, 2012). In this case, civil society organisations take a major role in terms of developing dialogue between individuals and policy makers (Sareen et. al., 2018). On the other hand, norm-based nudging interventions may also work effectively in encouraging pro-environmental, pro-social and cooperative behavioral changes (Farrow et. al. 2017; Bartke et. al., 2017; Nyborg et. al., 2016; Ölander and Thøgersen, 2014). However, "nudging comes with benefits and risks that are contingent and context-specific" (DellaValle and Sareen, 2020, p.6).

According to DellaValle and Sareen (2020), energy justice needs of the vulnerable energy poor people are not addressed by the energy supply side. There may be conflicting issues between the multi-level actors (individual households, energy providers, and decision-making authorities) taking place during the process. Context-specific nudging policies may ease the complex, problematic situation of energy justice.

Nudging policies are also adopted for pro-environmental behavioral changes and called as "green nudges". Thaler and Sunstein (2008) emphasize this with the "saving the planet" chapter in their book that mainly focuses on providing information about risks of a specific course of action: smoking, pesticides, fuels, energy use. Provision of information within the nudging context comes forward for the environmental-prone behavioral change. Ölander and Thøgersen (2014, p.345) emphasize "anchoring, default setting, and social nudges" as the most common and suitable forms of nudging approaches for environmental policies. They exemplify anchoring with EU's mandatory energy label for various appliances; default setting is illustrated through the default participation option for the Smart Grid creating higher participation rates; and finally, social norms related with the energy conservation working in a "follow the herd" context. Information is a significant component of nudging. Thaler and Sunstein (2008, p.65) state that "If choice architects want to shift behavior and to do so with a nudge, they might simply inform people about what other people are doing.". Consequently, to realize pro-environmental behavioral change appropriate cognitive elements produced by information (education, communication, persuasion) may be used for nudging (Ölander and Thøgersen, 2014, p.354).

Although adopting nudging strategies are common in pro-environmental behavioral change (so-called "green nudges"); nudging studies specifically focused on wind energy deployment are quite limited. However, public acceptance studies (Miłaszewicz, 2022); setting up of organizational frameworks in terms of legal regulations (Santos Silva, 2022; Tomazic, 2020) may be regarded within this context. Policymakers are heavily influential on individuals in taking particular decisions, especially when individuals have inadequate information and complex choice environments (Jachimowicz et.al., 2019).

Considering the climate change-related decarbonization interventions taking place in each and every city's and country's agenda, setting up incentives for wind energy developers/investors (Tomazic, 2020) at national and international levels may be evaluated as a nudging strategy. On the other hand, such nudges as the provision of information; use of social norms; eco defaults; context re-framing (e.g., stressing social gains rather than personal sacrifice) (Santos Silva, 2022; Sunstein, 2021) may be associated with manipulation of public/social acceptance of wind energy.

Social reactions in terms of public opposition against wind energy development lead to an interruption of the technical deployment of wind energy. This may in turn create a bottom-up nudging process that can be correlated with the developments in “*niches*” within the context of radical innovations generated at the ‘micro-level’ (local level). These niches will “provide locations for learning processes” (Geels, 2002). Guy and Karvonen (2011) emphasize that technological development is strongly intertwined with and influenced by social changes.

Following Table 4.4 introduces the nudging implementations taking place in the literature categorized according to the Hansen and Jespersen’s (2013) type and transparency context.

Table 4.4 Nudging Implementations Categorized According to Type and Transparency Contexts

	TYPE 1 (not reflective)	Examples	References
Transparent	**New Impulse Creation** *creating changes in a defined setting	**impulse**: playing relaxing music on plane boarding to calm passengers announcing “on time” in trains for positive memories changing printer defaults to save environment explicit visual illusions in traffic control, e.g., fake potholes, fake speed bumps	Hansen and Jespersen, 2013
Nontransparent	**New Context Creation** *creating a setting default for automatic choice	**auto sign in; auto-enrollment**: sign up automatically into the savings system via the default option; sign up automatically into the private pension system; auto-enrollment in organ donation programs **auto choice:** organization of cafeteria/buffet and other space-management for lowering calorie intake; reducing plate sizes so that reducing calorie intake	Madrian, 2014; Toder and Khitatrakun, 2006; ME, 2018; Abadie and Gay, 2006; Wansink, 2004

Table 4.4 (continued)

	TYPE 2 (reflective)	Examples	References
Transparent	**Contextual Association** *providing legal-financial frameworks-incentives **Information Provision** *providing factual information *providing a specific message for prompted choice	**Legal-financial framework provision:** Providing subsidy for self-consumption to change individual perception about renewable energy Promoting community based developments to implement self-sufficient territorial units climate change-related decarbonization interventions in terms of setting up incentives for wind energy developers/investors at national and international levels **Information provision:** Seat belt alarms / Fly-in-the-urinal / “Look right” signs in London Klick stickers next to a light switch / Green footprints leading to dustbins Provision of nutritional advise / Provision of information about the consequences of a choice (displaying disturbing pictures on cigarette boxes, putting calorie postings on menus, or providing real-time feedback on energy-use)	Colasante et al., 2021; Tomazic, 2020 Hansen and Jespersen, 2013

Table 4.4 (continued)

	TYPE 2 (reflective)	Examples	References
Nontransparent	**Information Selection** *simplification / context re-framing	**simplification**: simplifying decision-making in the American insurance system Medicare compiling, sorting, and simplifying the information presented to the parents during the school choice **re-framing**: stressing social gains rather than personal sacrifice to influence the social acceptance of renewable energy technologies clever framing the wording of choice-frames e.g., medical treatment; adding irrelevant alternatives to choice sets	Thaler and Sustein, 2008; Hastings and Weinstein, 2008; Santos Silva, 2022; Sunstein, 2021; Hansen and Jespersen (2013)

CHAPTER 5

METHODOLOGY FOR SOCIO-SPATIAL ASPECTS OF WIND ENERGY TRANSITION RESEARCH

This chapter introduces the methodological framework of the study. It includes the research design, adopted research approaches, the site selection, the fieldwork process, variables being tested, respondents, data gathering, and data analysis techniques.

5.1 Research Design

The research design is composed of three parts. These parts are interrelated and each aim at deciphering the grounding knowledge salient in wind energy transition: (i) the planning of wind energy development, (ii) social sensitivities towards wind energy development, and (iii) socio-psychological triggers that enhance and/or prevent wind energy development. In fact, research questions and the methodological framework are also formulated in reference to these parts. Table 5.1 and Figure 5.1 present this structure. Accordingly, following the main research question of '*How does wind energy transition lead to public opposition?*', the study aims at revealing the socio-technical dimensions and multi-level nature of the wind energy development process. This is incorporated with the sub-questions about (SRQ1) 'wind energy transition in the Turkish planning context', (SRQ2) 'the underlying socio-spatial sensitivity issues for public opposition', and (SRQ3) 'conditions nudging the involved actors in wind energy transition' (Figure 5.2).

Table 5.1 Research Design of The Study

Research question	Research approach	Data gathering methods	Data analysis methods
Wind energy transition in planning process	Qualitative research - to collect in-depth local/national knowledge	*in-depth interviews with decision-makers, investors and NGOs at the national level (face-to-face and telephone interviews) *Review of existing legal documents	descriptives interpretations process mapping
Socio-spatial sensitivity issues	Qualitative research - to collect in-depth local knowledge Quantitative research	*in-depth interviews, site surveys, focus group with decision-makers, investors and NGOs in İzmir and headman of research sites and residents from each settlement/research site *previously defined sensitivities: Likert scale rating	content analysis simple statistical analysis group comparisons
possible conditions nudging the involved actors	Qualitative research - to understand conditions nudging actors within different levels	* focus group * group observations	descriptives interpretations

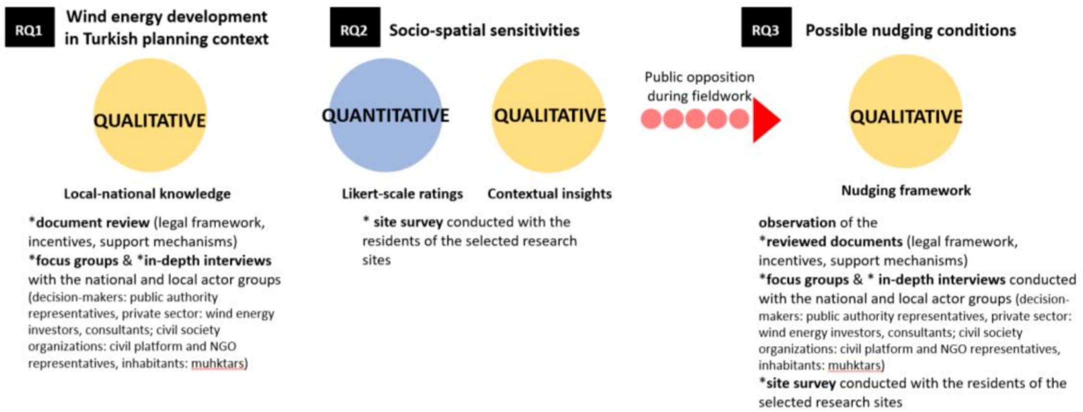

Figure 5.1. Research design of the study

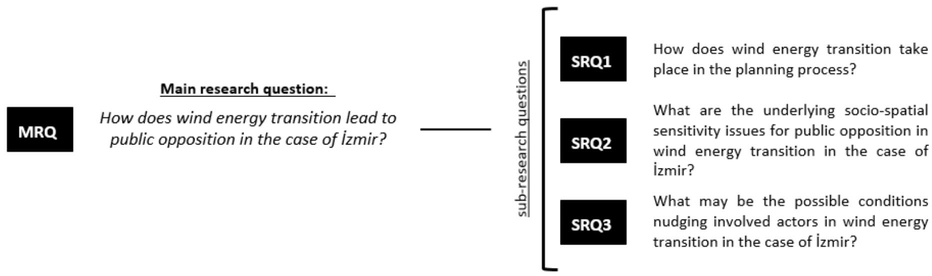

Figure 5.2. Research questions of the study

The study assumes that technology-focused wind energy development affects socio-spatial experiences and the perception of the community about the development. This, first, calls a need for drawing the Turkish planning context within which wind energy development finds its place. Second, although previous research shows evidence that communities become sensitive to certain issues when wind energy transition starts, the type of significant issues contextually vary. This requires a context-based investigation to understand how wind energy development creates annoyances for local communities. Understanding the social transition to wind energy development and identifying these experiences as lived yet sometimes just perceived by the community without necessarily experiencing it. Taking this as a point of departure, this research is designed with an aim at comprehending the areas of experience and/or constructed perception that such a transition may cause both socially and spatially, and thus, may arise as a sensitive issue for the community to oppose. These socio-spatial sensitivities may vary in different local contexts. The size and the proximity of wind energy facilities located at the vicinity of natural and human habitats may affect communities differently. Thirdly, not only individual experiences but also nationally, regionally and locally changing contextual characteristics may lead communities to construct different collective perceptions for wind energy development. A variety of actors involves in this transition, moreover, the organizational and active citizenship capacities may influence the representation of this collective perception.

This study pursues an exploratory research approach adopting a mixed-methodology. It uses qualitative and quantitative research techniques for data gathering and analysis. Research is carried out as a case study in İzmir, Turkey, where strong social oppositions towards wind energy transition take place. This is done in relation to its position within a Turkish context. For that, existing national reports and guidelines, enacted legislations are examined, in-depth interviews are conducted with representatives from central, regional and local authorities, and private sector. At the local level, to test the previously defined socio-spatial sensitivities extracted from previous research, Likert-scale ratings are used. Additionally, a qualitative study is also conducted to grasp the insight about the community's wind energy related socio-spatial sensitivities and to prioritize them. In-depth interviews, site surveys, and focus group techniques are used to further gather contextual insights about wind energy transition at the local level from civil initiatives in İzmir, and mukhtars (headmen) of selected villages and settlements, and their residents.

The analytical responses to the first research question are descriptively and schematically constructed. Chapter 6 presents the findings to this question. For the second and third research questions, responses collected through qualitative site surveys are analyzed by using the content analysis technique through which frequency tables are generated for extracted concepts. Descriptives revealed from in-depth interviews and focus groups are translated into systematic thematic concept groups, and process maps. The Likert ratings are analyzed by adopting simple statistical techniques including descriptive statistics, averages and group comparisons. Moreover, an additional analytical framework is designed to present the findings of the third research question based on the nudging theory and the descriptive analyses are presented respectively. Chapter 7 illustrates the analyses for the two last research questions.

The sections below discuss the components of the study's research design in detail and support that discussion with how the used methods and techniques are theoretically elaborated.

5.2 Research Approach

The research methodology conducted in this study is designed in pursuit of an exploratory research approach. The need for a contextual investigation and the lack of adequate scientific knowledge on wind energy transition in Turkey yet at the same time the accumulated body of literature representing different contexts make this study appropriate for the adoption of a case study approach. Moreover, the need for generating not only insightful but also generalizable knowledge on this transition requires the use of both quantitative and qualitative methods. Review of literature on wind energy development which reveals no scientific evidence on the use of such mixed methodology in the Turkish context also supports this.

Exploratory research "seeks to find out how people get along in the setting under question, what meanings they give to their actions, and what issues concern them. The goal is to learn 'what is going on here?' and to investigate social phenomena without explicit expectations." (Schutt, 2006, p.14). Additionally, Stebbins (2011) emphasizes that exploratory research is adopted when there is limited or no scientific knowledge about a particular subject (e.g. group, process, activity, or situation) while there are components of that subject that need to be investigated. In this regard, the study aims at exploring the socio-technical dynamics of wind energy development and community's socio-spatial sensitivities in the case of İzmir, where high levels of public opposition exist while scientific knowledge about the related topic in the literature falls short.

Public perception studies in renewable energy transition widely apply quantitative methods (Ribeiro et.al., 2011). Particularly questionnaires are used to collect data, however, they fall short regarding building a complete understanding of the social framework, they limit the possibilities of exploring the insight and they reveal restricted findings for interpretation (Bamberger, 2012). On the other hand, qualitative approaches allow the use of methods for public perception research also (Aitken, 2010) but they convey deficiencies in objectivity, generalizability, and consensus building (Bamberger, 2012). Taking these into consideration, many authors (e.g., Del Rio and Burguillo, 2009; Ferreira et.al., 2019; Munday et.al., 2011; Rogers et.al., 2008) suggest the combined use of qualitative and quantitative approaches claiming that it provides significant benefits to a research environment.

The mixed methodology draws from the strengths and minimizes the weaknesses of both qualitative and quantitative methods in research studies and across studies. Johnson and Onwuegbuzie (2004, p.17) define mixed methods research as a combination of “quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study”. A mixed methodology expands one’s understanding of a phenomenon without being limited to the scientific capabilities of one research type, positivist or descriptive. In order to reach stronger research results than using a single method, mixed methodology uses quantitative and qualitative approaches “iteratively or simultaneously” (Malina et.al., 2011, p.61). The use of a mixed methodology will curb the risk of limitations in the results which would be unavoidable if a solitary approach was to be used. It improves the validity and credibility of evaluations and findings (Bamberger, 2012). Such an approach allows one to investigate “more complex aspects and relations of the human and social world” (Malina et.al. 2011, p.61). While qualitative approaches focus on generalizable results disregarding individual judgments; qualitative approaches benefit from these fruitful descriptive individual judgments and make use of case comparisons still allowing generalizable results (Firestone, 1987 cited in Malina et.al., 2011, p.61). Similarly, Johnson and Onwuegbuzie (2004) emphasize the use of quantitative and qualitative research methods together to overcome the weakness in the other method. For example, quantitative research benefits from “words, pictures and narrative” in qualitative research to add meaning to numbers while qualitative research benefits from “numbers" to "add precision to words, pictures and narrative" (Johnson and Onwuegbuzie, 2004, p.21). These conditions give reasons to suggest the use of the mixed methodology to understand the socio-technical aspects of the wind energy development phenomena. On the other hand, mixed methodology has its weaknesses such as the difficulty of handling qualitative and quantitative research together as a single researcher; time-consuming and expensive structure, and being able to apply and interpret both techniques. On the other hand, mixed methodology has its weaknesses regarding the difficulty of handling qualitative and quantitative research together as a single researcher since it is a time-consuming and expensive research approach, and being able to apply and interpret both techniques is hard (Johnson and Onwuegbuzie, 2004).

Mixed methodology is commonly used in social studies. A number of studies adopt mixed methodology in wind energy deployment (Del Rio and Burguillo, 2009; Ferreira et.al., 2019; Munday et.al., 2011; Rogers et.al., 2008). These studies illustrate the convenience of mixed methodology in terms of gaining a comprehensive understanding of social factors influencing wind energy development in different parts of the world. Furthermore, Bamberger (2012) emphasizes that relating a case study to a mixed methodology strengthens both quantitative and qualitative aspects of research. He claims that a case study can enhance the representativeness of in-depth qualitative studies in quantitative sampling.

Case study research helps explore, understand and describe complex issues (Krathwohl, 1997; Zainal, 2007). It is a reliable research method for comprehensive, in-depth inquiries; therefore, it is commonly used in social science studies (Yin, 2014; Zainal, 2007). Case studies allow researchers to better understand the actor's perception apart from the limited explanatory abilities of quantitative approaches based on statistical findings (Tellis, 1997).

Case studies focus on exploring a real-life phenomenon within its real-life context. In this respect, in case study research, researchers carefully analyze the data regarding a limited number of events or conditions, and their relationships within a specific context such as a small geographical area or with a relatively small number of people (Zainal, 2007). Although the case study approach is criticized for lacking the possibility for generalizing research findings; it serves as a practical solution against a big sample population that is hard to reach (Tellis, 1997; Yin, 2014; Zainal, 2007).

5.3 Site Selection

İzmir represents a geography with high wind energy capacity as well as high numbers of existing and planned wind energy facilities together with high active citizenship capacity (Ataöv and Eraydın, 2011; Eraydın, 2009; Eraydın et.al., 2010). İzmir also stands out as a wind energy development site accommodating the highest public opposition in Turkey. Respectively, this study chooses İzmir as the inquiry case and divides the city into meaningful sites for wind energy development with respect to the locational parameters found affective on communities. Existing literature (Krohn and Damborg, 1999; Simon, 1996) indicates that there is a change in the perceived impact of wind energy production depending on the wind energy facilities' size and distance to settlements. While doing this, since the size of a facility and the number of turbines in the facility vary together, these two variables are taken as one single/joint variable of wind energy facilities. In addition, wind energy facilities and settlements representing different distances are identified through scanning of digital maps generated by Google Earth and Yandex search engines along with digital wind energy facility databases provided by the WindDecision and TÜREB.

At the time of the research, a total of 20 wind energy facilities are identified in İzmir (Table 5.2 and Figure 5.2). Assessment of these facilities shows a pattern of combinations of facility size, power, and number of turbines as well as different locational characteristics. The locational characteristics include the settlement structure (urban/rural/second house – summer housing) and wind energy facilities' proximity to settlements, natural (e.g. forest, shore, grassland, agriculture), and cultural sites. In this respect, the sizes of the facilities regarding their total energy production capacities range from 4,8 MW to 120 MW. Facilities are composed of wind turbines with an average power of 2,5-3 MW each (except the ones Mazı-1 RES with turbine power of 1 MW). Additionally, almost all of the facilities existing at the time of the research are situated within close distance or in natural areas (coasts, forest, agriculture, and grassland areas) as well as mainly within rural settlement settings.

Table 5.2 Attributes of The Wind Energy Facilities Identified at The Time of The Research (Color Change Represents The Groups of Facility Size)

Facility Name	District	Total capacity (MW)	Number of turbines	Turbine power (MW)	Locational characteristics		Settlement(s) at the vicinity	Distance of the settlement
Aliağa RES	Bergama	120	46	2,6	Forest + grassland	Rural	Seklik, Atçılar	500m-1km
Karaburun RES	Karaburun	120	50	2,4	Settlement	Rural	Yaylaköy	0-500m
Yuntdağ RES	Bergama	60	24	2,5	Mountain	Rural	Balaban	500m-1km
Mazı-1 RES	Çeşme	56,2	56	1,0	Forest +cultural site (archeological site)	Rural	Karaköy	0-500m
Mazı-3 RES	Çeşme	55	22	2,5	Forest+shore	Rural	Zeytineli	500m-1km
Düzova RES	Bergama	51,5	20	2,5	Agriculture	Rural	Aşağıkırıklar	0-500m
Zeytineli RES	Urla	49,5	20	2,5	Shore	Urban+ rural	Zeytineli mah.	500m-1km
Seyitali RES	Aliağa	37	18	2,1	Grassland	Rural	Atçılar	500m-1km
Samurlu RES	Aliağa	34,5	15	2,3	Mountain	Urban+ rural	Çukurköy (1,6 km)	1km +
Kozbeyli RES	Foça	32,2	14	2,3	Forest+shore	Rural	Kozbeyli	500m-1km
Mordoğan RES	Karaburun	31,5	15	2,1	Forest + Shore	2nd housing	Mordoğan mah. (1.2km)	1km +
Salman RES	Karaburun	27,5	10	2,8	Forest+shore	Rural	Hamzabükü (1,6 km)	1km +
Korkmaz RES	Seferihisar	25,2	12	2,1	Forest	Rural	Altınköy (3 km)	1km +
Kocadağ-2 RES	Çeşme	25	10	2,5	Forest	Rural	Zeytinler (1.4 km)	1km +
Çeşme RES	Çeşme	18	6	3,0	Forest + Shore + Settlement	Urban+ rural	Ovacık	0-500m
Bozyaka RES	Aliağa	12,5	5	2,5	Industry	Rural	Horozgediği	500m-1km
Germiyan RES	Alaçatı	10,7	7	1,5	Forest+Shore + Settlement	Rural - 2nd housing	Germiyan	500m-1km
Karadağ RES	Aliağa	10	4	2,5	Shore+port+industry	Rural	Çakmaklı	0-500m
Aliağa RES	Aliağa	9,6	4	2,4	Forest	Urban+rural	Aliağa	500m-1km
Pitane RES	Dikili	4,8	2	2,4	Shore	2nd housing	Çandarlı mah.(1.2 km)	1km +

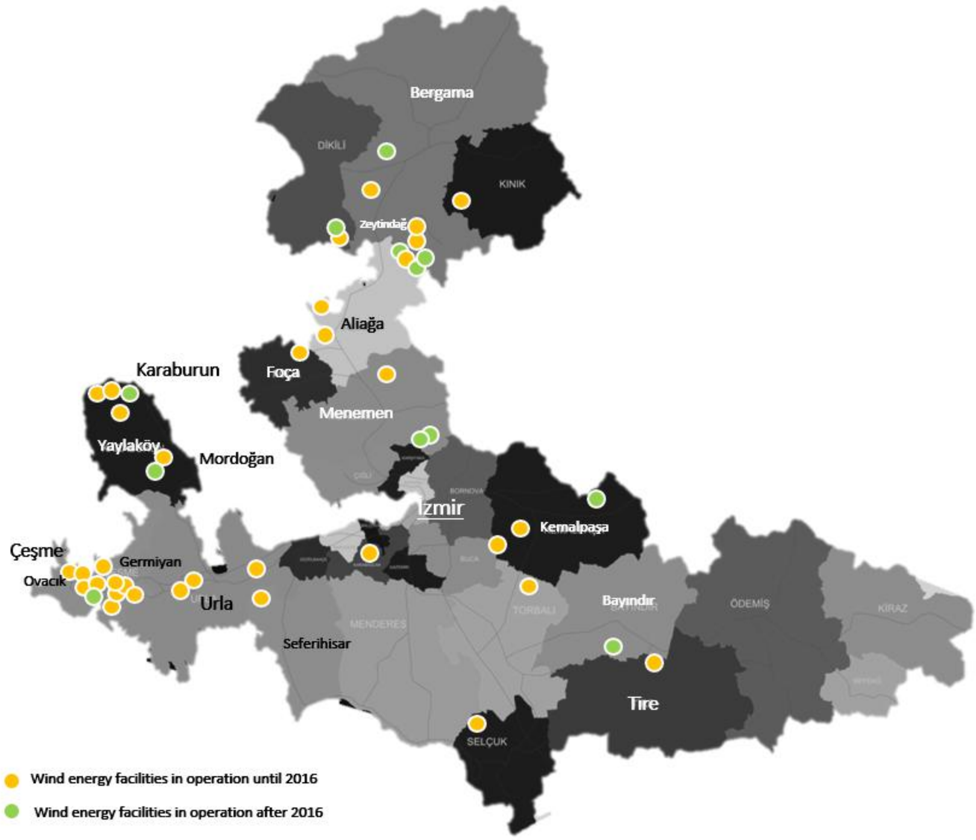

Figure 5.3. Distribution of the wind energy facilities in İzmir (adapted from TÜREB, nd.)

The pattern identified within the existing facilities regarding the combinations of facility size, number of turbines; wind energy facilities' proximity to settlement, natural or cultural sites; and settlement structure (urban/rural/second house – summer housing) appear parallel to the parameters impacting the perception of wind energy production found in literature (Krohn and Damborg, 1999; Simon, 1996). Respectively, existing wind energy facilities are reviewed with respect to the following categories:

1) Distance to the settlements, natural or cultural heritage sites (0-500m; 500m-1km; 1km+);

2) Size of wind energy facilities (large: >100MW; mid-large: 50-100MW; mid-small: 20-50MW; small: <20MW);

3) Number of turbines in wind energy facilities (large: >50; mid-large: 20-50; mid-small: 10-20; small: <10).

The size of the wind energy facilities and the number of turbines have a similar impact on the perception of wind energy production and respectively, they are considered as one parameter. Within this framework, taking all parameters into account and an observation of their combinations in terms of having minimum two facilities from each group of facility size with different proximities to settlement, natural or cultural areas, and new development areas reveal 12 settlements as research sites (Table 5.3).

Table 5.3 Properties of The Potential Research Sites

Facility Name	**District**	**Total capacity (MW)**	**Number of turbines**	**Turbine power (MW)**	**Locational characteristics**		**Settlement(s) at the vicinity**	**Distance of the settlement**
Aliağa RES	Bergama	120	46	2,6	Forest + grassland	Rural	Seklik, Atçılar	500m-1km
Karaburun RES	Karaburun	120	50	2,4	Settlement	Rural	Yaylaköy	0-500m
Mazı-1 RES	Çeşme	56,2	56	1,0	Forest +cultural site (Archeological Site)	Rural	Karaköy	0-500m
Zeytineli RES	Urla	49,5	20	2,5	Shore	Urban +rural	Zeytineli mah.	500m-1km
Kozbeyli RES	Foça	32,2	14	2,3	Forest+shore	Rural	Kozbeyli	500m-1km
Mordoğan RES	Karaburun	31,5	15	2,1	Forest+Shore	2nd housing	Mordoğan mah. (1.2km)	1km +
Korkmaz RES	Seferihisar	25,2	12	2,1	Forest	Rural	Altınköy (3 km)	1km +
Çeşme RES	Çeşme	18	6	3,0	Forest + Shore + Settlement	Urban +rural	Ovacık	0-500m
Germiyan RES	Alaçatı	10,7	7	1,5	Forest + Shore + Settlement	Rural - 2nd housing	Germiyan	500m-1km
New development	Kemalpaşa	-	-	-	Forest	Rural	Dereköy	-
New development	Bayındır	-	-	-	Forest	Rural	Marmariç	-
New development	Bayındır	-	-	-	Forest	Rural	Çınardibi	-

Once this is done, the list of selected sites is shared with the local administrations and members of the local civil society organizations and platforms (e.g., Greater

Metropolitan Municipality of İzmir, Karaburun Kent Konseyi: Karaburun City Council, Rüzgar Yaşamdan Yana Essin İnisiyatifi: Wind for Life Initiative, Gönüllü Çevre Avukatları: Volunteer Environment Lawyers) to identify the locally most sensitive sites to wind energy development. In this respect, after their overview, the list of selected settlements is revised to also include settlements where social reactions are concentrated but not heard on the media. As a result of long deliberation with local representatives, 8 urban and rural settlements with different distance to existing facilities, facility size and turbine numbers are selected from the total of existing wind energy facilities. In this respect, study incorporates three settlements within 0-500m proximity, four settlements within 500m-1km proximity, and only one settlement within over 1 km proximity to wind energy facilities. Two urban and rural settlements are selected from planned wind energy facility sites. Additionally, one more settlement with a new wind energy development area in Dereköy, Kemalpaşa is added to the list as a research site during the fieldwork in reference to their self-demand.

Research sites are located in Çeşme (Ovacık and Karaköy), Karaburun (Yaylaköy and Mordoğan), Alaçatı (Germiyan), Foça (Kozbeyli), Urla (Zeytineli), Bergama (Atçılar), and Bayındır (Marmariç and Çınardibi) districts of İzmir. Research sites within 0-500m proximity to wind energy facilities with different sizes are Ovacık (Çeşme RES -Vega Enerji with 18 MW facility size), Karaköy (Mazı-1 RES with 56,2 MW), and Yaylaköy (Karaburun RES with 120 MW). Research sites within 500m-1km proximity to wind energy facilities with different sizes are Germiyan (Germiyan RES with 10,7 MW), Kozbeyli (Kozbeyli RES with 32,2 MW), Zeytineli (Zeytineli RES with 49,5 MW), and Atçılar (Bergama Aliağa RES with 120 MW). Research site within over 1km proximity to wind energy facilities is Mordoğan (Mordoğan RES with 42 MW). The three research sites with planned wind energy facilities are Dereköy, Marmariç, and Çınardibi. Selected research sites incorporate wind energy facilities located mainly in natural and cultural sites (forest, shore, grassland areas) except the one in Yaylaköy at the vicinity of a settlement area. Table

5.4 and Figure 5.3 illustrate the properties of the wind energy facilities' and locational characteristics of the selected research sites.

Table 5.4 Properties of The Wind Energy Facilities and Locational Characteristics of The Selected Research Sites

Town	**Settlement**	**Wind energy facility**	**Distance**	**Wind energy facility size (MW)**	**Number of turbines**	**Location**
Çeşme	Ovacık	Çeşme RES (Vega Enerji)	0-500m	18	6	Forest + Shore + Settlement
Çeşme	Karaköy	Mazı-1 RES	0-500m	56,2	56	Forest +cultural site (Archeological Site)
Karaburun	Yaylaköy	Karaburun RES	0-500m	120 (in 2016) + 132 (extended)	50	Settlement
Alaçatı	Germiyan	Germiyan RES	500m-1km	10,7	7	Shore + settlement
Foça	Kozbeyli	Kozbeyli RES	500m-1km	32,2	14	Forest + Shore
Urla	Zeytineli	Zeytineli RES	500m-1km	49,5	20	Shore
Bergama	Atçılar	Bergama RES (Aliağa)	500m-1km	120	46	Forest + grassland
Karaburun	Mordoğan	Mordoğan RES	1km +	42	15	Forest + Shore
Kemalpaşa	Dereköy	New	-	-	-	Forest
Bayındır	Marmariç/ Dernekli	New	-	-	-	Forest
Bayındır	Çınardibi	New	-	-	-	Forest

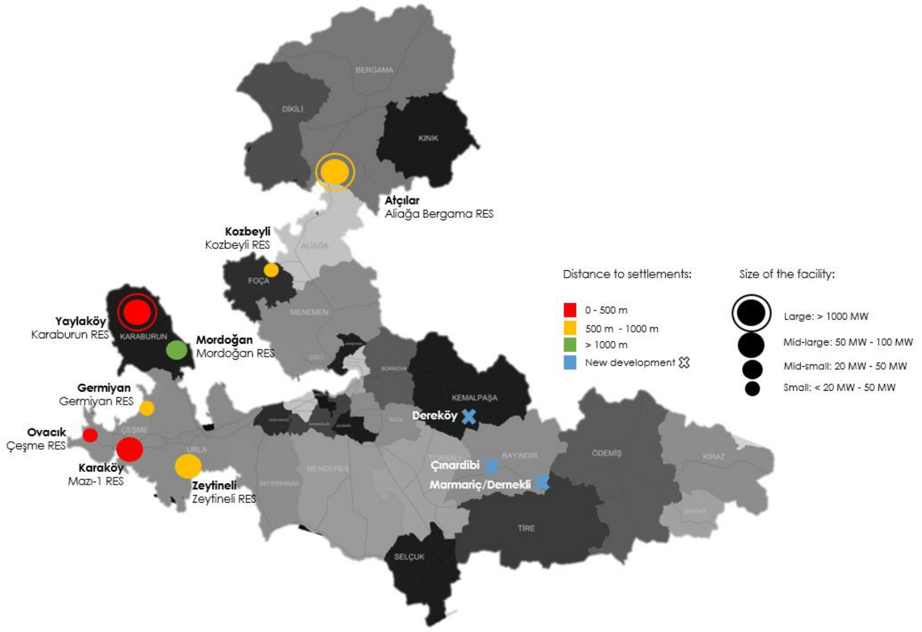

Figure 5.4. Research sites with wind energy facility sizes and proximity to the settlements

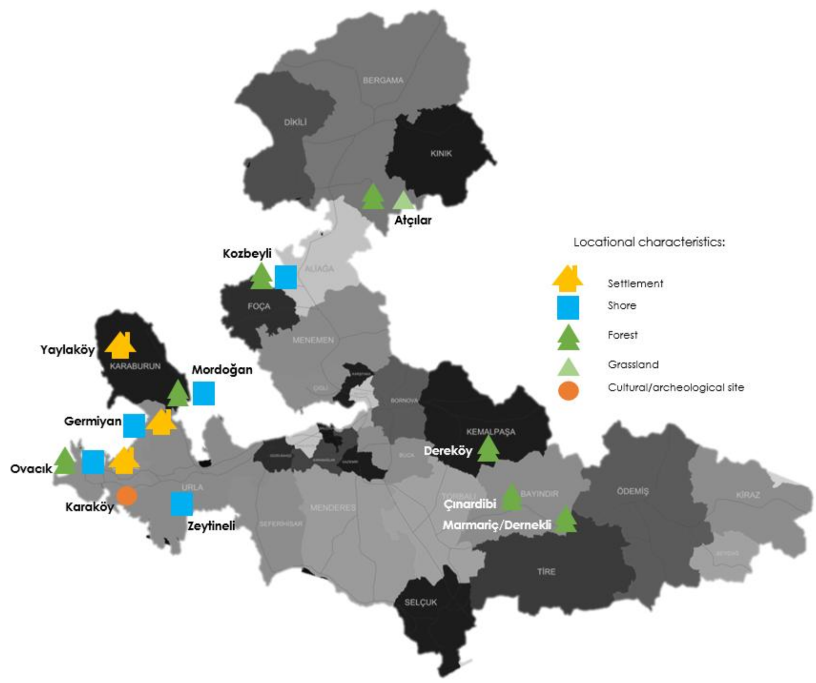

Figure 5.5. Research sites with locational characteristics

The fieldwork is conducted in June 2016 only in eight research sites with wind energy facilities. It could not be completed in three research sites with new planned wind energy developments. The open dialogue established from the beginning of the inquiry process with civil representatives, in fact, played a controversial role in data gathering. Some questions of the questionnaire, adopted from the significant findings in the literature, quickly arose a doubt that the inquiry is sponsored by the wind energy supporters and investors and that its purpose is to manipulate the local reality in favor of wind energy development. During the four-day fieldwork, this tension gradually accelerated and resulted in a public demonstration the last day of the fieldwork. The gathered crowd opposed providing any information on the basis of the assumed connection between the research institution and the state, the tendentious identification of certain questions (e.g., comparison between wind energy sources and other energy sources (e.g. fossil fuels, nuclear energy) and definitions (e.g., village mukhtars and teachers as local leaders, but in fact, they are state-paid employees) in the questionnaire. Although this was an unexpected progress which blocked the data gathering process, it was indeed enlightening in terms of experiencing, and thus, resonating with the emotions, opinions, and behaviors of public opposition against wind energy development. Methodologically, this situation limited the conduction of the research in Yaylaköy, Atçılar and Mordoğan; and disabled the conduction of the research in the three new development areas: Dereköy, Marmariç and Çınardibi. As for the analysis, due to this process outcome, the thesis expanded the analysis of wind energy transition to include the nudging affect.

Following section introduces the fieldwork process in detail.

5.4 Process of the Fieldwork: Preparation and Onsite Experiences

The study is designed to conduct a fieldwork adopting the *in-depth interview* technique with the residents of the selected settlements in order to reveal the socio-spatial sensitivities in wind energy transition. Moreover, the study also uses *focus* *groups* and *in-depth interviews* to be carried out with local actor groups (Greater Metropolitan Municipality of İzmir and civil society organizations). The fieldwork is composed of two main phases: 1) preparation, and 2) on-site experience.

The preparation phase includes the parallel and subsequent processes of reviewing related literature and documentation; scanning digital maps and databases (e.g. Google Earth, Yandex, WindDecision and TÜREB) for wind energy facilities in İzmir; listing and sorting wind energy facilities in İzmir according to facility sizes, number of turbines and proximity to settlements/natural/cultural areas; developing a network with national and local level actor groups; preparing the survey/questionnaire; communicating with the local actors (greater municipality and civil society organizations) regarding the selection of the research sites and survey/questionnaire; organizing the research team conducting the site survey/questionnaire.

The second phase covers the on-site experiences gained during the fieldwork, which is carried out in June 2016 and lasted for four days. The fieldwork is composed of two parallel research processes. One is the conduct of the focus group and in-depth interviews with the local actor groups (Greater Metropolitan Municipality of İzmir and civil society organizations: Karaburun Kent Konseyi: Karaburun City Council, Rüzgar Yaşamdan Yana Essin İnisiyatifi: Wind for Life Initiative, Gönüllü Çevre Avukatları: Volunteer Environment Lawyers); and the other is the conduct of in-depth interviews through the site survey - questionnaire in the selected research sites.

The fieldwork started with the research team meeting on the first day. To assist the on-site work, eight planning students are trained about the research and its conduct by the research leaders. After this training, in the first day of the fieldwork, the site survey and the conduct of the "questionnaire" are applied in Germiyan (Alaçatı), Ovacık (Çeşme), and Karaköy (Çeşme).

The conduct the site survey continued in Yaylaköy (Karaburun), Mordoğan (Karaburun), and Zeytineli (Urla) ion the second day of the fieldwork. However, the discomfort caused by some questions of the questionnaire adopted from the literature, and the conception of the community about an assumed research attempt as 'an intention to support wind energy development' prevented achieving the planned number of respondents in Yaylaköy and Mordoğan. The questions that discomforted some local initiatives refer to (i) an evaluation of renewable energy among other energy resources such as fossil fuels versus renewable energy resources, (ii) an evaluation of wind energy among renewable energy sources such as hydropower and solar, (iii) an assessment on the importance of electricity production from wind energy in Turkey, and (iv) a comparison of wind energy facilities with nuclear energy facilities. These questions are thought to convey an intentional direction to favor wind energy development. The possible results concerned local initiatives in a way that they could constitute the basis for more development in the region. However, these questions, initially formulated in reference to existing international studies, were included to test the validity in the İzmir context but they initiated a self-organized opposition of the civil society. Thus, at the end of the second day of the fieldwork, representatives in Dereköy, Kemalpaşa contacted the research team and demanded to include in the site survey. This was somewhat odd at that time but the cooperative intention of the research team led the acceptance of this offer. Respectfully, Dereköy is added to the fourth day site survey program.

On the third day of the fieldwork, a focus group is conducted with the representatives of local civil initiatives including Karaburun City Council (Karaburun Kent Konseyi), Wind for Life Initiative (Rüzgar Yaşamdan Yana Essin İnisiyatifi), Volunteer Environment Lawyers (Gönüllü Çevre Avukatları) as well as with the representatives from the Greater Metropolitan Municipality of İzmir. During the focus group, the tension was high and the discomforting questions to the society were discussed. It was collectively decided to exclude those questions from the evaluation. Simultaneously, on the other hand, since the research team continued to conduct the site survey in Atçılar (Bergama), and Kozbeyli (Foça), due to the continued discomfort and misconception, the planned number of respondents in Atçılar could not be achieved there either.

On the fourth and the last day of the fieldwork, the growing public opposition turned into a demonstration in Dereköy with the support of local civil initiatives. Local people protested the research and the research institutions, and thus, the team. No residents could be reached out for interviewing. Moreover, in Marmariç and Çınardibi, local people did not allow the researchers to enter the sites opposing their attempt to conduct a fieldwork. Consequently, the research leaders decided to stop the fieldwork.

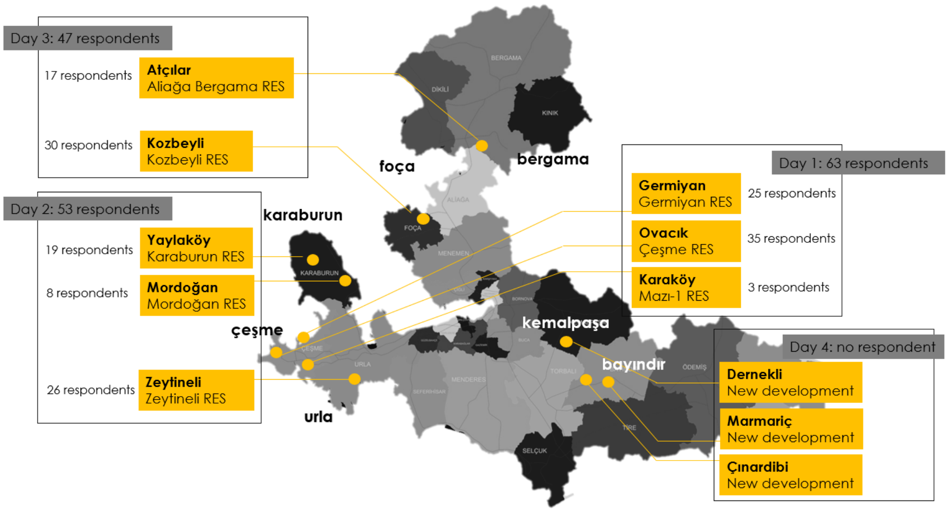

Figure 5.6. Distribution of the research sites and respondents according to the fieldwork process

The fieldwork illustrated the level of local community's saturation against wind energy investments. The collective reaction to the above-mentioned questions of the questionnaire was a proof of that. The on-site experience drastically changed the course of the fieldwork. It transformed a rather quasi-experimental study an interactive one by revealing how social sensitivities can suddenly occur and lead to opposition. This also extended the scope of the thesis to include the nudging theory and analysis. Within this framework, the study focused on understanding the nudging conditions (Thaler and Sunstein, 2008) that lead to support, acceptance and/or opposition in wind energy transitions with a multi-level sociotechnical perspective (Guy and Karvonen, 2011; Geels, 2002). Following Figure 5.7 illustrates the preparation, on-site and post experiences regarding the fieldwork process.

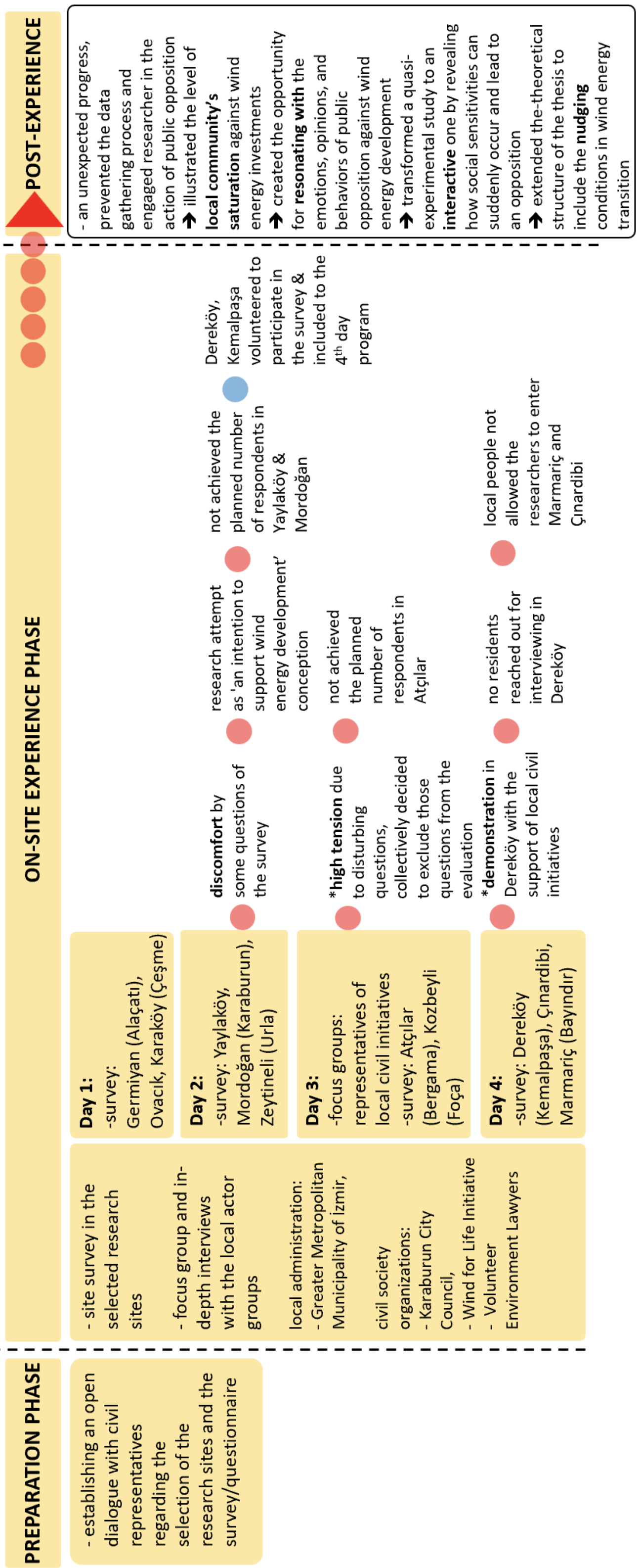

Figure 5.7. Preparation, on-site and post experiences of the fieldwork process

5.5 Variables of the Multi-Level Sociotechnical Wind Energy Transition Process

The study uses two major categories of variables revealed from the literature regarding the multi-level sociotechnical context of wind energy transition. The one category is about the socio-spatial variables of sensitivities and the other one consists of actor-behavior components in the nudging context occurring within the wind energy transition process. The following parts of this section introduce these variables in detail.

5.5.1 Socio-Spatial Variables of Sensitivities in Wind Energy Transition

Review of literature reveals four areas of socio-spatial sensitivities that significantly play a role in wind energy transition. These areas are namely as (i) environmental, (ii) economic, (iii) sensory, and (iv) technologic. Following Table 5.5 introduces the variables within each category that are adopted in this research.

First, environmental sensitivities cover the impacts on forests, wetlands, water resources, watersheds/basins, bird and bat lives (e.g. migration routes), local wildlife, historical and cultural heritage sites (Cavallaro and Ciralo, 2005; Drewitt and Langston, 2006; Kaya and Kahraman, 2010; NWCC, 1999; Telleria 2009; Wang et.al., 2009; Aydın et.al., 2013; Baban and Parry, 2001; EEA, 2009; Haugen, 2011; IFC and WBG, 2007; IPCC, 2012; NIA, 2013; Yue and Wang, 2006; Clarke, 1991; Dai et.al., 2015; Klepinger, 2007; Premalatha et.al., 2014; Pearce-Higgins et.al, 2012; Schaub, 2012; US EPA, 2013; Toja-Silva et.al., 2013; Zahedi, 2012; Tertra Tech EC Inc. et.al., 2008). Destructing such ecological environments may lead to habitat loss.

Second, economic sensitivities consider the impact on local economic activities, employment and property values which differs contextually (Krauss, 2010; Bohn and Lant, 2009; Breukers and Wolsink, 2007; Walker et.al., 2007; Devine-Wright, 2005a; Toke, 2005a,b; Pasqualetti et.al.,2002; Kılıç et.alç, 2017; Mikolajczak et.al., 2013; Baxter et. al., 2013; Heintzelman and Tuttle, 2012; Sampson et.al., 2020; Hoen et al., 2011; Sims et al., 2008; Li et al., 2018; Chen, 2019; Kaffine, 2019). Economic activities include forestry, animal husbandry, and farming and the impact of wind energy development on economic activities may differ contextually.

Third, sensory sensitivities include mainly the impacts on visual and aesthetic issues, shadow flicker, vibration, acoustics (noise), and health. According to the literature, wind turbines have negative visual impact on the landscape leading to public opposition Premalatha et.al., 2014; Zahedi, 2012; Haugen, 2011; Bishop and Miller, 2007; Wolsink, 2007; Baban and Parry, 2001; Wolsink, 2000; Daugarrd, 1997; Nguyen, 2007; Voivontas et.al., 1998). Shadow flicker and wind turbine noise negatively affect humans (Klepinger, 2007; Kılıç et.al., 2017; Lima et.al., 2013; Premalatha et.al., 2014; Aydın et.al., 2013; Bakker et.al., 2012; Bishop and Proctor, 1994; Haugen, 2011; Ramirez-Rosado et.al., 2008; Tester et.al., 2005; Toja-Silva et.al., 2013; Yue and Wang, 2006), yet wind turbine related ground vibrations do not have a detectable effect on humans (Hansen and Hansen, 2020). Respectively, wind turbines are interrelated with several negative health problems as well (McMurtry, 2011; Pierpont, 2009), however research shows inconsistentcy in health impacts of wind energy facilities (Nissenbaum et al.,2012; Persson-Waye et.al.,2003).

Finally, technological sensitivities include the negative impact of the electromagnetic field of wind turbines particularly on aircraft landing and take-off corridors, security signals and radar systems as well as power transmission lines (Burleson, 2009; Toja-Silva et.al., 2013; Haugen, 2011; Tetra Tech EC Inc. et.al., 2008; Katsaprakakis, 2012; Randhawa and Rudd, 2009; Dai et.al., 2015; Ofcom, 2009; Jackson, 2007).

Table 5.5 Socio-Spatial Variables of The Research

Categories	Variables
Socio-spatial sensitivities	
Environmental	impacts on: -forests -wetlands, water resources, watersheds/basins -local wildlife (e.g.birds, bats) -historical and cultural heritage sites
Economic	impacts on -local economic activities (forestry, animal husbandry and farming) -employment -property values
Sensory	impacts on -visual and aesthetic issues -shadow flicker -vibration -acoustics (noise) -health
Technological	impacts on -aircraft landing and take-off corridors -security signals and radar systems (in roads, railways and radio communication centers) -power transmission lines

5.5.2 Variables of The Multi-Level Nudging Process in Wind Energy Transition

Regarding Thaler and Sunstein's (2008) theorization of the nudging concept within the context of decision making as a policy tool changing the choice architecture, the study aims to reveal the multi-level nudging forces in wind energy transition. The process of nudging in wind energy transition takes place between actor groups (decision-makers: public authority, private sector: investors; civil society organizations, inhabitants) at multiple levels (international, national, regional and local). Thus, the actors constitute one of the main variable groups in this analysis. The study categorizes the actor groups according to the Geels' (2002) multi-level approach (international, national, regional, local) and examines their nudging effects on each other and across levels as well as the directions of the effects for an elaboration on the emergence of support, acceptance and opposition in wind energy transition.

Moreover, the study adopts two notions of nudges used in the model by Hansen and Jespersen (2013) for the responsible use of nudging in public policy. These include "type" and "transparency." Hansen and Jespersen (2013) categorize nudges according to the combined forms of type and transparency under four groups: (I) "Type 1" (ii) "Type 2", (iii) transparent, and (iv) non-transparent. The "type" of nudges refers to whether a policy triggers reflective thinking or not. The "transparency" of nudges is about the easy recognition of the intention and means regarding that policy. Nudging is used in different ways such as implementing default or simplified complex options, enacting the power of social norms, altering the profiles of different choices, and providing information for influencing choices (Bonell et al, 2011; Aldemir and Kaya, 2020).

Review of literature reveals that different combinations of type and transparency can be measured by using different sets of variables. These variables are rhetorically conceptualized for this analysis in reference to the investigated examples in research on nudging. Following Table 5.6 introduces variables within each type and transparency combined category that are descriptively measured in this research. Accordingly, Type 1 – Transparent nudges refers to new impulse creation through making recognizable changes in a defined setting (Hansen and Jespersen, 2013). Type 2 – Transparent nudges include a prompted choice through contextual association (e.g. providing legal-financial frameworks-incentives) (Santos Silva, 2022; Colasante et al., 2021; Tomazic, 2020), and information provision (providing factual information, a specific message for prompted choice) (Hansen and Jespersen, 2013; Thaler and Sunstein, 2008; Sustainable Brands, 2020; Caris et al., 2018). Type 1 – nontransparent nudges are associated with new context creation by providing a default setting for automatic choices (Madrian, 2014; Toder and Khitatrakun, 2006; ME, 2018; Abadie and Gay, 2006; Wansink, 2004). Type 2 – nontransparent nudges are achieved through information selection provided via simplification and context re-framing (Thaler and Sustein, 2008; Hastings and Weinstein, 2008; Santos Silva, 2022; Sunstein, 2021; Hansen and Jespersen, 2013).

Table 5.6 Variables of The Multi-Level Nudging Process within The Wind Energy Transition

	TYPE 1 (not reflective)	**TYPE 2 (reflective)**
Transparent	**New Impulse Creation** *creating changes in a defined setting	**Contextual Association** *providing legal-financial frameworks-incentives **Information Provision** *providing factual information *providing a specific message for prompted choice
Nontransparent	**New Context Creation** *creating a setting default for automatic choice	**Information Selection** *simplification / context re-framing

Taking this conceptual framework as a point of departure, the analysis details each group of nudges across levels ranging from international to local in the İzmir case within the Turkish context. To support this, qualitative and quantitative analyses from fieldwork are also integrated to the examination of nudging process. However, since the analytical part of the nudging discussion came out as an outcome of fieldwork, but not as a part of initially designed research process, the participants' responses related to the notions of nudging, particularly on attitudes and reactions, are limited to three combinations of type and transparency including Type1-Transparency, Type 2-Transparency, and Type 2-Non-Transparency.

Literature on social attitudes and reactions against wind energy introduces four main drivers explaining the social support or opposition. These are namely: (i) energy preferences; (ii) proximity, (iii) public engagement, (iv) individual perspective and characteristics. The energy preferences of the individuals that are obtained through the comparison of wind energy with other energy resources explains the influence on the individuals' support on wind energy transition (Krohn and Damborg, 1999; DWTMA, 1993; Gipe,1995; Simon, 1996; AMR Interactive, 2010; IPSOS, 2010, 2012). The proximity to a wind energy facility affects the NIMBY attitude of the society (Devine-Wright, 2005a; Kraft and Clary, 1991; Van der Horst, 2007; Kılıç et al. 2017; Wolsink, 2000, 2007). The public engagement refers to having economic benefits from and being informed about the wind energy facility. Research indicates that public engagement provides a positive on the social support of renewable energy transitions (Krohn and Damborg, 1999; Gipe, 1995; Warren and McFadyen, 2010; Slattery et.al., 2011; Mulvaney et.al., 2013; Haggett and Toke, 2006; Sonnberger and Ruddat, 2017; Munday et.al., 2011; Aitchison, 2004; Aitchison 2012; Starling, 2006; Young, 1993). The individual perspective and characteristics in terms of demographic structure, education, occupation, income status, ideological and political view also affect the attitude towards wind energy development (Aitken, 2010; Bishop, 2002; Bishop and Miller, 2007; Cavallaro and Ciralo, 2005; Daugarrd, 1997; Devine-Wright, 2007; Torres-Sibille et.al., 2009; Tsoutsos et.al., 2009a; Tsoutsos et.al., 2009b; Wang et.al., 2009; Warren and McFadyen, 2010).

Table 5.7 Drivers Explaining the Social Support or Opposition

Categories	**Variables**
Social attitudes and reactions	
Main drivers	-energy preferences -proximity (NIMBY: unfairness, endurance, co-movement) -public engagement -individual perspective and characteristics

5.6 Respondents

The study involves four groups of respondents with respect to the multi-level wind energy development process in Turkey. Following Figure 5.6 introduces these actor groups and the list of actors interviewed during the research process. Accordingly, the actor groups are (i) decision-makers at national and local levels, (ii) private sector representatives, (iii) civil society organizations at national and local levels, and (iv) inhabitants including muhktars (headmen) and site residents. Decision makers are composed of related directorates of the ministries (Ministry of Environment, Urbanization and Climate Change, Ministry of Agriculture and Forestry) at the national level; and related directorates of the municipalities (İzmir Greater Metropolitan Municipality) at the local level. Private sector involves investors (EnerjiSA, Borusan EnBW, Güriş Holding) and consultancy firms (Reconsult). Civil society organizations are composed of national level (TÜREB – Türkiye Rüzgar Enerjisi Birliği: Turkish Wind Energy Association) and local level organizations (Karaburun Kent Konseyi: Karaburun City Council, Rüzgar Yaşamdan Yana Essin İnisiyatifi: Wind for Life Initiative, Gönüllü Çevre Avukatları: Volunteer Environment Lawyers). The final group of actors take place at the local level as the inhabitants including muhktars (headmen) and residents of the research sites (Ovacık, Karaköy, Yaylaköy, Germiyan, Kozbeyli, Zeytineli, Atçılar, Mordoğan, Dereköy, Marmariç, and Çınardibi).

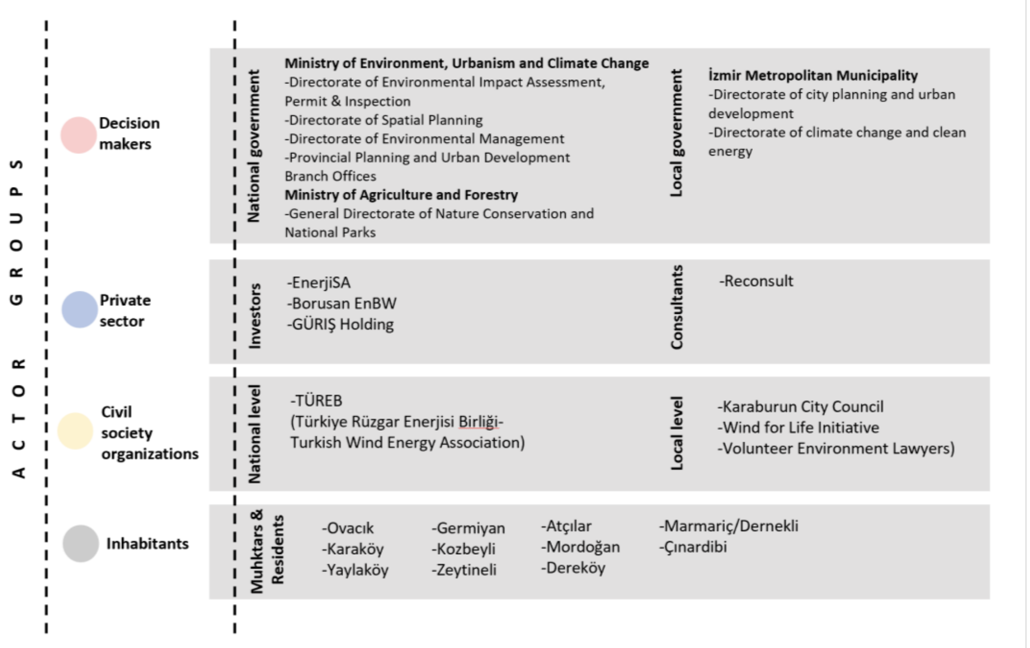

Figure 5.8. Actor groups and interviewed actors of the research

Firstly, in-depth face-to-face and telephone interviews are conducted with decision-makers at the national and local levels, private sector representatives including investors and consultancy firms, civil society organizations at national and local levels, and headman of research sites (mukhtar) in order to reveal the socio-technical aspects of wind energy development within planning processes.

Secondly, to find out the social aspects of the wind energy development process, the study focuses on extracting public attitudes and socio-spatial sensitivity issues. To do that, in-depth interviews are conducted with the residents of the selected settlements.

In-depth interviews are estimated to be conducted with a sample size of 25-30 interviews with the residents from each settlement/research site. To minimize a biased outcome, which could stem from the dominance of a certain group, it is aimed to create a respondent group with different ages and genders. In this respect, equal distribution of gender (Male/Female) and age (18-24; 25-60; 60+) is ensured in each research site.

Interviewees are chosen from each settlement with a snowball sampling method. However, during the fieldwork, the sample sizes varied between 3 and 35. This is due to the contextual saturation of the case study area İzmir in terms of wind energy development and the automatic community conception of such a research attempt as an intension to support wind energy development. Consequently, the intense reaction of the local people to any kind of wind energy related studies and their preference for not participating in the study resulted in variations in sample sizes. For example, while the projected number of residents are reached in Ovacık, Kozbeyli, Zeytineli and Germiyan; in Yaylaköy, Atçılar, Mordoğan and Karaköy numbers of respondents remained less than planned. Karaköy is declared as 1st degree archeological site, the number of people living in the village was limited, in this respect, the study could not reach adequate number of interviews. The discomfort caused by some questions of the questionnaire, as presented above, resulted in lower participation from Yaylaköy, Mordoğan and Atçılar to the survey on the second and third days of the fieldwork. Additionally, on the fourth day of the fieldwork, in Dereköy, due to local people's protest against the researchers in support of civil initiatives' conceptualization about the inquiry and their assumption about a connection with wind energy industry and the state, no residents could be reached for interviewing. Moreover, at the research sites, Marmariç and Çınardibi local people did not allow the researchers to enter the sites opposing their attempt to conduct a field work.

As a result, while 233 people were asked to take part in the inquiry, 70 of them refused to participate. As shown in Table 5.6, the number of people participated in the study totaled up to 163; including 35 in Ovacık, 30 in Kozbeyli, 26 in Zeytineli, 25 in Germiyan, 19 in Yaylaköy, 17 in Atçılar, 8 in Mordoğan, 3 in Karaköy. Table 5.8 presents the sample size distribution of the research sites.

Table 5.8 Sample Size Distribution of The Research Sites

Research sites	**Number of participants**	**Number of refusals**
Ovacik	35	31
Kozbeyli	30	21
Zeytineli	26	10
Germiyan	25	3
Yaylaköy	19	1
Atçilar	17	-
Mordoğan	8	4
Karaköy	3	-
Dereköy	-	-
Marmariç	-	-
Çinardibi	-	-
Total	**163**	**70**

Interviews are carried out with a total of 163 residents out of which are 82 women (50.3%) and 81 men (49.7%). More than half of the participants are in the age group of 26-65 years old (55%), a quarter of the participants are over 65 years old (24%) and one-fifth of the participants are in the age group of 18-25 years old (20.5%). More than half of the participants in the study are locals (58%), other participants are later-settlers (36%) or second house owners (6%). Half of the participants (56%) are primary school graduates, and one-third of the participants (32.5%) are secondary and high school graduates. Nearly one-tenth of the participants (8%) are university graduates. The majority of the females are in the age group of 26-65 years old (52%) and elementary school graduates (65%). Only 15% of the female participants are high school and university graduates. Similarly, the majority of the males are in the age group of 26-65 years old (58%) and elementary school graduates (47%). 40% of the male participants are high school and university graduates. The number of high school and university graduates is higher in male participants than in female participants. Following Table 5.9 present this demographic structure of gender and age.

Table 5.9 Demographic Structure of The Female and Male Samples

	GENDER		LOCALITY			EDUCATION				
AGE			**Local**	**2nd house owner**	**Later settler**	**Illiterate**	**Elementary school**	**Middle school**	**High school**	**University**
18-25	Female	16	5	1	10	1	5	7	3	-
	Male	17	8	1	8	-	6	3	7	1
26-65	Female	43	25	3	15	2	29	4	5	3
	Male	47	28	2	17	-	22	5	12	8
65+	Female	23	18	2	3	-	20	1	2	-
	Male	17	10	1	6	1	10	2	3	1
Total	Female	82	48	6	28	3	54	12	10	3
	Male	81	46	4	31	1	38	10	22	10
		163	**94**	**10**	**59**	**4**	**92**	**32**	**32**	**13**

5.7 Data Gathering

The study uses five main data gathering methods including document review, in-depth interviews, focus groups, surveys, and Likert-scale rating. In order to answer the first research question (*wind energy transition in the Turkish planning process*) **document review**ing technique is adopted to map the process of wind energy development in Turkey. Moreover, **in-depth face-to-face** and **telephone interviews** are conducted with national and local level decision-makers, private sector representatives including investors and consultancy firms, civil society organizations (national NGOs and local level civil initiatives), and mukhtars (headmen) of research sites during May and June, 2016.

For the second research question (the underlying socio-spatial sensitivity issues for public opposition) regarding socio-spatial sensitivity areas in case of İzmir, the **focus groups** are conducted with the local level decision-makers, and civil society organizations in İzmir. Additionally, apart from in-depth interviews, **surveys** are conducted with the inhabitants/residents of each research site**.** In order to test the previously defined sensitivities found in literature, the questionnaire includes a "**Likert scale rating**" section.

The in-depth interview technique is used to gain information regarding the individual’s perspectives about a specific theme (Brounéus, 2011). In such data gathering method both the researcher and participants take active roles. While the core questions of the researcher direct the interview; the answers of the participant create interview’s unique path (Brounéus, 2011; Bryman, 2012). In-depth interviews may also be designed as telephone interviews rather than face-to-face. Telephone interviews are advantageous in terms of time and budget management; as well as supervision. It may also eliminate bias of the personal characteristics (e.g. ethnicity, class) of the interviewer (Bryman, 2012). However, it may have limitations regarding accessibility of the participants in terms of not having a personal telephone or the length of the interview.

Interviews may have structured, semi-structured or unstructured formats. A structured interview works with standardized, rigid questions enabling quantifiable and generalizable data collection (Fowler, 2002). On the contrary, unstructured interviews provide flexible data collection mediums where participants freely express their thoughts. In semi-structured interviews, the interviewer has a general form of questions yet the sequence is flexible. the interviewer may ask further questions develop on significant replies (Bryman, 2012).

In-depth face-to-face and telephone interviews conducted during the study include open-ended core questions guiding the interview process, in order to grasp the participants’ knowledge and experience regarding the wind energy development. The core questions of the interviews conducted with the representatives of public sector, private sector and civil society organizations are about 1) the experienced conflicts (regarding specific areas or actor groups) during wind energy development process, 2) the experienced conflicts with the public (local community), and 3) ways of solutions. The core questions of the interviews conducted with mukhtars (headmen) of research sites are about 1) local people's problems related to wind energy facilities, 2) efforts of the local community about these problems, and 3) local community's solution suggestions to have this process more sensitive to society.

The other data-gathering method is document reviewing, that requires a systematic examination and interpretation procedure of gaining knowledge from the materials such as organizational and institutional documents (Bowen, 2009). The study reviews national legal documents, national and international organizational and institutional reports, and national and local newspapers to develop the framework of the wind energy transition.

The focus group is another data gathering technique that the study adopts. In the focus group technique, there is more than one participant being interviewed as a group about a specific topic (Bryman, 2012). In the focus group, the researcher guides the discussion through open-ended questions and takes notes on the discussion. This technique allows discovering variety of opinions and views within a population on a specific issue in a relatively short period of time (Morgan, 1988).

The focus groups are conducted with the local level decision-makers (İzmir Greater Metropolitan Municipality), and civil society organizations (Karaburun City Council, Wind For Life Initiative, Volunteer Environment Lawyers) in İzmir on the wind energy development process. The focus group is guided by the researcher through the similar questions adopted in the in-depth interviews : 1) the experienced conflicts (regarding specific areas or actor groups) during wind energy development process, 2) the experienced conflicts with the public (local community), and 3) ways of solutions. Due to the simultaneous conduction of the site survey and focus groups, civil society organizations represented the discomfort caused by some questions of the questionnaire adopted from the literature, and developed a bias towards the study regarding the conception of the research attempt as 'an intention to support wind energy development'. Thus, this situation influenced the course of the focus group with civil society organizations as well as the rest of the ongoing fieldwork.

The final type of data gathering techniques used in the study is survey. It is an instrument for gathering data about individuals' characteristics, attitudes, thoughts, behavior, and perspectives through a representative sample. The site surveys include a set of standardized and uniform questions making the collected data easier to compare (Bhattacherjee, 2012; Fowler, 2002). Surveys may be in the form of a questionnaire or interview. The questionnaire may include structured (selecting answers from given choices) and unstructured (free responses) questions. In order to reach a statistical generalization, responses of the participants on a structured questionnaire may be associated with a scale format. In this respect, one of the following formats may be used: (i) dichotomous response (selecting one of two possible choices: e.g. true/false, yes/no, or agree/disagree); (ii) nominal response (selecting from more than two unordered options); (iii) ordinal response (selecting from more than two ordered options); (iv) Interval-level response (selecting from a 5-point or 7-point Likert scale, semantic differential scale, or Guttman scale); (v) Continuous response (entering a continuous (ratio-scaled) value: e.g. age) (Bhattacherjee, 2012).

The study interlinks the conducted questionnaire with Likert scale rating. The Likert Scale "includes simply-worded statements to which respondents can indicate their extent of agreement or disagreement on a five or seven-point scale ranging from 'strongly disagree' to 'strongly agree'" (Bhattacherjee, 2012, p.100). A seven-point Likert scale is adopted in the study during testing the previously defined sensitivities found in literature.

The questionnaire is composed of unstructured (open-ended: exploring new data) and structured (close-ended: testing the literature) questions apart from the questions of personal (e.g., age, gender, education level, occupation, income) and wind energy facility information. The research team composed of 8 city and regional planning students, trained in advance about the research and its conduct by the leadership of the main researcher, carried out the site survey and conducted the "questionnaire". Table 5.10 introduces personal and wind energy facility related question of the questionnaire.

Table 5.10 Personal and Wind Energy Facility Information Questions of The Questionnaire

Location (research site)					
Personal information					
Age	18-25	25-65	65+		
Gender	Female	Male			
Education level	Elementary	Middle	Highschool	University	Graduate
Occupation	Farmer	Housewife	Retired	Other	
Annual income	………… TL	Assets/Properties (field, residence, summer house)	Yes	No	
Settlement type	Rural	Urban			
Locality	Yes	No	Summer/second house resident	Settled later	Years of residence
Wind energy facility information (site observation)					
Distance to farm	0-500m	500 -1000m	1000m +		
Number of turbines in the wind farm					
Number of visible turbines at the site	Less than 10	More than 10			

The rest of the questionnaire is prepared to include four main topics discussed in literature: environmental, economic, sensory, and technological sensitivities as well as the solution suggestions of the residents. The first group of questions aims to confirm the community's **socio-spatial sensitivity areas related to the environmental, economic, sensory,** and **technological impacts of wind energy development** and to identify the sensitivity variables specific to the İzmir context (Krohn and Damborg, 1999; Wolsink and Sprengers, 1993)

Table 5.11 Questions of The Questionnaire Rating The Wind Energy Related Socio-Spatial Sensitivities

Impact of wind energy facilities (evaluation)		
Sensitivity areas	**Importance**	**Why?**
Natural life, animal husbandry, aesthetics, noise, health, agriculture, magnetic field, number of turbines, expensive	1-7 (Likert scale evaluation) (1:least, 7:highest)	
other	-	
Reasons of opposition/acceptance		

The second group of questions aims to identify the **participants' attitudes towards renewable energy and wind energy** with reference to the findings in literature indicating that the effects of wind energy facilities change the attitude towards renewable energy and wind energy (Breglio, 1997; Gipe, 1995; Wolsink and Sprengers, 1993). The third group of questions includes questions about the Not In My Backyard (NIMBY) movement variables such as justice, acceptance, and co-movement (Bishop and Miller, 2007). Table 5.X presents the questions rating the wind energy related socio-spatial sensitivities and NIMBY attitudes of the individuals. The last part of the questionnaire aims to gather the **general preferences** of the community in terms of physical and socio-economical aspects of wind energy development and solution suggestions of the residents within the context of İzmir. Tables 5.12 and 5.13 introduce the last three sets of questions, which help answer the third research question (conditions nudging the involved actors in wind energy transition).

Table 5.12 Questions of The Questionnaire Rating the Wind Energy Preference of The Individuals and NIMBY Attitudes of The Individuals

Importance of renewable energy among other energy resources	
Fossil fuels vs renewable energy resources	1-7 (Likert scale evaluation) (1:least, 7:highest)
Rating among renewable energy sources: Hydropower – solar energy – wind energy	1:most preferred 3:least preferred
Wind energy preference	
Importance of wind energy	
Importance of Electricity production from wind energy in turkey	1-7 (Likert scale evaluation) (1:least, 7:highest)
Importance of wind power plants when compared with Nuclear power plants	1-7 (Likert scale evaluation) (1:least, 7:highest)
Wind energy preference (wind energy facilities in your site)	1-7 (Likert scale evaluation) (1:least, 7:highest)
About the wind energy facilities to be built at the vicinity of your settlement :	
I find it unfair. (political ecology) I don't want because others don't want too. (group psychology) I feel like "I" endure the consequences of the problem created by others. I don't want unless any public benefits are provided specific to my settlement. Can be built somewhere else but not in my vicinity. NIMBY	1-7 (Likert scale evaluation) (1:least, 7:highest)

Table 5.13 Questions of The Questionnaire Rating The Wind Energy Related Physical, Socio-Economic Preferences, and Solution Suggestions of The Individuals

General preferences	
Turbine preference	
Number: Size: Distance :	
Socio-economic preferences 1-7 (Likert scale evaluation) (1:least, 7:highest)	
Do you agree on governmental incentives for wind energy?	
Do you agree to paying 20kuruş more for electricity produced from wind energy?	
Would you like to share a hold in a wind energy facility close to your residence (cooperatives)?	
Would you like to be informed about a wind energy facility to be constructed close to your residence?	
Would you like to participate in a wind energy facility project planning/ decision making process close to your residence?	
Suggestions for problem solution	Open ended

During the fieldwork, the set of questions that intend to evaluate: (i) the importance of renewable energy among other energy resources (fossil fuels, hydropower, solar energy, and nuclear energy), and (ii) the wind energy specific preferences (e.g. electricity production from wind energy in Turkey) in reference to theoretical findings on attitudes towards renewable energy (Breglio, 1997; Gipe, 1995; Wolsink and Sprengers, 1993) created discomfort among some participants during the fieldwork at the end of the first day, with a common ground established at the focus group organized with the civil representatives, it is decided to exclude the discomforting questions from the analysis. This situation totally changed the conduct of the fieldwork, gained a new scope for the findings and extended the theoretical context of the study. Respectively, the study focused on better understanding the dynamics of the public opposition within the context of the nudging theory; and used the gathered data for the analysis of the multi-level nudging process within the wind energy transition.

5.8 Data Analysis

The study uses qualitative and quantitative data analysis techniques including content analysis, descriptive statistics and simple statistical analysis as well as conceptual process mapping.

In qualitative data analysis “coding” the data collected through in-depth interviews and focus groups is essential. It is the “process of classifying and categorising text data segments into a set of codes (concepts), categories (constructs), and relationships” (Bhattacherjee, 2012, p. 236). Similarly, content analysis is used "to make inferences by objectively and systematically identifying specified characteristics of messages" (Holsti, 1969, p.14). The content analysis technique enables simplifying and categorizeing the collected data to make a deep examination and reveal the relationships between these categories (Mayring, 2004). The verbal/narrative data collected as subjective descriptions, during in-depth interviews, is analyzed by the "content analysis" technique. This technique allows one to observe the frequency of the mentioning of the particular variables and to reveal some other variables which are not prevalent in the literature reviewed.

Along with the identification of the general concept categories, several integration techniques may be used to interrelate them. In this respect, following the translation of collected descriptive-qualitative data into systematic thematic concept groups, the study interrelates them with concept and process maps. The concept mapping technique enables to graphically visualize the relationships between the obtained concepts using boxes and arrows (Bhattacherjee, 2012). Similarly, process mapping allows one to graphically visualize “sequence of actions for a given activity” through diagrams (Heher and Chen, 2017).

The quantitative data analysis in terms of descriptive analysis includes digitization of the data which is transferring the verbal data into a numeric format. The collected data is interviews and questionnaires are converted into numeric data in terms of variables and measurement items of the research. Accordingly, the study used the frequency of mentions for the retreived concepts from the descriptives. The study also presents simple statistics from Likert-scale ratings, including descriptive statistics such as frequency distribution that is summarizing frequencies of individual values of a variable and averages (Bhattacherjee, 2012). This allows create not only numerical outcomes for the selected sample but also simple group comparative analyses. Descriptive statistics are "used to describe the basic features of the data in a study … provid[ing] simple summaries about the sample and the measures and simply describ[ing] what is or what the data shows" (Friedman, 1998, p.40).

The study developed an additional analytical framework based on the nudging theory to analyze the multi-level nudging process. It adopts the model by Hansen and Jespersen (2013) including the two notions of nudges as “type” and “transparency” under four groups: (I) “Type 1” (ii) “Type 2”, (iii) transparent, and (iv) non-transparent. Accordingly, qualitative and quantitative analyses from fieldwork regarding the social attitudes and reactions against wind energy within the context of four main drivers (-energy preferences; -proximity (NIMBY: unfairness, endurance, co-movement); -public engagement; -individual perspective and characteristics) are integrated to the examination of nudging process.

The data gathered for to the first research question (*wind energy transition within Turkish planning process*) is descriptively and schematically analyzed. The data collected for the second (*underlying socio-spatial sensitivity issues for public opposition*) and third (*conditions nudging the involved actors in wind energy transition*) research questions are analyzed by using the content analysis technique through which frequency tables are generated for extracted concepts. Descriptives revealed from in-depth interviews and focus groups are translated into systematic thematic concept groups, and process maps. The Likert ratings are analyzed by adopting simple statistical techniques including descriptive statistics, averages and group comparisons. Moreover, with the additional analytical framework based on the nudging theory, the third research question is answered through the descriptive analyses.

CHAPTER 6

WIND ENERGY TRANSITION WITHIN THE TURKISH CONTEXT

This chapter presents the wind energy transition process within the Turkish context. The chapter firstly introduces the national legal framework for wind energy transition regarding the processes of electricity generation from wind energy. Secondly, the chapter presents the support mechanisms and incentives provided for the investors within the wind energy transition process. It also makes a comparison of Turkish and international legal contexts in terms of wind energy transition. The following section of the chapter focuses on the wind energy transition process within the multi-level planning context in Turkey. Finally, the chapter introduces İzmir as the case study area and briefly presents the characteristics of the selected research areas.

6.1 National Legal Framework for The Wind Energy Development

Electricity generation from wind energy in Turkey is pursued in two ways depending on the facility's installed capacity: (i) licensed and (ii) unlicensed. In this respect, different legal frameworks are valid for each production process. The following sections introduce these frameworks, first for licensed and, later, for unlicensed production.

6.1.1 Licensed Wind Energy Production

In order to encourage the use of renewable energy resources and to regulate the conditions under which they will be produced, the Law No. 5346 on *the Use of*

Renewable Energy Resources for the Purpose of Generating Electrical Energy has been enacted on 18 May 2005. Licensing conditions and obligations to be fulfilled to obtain a license are regulated by the *Electricity Market Law* No. 6446 - enacted on 30 March 2013 - and *Electricity Market Licensing Regulation*. In Article 5 (1) of Electricity Market Law, titled *License Principles*, the license is defined as "the certificate granted to legal entities in order to carry out registered market activities in accordance with the provisions of this Law". These regulations control wind energy development in three main phases: (i) project development, (ii) licensing, and (iii) operation. Figure 6.1 summarizes this process including the phases, a list of required documents and related institutions.

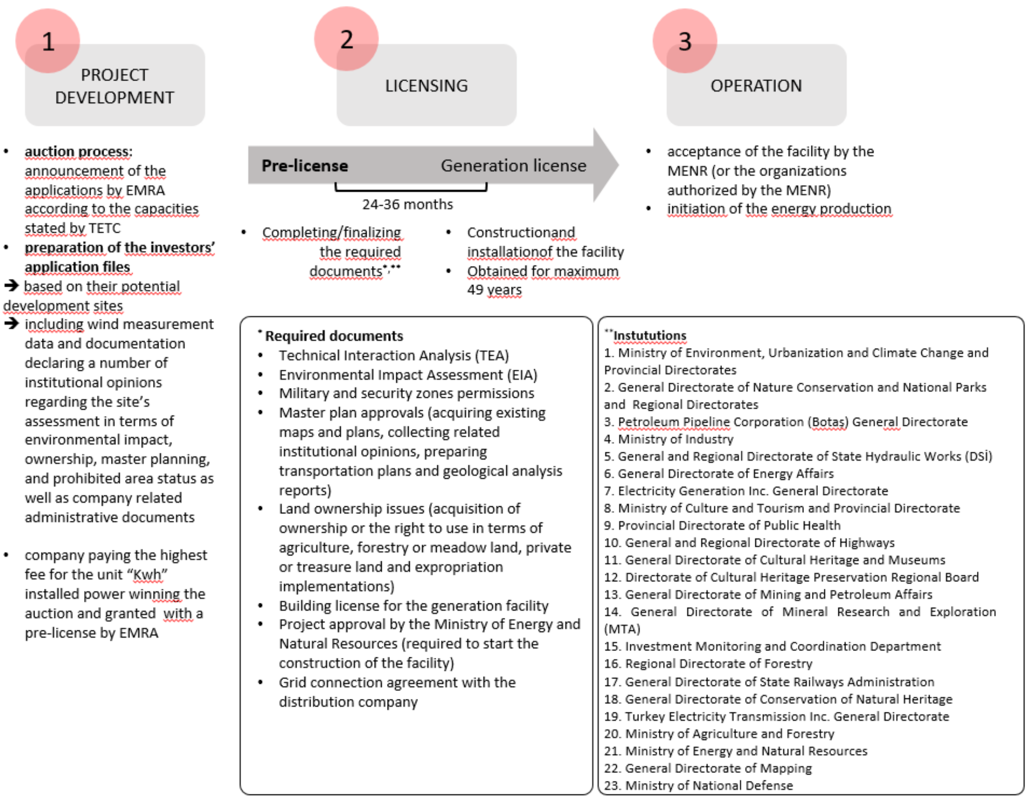

Figure 6.1. Licensed wind energy generation process

Accordingly, the **project development** phase includes the work to be done by the investors regarding the auction processes. The auction process starts with the announcement of the applications by the Energy Market Regulatory Authority (EMRA, EPDK: Enerji Piyasası Denetleme Kurumu) according to the capacities stated by the Turkish Electricity Transmission Corporation (TETC / TEİAŞ). During the project development phase, investors prepare their auction application files based on their potential development sites which are selected through analyzing the site's wind energy potential as well as administrative and financial issues.

In this respect, application files consist of the wind measurement data and documentation declaring a number of institutional opinions regarding the wind energy development site's assessment in terms of environmental impact, ownership, master planning, and prohibited area status as well as company related administrative documents (EMRA, n.d.). EMRA, The General Directorate of Energy Affairs (EIGM), and TETC (TEİAŞ) review the applications. The company paying the highest fee for the unit "Kwh" installed power wins the auction and is granted a pre-license by EMRA.

The **licensing** phase is composed of two steps, (i) pre-licensing, by which investors have the official permission to prepare the necessary documentation, and (ii) generation licensing, through which, investors initiate the construction of the wind energy generation facility.

Pre-licensing procedures are identified in the Article 12 of the Electricity Market Licensing Regulation. According to the *Electricity Market Law* No. 6446, a legal person applying for a generation license is granted a pre-license for a certain period of time in order to start the construction of the generation facility, to complete the documents specified in the legislation, and to obtain the ownership or usage right of the area where the generation facility will be established. The duration of the pre-license is twenty-four months at most. However, pre-licenses can be extended up to thirty-six months with the decision of the Board if the production facility is large (*Electricity Market Licensing Regulation, article 9*). Companies with a pre-license are required to fulfill the previously declared documentation and to prepare the final version of the master plans incorporating the wind energy facility during the specified period of time. The documentation consists of the wind energy facility's Technical Interaction Analysis (TEA), Environmental Impact Assessment (EIA), Military and security zones permissions, master plan approvals (acquiring existing maps and plans, collecting related institutional opinions, preparing transportation plans and geological analysis reports), land ownership issues (acquisition of ownership or the right to use in terms of agriculture, forestry or meadow land, private or treasure land and expropriation implementations), building license for the generation facility, project approval by the Ministry of Energy and Natural Resources (required to start the construction of the facility), grid connection agreement with the distribution company.

According to the EIA Regulation issued on 25.11.2014, wind energy facilities with 5 or more turbines, or an installed capacity of 10 – 50 MW are subject to the "Selection-Screening Criteria". Wind energy facilities with 20 or more turbines or an installed power of 50 MW and above are subject to Environmental Impact Assessment. To initiate the operation of a wind energy facility, investors must obtain an "EIA Not Required" for the first or "EIA Positive" certificate for the second case. It is also necessary to declare whether the wind energy generation site takes place within any "sensitive region" enlisted in the Environmental Impact Assessment Regulation. Sensitive regions include the wetlands, coastal areas, mountainous and forested areas, agricultural areas, national parks, special protection areas, densely populated areas, historically, culturally, archaeologically important areas, erosion areas, landslide areas, afforested areas, potential erosion and afforestation areas and aquifers to be protected. If the wind energy generation site takes place in a sensitive region, applicants need to submit the necessary documentation explaining how the "Sensitive Region" in question does not prevent the establishment of such a generation facility or how the obstacle will be overcome. However, according to the recent EIA regulation issued on 29.07.2022, the only statement is that the EIA is required for all wind energy facilities regardless the facility's size and capacity. Moreover, according to the regulation, if the investor who wants to establish an electrical energy facility based on wind energy is also the owner of the site where the generation facility will be established, other applications made for the same site are not considered (*Electricity Market Law* No. 6446, article 7 (4) titled Generation Activity).

Pre-licensing terminates when the investor obtains a *generation license* (Electricity Market Licensing Regulation, article 19). In order to obtain a *generation license* investor applies to EMRA with a "License Application Letter" together with the required documents within a time limit of 24-36 months. EMRA examines and evaluates the complete applications and presents to the Board within 45 days.

After obtaining the generation license, the investor is required to complete the construction of the facility within that specified time. Licenses are issued for a maximum of forty-nine years. The minimum term valid for generation, transmission and distribution licenses is ten years (Electricity Market Law, article 5). After the completion of the construction and installation processes of the facility, the MENR (or the organizations authorized by the MENR) acceptance process begins in order to put the facility into operation.

The **operation** phase covers the facility's energy generation process. Energy generation starts upon the completion of necessary registrations procedures of commercial companies to the Energy Markets Management Incorporation (EMMI, EPİAŞ: Enerji Piyasası İşletmeleri A.Ş.). During the operation phase, investors can benefit from the support mechanisms and incentives provided by the government to promote the renewable energy transition. Section 6.1.3 introduces such mechanisms.

Another licensing procedure is realized through the Renewable Energy Resource Areas (YEKA) regulation. The Law No. 5346 *the Use of Renewable Energy Resources for the Purpose of Generating Electrical Energy*, article 4 titled '*Determination, conservation and use of resource areas'* defines how the renewable energy resource areas are created by the Ministry of Energy and Natural Resources (MENR) in order to ease the renewable energy transition process. In this regard, the MENR can select renewable energy resource areas on public, treasury, and private property lands, taking the opinions of relevant institutions and organizations. Urgent expropriation can be made for renewable energy resource areas in private lands according to Article 27 of Law No. 2942. MENR informs the relevant planning authorities to include the specified areas in the master plans. Respectively, MENR organizes an auction for the electricity generation facilities to be established in renewable energy resource areas following the EMRA regulations.

6.1.2 Unlicensed Wind Energy Production

Unlicensed electricity generation from wind energy can also be pursued. According to the Energy Market Law No. 6446 Article 14, a generation facility based on renewable energy resources, and real and legal persons who use all the energy produced without giving it to the transmission or distribution system, whose production and consumption are at the same measurement point, and who have a generation facility based on renewable energy resources are exempt from establishing a company and obtaining a license. In accordance with the Presidential Decision No 1044, dated 09.05.2019, an unlicensed generation facility based on renewable energy sources up to 5 MW can be established.

The surplus electrical energy generated from any renewable energy source supplied to the grid by the unlicensed producer is evaluated within the scope of renewable energy resources support mechanism (YEKDEM), and purchased by the authorized supply company for 10 years (MENR, n.d.; Regulation for Unlicensed Electricity Generation in the Electricity Market, Article 5:2).

During the operation phase, licensed and unlicensed electricity generators can benefit from the support mechanisms (e.g. YEKDEM) and incentives provided by the government to promote renewable energy transition. The following section introduces these mechanisms.

6.1.3 Support Mechanisms and Incentives for The Wind Energy Developers (Investors)

A variety of support mechanisms and incentives are provided for wind energy developers in order to ensure the transition to renewable energy resources, and thereby, to reduce fossil fuel dependency. In this respect, the public sector has become a prominent actor in the provision of laws, regulations, and directives since the early 2000s (Bayraktar and Kaya, 2016). Specifically, targets that are set in the national development plans constitute the basis of support frameworks for the national growth of renewable energy. There are also private incentives provided to developers and consumers. Table 6.1 summarizes these in reference to the sector and sources.

Table 6.1 Incentives / Supports Provided for The Developers and Consumers

Incentive/support sources	**Incentives/support mechanisms**	**Year**
8th Five-Year Development Plan	-sustainable alternative energy **policies** -integration of private sector into the energy market	2001-2005
9th Development Plan	- preparations of the **legal framework** for the development of the renewable energy market (laws numbered 5346, 6094, and 6446)	2007-2013
10th Development Plan	-provision of incentives for the **domestic production** of related renewable energy equipment	2014-2018
11th Development Plan	-developing high added value renewable energy market -**YEKA mechanisms** focusing on **R&D** and **technology transfer** -increasing the **share of renewable resources** in electricity generation to **38.8%** for 2023	2019-2023

Table 6.1 (continued)

Incentive/support sources	**Incentives/support mechanisms**	**Year**
Law No. 5346 *the Use of Renewable Energy Resources for the Purpose of Generating Electrical Energy*	-Providing various services (e.g. master planning, pre-examinations) **free of charge** to encourage renewable energy investments, especially for unlicensed wind energy facility developers -provision of Renewable Energy Resource Certificate (YEK Certificate - **YEK Belgesi**) for the investors in order to benefit from the incentive and support mechanisms provided for renewable energy development	2005
Law No. 6094	-regulating prices of the electricity sales to the government - **YEKDEM support mechanism** provided for the license-holding investors: **fixed price guarantee** +additional support for using domestically produced components (minimum 55% of the whole component) -**free of charge service fee** for the investors who set up electricity generation facilities to meet their own needs -granting **permission on state-owned properties**, forestry, or treasury lands -providing easement, lease or use permit and a **discount** of 85% will be applied for the first 10 years	2011

Table 6.1 (continued)

Incentive/support sources	Incentives/support mechanisms	Year
The Ministry of Industry and Technology	-provision of **Investment Incentive Certificate** - **VAT and Customs Tax exemption** -corporate tax, SSI, VAT, and Customs Tax supports for the unlicensed wind energy investments - **priority area supports** applied for 5th and 6th investment regions regarding the wind energy related technical components including turbine, generator, and blades manufacturing	2022
Energy Markets Management Inc. (EPİAŞ)	-**YEK-G System**: working both for renewable energy investors/suppliers and consumers (recording and documenting the characteristics of each 1 MWh of renewable energy supplied by the licensed renewable energy developers - **Green tariff** (yeşil tarife): consumers gaining information about the energy purchased and choose a supplier generating electricity from renewable energy sources	2021

The last four development plans commonly emphasize increasing the share of renewable energy sources in electricity generation as well as transitioning to a market structure in which the private sector plays a more active role (SBB, 2019; MD, 2013; SPO, 2006; SPO, 2001). Beginning with the 8th Five-Year Development Plan (2001-2005) governmental policies indicate that there is a search for finding sustainable ways of alternative energy supply against finite fossil fuel sources, and integrating the private sector into the energy market. The 9th Development Plan policies focus on the legal framework preparations for the development of the renewable energy market. The 10th Development Plan highlights the provision of incentives along with the maximization of the economic contribution of the renewable energy sector through promoting domestic production of related equipment. The 11th Development Plan introduces policies on developing the renewable energy market in a way that creates high added value by focusing on R&D and technology transfer implemented through YEKA mechanisms, apart from domestic equipment production. Additionally, it is aimed to increase the share of renewable resources in electricity generation to 38.8% for 2023 within the context of the 11th Development Plan (SBB, 2019).

The legal framework for the regulation of the renewable energy market developed as a result of these national development policies provides guidance for the operation of the incentive and support mechanisms. In this regard, the previously mentioned laws numbered 5346, 6094, and 6446 are of high importance.

Law No. 5346 on *the Use of Renewable Energy Resources for the Purpose of Generating Electrical Energy* that has been enacted in 2005 aims to increase the share of renewable energy sources in electricity generation by providing high quality, reliable, economic, and environmentally friendly renewable energy alternatives; thus, reducing greenhouse gas emissions and creating a renewable energy-related manufacturing sector (Bayraktar and Kaya, 2016). This law also regulates the investment processes within the previously introduced licensed and unlicensed energy production contexts. In this regard, various services (e.g. master planning, pre-examinations) are provided free of charge to encourage renewable energy investments, especially for unlicensed wind energy facility developers.

In both licensed and unlicensed energy production, in order to determine and monitor the source type of electricity generated from renewable energy sources in the national and international markets, a "Renewable Energy Resource Certificate" (YEK Certificate - YEK Belgesi) is issued to the generation licensee by EMRA (Law No. 5346, article 5). Investors only with the YEK Certificate can benefit from the incentive and support mechanisms provided for renewable energy development.

The renewable energy law numbered 6094, enacted in 2011 amending law numbered 5346, regulates prices regarding electricity sales to the government; and introduces the support mechanism (YEKDEM) that includes the procedures and principles regarding the prices, periods and payments as well as the use of domestically manufactured equipment and components.

Supports such as YEKDEM prices and domestic contribution prices are provided for the license-holding investors with energy facilities in operation (generating electric energy from these facilities and sending it to the transmission and distribution system) before 2020 and using domestically produced mechanical and electro-mechanical components. Through this law, developers were guaranteed a fixed price for 10 years starting from the enactment of the law in 18.05.2005 until 31.12.2020. This period is extended until 30.06.2021 with a 6 month-extension on 25.11.2020. With the Presidential Decision No 3453 dated 30.01.2021, the implementation period of YEKDEM price for electricity generation facilities with "renewable energy source certificate", has been put into operation from 01.07. 2021 to 31.12.2025, is arranged to be 10 years, and the implementation period of domestic contribution price to be 5 years. Additionally, prices are to be updated quarterly. "Domestic contribution" support is provided in the case of using domestically manufactured wind turbine parts and components. The minimum domestic contribution rate must be 55% within the whole component. Each facility type has a different component breakdown, in this regard, support is given according to the component breakdown of the renewable energy facility. Following Table 6.2 introduces the schedule for the YEKDEM and domestic contribution prices, and Table 6.3 presents the wind energy facility component breakdown.

Table 6.2 YEKDEM and Domestic Contribution Price Schedule

Type of the energy facility	**YEKDEM Price TL kuruş/kWh**	**YEKDEM Upper Limit Price USD-cent/kWh**	**Domestic Contribution TL kuruş/kWh**
Wind	32,00	5,10	8

Table 6.3 Domestic Contribution Component Breakdown for Wind Energy Facility

Type of the energy facility	**Domestic manufacturing component**	**Ratio of the integrative part within the component (%)**
Wind	Blade	100
	Generator & Power Electronics	70 30
	Turbine tower (main structural system holding rotor and nacelle groups) Integrative parts	80 20
	All of the mechanical parts in rotor and nacelle groups (excluding the payments made for the blade group, generator and power electronics) (e.g.hub, pitch systems, gears etc.)	Ranging 5-30

The law also states that the service fee will not be charged from the investors who set up electricity generation facilities to meet their own needs using renewable energy resources. It has been stipulated that State-owned real properties, forestry, or treasury lands will also be granted permission, as well as easement, lease or use permit will be granted and a discount of 85% will be applied for the first ten years.

Wind energy investors can also have support and incentives from the Ministry of Industry and Technology apart from those previously mentioned ones. By obtaining an Investment Incentive Certificate from the Ministry of Industry and Technology, wind energy investments can benefit from general incentive implementations such as VAT and Customs Tax exemption (MIT, 2022). Additionally, unlicensed wind energy investments have been included in the scope of the 4th region incentives with the new amendment, regardless of the investment location, and can benefit from corporate tax, SSI, VAT, and Customs Tax supports (Official Gazette, 24 Feb. 2022, decision no. 5209). Regarding the investments in manufacturing wind energy related technical components including turbine, generator, and blades, the Ministry of Industry and Technology provides priority area supports applied for 5^{th} and 6^{th} investment regions (MIT, 2022).

A recent application refers to the *YEK-G System* provided by Energy Markets Management Inc. (EPİAŞ). It is mainly a voluntary based system to promote a sustainable lifestyle in terms of electricity production and consumption from renewable energy. In this respect, YEK-G System works both for renewable energy investors/suppliers and consumers (EMMI, 2021). Through YEK-G System, EPİAŞ aims to keep track of the amount of renewable energy generated and to prove this to consumers by utilizing a blockchain technology. Blockchain technology enables to record and document the characteristics of each 1 MWh of renewable energy supplied by the licensed renewable energy developers to the grid via a YEK-G Certificate. This system also allows consumers to gain information about the energy purchased and to choose a supplier generating electricity from renewable energy sources which is called green tariff (yeşil tarife) (EMRA, 2020).

6.1.4 Comparison of Turkish and International Legal Contexts

The primary legal framework on energy issues mainly regulates the licensing procedure and guides wind energy investments. It is also strongly intertwined with the other legislation complementing the procedure through the provision of the socio-spatial criteria which are influential on the wind energy facilities' siting processes. In this respect, many countries such as Germany, the UK, and Canada, where wind energy is widely used, have developed a variety of restrictions. However, in Turkey, there are only a very limited number of restrictions defining setback distances for the wind energy facility siting.

It can be assumed that the lack of such regulations regarding how close the wind turbines can get to residential areas can trigger local resistance in Turkey. In addition, within the context of the previously mentioned legal framework, wind energy facilities can even be located directly in the natural, cultural, and socio-economic activity areas. Yetiş et. al.'s (2015) study reveals the inadequacy of the existing legal framework in Turkey that is guiding wind energy facilities' site selection processes. They introduce a comparison of wind energy facilities' setback distances in Turkey with respect to international values regarding environmental, socio-economic, and residential issues.

Within the context of international literature wind energy facilities are located from the settlements at distances ranging minimum of 300 m to 2000 m (Peri and Tal, 2021; Yetiş et.al., 2015; Baban and Parry, 2001; Nguyen, 2007; Voivontas et.al. 1998; Nguyen et.al., 2019; Salomon et al., 2020). Setback distances vary in different countries. For example, the US (excluding Maine) and China have lower setback distances that are below 1000 m; Europe has setback distances that are generally above 1000 m. For instance, in Germany, although there is not a uniform national restriction set for minimum settlement distances from a wind energy facility, legally the smallest minimum settlement distance is about 800 m (Eichhorn et al., 2017). On the other hand, several federal states of Germany have more restrictive regulations such as in Bavaria where minimum settlement distance is 10 times the wind turbine's height corresponding to nearly 2000 m (Salomon et al., 2020). Turkish legislation does not include such restrictions for minimum settlement distance from a wind energy facility.

Table 6.4 Different Countries' Setback Distances For Wind Energy Facilities From Settlements (Source: Adapted From Peri and Tal, 2021; Dai et.al., 2015)

Country	**Setback distance (meters)**
Austria	800-1,200 (Set by regions)
Belgium	Rotor diameter*3 (Flanders) Tip height *4 (Wallonia region)
Denmark	Tip height *4
England	Local people have the final say on WTs applications: Min. 700 Max. 2,000 or Tip height *10
Estonia	1,000–2,000 (Set by regions)
Finland	NA
France	500

Table 6.4 (continued)

Country	Setback distance (meters)
Germany	Set by regions: Min.300 (Hamburg) Max. Tip height *10 (Bavaria)
Greece	500-1,500 (By settlement type)
Hungary	1,000
Israel	500
Ireland	Tip height *4
Italy	200 (From single dwelling) Tip height *6 (From towns)
Netherlands	hub height *4
Poland	Tip height *10
Portugal	NA
Romania	300 (1–3 buildings) 500 (More than three buildings)
Scotland	2,000 (Governmental guide, final decision by local circumstances)
Spain	Set by regions: Min.500 (isolated dwellings) Max. 1,000 (urban areas)
Sweden	500 (From isolated dwellings) 1,000 (From urban areas)
Manitoba (Canada)	550
Prince Edward Island (Canada)	Tip height *3
Illinois (U.S.)	3 * the total height of the tower + the length of one blade
Kansas, Butler County (U.S.)	304.8
Kansas, Geary County (U.S.)	457.2 m
Maine (U.S.)	-
Massachusetts (U.S.)	Tip height *1.5
Minnesota (U.S.)	At least 152.4 and sufficient distance to meet state noise standard
Michigan (U.S.)	-
New York (U.S.)	Tip height *1.5 or 457.2 m
Oregon (U.S.)	1000
Door County, Wisconsin (U.S.)	Tip height *2 and no less than 304.8
Portland, Michigan (U.S.)	Tip height *2 and no less than 304.8
North Carolina (U.S.)	Tip height *2.5
Dixmont, Maine (U.S.)	1609
China	200 for a single wind turbine, 500 for a large wind energy facility

Additionally, while wind energy facilities in the world can be located within a minimum of 200 m and 500 m distance from forest areas (Bunzel et.al., 2019; Baban and Parry, 2001; Yue and Wang, 2006); in Turkey, as long as the cost of disafforestation is defrayed by the investor, facilities can be established within the forest areas (Yetiş et.al., 2015), apart from minor exceptions (Güdül, 2015). Similarly, wind energy facilities within ecologically valuable areas are sited at distances ranging from 200 m to 1000 m according to international literature (Baban and Parry, 2001; Yue and Wang, 2006). In Turkey, the legislation allows the establishment of wind energy facilities at a distance of at least 300 m from the protected sensitive natural areas; on the other hand, facilities can continue their activities in a controlled manner in qualified and sustainable protection and controlled use areas. Facilities can also be located within National and Natural Parks, Specially Protected Environment Areas, and Natural Life Development areas upon the opinion of the relevant institution.

According to Article 8 of the Law numbered 5346, regulations regarding wind energy facilities' land requirements indicate that permission is given for a fee, in terms of leasing, easement, or right of use within the state-owned Treasury or forestry lands by the ministries of Environment, Urbanism and Climate Change, Agriculture and Forestry, Treasury and Finance.

On the other hand, according to the same law 5346, in case there are pastures (including winter quarters and public pastures and meadows) within the wind energy facility development site, in accordance with the provisions of the Pasture Law No. 4342 these pasture lands are registered in the name of the Treasury by changing the allocation purpose. Pasture areas are leased by the Ministry of Treasury and Finance in return for their price or the right of easement is obtained.

Additionally, in accordance with the principal decisions of the High Council for the Protection of Cultural and Natural Heritage, renewable energy facilities cannot be established in 1st and 2nd Degree Natural Protected Areas. For the 3rd Degree Protected Areas, the permission of the relevant Conservation Board is required. Recent amendments indicate that 1st Degree Natural Protected Areas are called Absolute Natural Sites; 2nd Degree Natural Protected Areas are called Qualified Natural Sites, and 3rd Degree Natural Protected Areas are called Sustainable

Protection and Controlled Use Areas. In this respect, renewable energy facilities cannot be established in Absolute Natural Sites. However, the establishment of renewable energy facilities is permitted in Qualified Natural Sites and Sustainable Protection and Controlled Use Areas.

Articles 17/3 and 18 of the Forestry Law numbered 6831, enacted on 18.04.2014, regulate how the wind energy facilities' land permissions are granted. In accordance with these regulations, energy related facilities can be built within state owned forests in return for a fee, if there is a public interest and necessity for their construction. Investors receive land permissions for a maximum of 49 years period of time. This permission may be extended for 99 years at the end of 49 years.

Article 8 of the Law numbered 5346 allows the establishment of electricity generation facilities based on renewable energy resources in national parks, nature parks, nature monuments and nature protection areas, conservation forests, wildlife development areas, and special environmental protection areas, provided that the positive opinion is obtained from the relevant Ministries and in natural sites, from relevant conservation regional board.

Most forestry land in Turkey takes place in mountainous and hilly areas where the wind is direct and long-term; along with the enabling structure of the legal framework specifying "energy" permits and easing land allocation results with the concentration of wind energy facilities in forest areas (Güdül, 2015). In this respect, a circular is issued in 2014 by the Ministry of Forestry and Water Affairs to control the impact of energy generation and mining activities on nature through certain restrictions regarding siting permissions. According to this circulation, in the geographically determined areas of Istanbul, Kocaeli, Çanakkale, Tekirdağ, Hatay, and Artvin provinces, wind energy facilities or wind measurement applications are not taken into consideration and capacity increase are not allowed. Additionally, this circulation bans wind energy development in conservation forests, gene conservation forests, seed stand areas, as well as wetlands, wetland buffer zones (2.5 km), planned and existing dam and pond reservoir areas.

Although it is not included in the legislation, recommendations to be considered during the construction of a wind energy facility including road construction, energy transmission lines, crane areas, and setback distances are provided by the Ministry of Agriculture and Forestry (Güdül, 2015). In this respect, Güdül (2015) indicates that, for transportation to the wind energy facility and between the turbines, the ministry primarily recommends the use of existing forest roads, and the construction of narrow roads with a maximum of 6m width if needed. Ministry also recommends the use of excavators to prevent further destruction of forest areas during road construction. For the energy transmission lines from the switchyard to the connection point, the ministry recommends them to be underground following the road route. In order to reduce forest destruction, it is recommended to have fewer crane areas, not to cut excessive trees under the turbines except for technical reasons, not to replace cut trees with materials such as gravel, stone, or concrete, and to take necessary precautions against potential forest fires as well. Regarding the setback distances from residential areas, the ministry recommends not having facilities less than 500 meters to ensure noise is within acceptable limits.

International literature introduces that wind energy facilities can be located within 400 m distance from water bodies (Baban and Parry, 2001), and 3-4 km from the sea (Haugen, 2011; Effat, 2014; Moiloa, 2009; DEADP, 2006). In Denmark, wind turbines cannot be placed within 3 km of the coastline unless special permissions are obtained (Haugen, 2011). In Turkey, wind energy facilities can be sited within a distance of 300 m to lakes and rivers, and 100 m to the seashore (Yetiş et. al. 2015). In accordance with the Water Pollution Control Regulation, an absolute protection area of 300 m used to be recommended for water bodies that have the potential to be used as drinking and utility water; yet this practice has been repealed in 2018. In the wetland buffer zones to be determined by the Commission in accordance with the Regulation on the Protection of Wetlands, wind energy facilities with the capacity of 10 MW or more are subject to the permission of the related Ministry. The Coastal Law defines the shoreline which is to be minimum 100 m; and allows construction only after this border. However, it does not set any restrictions for wind energy facility siting.

According to the international literature, agriculture can be practiced within wind energy facility areas (Li et.al., 2018; Chen, 2019; Kaffine, 2019). In this respect, there is not a specific agricultural limitation. In Turkey, wind energy facilities can be established depending on the permission to be obtained from the Soil Conservation Commission in Turkey. In accordance with Article 13 of the Soil Conservation and Land Use Law, absolute agricultural lands, special crop lands, planted agricultural lands and irrigated agricultural lands cannot be used for purposes other than agricultural production. However, provided that there is no alternative area, and the Board deems it appropriate; upon the request of EMRA, to renewable energy investments can be permitted by the related Ministry, provided that soil protection projects are complied with. Another special case is about the olive groves. According to the Law on Improvement of Olive Growing and Inoculation of Wilds, olive groves cannot be narrowed.

Along with the ecological, natural, and agricultural areas, literature also puts emphasis on the regulations regarding the historical and cultural heritage sites (Fast et.al, 2016; Haugen, 2011; Tetra Tech EC Inc. et al. 2008). In this regard, the German state Thuringia recommends wind energy facilities to be located minimum 1 km from historical and recreational areas (Haugen, 2011). Jerpasen and Larsen (2011) criticize Environmental Impact Assessment’s content as lacking in integrating landscape and cultural heritage. On the other hand, in Turkey, wind energy facilities are not allowed in first and second degree cultural heritage sites.

Literature additionally introduces wind energy facility setback regulations regarding natural life issues regarding birds, bats and other species. In terms of natural life, especially for birds and bats, Dai et.al. (2015) summarizes suggestions regarding the site selection of wind energy facilities and the technical characteristics of wind turbines. Regarding site selection, wind energy facilities are recommended to be installed away from important habitats, breeding areas, migration routes for birds and bats; and the construction phase of the facilities needs to be carried out except the breeding periods. From a technical point of view, in order to make the turbines more noticeable it is recommended to paint blades and make some structural changes such as enlarging the turbine blades or reducing the rotational speed (Dai et al., 2015). In this respect, in Hamburg, to protect the environment, wind energy facilities are established minimum 200-500 meters away from forests, wetlands, bird and bat areas (Haugen, 2011). Turkish regulations do not provide any specific rule about locating the wind energy facilities in relation to the animal habitats such as bird migration routes. Legislation about wildlife protection and development areas indicate that any facilities that can negatively affect these areas even outside these areas are not allowed to take place. These issues can be assumed as the subjects of Environmental Impact Assessment (EIA). According to the recent amendments in EIA regulation issued on 29.07.2022, all licensed wind energy facilities require EIA. However, regulations do not define any further restriction.

Wind energy facilities' noise requirements also take place as a significant criterion in international legislation. Setback distances are determined taking into consideration the noise impact. In Turkey, neither the Environmental Noise Assessment and Management Regulation nor EIA regulation do not define any no noise restrictions specific to wind energy facilities. The Environmental Noise Assessment and Management Regulation recommends having 35 dB(A) noise level around residential areas specifically in bedrooms and with open windows; and 55 dB(A) noise level in living rooms and with closed windows. Table 6.5 introduces values for indoor noise level limits in detail. However, these noise laws are general and not specific to wind turbines. The noise level at a distance of 350 m from a wind energy facility is around 35-45 dB(A) (Yetiş et.al., 2015). Additionally, noise impact can be different during day and night times. In this respect, some countries such as the UK (40 dBA- day and 43 dBA -night), Germany (50 dBA –day, and 40 or 35 dBA- night), Belgium (49 dBA-day and 39 dBA-night), and Canada (Alberta: 50 dBA-day and 40 dBA-night) set differentiating wind turbines' day and night noise levels regulations along with setback distances (Dai et.al. 2015).

Table 6.5 Indoor Noise Level Limit Values (Source: Environmental Noise Assessment and Management Regulation)

Type of the facility		Closed window Leq (dBA)	Open window Leq (dBA)
		Values when there is no activity in the facilities:	
Cultural Facilities	Theatre halls	30	40
	Cinema halls	30	40
	Concert halls	25	35
	Conference halls	30	40
Health Facilities	Inpatient treatment institutions and organizations, dispensaries, polyclinics, nursing and nursing homes etc.	35	45
	Rest and treatment rooms	25	35
Education facilities	Classrooms in schools, special education facilities, kindergartens, laboratories etc.	35	45
	Sports halls	55	65
	Cafeterias	45	55
	Bedrooms in nurseries/kindergartens	30	40
Tourism facilities	Bedrooms in accommodation facilities such as hotel, motel, holiday inn, hostel etc.	35	45
	Restaurant in accommodation facilities	35	45
Sites	Archaeological, natural, urban, historical etc.	55	65
Commercial facilities	Large offices	45	55
	Meeting rooms	35	45
	Large typewriter and Computer rooms	50	60
	Play rooms	60	70
	Private offices (practical)	45	55
	General office (accounting, writing panes)	50	60
	Business centers, shops etc.	60	70
	Commercial storage	60	70
	Restaurants	45	55

Table 6.5 (continued)

Type of the facility		Closed window Leq (dBA)	Open window Leq (dBA)
		Values when there is no activity in the facilities:	
Public institutions	Offices	45	55
	Laboratories	45	55
	Meeting rooms	35	45
	Computer rooms	50	60
Sports facilities	Sports halls and swimming pools	55	65
Residential areas	Bedrooms	35	45
	Living rooms	45	55

Final type of setback distances defined for wind energy facilities are related with the technical issues such as aviation, radar systems, roads and railways. International literature recommends locating wind energy facilities outside the aircraft landing and take-off corridors, within a minimum of 2500 m distance from the airports (Burleson, 2009; Toja-Silva et.al., 2013; Haugen, 2011; Tetra Tech EC Inc. et.al., 2008). In Denmark, wind energy facilities are located at minimum 50 to 120 m distance from roads, railways, radio communications and power transmission lines (Haugen, 2011). In Turkey, Technical Interaction Analysis (TEA) is one of the most important stages of the licensing process that deals with the wind energy facilities' interference with security signals and radar systems. Within the context of the TEA, in accordance with Article 7.2 of the Regulation on Communication, Navigation, Surveillance Systems Obstacle Criterion, wind energy facility requests need to be evaluated in a 3 km radius area with respect to CVOR and DVOR devices, as well as within a 15 km radius area according to VOR devices. There is no setback distance specifically defined for the roads, and railways in Turkey.

Table 6.6 Main Areas and Related Setback Restrictions Pursued During Appropriate Wind Energy Site Selection in Turkey and The World

Areas	**In the world**	**In Turkey**
Forest	200-500 m	Permitted as long as its cost is paid
Settlement	300-2000 m	N/A
Ecologically valuable areas	200-1000 m	Not Permitted on Absolute Natural Sites (1st degree); Permitted on Qualified Natural Sites (2nd degree) and Sustainable Protection and Controlled Use Areas (3rd degree) Permitted in National and Natural Parks, Special Environmental Conservation Areas, and Wildlife Development Areas in reference to the opinion assessment of related ministries
Water bodies	3000 m (sea)	Permitted beyond 300m to lakes and rivers Permitted beyond 100m to seashores
Cultural heritage	1000 m	Not Permitted on 1st and 2nd degree Cultural Heritage Sites
Agriculture		Permitted in reference to related committee
Natural life (birds and other species)	200-500 m	No specific regulations/restrictions can be assumed as the subjects of EIA
Noise	150-1000 m	no noise restrictions specific to wind energy facilities
Airports	2500 m	3 km radius area with respect to CVOR and DVOR devices, as well as within a 15 km radius area according to VOR devices
Roads and railways	50-500 m	No specific regulations/restrictions

6.2 Wind Energy Development Process within The Multi-Level Planning System in Turkey

This section introduces the multilevel urban planning system in Turkey with respect to wind energy transition. It is essential to comprehend the existing urban planning system in order to develop a comprehensive understanding of how the process of energy generation from wind, including all the phases (project development, licensing, construction and operation), take place within the whole system. The section firstly presents the multilevel planning system with a wind energy transition perspective. Secondly, the section introduces the analysis of the wind energy development process within the Turkish context considering its main stages, actors, and public participation issues; and explains the gaps and bottlenecks within the Turkish urban planning system regarding the wind energy development processes.

6.2.1 Multi-Level Planning System in Turkey

Turkey has a planning hierarchy that is carried out in multiple levels. A variety of binding conditions and documents are developed within the spatial and strategic contexts of these levels ranging from national, regional, local to global/international. The renewable energy transition is in a complex interaction with national, regional, and local level strategy documents and spatial plans as well as global/international documents. Table 6.7 presents the documents and the plan types related with wind energy in Turkey, and the scales and responsible authorities in charge of their preparation.

Table 6.7 Documents and Plan Types Related with Wind Energy in Turkey Indicated with Scales and Responsible Authorities

Levels	Documents	Authorities	Scale / Type
International	- Paris Agreement - Kyoto Protocol	International institutions	Strategy documents
National	- Development Plans - Climate Change Strategy 2010-2023 (Türkiye İklim Değişikliği stratejisi/IDES) - Climate Change Action Plan (T.C. İklim Değişikliği Eylem Planı/İDEP (2011-2023)) - Climate Change Adaptation Strategy and Action Plan of Turkey (Türkiye'nin İklim Değişikliği Uyum Stratejisi ve Eylem Planı) (2011-2023) - National Renewable Energy Action Plan of Turkey (Türkiye Ulusal Yenilenebilir Enerji Eylem Planı) (2014)	Presidency of Strategy and Budget Ministry of Environment, Urbanism and Climate Change Ministry of Energy and Natural Resources	Policy documents Strategy documents

Table 6.7 (continued)

Levels	Documents	Authorities	Scale / Type
Regional	- Environmental plans - Development agency strategy documents - Wind atlas *signifying regional wind potential - YEKA (yenilenebilir enerji kaynak alanları)	Ministry of Environment, Urbanism and Climate Change Development Agencies Ministry of Energy and Natural Resources	1/100.000 1/50.000 1/25.000 1/5.000
Local	- Environmental Plans (ÇDP) (provincial level) - Development (Master) plans - Implementation plans	Provincial Special Administrations Greater Municipalities Municipalities	1/25.000 scale 1/5000 scale 1/1000 scale

Within the context of the renewable energy transition, international efforts focusing on climate change and sustainability issues come into prominence. These efforts include various global, international agreements, documents, and policies produced to achieve energy-oriented goals such as greenhouse gas emissions, renewables, and energy efficiency.

Turkey takes part in these efforts to serve both global and national energy concerns. The primary globally binding documents that have been orienting the Turkish renewable energy policies within the context of climate change and sustainability approaches are the Kyoto Protocol adopted in 1997 and entered into force in 2005, and the Paris Agreement signed in 2015 (UNFCCC 1997, 2015) . These two documents establish a strong link between global warming and high level of greenhouse gas emissions due to human activities and see renewable energy development as one of the primary energy strategies to combat with this challenge.

The Kyoto Protocol is a commitment provided by the industrialized countries and economies to limit and reduce greenhouse gas emissions according to their individually differentiating responsibilities through the United Nations Framework Convention on Climate Change (UNFCCC). Although Turkey is a party to the convention, the Kyoto Protocol primarily binds the developed countries and asks for periodic emission reports. Kyoto Protocol aims to achieve a 5% reduction over the first commitment period of 2008–2012 and an 18 % reduction in the second commitment period 2013-2020 (Doha Amendment) compared to 1990 levels of greenhouse gas emissions (UNFCCC, n.d.a). To do this, the protocol obliges the committed parties to transfer to environmentally friendly technologies; focus on encouragement and research on these technologies (MFA, n.d).

The Paris Agreement, adopted in 2015 and entered into force on 4 November 2016, is a fundamental document constituting the first legally binding global climate change agreement. It aims to "strengthen the global response to the threat of climate change by holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" (MFA, n.d). The Paris Agreement includes both social and economic transformation. Involved countries submit their 5-year climate action plans by 2020 in terms of nationally determined contributions (UNFCCC, n.d.b). In this regard, the Agreement provides support for the countries that require assistance with financial, technical, and capacity building issues (UNFCCC, n.d.b).

On the other hand, being a candidate for European Union (EU) accession, Turkey also cooperates with the EU. Cooperation between Turkey and the EU takes place within the context of the Energy Dialogue since 2015 (EU Delegation to Turkey, n.d.a). The EU provides support for the development of Turkish legal and regulatory framework as well as power networks in line with EU standards (EU Delegation to Turkey, n.d.b). Another EU related effort is the climate action plan of the European Union which is called the European Green Deal issued in 2019. With the European Green Deal, the EU aims to become climate-neutral by 2050. As a new growth strategy, Green Deal promotes clean energy and extending emission trading, and puts emphasis on the circular economy (EC, 2019). Turkey, as a commercial partner of the EU, adjusts in order to maintain its commercial relations with the EU countries (Ecer et.al. 2021).

Apart from the global/international binding documents, there are also national, regional, and local level planning documents prepared on various scales related with the renewable energy transition processes in Turkey including wind energy development as well. National planning documents are mainly policy and strategy documents prepared by government bodies for a certain period. Development plans are the primary nationwide policy documents setting development targets for the whole country. These plans introduce a long-term roadmap for the future of the country in all socio-economic fields ranging from education, health, justice, tourism to transportation and energy. Previously, the State Planning Organization, later the Ministry of Development, and recently the Presidency of Strategy and Budget is responsible for the preparation of these plans. Development plans are not binding yet principal national guiding documents. Plans aim to influence lower level decisions and direct them in line with the previously determined targets (Övgün, 2010).

Similarly, Climate Change Strategy and Action Plan documents are prepared by the Ministry of Environment, Urbanism and Climate Change (MEUCC) as national guiding strategy documents. The first national Climate Change Strategy document is prepared for the 2010-2023 period. For tackling climate change, the document sets a national vision as well as short-, medium-, and long-term goals, strategies, and measures, especially in the energy, agriculture, forestry, transportation, industry, and waste sectors. Recently, the Presidency of Climate Change, working under the MEUCC, is established in 2021. In line with Turkey's 2053 net zero emission and green development goals, the Presidency of Climate Change is responsible for determining policies, strategies, and actions at the national and international levels, conducting negotiation processes and ensuring coordination with institutions and organizations (MEUCC, 2022).

The National Renewable Energy Action Plan of Turkey is another national level guiding document provided by the General Directorate of Renewable Energy working under the Ministry of Energy and Natural Resources. This document is prepared as part of Turkey's EU accession process (YEGM, 2014). It introduces Turkey’s renewable energy goals and strategies until 2023. The General Directorate of Renewable Energy (YEGM) was established in 2011, yet it is closed in 2018.

Recently, renewable energy issues are pursued by the General Directorate of Energy Affairs under the Ministry of Energy and Natural Resources (EİGM, n.d.). The General Directorate of Energy Affairs carries out measurement, feasibility, and sample application project studies regarding all energy resources, including renewable energy resources within the country; and determines the goals and priorities according to the needs and conditions of the country (EİGM, 2022a). In this respect, the General Directorate of Energy Affairs provides regional level wind energy data such as Wind Energy Potential Atlas (REPA) and Renewable Energy Resource Areas (YEKA).

The recent Turkish Wind Energy Potential Atlas is produced under the coordination of the Ministry of Energy and Natural Resources with the European Union funding and the European Bank for Reconstruction and Development (EBRD) support (EİGM, 2022b). The atlas has a 100 m x 100 m resolution incorporating the 30, 60, 100, and 150 meters above ground level wind resource information and 100 meters heights wind direction data. According to these parameters, the atlas also presents values of the annual energy production with power density, wind class, and capacity factor for a 3 MW wind turbine. Within this context, considering the obtained wind resource information as well as the developing wind turbine technologies, today's investment costs, and site selection restrictions provincial and regional (geographical regions) total wind energy facility capacity information that can be established in Turkey is created.

On the other hand, Renewable Energy Resource Areas (YEKA) are determined through administrative and technical studies carried out by the Ministry of Energy and Natural Resources and announced in the Official Gazette. For wind energy facilities to be established on the determined YEKAs, the Ministry of Energy and Natural Resources organized three tender processes in 2017 (YEKA-1 RES), 2019 (YEKA-2 RES) and 2022 (YEKA-3 RES.) YEKA-1 RES covers a total of 1000 MW capacity in 5 different regions as "Kayseri - Niğde, Sivas, Edirne-Kırklareli-Tekirdağ, Ankara-Çankırı-Kırıkkale, Bilecik-Kütahya, Eskişehir". YEKA-2 RES also includes a total capacity of 1000 MW at the provinces of "Aydın, Muğla, Balıkesir, and Çanakkale" with 250 MW power in each. YEKA-3 RES tender process is being held with a total power of 850 MW in 2022 for 20 different regions with lower wind energy capacities (Adıyaman, Amasya – Samsun, Ankara - Kırıkkale – Çankırı, Artvin - Rize – Trabzon, Bartın - Zonguldak – Karabük, Batman - Mardin - Diyarbakır – Şanlıurfa, Bayburt - Gümüşhane – Giresun, Bilecik - Eskişehir – Kütahya, Bingöl - Tunceli , Bitlis – Muş, Çorum - Kastamonu – Sinop, Elazığ, Karaman – Mersin, Malatya, Ordu, Siirt - Şırnak – Hakkari, Sivas, Tokat, Van, Yozgat). The following Figure 6.2 illustrates the distribution of YEKA-RES tender areas.

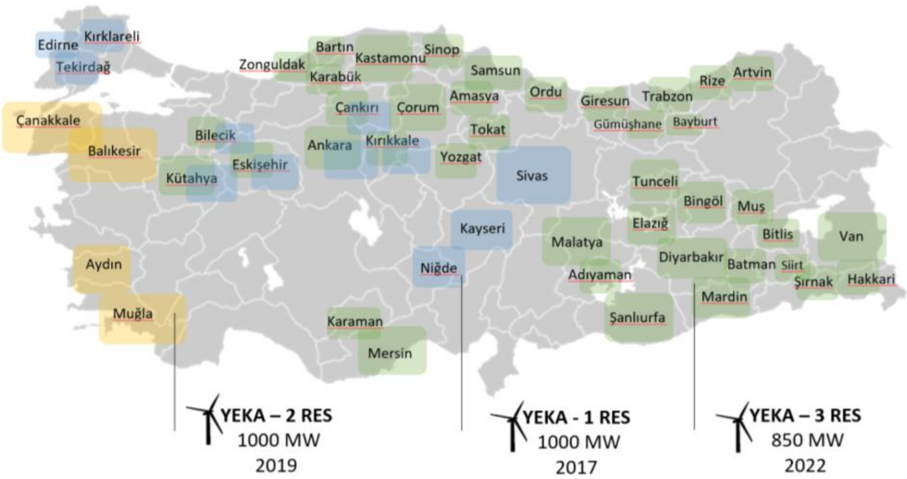

Figure 6.2. Distribution of the provinces open to wind investments with YEKA-RES tenders through years

Along with the national strategy documents, as well as the regional and provincial level wind energy data, there are regional level strategy documents prepared by Regional Development Agencies for specific NUTS (Nomenclature of Territorial Units for Statistics) regions. Development Agencies work under the Ministry of Industry and Technology and aim at the regional level development by focusing on regional resources and potentials. Development Agencies' energy policies and support mechanisms also have an important and complementary role in achieving nationwide energy targets. In this respect, Agencies provide a variety of financial, technical, research, and feasibility support for renewable energy development at the regional level (DA, n.d.).

Regarding the spatial planning practices in Turkey, there are basically two types of planning documents taking place at regional and local levels apart from specific area or objective plans at different scales (e.g. tourism plan, conservation plan, special environmental area protection plan, coastal area plan, urban transformation area plan, industrial area plan, transportation master plan, rehabilitation plan, agricultural area plan, meadow-lea-grassland plan, village settlement plan, national park area plan, water basin area plan, mass housing area plan). A number of plans at different levels are being produced for the same area (Sarı et. al., 2018).

Regional level Environmental Plans are prepared at 1/100000, 1/50000, and 1/25000 scales depending on the size of the territory, by the Ministry of Environment, Urbanism, and Climate Change. Provincial Special Administrations and Greater Municipalities prepare local-level, provincial Environmental Plans. These plans function as the upper-scale strategy and vision plans. Local level Development/Master and Implementation Plans are prepared by municipalities and concentrate on city scale development strategies and planning actions.

Environmental plans introduce the main spatial development strategies regarding a variety of sectors such as housing, industry, tourism, agriculture, and transportation corresponding with the national development plan policies and strategies (Akkar et al., 2011). Development/Master plans are in 1/5000 scale and introduce strategic land use decisions guiding the 1/1000 scale implementation plans. Implementation plans include specific details regarding the urban form, population densities, and land parcel developments (Peker, 2016).

Although the socio-spatial impacts of wind energy development need to be considered as a site selection problem within the context of spatial planning; wind energy development is basically carried out independently from the spatial planning processes that are taking place at regional and local levels. The existing wind energy development process operates as a purely top-down, bureaucratic licensing issue involving numerous institutions.

The wind energy development process interacts with spatial plans in two ways (Figure 6.3). One is through the YEKA model where wind energy resource areas are technically determined by the Ministry of Energy and Natural Resources and information is given to the relevant planning authorities to include the specified areas in the plans. Private sector investors carry out the wind energy project development process on their own. The other is through the implementation plan revision within the wind energy facility licensing process. Following the investor's application to EMRA for the energy generation from the wind; the investor obtains a pre-license and accordingly the documentation phase. The documentation phase includes the EIA process, collection of the related institutional opinions, ownership issues, and revision of the implementation plans to include the wind energy facility. If the project is approved by the Ministry of Energy and Natural Resources, the construction of the facility starts. The following section introduces the wind energy development process in detail.

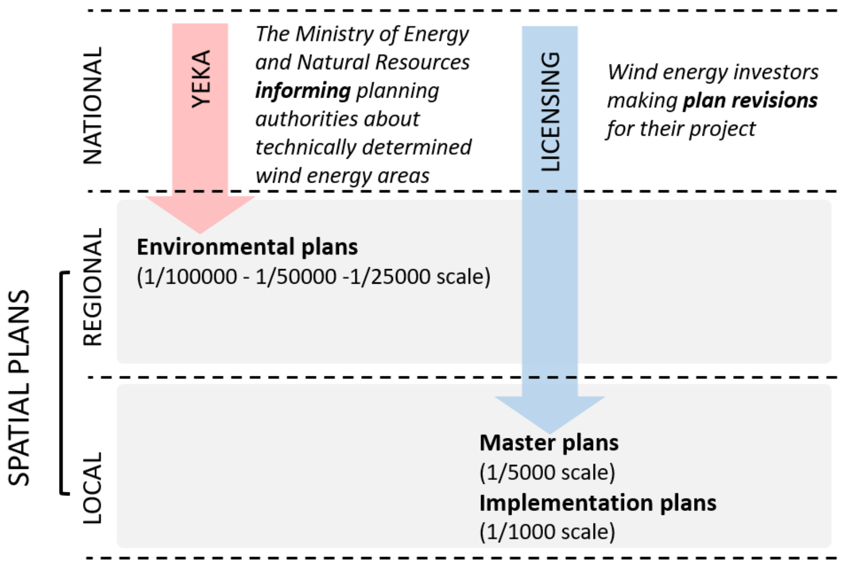

Figure 6.3. Interaction of wind energy development with spatial plans in Turkey

6.2.2 Mapping the Process of Wind Energy Development within the Turkish Context

The study maps the process of wind energy development within the Turkish planning context through the analysis of the reviewed documents, focus groups, and in-depth interviews pursued with the national and local level actor groups: 1) decision-makers: public authority representatives, 2) private sector: wind energy investors, consultants, 3) civil society organizations: NGO representatives, 4) inhabitants: muhktars, residents. The process map includes the stages of the wind energy facilities' licensing process, and examination of these stages regarding the roles of the corresponding actor groups and the possible public participation opportunities (e.g. provision of information, objection, opposition).

As mentioned previously, wind energy facilities' licensing is a very complex, bureaucratic, and multi-actor process that lasts 24 to 36 months. However, the process is carried out in the form of licensing the facilities rather than proceeding in coordination with spatial plans. Research identifies 3 main stages followed during the licensing process: **1) Pre-Licensing**; **2) Documentation** [(i) Institutional opinion assessment, (ii) Environmental Impact Assessment, (iii) Ownership Permission; (iv) Master Planning]; **3) Project Approval** (Figure 6.4).

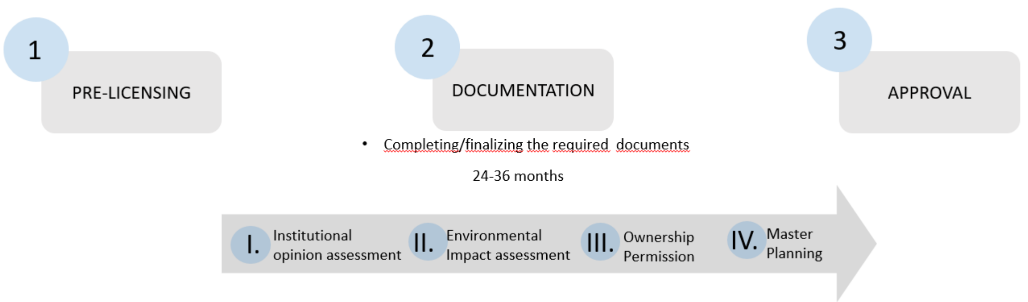

Figure 6.4. Main stages of the wind energy licensing process

The **pre-licensing** is the first stage of the process in which Energy Market Regulatory Authority (EMRA/EPDK), The General Directorate of Energy Affairs

(EIGM), and Turkish Electricity Transmission Corporation (TETC / TEİAŞ) review the applications to check whether there is a conflict of expression and site selection. Subsequently, the applicant is granted a pre-license for a certain period of time in order to complete the necessary documentation.

Documentation is the second stage composed of four subsequent and parallel processes: (i) Institutional opinion assessment, (ii) Environmental Impact Assessment, (iii) Ownership Permission; (iv) Master Planning.

The *institutional opinion assessment* process includes the fulfillment and finalization of the documents specified in the legislation. Final opinions of all the related institutions at different levels (ministries, regional and provincial directorates) are collected regarding the location of the selected site such as natural environment, forest, cultural heritage, agriculture, and military areas. The number of institution opinions to be collected can be up to 25-30 depending on the characteristics of the selected energy generation site (Figure 6.5). The national level institutions are mainly the ministries namely Ministry of Environment, Urbanization and Climate Change, Ministry of Energy and Natural Resources, Ministry of Industry, Ministry of Agriculture and Forestry, Ministry of Culture and Tourism, Ministry of National Defense; and their several general directorates such as General Directorate of Nature Conservation and National Parks, General Directorate of Conservation of Natural Heritage, General Directorate of Cultural Heritage and Museums, General Directorate of Energy Affairs, General Directorate of Mining and Petroleum Affairs, General Directorate of Mapping, Petroleum Pipeline Corporation (BOTAŞ) General Directorate, General Directorate of State Hydraulic Works (DSİ), Electricity Generation Inc. General Directorate, General Directorate of Highways, General Directorate of Mineral Research and Exploration (MTA), General Directorate of State Railways Administration, Turkey Electricity Transmission Inc. General Directorate. Institutions at the regional level are the regional directorates of the mentioned institutions such as the Regional Directorate of Nature Conservation and National Parks, Regional Directorate of Highways, Regional Board of Cultural Heritage Preservation, Regional Directorate of Forestry, Regional Directorate of

State Hydraulic Works, Regional Directorate of Highways. Institutions taking place at the local level are the provincial directorates of the ministries such as the Provincial Directorate of the Ministry of Environment, Urbanization and Climate Change, Provincial Directorate of the Ministry of Culture and Tourism, Provincial Directorate of Public Health; and governorships as local level administration and their units such as Investment Monitoring and Coordination Department.

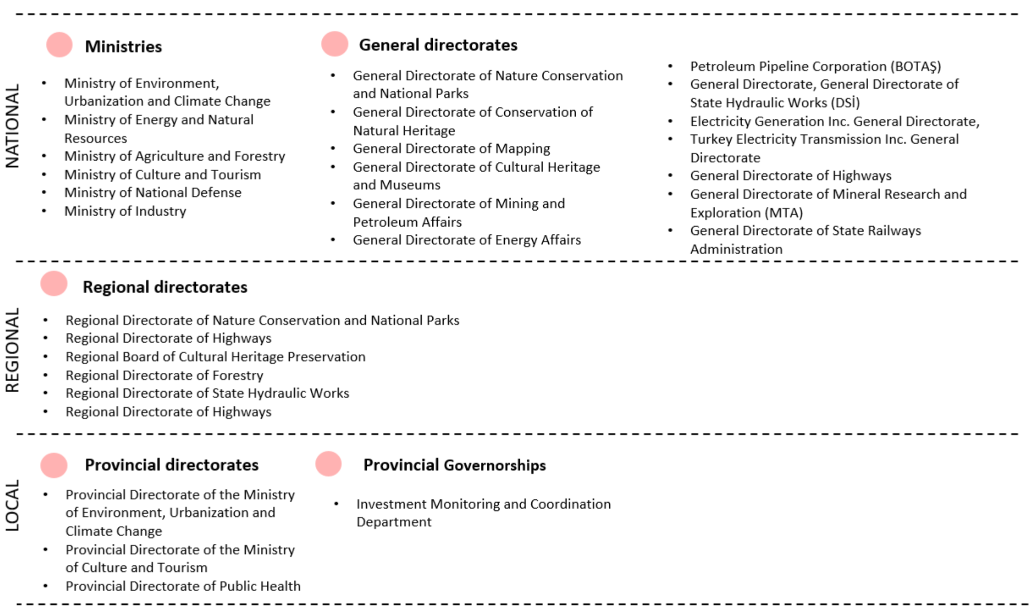

Figure 6.5. Multi-level structure of the public institutions taking place at the institutional opinion assessment stage

The following stage is the Environmental Impact Assessment (EIA) process of the proposed energy generation site. Regardless of their capacity, all wind energy facilities are subject to EIA. EIA is carried out under the control of the Ministry of Environment, Urbanism and Climate Change. The EIA process legally requires organization of meetings with public participation (public hearings). At this phase, local people have the legal right to object to the EIA report for certain reasons. However, in practice, these meetings are merely working as a medium for receiving feedback from the public regarding their objections and suggestions about the assessment instead of an environment providing a democratic public participation opportunity in the assessment process. Depending on the perspective of the applicant firms/investors or EIA expert consultancy firms working on behalf of the applicants, the EIA process may be realized in a more democratic structure and include social impacts along with environmental impacts. Thus, the EIA process may incorporate two different approaches depending on the differentiating contexts and applications. One considers local people as solely observing or receiving information during the assessment process. The other considers local people as partners in constructing the assessment altogether. Moreover, in some cases, local people specifically refuse to participate in EIA meetings as a reaction to the applications in which public participation is "pretended" to be provided.

The *Ownership Permission* stage is about obtaining the ownership or usage right of the proposed energy generation site. Acquisition of ownership or the right to use methods depends on the ownership type and characteristics of the land in terms of agriculture, forestry or meadow land, private or treasure land. Unless the applicant firm/investor develops its project on its own land, mainly land expropriation implementations are initiated. In this regard, ownership of the land in question is removed from its old status with the permission of the related institutions (Ministry of Agriculture and Forestry, Ministry of Finance, Soil Protection Board and Property Directorate) according to its characteristics (e.g. forest, meadow, treasury, private ownership). Finally, land ownership is accommodated for energy generation by transferring it to the public under the control of the Ministry of Energy and Natural Resources or, a change of ownership is carried out through expropriation.

The last phase is the *master planning* process. It incorporates the revision/amendment of the existing plans (plan tadilatı) in light of the collected institutional opinions regarding the energy generation site. Additional geological analysis reports and transportation plans are prepared and submitted to the local level municipalities. Local municipalities revise their plans and deliver the plans to the Ministry of Environment, Urbanism and Climate Change for final approval of the plan. In some cases, the municipality may not approve the plan proposal. Yet, investors may continue their plan revision process through the Ministry. Following the approval of the plan at the Ministry level, the plan is suspended for one month. During this one-month period, citizens have the right to investigate and object to the plan. However, this does not guarantee a plan change. The final decision belongs to the decision-making body (Ministry of Environment, Urbanism and Climate Change). At the end of the suspension period, the plan is approved and enters into force. After this stage, legally a lawsuit can be filed.

The third stage is the **approval** that includs the submission and approval of all the documentation to the Ministry of Energy and Natural Resources (MENR). With the approval received from the Ministry of Energy and Natural Resources the wind energy facility construction begins. Figure 6.6. illustrates the multi level process map of the wind energy development within the Turkish context including three main stages and possible participation and objection opportunities.

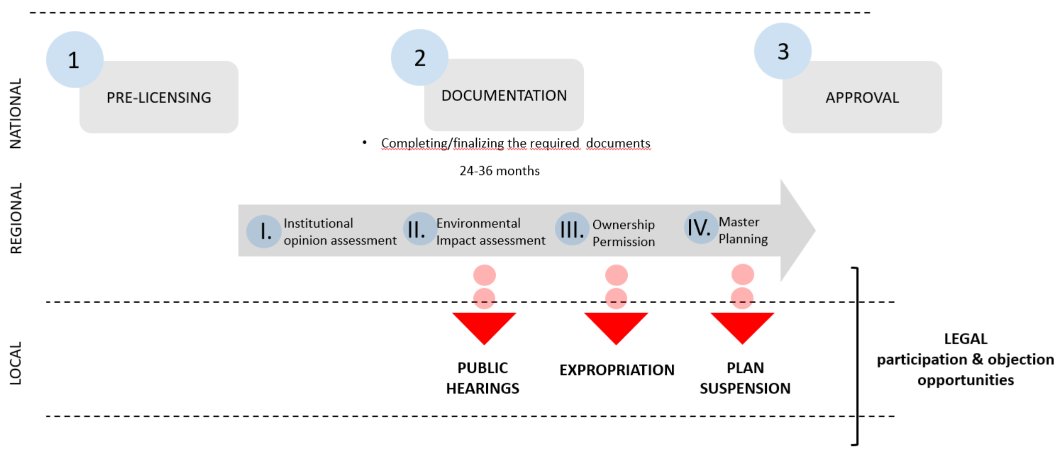

Figure 6.6. Multi-level process map of the wind energy development and possible participation and objection opportunities

Since renewable energy is defined as a priority public interest area, wind energy facilities can be located next to or inside the special areas both incorporating natural and cultural values such as cultural heritage, water, forest, agricultural areas, and socio-economic activities. However, Turkish legislation lacks in providing regulations sensitive to wind energy facility siting with respect to such special areas and human settlements. This situation paves the way for the emergence of social reactions against energy generation from wind.

On the other hand, participatory planning processes in Turkey are also problematic. Although participatory planning processes are legally defined, it is only limited with receiving public opinion through EIA public meetings and plan suspension periods. Additionally, in practice, implemented depending on the initiatives of the authorities. In Turkey, since the role and position of society within the context of wind energy development is ill-defined, society remains ineffective. In this regard, central authorities take the lead role, and such top-down central approaches regarding wind energy development face rather public opposition, instead of a reconciliatory environment at the local level. This necessitates approaching the process of energy generation from the wind with a social and local sensitivity beyond technical solutions.

6.3 Studying İzmir: Characteristics and the Research Sites

The study focuses on a wind energy development region, the Province of İzmir, as a case study. İzmir has one of the highest wind energy potentials in Turkey yet receives the highest public reactions against wind energy development due to the excessive use of land for wind energy development as well as to its high active citizenship capacity. The following sections introduce this region's wind energy potential and its socio-politic and economic structure in detail. The following part presents the selected research areas in İzmir.

6.3.1 Wind Energy Potential of İzmir

Wind energy has a long history in İzmir considering the historical Foça and Alaçatı windmills used in the 18^{th} century (İZKA, 2021). İzmir also leads important firsts in terms of wind energy development within the country. The first wind measurement mast, the first wind turbine, and the first wind energy facility in Turkey are established in İzmir. Moreover, Marmara, the southeast Anatolian, and the Aegean regions are highly suitable for wind energy development due to their wind speeds exceeding 3 m/s (İlkiliç, 2012). İzmir is located in the western region of Turkey which has high wind energy potential (EİGM, 2022b) (Figure 6.7); and is the third province with the highest theoretic wind energy potential (11.854 MW) following Balıkesir (13.827 MW) and Çanakkale (13.013 MW) (EİGM, 2022b, Enerji Atlası, 2022) (Figure 6.8).

Additionally, with the existing 1749 MW capacity in the operating, licensed wind energy facilities, İzmir houses 16% of the total installed capacity of 10.930 MW in the whole country. Followed by İzmir, Balıkesir (1345 MW), Çanakkale (858 MW), Istanbul (789 MW), Manisa (702 MW), Hatay (428 MW), Aydın (391 MW), Kırklareli (385 MW), Afyonkarahisar (351 MW), and Bursa (299 MW) are listed as the top 10 cities with the highest installed wind energy capacities.

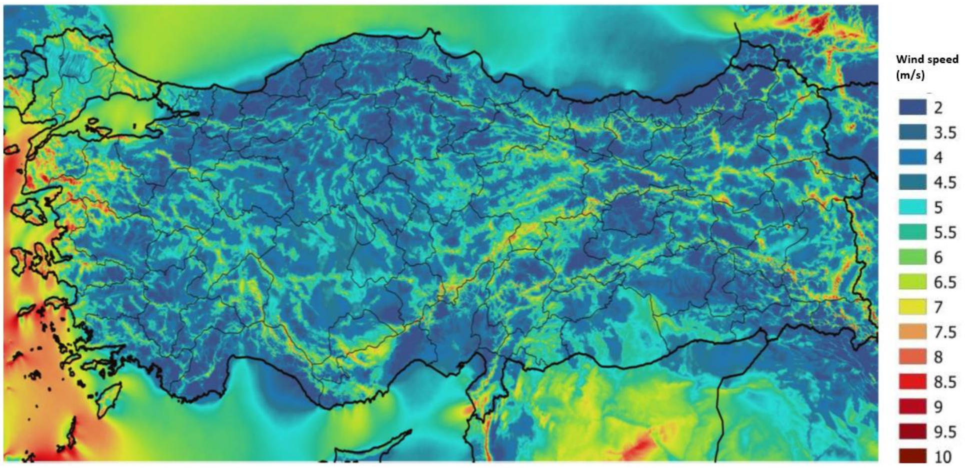

Figure 6.7. Annual average wind speed distribution (EİGM, 2022b)

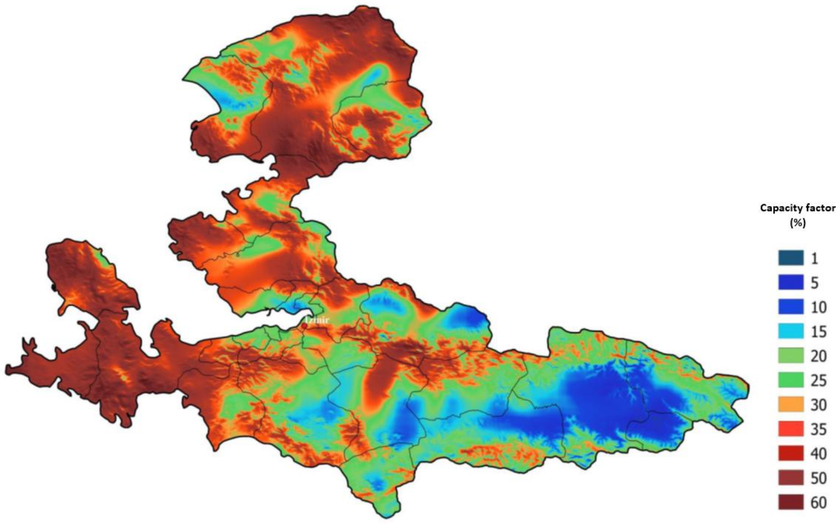

Figure 6.8. Capacity factor distribution (prepared by considering the technical values of a 3 MW wind turbine) (EİGM, 2022b)

İzmir holds 56 of the total 267 licensed wind energy facilities in operation and is one of the geographies where wind companies and the Turkish government receive the highest public opposition during this transition (Evrensel, 2016; Hürriyet, 2018a,b; Hürriyet, 2017; Hürriyet, 2016a,b,c; Hürriyet, 2015a,b,c,d,e,f, g; Hürriyet, 2014a,b,c,d). This may be related with the unique character of the İzmir social context, which will be reflected in the following sections.

6.3.2 Socio-Political and Economic Structure of İzmir

İzmir is the third most developed city and one of the major metropolitan regions in Turkey, with a population of 4.4 million (TÜİK; 2021). İzmir has experienced a rapid economic growth and population increases proving its attractiveness. It has historically been an important region of trade and manufacturing, traditionally based on agricultural products until 1990s. After the 1990s, in order to integrate with the global economy relatively high-value-added and high-tech manufacturing sectors are adopted which have been economically strengthening the city and its territory (Ataöv and Eraydin, 2011).

Izmir is a unique case regarding its mature political culture when considered its experience in developing active citizenship. Developing such an experience is related with the share of urbanites and the political leanings of the urban society and, respectively, the political party that governs the municipality (Ataöv and Eraydın, 2011). According to the studies carried out in Izmir (Eraydin 2009; Eraydin, Kok, and Vranken 2010; Ataöv and Eraydın, 2011) the society has always been active in urban politics and decision making, participating in the local activities and protesting the threats to their lifestyle and quality of urban environment.

Eraydın's (2009) study illustrates that the active citizens who participate in the activities of the NGOs and other local activities belong to middle income groups with high education levels, most of whom either are Izmir born or have been living in Izmir for more than 20 years. This "educated social group of the society" composed of lawyers, architects, doctors are the main initiators of the civil reactions acting in terms of community initiatives. There are also some cases in which villagers took active role in responding to decisions taken without integrating the public view (Ataöv and Eraydın, 2011).

In İzmir, left-wing bloc parties have had a better election performance than the national average in the past eight elections; the governing mayor and his predecessors who belonged to the Social Democratic Party (Cumhuriyet Halk Partisi) formed a wider cooperation with professional chambers and civil associations. This situation have paved the way for İzmir to produce more bottom-up emergent mechanisms and allowed the inclusion of civil associations in the decision-making processes (Ataöv and Eraydın, 2011). Ataöv and Eraydin (2011) summarize this sociopolitical culture of İzmir as it has evolved out of the tradition of the community to take an active role in urban processes, hence leading to the foundation of active civil organizations. They also refer to a saying in Turkey as "the democratic sparks of Turkey strike in Izmir," which is a testament to its nationwide reputation. Velibeyoğlu and Mengi's (2019) study illustrates the active citizenship character of the İzmir society. They exemplify the reactions and the organizations of environmentalist groups against various renewable energy investments (e.g. wind energy investments), and the cyclist groups for environmental and social problems (e.g. promoting low carbon transportation modes, cycling and existence of women in public space) as the actors leading behavioral changes in İzmir.

Recent researches (Atay Kaya, 2014; Atay Kaya and Kaya Erol, 2016) also emphasize a variety of conflict present in İzmir through an examination of conflictual Locally Unwanted Land Use (LULU) cases. The industrial, transportational, housing, technic and social infrastructural land uses represent the issues subject to the major LULU categories. Accordingly, İzmir accommodates at least one LULU from each category, but higher conflictual cases are seen in waste facilities, fisheries and quarries (Atay Kaya, 2014). The energy LULUs in İzmir refer to refineries, mines, dams and electricity generating stations (e.g. thermal, hydrothermal, wind energy and other renewable energy power plants) and substantially concentrate in Urla, Seferihisar, Karaburun, Mordoğan, Çesme, Foça, Aliağa districts. This indicates some districts included in this study, particularly Karaburun, Mordoğan, Çeşme and Foça, as places already politically activated to defend the community point of view in the face of development that fail to consider all interests (Figure 6.9).

Figure 6.9. Photos of local meetings and protests against wind energy facilities in İzmir (from the Hürriyet archive: 2014–2016)

However, on the opposite side, as if this conflicting atmosphere does not exist, existing national regulations and spatial plans support wind energy investments in İzmir. The İzmir - Manisa Environmental Plan (2013), İzmir West Master Plan (2018) and İzmir Integrated Coastal Plan (2013) proposed the use of İzmir's wind energy potential without setting any restrictions (Özcan Cive and Arslan Avar, 2019). Respectively, wind energy facilities started to be established especially at the rural periphery of İzmir, at the vicinity of settlements, as well as in main socio-economic activity areas of agricultural lands and grasslands (Özçam, 2019).

Accordingly, wind energy development receives high public opposition through civil society organizations (e.g. Karaburun Kent Konseyi: Karaburun City Council, Rüzgar Yaşamdan Yana Essin İnisiyatifi: Wind for Life Initiative, Gönüllü Çevre Avukatları: Volunteer Environment Lawyers) in İzmir. Such organizations organize public meetings to inform and consult local people as well as develop their communication with decision-makers and investors. They enable local people to act in an organized manner and lead the way for legal processes. Such kind of actions signifying the power of the organized social character of İzmir society mainly takes place in media (Evrensel, 2016; Hürriyet, 2016a,b,c; Hürriyet, 2015a,b,c,d,e,f,g; Hürriyet, 2014a,b,c,d). Karaburun, Çeşme (especially Germiyan and Ovacık), Urla and Bayındır are the areas that are frequently the subject of the news (Figure 6.9).

Karaburun peninsula constitutes a specific wind energy development area in İzmir toghether with its strong public opposition against such developments. The peninsula has a special ecological structure and accordingly, it is firstly declared as a natural conservation area in the 1990s - including protection of the flora and fauna ensured by international contracts (e.g. Bern Convention, CITIES) - and later as special environment protection area in the 2000s. However, although the site has a naturally significant character, wind energy investments are widely located in the peninsula since 2013 (Özcan Cive and Arslan Avar, 2019). The respective local opposition is related with the expropriation of the private properties for wind energy facilities, interruption of local peoples' access to the agricultural lands and grasslands for the conduction of socio-economic activities (e.g. plant production, goat breeding) due to the enclosed wind energy facility sites as well as environmental degradations and noise disturbances (Özcan Cive and Arslan Avar, 2019; Özçam, 2019). In this respect, Özcan Cive and Arslan Avar (2019) argue that Karaburun peninsula is commodified within the context of national neo-liberal policies, and marketted to the private sector. Thus, the local people of the peninsula are disspossessed for the sake of national wind energy development.

6.3.3 Locational Characteristics of The Research Areas

Built upon the above contextual framework, the study focuses on eight research areas taking place in five different districts of Izmir, namely Urla, Çeşme, Karaburun, Foça and Bergama. These settlements were selected out of the settlements accommodating 20 wind facilities at the time when the inquiry was conducted. They include Karaköy and Ovacık in Çeşme, Yaylaköy and Mordoğan in Karaburun, Atçılar in Bergama, Kozbeyli in Foça, Zeytineli in Urla and Germiyan in Alaçatı. The settlements are in different distances (0–500 m; 500 m–1 km; 1 km+) from the wind energy facilities with different sizes (120 MW; 60–50 MW; 25–40 MW; <20 MW), and have different locational characteristics in the sense that some are close to settlements and shores, the others in or near forest, grassland and archeological sites. Following part introduces the locational characteristics of the eight research areas via benefitting from the İzmir-Manisa Environmental Plan prepared by the Ministry of Environment, Urbanization and Climate Change (2013).

Zeytineli is located in Urla district at the south-western shores of İzmir. It houses Zeytineli Wind Energy Facility (Zeytineli RES) with 49,5 MW capaticy of 20 turbines (Figure 6.9). The site is surrounded by other wind energy facilities such as MAZI-1 RES, MAZI-3 RES and Alaçatı RES. The Zeytineli RES is located within 500m-1km distance to the Zeytineli rural settlement of Urla. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Zeytineli RES is located on a natural protected area covering forest and scrub areas (Figure 6.10).

Figure 6.10. Research area: Zeytineli, Urla with Zeytineli RES turbines

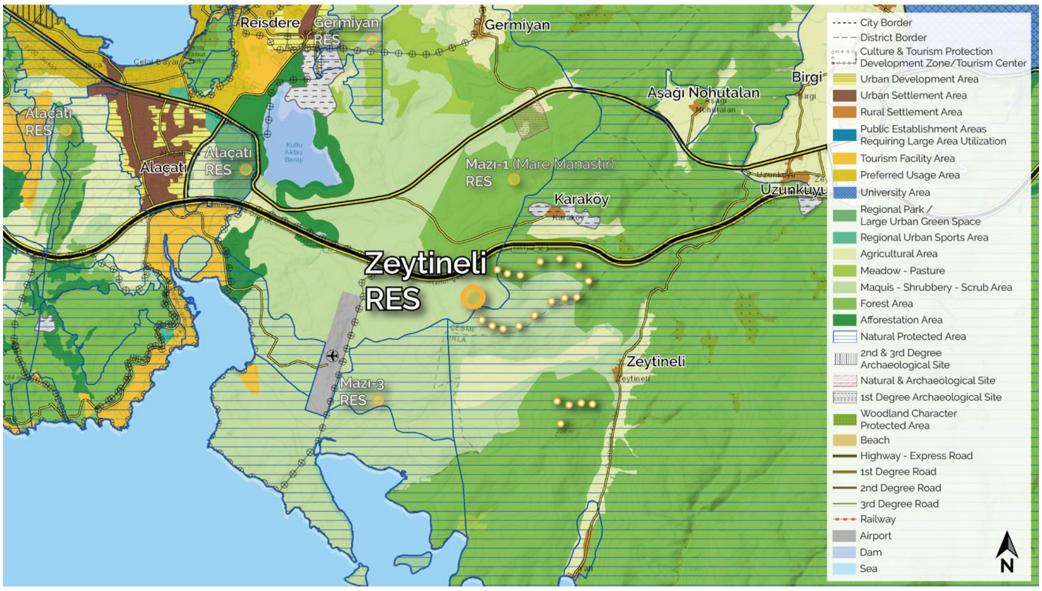

Figure 6.11. Zeytineli RES and surrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Karaköy is located in Çeşme district at the western shores of Izmir. It houses Mazı-1 Wind Energy Facility (Mazı-1 RES) with 56,2 MW capaticy of 56 turbines (Figure 6.11). Zeytineli-RES takes place at the south of Mazı-RES. Karaköy is a 1st degree archeological site. Mazı-1 RES is located within 0-500m distance to the Karaköy rural settlement of Çeşme. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Mazı-1 RES is located on natural protected area covering forest areas (Figure 6.12).

Figure 6.12. Research area: Karaköy, Çeşme with Mazı-1 RES turbines

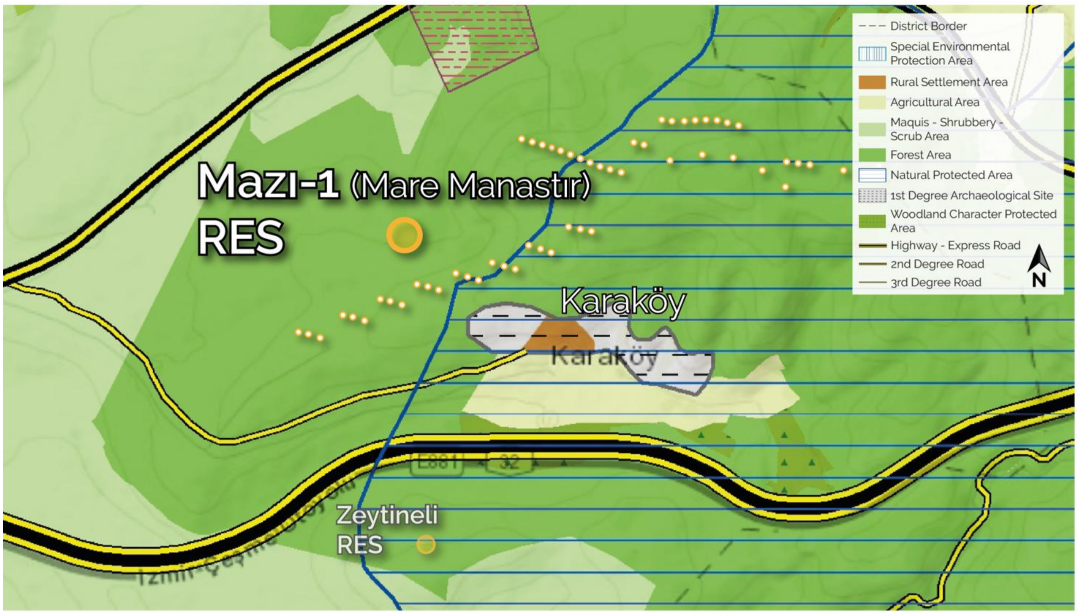

Figure 6.13. Karaköy, Mazı-1 RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Ovacık is located in Çeşme district at the western shores of Izmir. It houses Çeşme Wind Energy Facility (Çeşme RES) with 18 MW capacity of 6 turbines (Figure 6.13). Karadağ-RES takes place at the west and Alaçatı-RES takes place at the east of Çeşme-RES. Ovacık has various location characteristics namely forest, shore, and settlement. Çeşme RES is located within 0-500m distance to the Ovacık rural settlement of Çeşme. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Çeşme RES is located on natural protected area covering afforestation areas (Figure 6.14).

Figure 6.14. Research area: Ovacık, Çeşme with Çeşme RES turbines

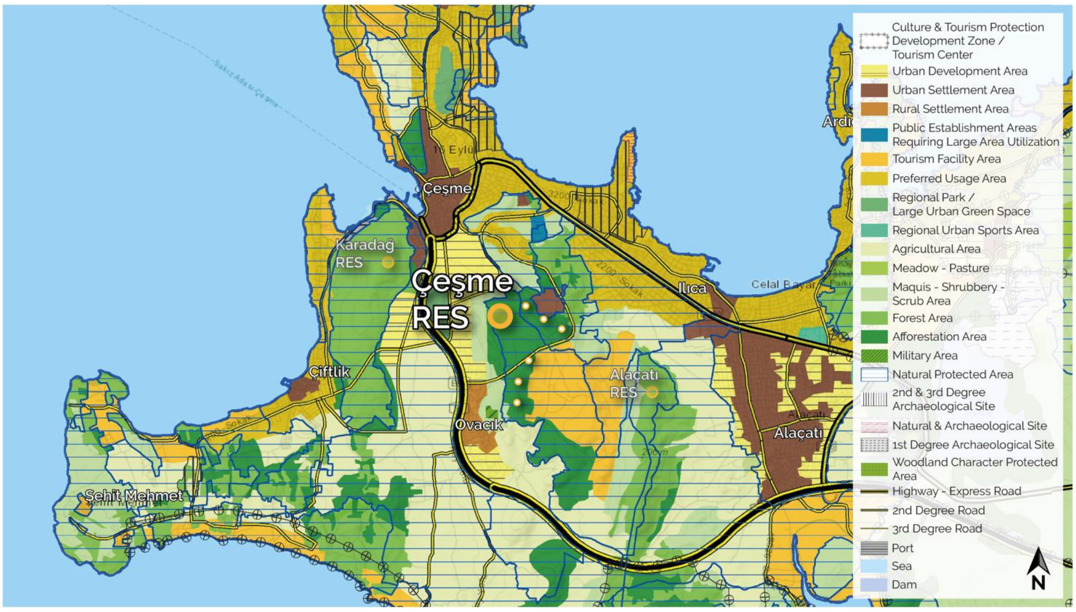

Figure 6.15. Ovacık, Çeşme RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Germiyan is located in Alaçatı - Çeşme district at the western shores of Izmir. It houses Germiyan Wind Energy Facility (Germiyan RES) with 10,7 MW capaticy of 7 turbines (Figure 6.15). Salman-RES takes place at the southeast of Germiyan-RES. Germiyan has shore and settlement location characteristics. Çeşme RES is located within 500m-1km distance to the Germiyan rural settlement of Alaçatı-Çeşme. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Germiyan RES is located on natural protected area covering meadow land (Figure 6.16).

Figure 6.16. Research area: Germiyan, Alaçatı - Çeşme with Germiyan RES turbines

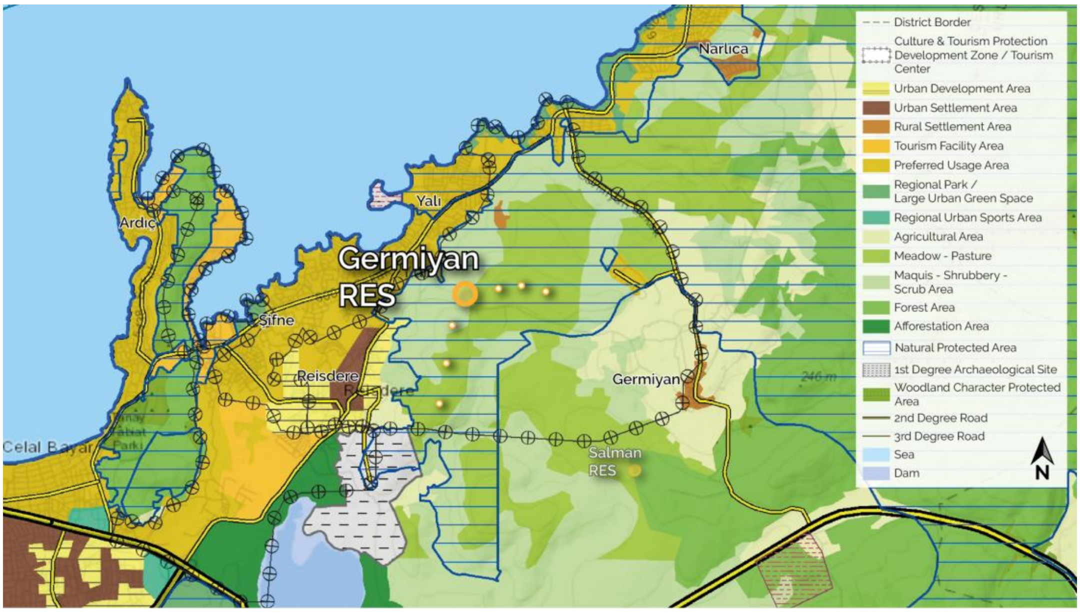

Figure 6.17. Germiyan, Germiyan RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Mordoğan is located in Karaburun district at the western shores of Izmir. It houses Mordoğan Wind Energy Facility (Mordoğan RES) with 42 MW capaticy of 15 turbines (Figure 6.17). Mordoğan has forest and settlement location characteristics. Mordoğan RES is located beyond 1km distance to the Mordoğan rural settlement of Karaburun. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Mordoğan RES is located on special environmental protection area mainly including forest areas (Figure 6.18).

Figure 6.18. Research area: Mordoğan, Karaburun with Mordoğan RES turbines

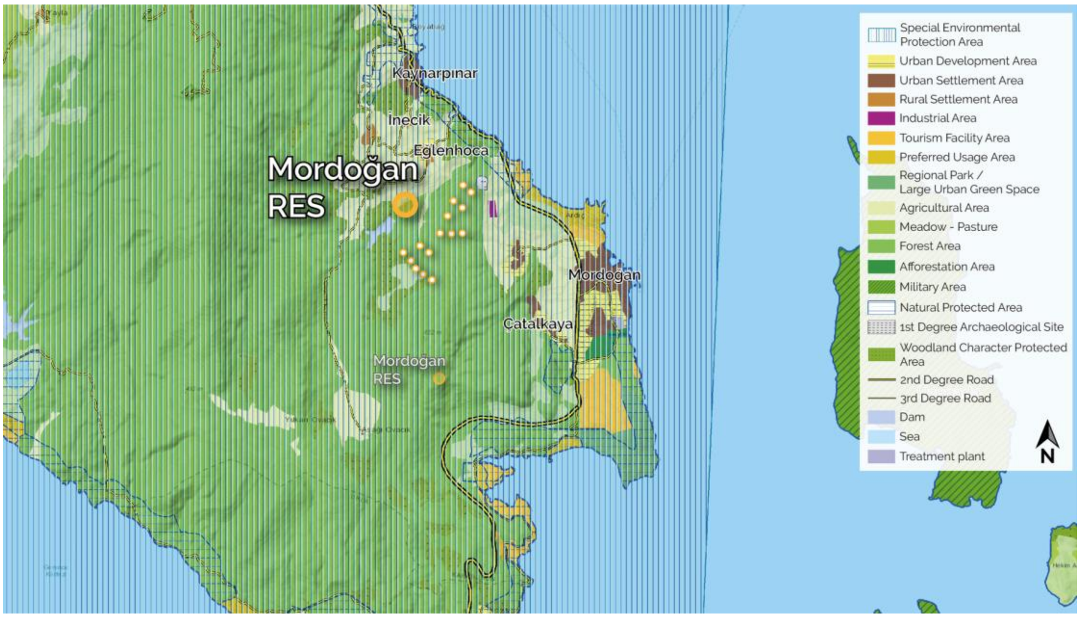

Figure 6.19. Mordoğan, Mordoğan RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Yaylaköy is located in Karaburun district at the western shores of Izmir. It houses Karaburun Wind Energy Facility (Karaburun RES) with 223 MW capaticy of 50 turbines (Figure 6.19). Yaylaköy is settlement area. Karaburun RES is located within 0-500m distance to the Yaylaköy rural settlement of Karaburun. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Karaburun RES is located on special environmental protection area (Figure 6.20).

Figure 6.20. Research area: Yaylaköy, Karaburun with Karaburun RES turbines

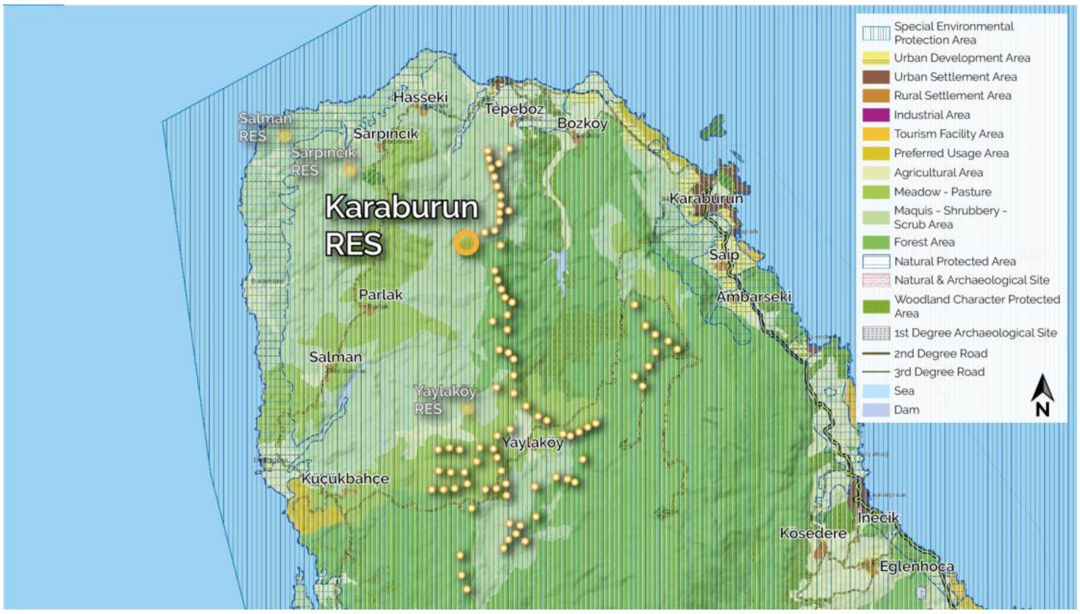

Figure 6.21. Yaylaköy, Karaburun RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Kozbeyli is located in Foça district at the northwestern shores of Izmir. It houses Kozbeyli Wind Energy Facility (Kozbeyli RES) with 32,2 MW capaticy of 14 turbines (Figure 6.21). Kozbeyli has forest and shore location characteristics. Kozbeyli RES is located within 500m-1km distance to the Kozbeyli rural settlement of Foça. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Kozbeyli RES is located at the forest area (Figure 6.22).

Figure 6.22. Research area: Kozbeyli, Foça with Kozbeyli RES turbines

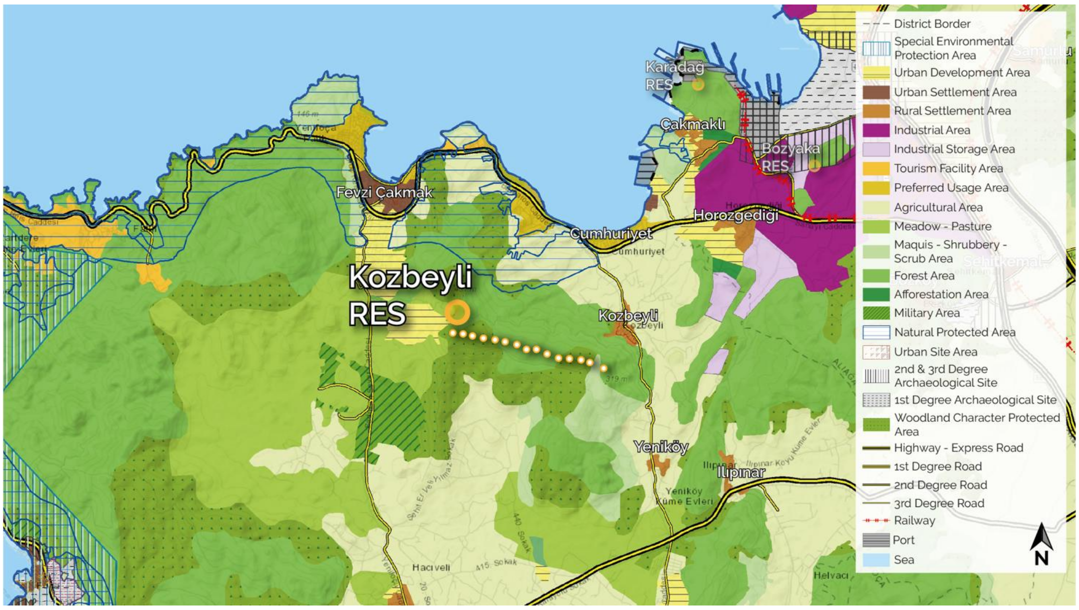

Figure 6.23. Kozbeyli, Kozbeyli RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

Atçılar is located in Bergama district at the north of Izmir. It houses Bergama (Aliağa) Wind Energy Facility (Bergama RES) with 120 MW capaticy of 46 turbines (Figure 6.23). Yuntdağ RES takes place at the north, Örlemiş RES takes place at the west and Seyitali RES takes place at the south of the Bergama RES. Atçılar has forest and meadow location characteristics. Bergama (Aliağa) RES is located within 500m-1km distance to the Atçılar rural settlement of Bergama. According to the 1/25000 scale Izmir – Manisa Environmental Plan, Bergama RES is located forest and meadow area (Figure 6.24).

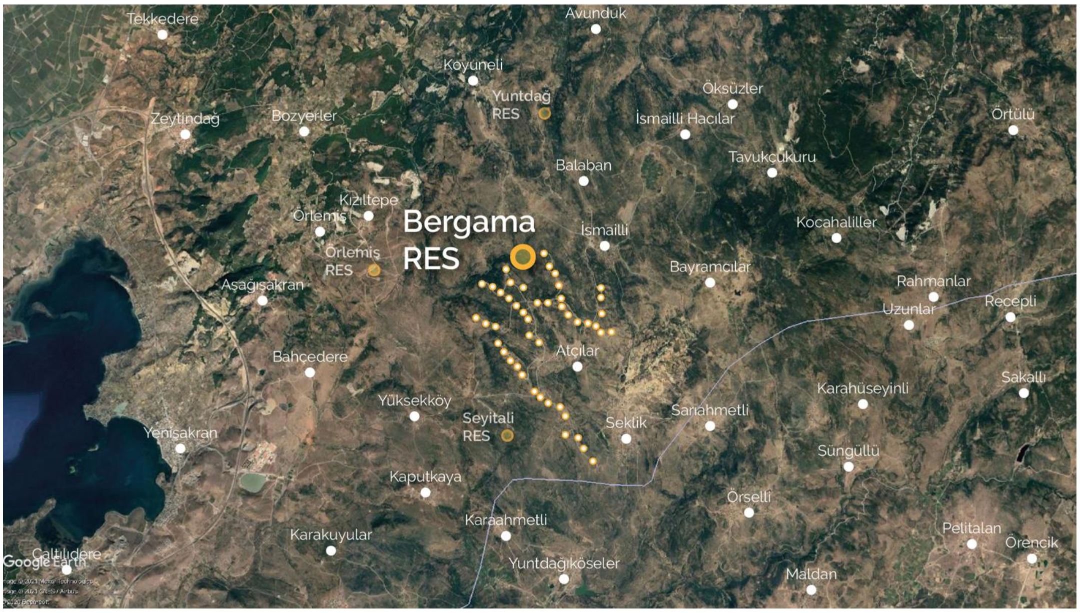

Figure 6.24. Research area: Atçılar, Bergama with Bergama RES turbines

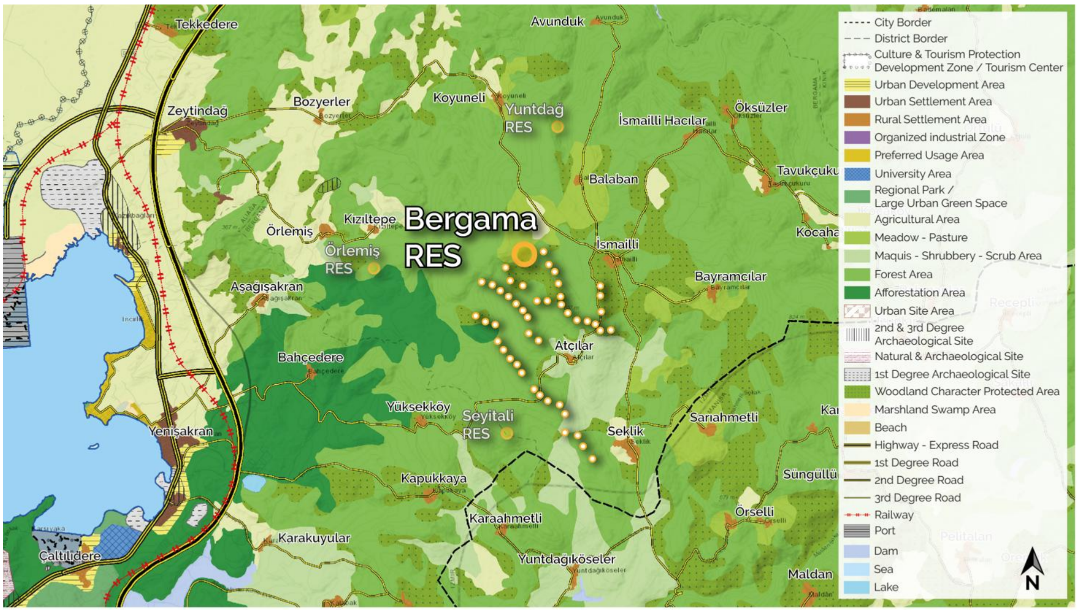

Figure 6.25. Atçılar, Bergama RES and sorrounding areas landuse (developed according to İzmir Manisa Environmental Plan)

CHAPTER 7

RESEARCH FINDINGS

The study reveals two venues of results apart from the analysis of wind energy development in the Turkish planning context. This chapter presents these research findings. The chapter, first, introduces the quantitative findings about the socio-spatial sensitivity areas within the context of İzmir together with the group differentiations according to the distance to wind energy facility, locational characteristics, gender and age. Additionally, the chapter introduces qualitative findings regarding the inhabitants' insights on sensititives for wind energy development. Second, the chapter presents the findings of multi-level nudging analysis integrating with the NIMBY attitude and solution suggestions of the inhabitants regarding the conditions nudging the actors within the wind energy transition.

7.1 Socio-Spatial Sensitivities in Wind Energy Development

In-depth interviews conducted during the site survey in Izmir revealed two types of information.The first one presents the salience of socio-spatial issues in wind energy transition in the case of İzmir, and a numerical assessment of inhabitants' view on the environmental, economic, sensory and technological impacts of wind energy facilities. The second one identifies sensitivity areas that are valid and meaningful within the context of İzmir.

The study confirms that environmental, economic, sensory, and technological sensitivities exist in İzmir. The findings indicate that participants do not prefer wind energy facilities at their vicinity and they are mostly sensitive about *natural life*, *noise* and *number of wind turbines*. Accordingly, sensitivities in all socio-spatial areas tend to decrease (except the magnetic field impact) with the increasing distance from the wind energy facilities.

Participants' sensitivities on natural life is found to be high regardless of the distance from wind energy facilities, among all gender and age groups; specifically in locations with natural values such as forest, shore and grassland areas. Inhabitants' insights on the impacts of wind energy facilities on natural life heavily focus on the facilities' impacts on fauna, flora, and natural resources such as soil, water and air.

Noise impact is felt specifically up to 1 km distances from wind energy facilities. Sensitivity about noise is valid for both women and men, especially in middle-aged group; and higher in shore (Germiyan) and grassland (Atçılar) areas. According to the participants, noise nuisance is significantly felt higher in windy weather conditions and, particularly, at nights. The participants' visual sensitivity is the highest in the closest distances (0-500m), and decreases in distances beyond 1 km. Similar to the natural life sensitivity, visual sensitivities are higher in locations with natural values such as forest, shore, grassland areas. In general, local people are disturbed about the physical characteristics and the image of turbines that distract the natural landscape of the region.

Corresponding with the visual sensitivities, participants' sensitivities on the number of turbines is higher in closer distances, and significantly decreases in above 1km distances. Sensitivities on the number of turbines are valid for all gender and age groups. Insights of the local people show that increasing number of turbines leads to an accumulated impact (e.g. noise, visual) on the community and the felt disturbance becomes much higher, even intolerable by the community.

Sensitivities regarding agricultural activities including husbandry and plant production are higher in 500m-1km distances than in 0-500m distances, and significantly for the elderly age group. Impact is felt higher in locations where agriculture is seen as the local economic activity such as Atçılar (grassland area) and Germiyan (shore area close to a settlement). Participants feel the impact of the surrounding wind energy facilities mainly on agriculture in terms of narrowing of the grasslands and poultry, small cattle, bovine animals' birth and production problems, including apiculture and extinction of bees. For the plant production destruction of crops and decreasing soil fertility are expressed as the major disturbances by the research participants.

The findings illustrate that the sensitivity on health issues is relatively lower in all distances. However, there are higher health concerns in grassland area Atçılar and elderly age group. Participants refer to various sensorial and neurological health problems ranging from headache, anxiety, stress, ear pain, tinnitus to vertigo, tachycardia, blurred eyes, insomnia, stuffy nose, flu, and cancer. They also mention the radiation impact stemming from the magnetic field sensitivity. Interestingly, research participants state that the magnetic field sensitivity increases with the increasing distance from the wind energy facilities and is felt higher in Atçılar (grassland) and Germiyan (shore area close to a settlement) locations. Moreover, magnetic field affects networks (e.g. telephone, internet, cellular phone) particularly within close distances.

The following sections present the findings regarding these socio-spatial sensitivities in detail supported by the Likert scale assessments and individual insights.

7.1.1 General Assessment of Socio-Spatial Sensitivities and Group Differentiations

The study analyzes how the participants' preferences of having a wind energy facility in the surrounding living environment differ with repect to the assessment of the impact on socio-spatial sensitivity issues. The analysis is carried out according to the distance to the wind energy facility, locational characteristics, gender and age groups.

Table 7.1 illustrates the average Likert values for the preference of having a wind energy facility in the surrounding living environment and the assessment of the impact on socio-spatial sensitivity issues according to distance and locational characteristics. Additionally, figures 7.1 and 7.2 show the distribution of socio-spatial sensitivity assessments according to the differentiating distances and locational characteristics.In this respect, the preference of participants for having a wind energy facility at the vicinity of their living environment changes from "I do not prefer much" (as average values are 3.1 and 3.4 for the 0-500m and 500-1000m research sites respectively) to "does not matter" (as a preference value of 4 is identified in the 1000m+ distant research sites) which is in a direct proportion with the increasing distance of the wind energy facility from the living environments.

Nevertheless, the assessment of sensitivity areas found significant in previous studies changes from “affects less” to “does not affect” with the increasing distance from the wind energy facilities. Moreover, the qualitative responses provide detailed insight about how such a transition can cause impact meaningful to the inhabitants. The details of that part will be given in the next section but, in quantitative terms, this research shows that inhabitants living in 1000m+ distance from the wind energy facilities have a tendency of assessing the impact as "does not affect". Within this context, it is observed that there is a linear relationship especially for the 'natural life' and 'visual aspects' sensitivity areas according to the distance from the wind energy facilities. In all observed sites regardless of their distance from wind energy facilities, an impact on the natural life is stated by the inhabitants. On the other hand, visual sensitivity decreases as the distance to the wind energy facilities increaes. Visual sensitivity evaluations present inexistance of such an impact with the increasing distance to the wind energy facilities with evaluations changing from “does not matter” in 0-500m distances to “does not affect” in 1000m+. Additionally, the average social sensitivity values observed in husbandry, noise, health, agriculture and number of turbines are higher in the research sites with wind farm distance of 500-1000m than the ones with 0-500m. Moreover, the average magnetic field sensitivity increases as the distance to the wind energy facility increases (0-500m: 2,5; 1000+: 4). This kind of unexpected value changes and increases indicate that further research needs to be conducted.

The analyses are also carried out for the participants' wind energy preferences and socio-spatial sensitivity impact assessments according to the differentiating locational characteristics of the research sites included within the context of the study. While some are closer to settlements, the others are located on the shore, in or close to natural and cultural protection sites, forests, and grassland. In this respect, when investigated the preferences of the participants about having wind facilities in their living environment, participants at "**shore+settlement**" locations (Germiyan: Likert mean 1.8) assert that they "don't prefer at all." Participants at "**forest+shore**" (Kozbeyli, Mordoğan: Likert mean: 2.0) and **forest+grassland** (Atçılar: Likert mean: 2.0) and "**forest+shore+settlement**" (Ovacık: Likert mean:2.5) make a rather softer claim with "don't prefer." Moreover, participants at "**shore**" locations (Zeytineli:Likert mean 3.7) "don't prefer much.". These evaluations show that preference tends to fall to "doesn't matter" at "**archeological site**" (Karaköy: Likert mean: 4.1) and "**settlement**" (Yaylaköy: Likert mean: 4.2) locations.

Sensitivity issues differ according to the locational characteristics as well. Sensitivities about wind energy facilities' impact on natural life is the highest at the "forest+shore" (Kozbeyli, Mordoğan: Likert mean: 7.0) locations. "Shore+settlement" (Germiyan: Likert mean: 5.8) and forest+grassland (Atçılar: Likert mean: 5.7) locations also have sensitivities about impact on natural life. Sensitivity evaluations decrease at the "forest+shore+settlement" (Ovacık: Likert mean:4.9), "archeological site" (Karaköy Likert mean:4.1), "shore" (Zeytineli: Likert mean:3.6) "settlement" (Yaylaköy: Likert mean:3.5) locations.

Sensitivity to the impact of wind energy facilities to animal husbandry is highest in the grassland locations (Atçılar: Likert mean: 6.0). Participants at the "shore+settlement" (Germiyan: Likert mean: 5.0) locations also indicate sensitivity on animal husbandry. Sensitivity evaluations decrease from "does not matter" to "does not affect" at the rest of the locations.

Sensitivity to the impact of wind energy facilities to agriculture is highest at the "shore+settlement" (Germiyan: Likert mean: 5.4) and forest+grassland (Atçılar:

Likert mean: 5.1) locations. Similar to the sensitivity on animal husbandry, sensitivity evaluations tend to decrease from “does not matter” to “does not affect” at the rest of the locations.

Sensitivity areas of wind energy production regarding sensory issues include impact on visual integrity and noise. Participants sensitivity evaluations on visual integrity signify an impact with Likert mean: 5.0 at the forest+grassland (Atçılar), “forest+shore” (Kozbeyli, Mordoğan) and “forest+shore+settlement” (Ovacık) locations. Sensitivity evaluations on visual integrity decrease from “does not matter” to “does not impact” at the rest of the locations.

Atçılar (forest+grassland) presents highest sensitivity about noise impact (Likert mean: 6.8), followed by “shore+settlement” (Germiyan: Likert mean: 5.6). Noise “does not affect much” the participants in Karaköy (archeological site: Likert mean: 3.5) while participants at the rest of the locations indicate that noise “does not matter”.

Sensitivity of wind energy production regarding health (effect on human health) is highest at the forest+grassland (Atçılar: Likert mean: 6.4) location. Yet, participant evaluations at the rest of the locations decrease from “does not matter” to “does not affect”.

Sensitivity of wind energy production regarding technological (magnetic field and turbine number) issues is higher in forest+grassland (Atçılar Likert mean: 6.9 – 7.0) and “shore+settlement” (Germiyan Likert mean: 5.3 – 7.0) locations. Kozbeyli and Mordoğan (forest+shore locations) are also sensitive about number of turbines (Likert mean: 5.0). Participant evaluations at the rest of the locations decrease from “does not matter” to “does not affect”. Stronger reactions take place especially in Atçılar, on grassland and “forest+shore” areas (Kozbeyli, Mordoğan: Likert means: 5.0).

Table 7.1 The Average Likert Values for The Preference of Having a Wind Energy Facility in The Surrounding Living Environment and The Assessment of The Impact on Socio-Spatial Sensitivity Issues According to Distance and Locational Characteristics

	Wind energy facility preference	SA1 Natural life	SA2 Husbandry	SA3 Visual	SA4 Noise	SA5 Health	SA6 Agriculture	SA7 Magnetic Field	SA8 Number of turbines
GENERAL	3.3	4.5	3.9	3.9	4.6	3.7	3.9	3.4	4.5
DISTANCE									
0-500m	3.1	4.6	3.8	4.3	4.4	3.7	3.9	2.5	4.4
500-1km	3.4	4.5	4.1	3.8	4.9	3.9	4.0	3.9	4.6
1km +	4	4.4	3.4	2.5	2.4	1.8	3.3	4.0	3.6
LOCATIONAL CHARACTERISTICS									
Shore	3,7	3,6	3,5	2,8	4,3	2,7	3,4	2,7	3,5
Settlement	4,2	3,5	3,4	2,9	4,4	3,0	2,6	2,1	3,7
Forest +cultural site (Arch.Site)	4,1	4,1	2,9	3,6	3,5	2,1	3,1	3,3	3,6
Forest + Shore	2,0	7,0	3,0	5,0	4,3	3,0	4,7	1,0	5,0
Shore + Settlement	1,8	5,8	5,0	4,2	5,6	4,9	5,4	5,3	6,1
Forest + grassland	2,0	5,7	6,0	5,0	6,8	6,4	5,1	6,0	7,0
Forest + Shore + Settlement	2,5	4,9	4,1	5,0	4,4	4,1	4,4	2,8	4,7

*(**Preference**: 1: "I do not prefer at all"; 2: "I do not prefer"; 3: "I do not prefer much"; 4: "does not matter"; 5 "I prefer less "; 6: "I prefer"; 7: "I highly prefer") (**Sensitivity Areas (SA)**: 1: "does not affect at all"; 2: "does not affect"; 3: "does not affect much"; 4: "does not matter"; 5: "affects less"; 6: "affects"; 7: "highly affects")*

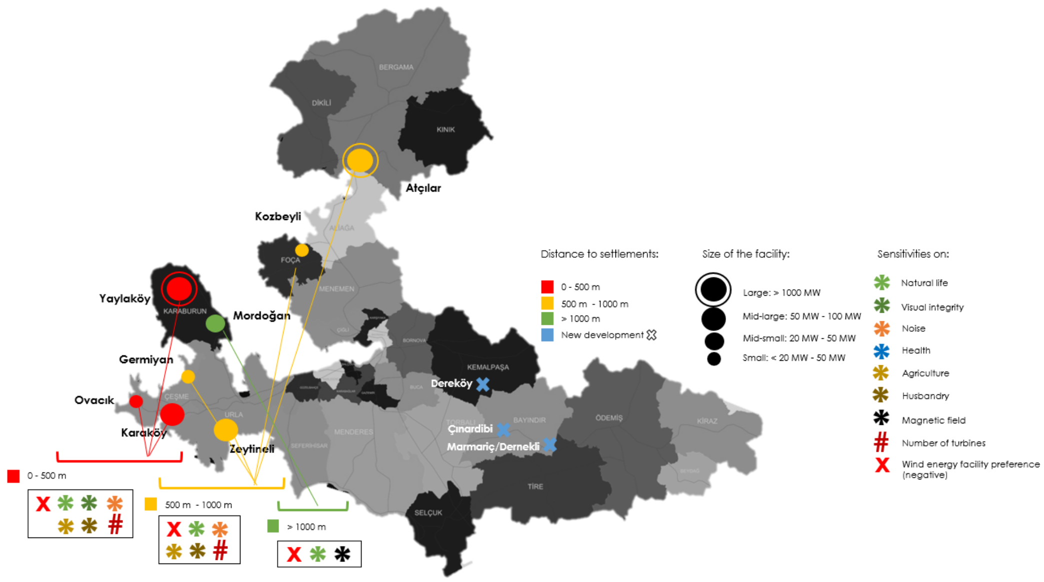

Figure 7.1. Distribution of socio-spatial sensitivities according to distances

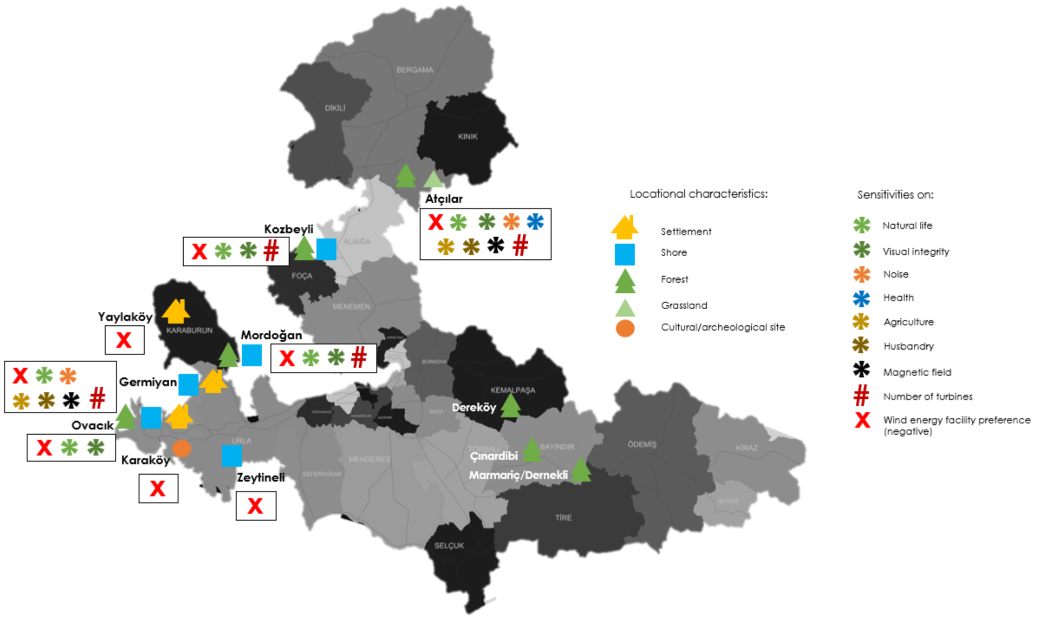

Figure 7.2. Distribution of socio-spatial sensitivities according to locational characteristics

The study also analyzes how participants' wind energy preferences differ in relation with socio-spatial sensitivities according to the gender (women and men) and age groups (18-24; 25-65; 65+ years old). The total number of people participated in the study is 163 out of which is 82 women/female (50.3%) and 81 men/male (49.7%). There are 33 young participants (18-24 years old), 90 middle-aged participants (25-65 years old), and 40 elderly participants (65+ years old). Table 7.2 illustrates the average Likert values for the preference of having a wind energy facility in the surrounding living environment and the assessment of the impact on socio-spatial sensitivity issues according to gender and age groups.

Likert scale evaluations of the participants' wind energy preferences indicate that women "do not prefer" (Likert mean: 2.7) having wind facilities in their living environment where men with higher Likert evaluations "do not prefer much" (Likert mean: 3.6) having such facilities around them.

Women participants' evaluations tend to have higher values than men participants. Highest evaluations among all are made for wind energy facilities' impact on natural life (Likert means women: 4.8 and men: 4.4) and number of turbines (Likert means women: 4.7 and men:4.3). In addition to that, women and men participants' evaluations significantly differentiate especially on wind energy facilities' impact on animal husbandry (Likert means respectively 4.3 and 3.6), agriculture (Likert means respectively 4.3 and 3.6), health (Likert means respectively 4.1 and 3.2), and visual integrity (Likert means respectively 4.0 and 3.9). Men show higher sensitivity only on the noise issue (Likert means women: 4.5 and men:4.7) with a minor differentiation. According to the analysis women are more sensitive than men in general.

Regarding the age groups, although there is a similar trend about wind energy preferences regarding having such facilities around them, Likert scale evaluations indicate that elderly participants with lower evaluations "do not prefer" (Likert mean: 2.9) having wind facilities in their living environment while young and middle-aged participants with higher evaluations “do not prefer much” (Likert means respectively: 3.3 and 3.2) having such facilities around them.

Evaluations about wind energy facilities’ impact on sensitivity issues receive higher ratings from elderly participants in almost all areas except rather technological/technical aspects: magnetic field effect and number of turbines. Young and middle-aged participants’ evaluations indicate that wind energy “does not affect much” in general except natural life and number of turbines. Elderly and middle-aged group is most sensitive to noise impact (Likert means respectively: 5.1 and 4.9).

Likert scale ratings for sensitivity areas tend to fall from elder to younger ages. Although ratings imply a moderate value, according to all age groups are sensitive to the wind energy facilities’ impact on natural life (Likert means young: 4,3, middle aged: 4,5, elderly: 4,8) and number of turbines (Likert means young: 4,0, middle aged: 4,7, elderly: 4,3). While elderly age group perceive the impact of wind energy facilities on animal husbandry (Likert mean: 4,9), agriculture (Likert mean: 4,4), health (Likert mean: 4,3) and visual integrity (Likert mean: 4,1); according to young and middle-aged groups wind energy “does not affect much” animal husbandry (Likert means respectively 3.2 and 3.9), agriculture (Likert means respectively 3.9 and 3.5) and visual integrity (Likert means respectively 3.9 and 3.7). Although elderly participants imply such an impact; according to young participants’ evaluations wind energy does not have an impact on health (Likert mean: 2,7), and according to middle aged participants “does not affect much” health (Likert mean: 3,8).

Table 7.2 The Average Likert Values for The Preference of Having a Wind Energy Facility in The Surrounding Living Environment and The Assessment of The Impact on Socio-Spatial Sensitivity Issues According to Gender and Age Groups

	Wind energy facility preference	SA1 Natural life	SA2 Husbandry	SA3 Visual	SA4 Noise	SA5 Health	SA6 Agriculture	SA7 Magnetic Field	SA8 Number of turbines
GENDER GROUP									
Women/Female	2,7	4,8	4,3	4,0	4,5	4,1	4,3	3,6	4,7
Men/Male	3,6	4,4	3,6	3,9	4,7	3,2	3,6	3,3	4,3
AGE GROUP									
18-24 years old	3,3	4,3	3,2	3,7	3,2	2,7	3,5	3,4	4,0
25-65 years old	3,2	4,5	3,9	3,9	4,9	3,8	3,9	3,6	4,7
65+ years old	2,9	4,8	4,9	4,1	5,1	4,3	4,4	2,9	4,3

*(**Preference**: 1: "I do not prefer at all"; 2: "I do not prefer"; 3: "I do not prefer much"; 4: "does not matter"; 5 "I prefer less "; 6: "I prefer"; 7: "I highly prefer") (**Sensitivity Areas (SA)**: 1: "does not affect at all"; 2: "does not affect"; 3: "does not affect much"; 4: "does not matter"; 5: "affects less"; 6: "affects"; 7: "highly affects")*

7.1.2 Insightful Descriptives on Inhabitants' Sensitives for Wind Energy Development

In addition to the participants' assessments, the research also reveals socio-spatial sensitivity areas specific to the İzmir context in terms of participants' "own expressions". More insightful than their numeric ratings, these expressions provide grounded reasons for the participants' reactions to wind energy development. The content analysis applied to these descriptives provide conceptual clues about how local people experience the impacts on natural life, husbandry, visual aspects, noise, health, agriculture, magnetic field and number of turbines. This section presents the insight on that revealed by this research.

Some highlights of participant mentions refer to wind energy development impact on fauna, flora, and natural resources such as soil, water and air in natural life. Problems are observed in poulty, small cattle, bovine animals, and bees. Participants also argue that grasslands narrow down. The physical characteristics and image of the turbines disturb the natural landscape in the region. More importantly, noise generated from turbines causes significantly felt nuisance for the community. This is higher in windy wheater conditions and, particularly, at nights. Moreover, wind energy facilities cause a variety of diseases mainly sensorial and neurological. While wind energy facilities directly impact agricultural plant production by destroying crops and decreasing fertility, they also indirectly impact this community's main economic activity through wind turbines' impact on climate. According to the participants, magnetic field effect occurs on networks and particularly within close distances. Moreover, increase in the number of turbines create an accumulated impact in its vicinity. The disturbance is much higher than the affect of the sum and it is felt untolerable by the community.

The research indicates that results are contradicting. While some of these mentions make a strong emphasis on for what people are sensitive in a wind energy development area, the other claims may not find substantial ground for their validity. The in-depth findings also support this in a certain way because some participants' expressions did not reflect their experiences but refered to what they heard. For example, 20% of all mentions represented that for natural life, 17% for agriculture, 13% for health, 9% husbandry, but only 4% for noise are expressions heard from others. Additionally, the proportion of primary school graduates in the sample, which is more than half, may also justify the intent to share not what is experienced but what is collectively recognized. Following Table 7.3 introduces the frequency of mentions regarding the contradictory expressions.

Table 7.3 Frequency of Mentions Regarding Contradictory Expressions

Sensitivity areas	**Impact**	**No impact**	**Heard from others**
Natural life	80%	-	20%
Husbandry	81%	-	9%
Visual	70%	30%	-
Noise	84%	12%	4%
Health	76%	11%	13%
Agriculture	57%	26%	17%
Magnetic Field	47%	29%	24%
Number of turbines	88%	12%	-

Next sections introduce the details of the participants' socio-spatial sensitivities through the analysis of their insightful descriptions.

7.1.2.1 Natural life

Participants' expressions heavily emphasize that wind energy facilities' have impact on natural life in terms of flora, fauna, and natural resources. Table 7.4 shows that one third (29,8%) of all mentioned concepts about wind energy facility's impact on natural life refers to the "impact on animals". Respectively, impacts on birds and bats, disturbing affect on animals, loss of bees but increase of insects are some issues expressed. Other one third of the concepts used is about the negative impact of wind energy facilities on "flora" (19%) and "soil fertility" (14.3%). Impact on trees and grassland, in general, expressed as some issues related to this assessment. Additionally, least frequently mentioned concepts are about the impact of wind energy facilities on human (10.7%) and natural resources (6%). Although these impacts are expressed as participants' experienced knowledge, "expressions based on the information heard from others" constitutes 20% of all concepts mentioned. This situation, on the one hand, raises questions about the participants not only expressing their experiences but also a general social perception and contextual emotional saturation. On the other hand, this situation puts forward that participants need to be informed about the social impacts of wind energy production. These issues need to be taken into consideration and further research should be conducted. Following quotations from the participants' expressions illustrate the impact of wind energy facilities on the natural life elements.

> *"Migration routes of birds have changed. The bats' signal is broken. Insects increased."*(Female, 26-65 years, Mordoğan)
>
> *"The bees are gone. Pollination is not possible."* (Female, 26-65 years, Germiyan)

“The flies multiplied. I would never spray pesticides to tomato before. I haven’t planted tomatoes for 3-4 years.” (Male, 26-65 years, Germiyan)

“It caused the trees to dry up, ruined the nature.” (Male, 26-65 years, Ovacık)

“It affected nature a little. The color of olives and forests was better, the soil was more fertile.” (Female, 65+ years, Karaköy)

“It dried the grasslands. All endemic plants have disappeared.” (Female, 18-25 years, Mordoğan)

“The area where the animals roamed is filled with concrete.” (Female, 18-25 years, Ovacık)

“They say it's harmful, I don't know we're old.” (Female, 65+ years, Ovacık)

“I am not a professor. It is said that it emits radiation. Experts will consider.” (Male, 65+ years, Germiyan)

“They say it might affect in the future.” (Male, 65+ years, Yaylaköy)

Table 7.4 Perceived Impacts of Wind Energy Facilities on Natural Life, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON NATURAL LIFE	Frequency of mention	%
Impact on animals	**25**	**29,8**
Impact on birds	12	
Loss of bees	6	
Disturbing animals	4	
Increase of insects	2	
Impacts on bats	1	
Expressions of impact on natural life based on the information heard from others	**17**	**20,2**
Impact on flora	**16**	**19**
Impacts on trees	14	
Impacts on grassland	2	
Impact on soil fertility	**12**	**14,3**

Table 7.4 (continued)

IMPACT OF WIND ENERGY FACILITIES ON NATURAL LIFE	Frequency of mention	%
Impact on human	**9**	**10,7**
Human health	3	
Noise	2	
Radiation	3	
landscape	1	
Impact on natural resources	**5**	**6**
Impact on water	3	
Impact on air	2	
TOTAL	**84**	**100**

7.1.2.2 Animal Husbandry

Participants' insights on animal husbandry concentrates on issues regarding animals' products (e.g. egg, milk, honey) and grazing (e.g. grasslands narrowing down). Table 7.5 presents the impact areas of wind energy facilities on animal husbandry. One third (28.9%) of all the mentions is about the problems observed due to the impact of wind energy facilities on poultry, small cattle and bovine animals. Respectively, animals birth, egg and milk shortage, noise disturbance, animals getting scared and sometimes being shot are some problems highlighted. Quarter of the mentions refers to the narrowing of the grasslands (24.4%); and one third is about apiculture and extinction of bees (17.8%) and decrease in and depletion of wildlife animals, particularly birds and insects (15.6%). On the other hand, expression of impacts on animal husbandry "based on the information heard from others" constitutes approximately one tenth (8.9%) of all the concepts mentioned. The least mentioned impact is about drought (4.4%). Following quotations express the insights of the participants regarding the impact of wind energy facilities on animal husbandry.

> *"The bees of the beekeepers have escaped. Chickens' laying has decreased."* (Female, 26-65 years, Germiyan)

"Animals cannot find grasslands. The grasslands have been roads and covered with turbines." (Female, 65+ years, Germiyan)

"The animals were weaned for one month . In the past, 10 lambs used to be young/tender, but now half of the flock is young/tender." (Male, 26-65 years, Yaylaköy)

"They say it harms animals and causes disease." (Female, 26-65 years, Yaylaköy)

Table 7.5 Perceived Impacts of Wind Energy Facilities on Animal Husbandry, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON ANIMAL HUSBANDRY	Frequency of mention	%
Problems observed in poultry, small cattle and bovine animals	**26**	**28,9**
Problems with animal births	6	
Noise disturbance	3	
Animals being shot	3	
Animals getting scared	3	
Disturbed from road construction	2	
Egg issues	1	
Milk issues	1	
Goat problems	1	
Narrowing of the grasslands	**22**	**24,4**
Apiculture and extinction of bees	**16**	**17,8**
Decrease in and depletion of wildlife animals	**14**	**15,6**
Disappearance of birds	8	
Decreasing insect numbers	5	
Loss of prey animals	1	
Expressions of impact on husbandry based on the information heard from others	**8**	**8,9**
Drought	**4**	**4,4**
Drying up of forest, plants and fruits	2	
Drying up of water	2	
TOTAL	**90**	**100**

7.1.2.3 Visual integrity

Participants expressed that they are disturbed by the physical characteristics and image of the turbines and that they are ruining the natural landscape. Table 7.6 illustrates that one third of the concepts mentioned about the impacts of wind energy facilities on visual integrity are about "disrupting the natural landscape" (33.3%) by ruining the quality of naturalness and the landscape, by cutting trees and occupying the land. Approximately a quarter of the mentions (23,8%) indicates the "disturbance from the physical attributes of the turbines" including the size, number, location, and the presence of flicker. One tenth of the mentions (13.3%) indicates a "general disturbance from the image". The remaining one third part of all mentions indicates that participants "felt no disturbance" (24.8%) and "accepted the image" (4.8%). Sample quotations regarding the visual integrity and wind energy facility relations are as follows.

> *"I don't want to see them instead of seeing beautiful forests."* (Female, 26-65 years, Kozbeyli)

> *"They destroy the green of the mountains, we used to sit and watch these mountains in the evenings."* (Male, 26-65 years, Zeytineli)

> *"It does not ruin my scenic view because it is located higher, but I am disturbed when I see it too much."* (Male, 18-25 years, Ovacık)

> *"I think it ruins the view a lot. I was interested in photography, now I have no enthusiasm."* (Male, 26-65 years, Karaköy)

> *"They have surrounded the mountains around us, it is not pleasant at all."* (Female, 65+ years, Germiyan)

> *"Turbines are huge and create ugly images. Turbines have started with 20m towers, now they are 90-100m."* (Male, 26-65 years, Germiyan)

> *"We love it, the image does not harm us."* (Male, 65+ years, Ovacık)

Table 7.6 Perceived Impacts of Wind Energy Facilities on Visual Integrity, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON VISUAL INTEGRITY	Frequency of mention	%
Disrupting the natural landscape	**35**	**33,3**
Ruining naturalness	20	
Ruining landscape	12	
Trees are cut	2	
Lands are occupied	1	
No disturbance	**26**	**24,8**
Disturbance from the physical attributes of the turbines	**25**	**23,8**
Size	4	
Number	11	
Location	8	
Flicker effect	2	
Disturbance from the image	**14**	**13,3**
Accepted the image	**5**	**4,8**
TOTAL	**105,0**	**100,0**

7.1.2.4 Noise

According to the participants, wind turbine generated noise saliently disturb the community. The feeling of nuisance is higher in specific conditions (windy wheaters and night times). Respectively, approximately a quarter (22.7%) of the mentions about the impact of wind energy facilities on noise are related with the "increase in noise" when it is too windy or in rare weather conditions. In addition to this, more than half of the mentions are composed of such impacts with similar distributions as "high noise levels in the evenings/at nights/silence" (19.5%), "depending on the distance to wind farm" (18.8%), and "high levels of noise" (18.8%). Participants also mentioned the "negative impact on health" (4.7%). They also expressed that noise increases within closer distances and decreases when wind farms are located further away. Remaining one tenth part of all mentions consists of "no disturbance/getting used to it" (7.8%), "better than city noise" (3.1%) and "having higher number of turbines" (0.8%). Expression of impacts on noise "based on the information heard from others" constitutes 3.9% of all the mentions. Table 7.7 presents these infromation in detail. Some sample quotations expressing the participants insights on the wind turbine noise are as follows:

> *“You can't sleep with open windows, doors at night.”* (Male, 26-65 years, Germiyan)
>
> *“We cannot sit on the balcony in the evenings because of the sound.”* (Female, 65+ years, Germiyan)
>
> *“It makes a lot of noise in windy weather.”* (Male, 26-65 years, Ovacık)
>
> *“There is a lot of noise. It affects a lot when there is wind.”* (Female, 65+ years, Yaylaköy)
>
> *“It disturbs us in the evenings, because two turbines are very close to the village.”* (Male, 65+ years, Zeytineli)
>
> *“My ears went deaf and caused headache.”* (Male, 65+ years, Atçılar)
>
> *“It is just above us, but we do not hear its voice. I don't hear any sound even at nights.”* (Male, 26-65 years, Kozbeyli)

Table 7.7 Perceived Impacts of Wind Energy Facilities on Noise, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON NOISE	Frequency of mention	%
Increase in noise regarding the levels of wind	**29**	**22,7**
When it’s too windy	20	
Disturbance in some/rare weather conditions	9	
High noise levels in the evenings/at nights/silence	**25**	**19,5**
Depending on the distance to wind energy facility	**24**	**18,8**
Increasing noise within closer distances	15	
Decreasing noise within farther distances	9	
High levels of noise	**24**	**18,8**

Table 7.7 (continued)

IMPACT OF WIND ENERGY FACILITIES ON NOISE	Frequency of mention	%
No disturbance/getting used to it	**10**	**7,8**
Better than city noise	**4**	**3,1**
Having higher number of turbines	**1**	**0,8**
Negative impact on health (headache, hearing disorders, psychological impacts, impacts on children and adolescents))	**6**	**4,7**
Expressions of impact on noise based on the information heard from others	**5**	**3,9**
TOTAL	**128,0**	**100,0**

7.1.2.5 Health

Participants' expressions indicate that wind energy facilities cause various sensorial and neurological diseases. Table 7.8 presents that half of the mentions about the impact of wind farms on health is related with a variety of diseases (48.9%). Most frequently expressed diseases are headache, anxiety, stress, ear pain, and tinnitus. The less frequently mentioned ones include vertigo, tachycardia, blurred eyes, insomnia, stuffy nose, flu, and cancer. On the other hand, while one fifth of the mentions refers to "radiation" (10%) and "increase in diseases" (8.9%); one tenth of all mentions indicates that there is "no relation with the diseases" (11.1%). One tenth of the mentions about the impact of wind farms on health are composed of the "expressions based on the information heard from others". Remaining one tenth part of the mentions are composed of "no idea since wind energy facility is newly established" (4.4%), "relating with distance" (2.2%) and "comparing the impact of wind energy facility with the drugs used in mains water" (1.1%). Following quotations illustrate the expressions of the participants health related insights.

> *"It makes headache. The constant noise annoys people."* (Female, 26-65 years, Ovacık)

“Of course it affects. They (number of turbines) will increase even more. Increasing diseases are all because of this.” (Male, 26-65 years, Ovacık)

“They say it causes psychological problems. It may cause cancer.” (Male, 18-25 years, Ovacık)

“Headache, anxiety, stress. Three people died of heart attack this year, this needs to be investigated.” (Male, 26-65 years, Yaylaköy)

“Headache, nasal congestion, flu increased in the village.” (Female, 65+ years, Atçılar)

“Since there is electricity, it emits radiation.” (Male, 65+ years, Zeytineli)

Table 7.8 Perceived Impacts of Wind Energy Facilities on Health, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON HEALTH	Frequency of mention	%
Relating with a variety of diseases	**44**	**48,9**
Headache	15	
Anxiety, stress psychological problems	9	
Ear pain/tinnitus	8	
Vertigo	5	
Tachycardia	2	
Blurred eyes	1	
Insomnia	1	
Stuffy nose, flu	1	
Cancer	2	
Expressions of impact on health based on the information heard from others	**12**	**13,3**
No relation with the diseases	**10**	**11,1**
Radiation	**9**	**10,0**
Increase in diseases	**8**	**8,9**
No idea since wind energy facility is newly established	**4**	**4,4**
relating with distance	**2**	**2,2**
Comparing the impact of wind energy facility with the drugs used in mains water	**1**	**1,1**
TOTAL	**90**	**100**

7.1.2.6 Agriculture (plant production)

Participants' insights regarding the wind energy facilities impact on agricultural plant production mainly concentrate on the destruction of crops and decrease in fertility. They also emphasize wind turbines' impact on climate which is indirectly infleuncing the economic activity of plant production. Accordingly, approximately half of the mentions (42.4%) about the impact of wind energy facilities on plant production is related with the "decrease in crops/destruction of crops/drying up of plants". It is claimed that fertility decreases particularly in the production of olive, tomato, pear, almond, pistachio, plum, melon and watermelon. In constrast to this, a quarter of all mentions (25.9%) indicate that there is "no impact on agriculture". Participants also expressed that they heard about the impact on agriculture from others (16.5%). The rest refers to the "impact on natural life and climate" in general (8.2%), "creating radiation" (3.5%), and "depletion of large agricultural land" (3.5%). The following table 7.9 presents these findings in detail. Some sample quotations for the participants' agricultural insights are as follows.

> *"There used to be a lot of crops, it has decreased. It throws the flowers of the olives, the yield has decreased."* (Female, 26-65 years, Germiyan)

> *"Worm and spotting increased in tomatoes. Tomatoes dried in a month. Maybe that also affects the rain."* (Female, 65+ years, Germiyan)

> *"There is no fertility left in the soil. I use fertilizer but in vain. The grass around it dried."* (Female, 26-65 years, Ovacık)

> *"Almonds and pears dried, soon the olives will dry too."* (Male, 65+ years, Zeytineli)

> *"I don't think it has any effect on agriculture. My olives were not affected either. It even prevents frost by mixing cold air."* (Male, 26-65 years, Karaköy)

"I don't know much. They say leaves are falling." (Female, 18-25 years, Kozbeyli)

Table 7.9 Perceived Impacts of Wind Energy Facilities on Agriculture, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON AGRICULTURE	Frequency of mention	%
Decrease in crops/destruction of crops/drying up of plants	**36**	**42,4**
Decreasing fertility	12	
Olives	9	
Tomato	4	
Pear	5	
Almond	3	
Pistachios	1	
Plum	1	
Melon, watermelon	1	
No impact on agriculture	**22**	**25,9**
No impact on agriculture	16	
No impact seen yet (since there is no agriculture, facility is newly established, gardens are small)	6	
Expressions of impact on agriculture based on the information heard from others	**14**	**16,5**
Impact on natural life and climate	**7**	**8,2**
Increase in insects/flies	2	
Changing the climate	3	
Cutting of trees	2	
Creating radiation	**3**	**3,5**
Depletion of large agricultural land	**3**	**3,5**
TOTAL	**85**	**100**

7.1.2.7 Magnetic Field

Participants' insights indicate that magnetic field effect occurs on networks and particularly within close distances. Half of the mentions about the impact of wind energy facilities on magnetic field formation are related with the "areas where magnetic field effect is felt" (33.3%) and the impact of the magnetic field in "relation with the distance to the turbine" (14.3%). networks [e.g. telephone, internet, cellular phone], health, and nature are the areas where magnetic field is effective. The remaining half of the mentions indicate that there is "no magnetic field effect"(19%) and that participants have "no idea" (9.5%) about such an impact. Additionally, rest of the mentions composing quarter of all the mentions include participants' "belief on a possible magnetic field impact" (16.7%), and "expressions based on the information heard from others" (7.1%). Table 7.10 presents these infromation in detail and following quotations introduce the participants' expressions on the impact of magnetic field.

> *"There would be no headache if there is no magnetic field."* (Female, 26-65 years, Germiyan)

> *"Planes cannot fly because of its signal."* (Female, 65+ years, Germiyan)

> *"Sometimes cell phones turn off. Some TV channels are not working."* (Female, 26-65 years, Germiyan)

> *"Definitely, sometimes we cannot breathe. I think it creates radiation."* (Male, 26-65 years, Zeytineli)

Table 7.10 Perceived Impacts of Wind Energy Facilities on Magnetic Field Formation, Frequency of Mentions and Percentages

IMPACT OF WIND ENERGY FACILITIES ON MAGNETIC FIELD FORMATION	Frequency of mention	%
Areas where magnetic field effects	**14**	**33,3**
Networks (telephone, internet, tv), planes	7	
Human health	5	
Nature	2	
No magnetic field effect	**8**	**19**
No idea	**4**	**9,5**
Relation with the distance to the turbine	**6**	**14,3**
Impacts in closer distances	4	
Impacts only around the turbine	2	
Belief on a possible magnetic field impact	**7**	**16,7**
Expressions of impact on magnetic field formation based on the information heard from others	**3**	**7,1**
TOTAL	**42**	**100**

7.1.2.8 Number of Turbines

According to the participants, increase in the number of turbines create an accumulated impact in its vicinity. Approximately half of the expressions (41.9%) about the perceived impact of number of turbines indicates a relation about an "increasing impact (noise, visual, etc.) as the number of turbines increases". On the other hand, while one tenth of the mentions (11.8%) indicates "no impact", one fifth of the mentions include expressions of "fewer numbers of turbines" (12.9%) and "no turbines at all" (10.8%). Remaining one third portion of the mentions are composed of expressions about positive views on the existence of wind turbines such as "increase in the number of turbines" (9.7%); as well as relatively positive views as "adequate number of turbines in each settlement" (8.6%) and "there can be turbines, but no turbines at the vicinity" (4.3%) (Table 7.11). Some sample quotations from the participants' expressions are as follows.

> *"I don't want to see it everywhere."* (Male, 26-65 years, Germiyan)
>
> *"It was better when sparse. They became more frequent and the land they cover has widened."* (Female, 65+ years, Karaköy)
>
> *"The more it is, the greater the negative effects."* (Male, 18-25 years, Germiyan)
>
> *"If the number of turbines increases too much, it will deteriorate the landscape and the noise will increase."* (Female, 26-65 years, Ovacık)
>
> *"Having one is different, having it on everywhere is different. It affects development."* (Male, 18-25 years, Ovacık)
>
> *"It would be better if they were not around the village, they should have been established further away."* (Female, 26-65 years, Yaylaköy)
>
> *"10 is enough, 40 is too much!"* (Male, 26-65 years, Atçılar)

"It would be less disturbing in terms of image and noise, if the numbers of turbines were less." (Female, 26-65 years, Kozbeyli)

"In our area, 3 of them are enough, but 4 of them are with us. Each village should have enough." (Male, 18-25 years, Germiyan)

Table 7.11 Perceived Impacts of Number of Wind Turbines, Frequency of Mentions and Percentages

IMPACT OF NUMBER OF TURBINES	Frequency of mention	%
Increasing impact as the number of turbines increases	**39**	**41,9**
Increasing noise if the number of turbines increase	13	
Too many turbines ruin the landscape	10	
Increasing impact with the increased number of turbines	6	
Should not be everywhere; should not increase the existing number	10	
Fewer numbers of turbines	**12**	**12,9**
No impact	**11**	**11,8**
No impact/ No disturbance	5	
Established for the national energy need	3	
They are distant	2	
Getting used to	1	
No turbines at all	**10**	**10,8**
Increase in the number of turbines	**9**	**9,7**
Adequate number of turbines in each settlement	**8**	**8,6**
There can be turbines, but no turbines at the vicinity	**4**	**4,3**
TOTAL	**93,0**	**100,0**

In summary, the study confirms that environmental, economic, sensory, and technological sensitivities exist in İzmir. Yet, research also indicates that these issues are not problematic for some inhabitants in the selected sites . For example, 30% of the mentions about wind farm impact on visual integratity indicates that there is no impact. This is 12% for noise, 11% for health, 26% for agriculture (plant production), 29% for magnetic field, and 12% for the number of turbines. This contradictory structure of the findings shows that, on the one hand, there is sensitivity in the society towards wind energy development, on the other hand, there is a collective conception about the negative effect of wind energy facilities in addition to individual sensitivities constructed upon personal experiences. Research findings reveal that this particularly appears in the sensitivies for magnetic field, natural life and agriculture. 24% of all mentions about the impact on magnetic field refers to the knowledge framed based on what is heard, 20% for natural life and 17% for agriculture (plant production). It is 9% for animal husbandry, 4% for noise, and 13% for health. Having said that, not experiencing the effect does not mean that social sensitivity is invalid. In this respect, in order to better understand this contradiction the study analyzes the site survey benefitting from the nudging theory. With respect to participants' evaluations regarding NIMBY attitude and solutions variables as well as the personal opinions and solution suggestions of the participants. The following section introduces the multi-level nudging analysis of the wind energy transition process.

7.2 Multi-Level Nudging Analysis of Wind Energy Transition Process

This section of the study introduces an analysis of the multi-level nudging within the wind energy transition process. The scope of the analysis is limited to the 1) reviewed documents about wind energy development within the Turkish planning context (legal framework, incentives, support mechanisms); 2) the information gained from focus groups and in-depth interviews conducted with the national and local actor groups (decision-makers: public authority representatives, private sector: wind energy investors, consultants; civil society organizations: civil platform and NGO representatives, inhabitants: muhktars); and 3) the site survey conducted with the residents of the selected research sites.

This research shows that the process of nudging in wind energy transition takes place between different actor groups (decision-makers: public authority, private sector: investors; civil society organizations, inhabitants) at multiple levels and that the type of nudges varies for each actor group. This analysis is done with a focus on three main actor groups, decision-makers, investors and inhabitants, and at four levels, global, national, regional, and local (Figure 7.3).

Accordingly, the global level renewable energy context in terms of agreements on sustainability and climate change nudge the decision-makers' national, regional and local level policies, strategies and plans regarding wind energy transition. The global research and developments in wind energy sector (e.g. wind turbine designs, micro-siting techniques; health impact researchs) nudge private sector wind energy investors, consultants at the national level, and thus inhabitants through civil society organizations at the local level. The decision-makers at the national level nudge investors and inhabitants at national, regional and local levels through setting renewable energy (including wind) policies, strategies and plans supported with legal frameworks, and incentive mechanisms. The wind energy investors at the local level nudge inhabitants through providing public benefits during implementation of wind energy projects.

During this itirative nudging process occuring at multiple levels, civil society organizations work as a catalyzer that nudges in both top-down and bottom-up directions. The civil society organizations at the local, regional and national levels nudge inhabitants by providing top-down global and national wind energy related information (e.g. research and developments, recent applications) to local level. They also nudge investors and decision-makers in the bottom-up direction through a provision of local level information (e.g. oppositions, disturbances) at regional and national levels. On the other hand, national level wind energy related civil society organizations (e.g. TÜREB) nudge investors by providing information on wind energy at global and national levels.

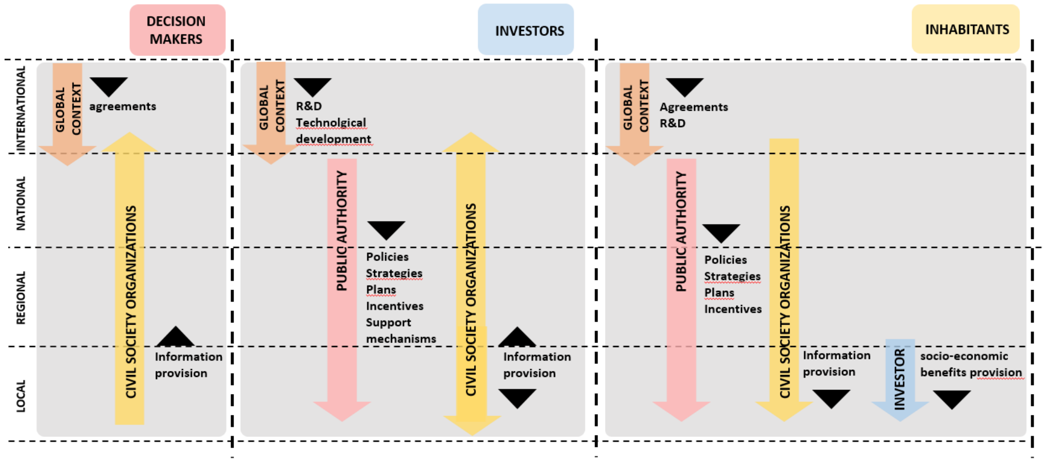

Figure 7.3. Multi-level nudging process between actor groups

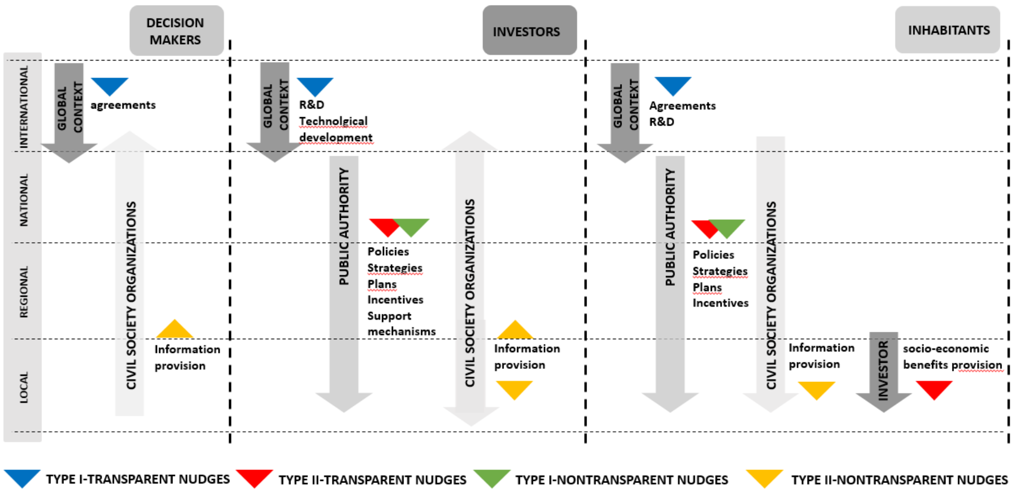

Figure 7.4. Types and transparency context of the multi-level nudging process between actor groups

In order to analyze the nudging conditions of the involved actors wind energy transition, the study adopts the model developed by Hansen and Jespersen (2013) for the responsible use of nudging in public policy. As discussed thoroughly in the above chapters, Hansen and Jespersen categorize nudges according to their types and transparency under four groups: (I) Type 1 (automatic thinking), (ii) Type 2 (reflective thinking), (iii) transparent (easily identifiable context of the choice), and (iv) non-transparent (not easily identifiable context of the choice). Respectively, in the context of wind energy transition, Type 1-transparent nudges occur at the international level in the form of technological developments and agreements that lead the context in such a way that investors and inhabitants make automatic choice in favor of wind energy development. Type 1-nontransparent nudges are placed in the top-down site selection for wind energy development by national decision makers (e.g. YEKA process). Type 2-transparent nudges take place often at the national level in the form of providing benefits for the inhabitants by the investors (e.g. building schools, providing electricity). Type -2 nontransparent nudges at the local where investors and decision makers meet the public, and the civil society face against the investors and decision makers.

Figure 7.4 illustrates these types of the multi-level nudging process between actor groups. The sections below details the occurring nudges in wind energy transition. It does that, first, by taking a closer look at the nudges from the inhabitants' perspectives with different gender and age characteristics. It also examines the differentiation of the public view between settlements with different distances to wind farms with different locational characteristics. The nudges are explored in relation to the public's attitude for NIMBY and suggestions for adapting to wind energy development. On the basis of these analyses, second, a detailed presentation is provided in a framework of nudges, occurring in different combinations of type and transparency at different levels including international, national, regional and local.

7.2.1 Public View on Nudges Leading to NIMBY Attitude

The study reveals the individual assessments of NIMBY attitude variables with respect to the type and transparency context of nudges. Accordingly, the NIMBY concepts investigated through the site survey as of proximity (Can be built somewhere else but not in my vicinity), endurance (I feel like "I" endure the consequences of the problem created by others), unfairness (I find it unfair), co-movement (I don't want because others don't want too), and public benefits (I don't want unless any public benefits are provided specific to my settlement) are categorized into the context of nudging. Additionally, the NIMBY attitudes regarding, endurance and unfairness are considered within the context of the proximity concern. Accordingly, proximity concerns representing an urge to create a new impulse within the wind energy development process are categorized under Type 1-transparent nudges. Expectatitons of public benefit provision specific to the locality signifies demad for the provision of a public incentive context, and thus categorized under Type 2-transparent nudges. The final NIMBY concept as of co-movement is about reframing the context of public opposition against wind energy development associating with the others' opinion; and thus categorized as Type 2-non-transparent nudges.

Table 7.12 introduces the average Likert values of the participants' NIMBY attitude ratings with nudge categories. Accordingly, it is observed that participants somewhat disagree the Type 1-transparent nudges of NIMBY attitude against wind energy facilities regarding the proximity concern and feeling of endurance (Likert means respectively: 3.8 and 3.7). However, they find having wind energy facilities at the vicinity of their living environment unfair (Likert mean: 4.8). They also disagree the Type 2-nontransparent nudges in terms of co-movement idea (Likert mean: 2.5), implying that the NIMBY attitude of the participants against wind energy facilities is not related with others' opinion. On the other hand, participants are in search for a larger public benefit provided specific to their settlements (Likert mean: 4.6) within the context of Type 2-transparent nudges.

Table 7.12 Nuding Categories and The Evaluation of NIMBY Attitude Regarding Wind Energy Facilities to be Built at The Vicinity of The Living Environments

NUDGE TYPE	**NIMBY attitude** about the wind energy facilities to be built at the vicinity of your settlement:	**Mean**
Type 1 – transparent	Can be built somewhere else but not in my vicinity.	3,8
	I find it unfair.	4,8
	I feel like "I" endure the consequences of the problem created by others	3,7
Type 2 - transparent	I don't want unless any public benefits are provided specific to my settlement.	4,6
Type 2 - nontransparent	I don't want because others don't want too.	2,5
NUDGE TYPE	**SOLUTIONS for NIMBY ATTITUDE** about the wind energy facilities to be built at the vicinity of your settlement:	
Type 2 - transparent	Would you like to be informed about a wind energy facility to be constructed close to your residence?	6,3
Type 2 - transparent	Would you like to participate in a wind energy facility project planning/ decision making process close to your residence?	6,3
Type 2 - transparent	Do you agree on governmental incentives on wind energy?	4,4
Type 2 - transparent	Would you like to share a hold in a wind energy facility close to your residence (cooperatives)?	3,9
Type 2 - transparent	Do you agree on paying 20kuruş more for electricity produced from wind energy?	2,6

*(**Agree/disagree**: 1: "I totally disagree"; 2: "I disagree"; 3: "I somewhat disagree "; 4: "does not matter"; 5 "I somewhat agree"; 6: "I agree "; 7: "I totally agree")*

The findings of the study also reveals the participants' evaluations regarding the solution suggestions about opposition/acceptance of the wind energy facilities to be built at the vicinity of their living environments. However, as explained in detail in previous chapters, from within the public opposition dynamics experienced during the fieldwork, the study reconceptualized the theoretical framework and thereafter included the nudging theory in the research scope. In this respect, the solutions investigated throughout the survey in reference to the initial research design remain limited with the Type2-transparent nudges. The evaluated solutions within the context of Type 2-transparent nudges include concepts such as information provision in terms of *being informed* about and *participating* in the process of wind energy facilities to be built at the vicinity of the living environments; provision of support mechanisms (e.g. legal frameworks, incentives) in terms of *governmental incentives, share holding*, *paying more* for electricity produced from wind energy.

Table 7.13 introduces the average Likert values of the participants' ratings for solutions including nudge categories. Accordingly, evaluations of the participants indicate that they agree on Type 2-transparent nudges and that the provision of information trigger the reflective thinking on wind energy development. This is supported by the highest ratings focusing on the concepts of "being informed" about (Likert mean: 6.3) and "participating" (Likert mean: 6.3) in a wind energy facility project planning/decision making process at the vicinity of their settlements. In addition to this, the findings illustrate that while participants have a neutral position about other Type 2- transparent nudges as of "governmental incentives" on wind energy (Likert mean: 4.4); they "somewhat disagree" sharing a hold in a wind energy facility cooperative at their vicinity (Likert mean: 3.9). They also disagree paying more for electricity produced from wind energy (Likert mean: 2.6).

Moreover, the study also reveal participants' solution suggestions, which provide some clues on their state of being nudged. The expressed solutions regarding being informed, having a legal framework determining/controlling the limits for the number of turbines, setback distances, environmental and humane disturbances, and provision of public benefits for the locality fall under the category of Type 2-transparent nudges in terms of framework, incentive mechanism development and provision of information with respect to wind energy transition. The suggested solutions re-framing the expression of public opposition in terms of collective movements (legal channels /protests/unity) are counted as Type 2-nontransparent nudges. The suggestions regarding the use of other resources than wind energy signify Type 1-non-transparent category of nudge, since a new setting is recommended for the energy production. Table 7.13 introduces the key concepts of the participants' expressions on the solution suggestions, their frequency distribution and nudge category.

In parallel with the Likert evaluations, analysis of the expressed solution suggestions of the participants regarding the problems they face during the wind energy development process, three quarters of the expressions is composed of Type 2-tansparent nudges regarding the public participation in the process (34.6%), determination of limitations and setback distances (22.9%); and consideration of public benefits (14.9%). The expressions about the limitations and setback distances focus on the limitations regarding the number of turbines taking place at the vicinity of the living environments; setting setback distances from residential, tourism, animal husbandry and agricultural areas, developing governmental control mechanisms in order to prevent disturbance among human and natural life. With respect to the public participation, setting the communication and information channels and having inhabitants' opinions during the wind energy development process are highlighted.

The rest of the expressions presents views on local collective movements as of Type 2 -nontransparent nudges, regarding the "use of legal channels, protesting to be heard; being united" (13.9%). On the other hand, approximately one tenth of the participants' expressions indicate that "there is no problem, they are done for the society" (7.4%). Remaining mentions suggest the use of other resources than wind energy (6.4%) which is considered within the context of Type 1-nontransparent nudges.

Table 7.13 Expressed Solutions, Frequency Distribution and Nudge Category

NUDGE TYPE	SOLUTION SUGGESTIONS	Frequency of mention	%
Type 2 - transparent	Informing/ communication/ having public opinion/public participation	65	**34,6**
Type 2 - transparent	Turbine number limitation Setting setback distances from residential, tourism, animal husbandry and agricultural areas Should be done without creating any disturbance /showing respect for human-animals/without harming the environment Political attitude and control	43	**22,9**
Type 2 - transparent	Consideration of public benefits	28	**14,9**

Table 7.13 (continued)

NUDGE TYPE	SOLUTION SUGGESTIONS	Frequency of mention	%
Type 2 - nontransparent	Use of legal channels by public /protests/to be heard Unity	26	**13,9**
-	No problem/ they are done for the society-country	14	7,4
Type 1- nontransparent	Use of other resources	12	6,4
TOTAL	**28**	**100**	TOTAL

7.2.2 Group Comparisons

The study analyses the Likert scale ratings of local people's preferences about NIMBY attitude regarding having a wind energy facility in their living environment with respect to nudging categories. It aims to find out the interrelation between distance to wind energy facility, locational characteristics, gender, age groups and NIMBY attitude variables (proximity, unfairness, endurance, public benefits, co-movement) to better understand the reasons of the public acceptance/opposition within the nudging context.

In this respect, Table 7.14 introduces the average Likert values of the participants' NIMBY attitude ratings with nudge categories according to the differentiating distances to wind energy facility and locational characteristics of the research sites. Additionally, figures 7.5 and 7.6 illustrate the distribution of NIMBY attitudes according to the differentiating distances and locational characteristics.

Participants' evaluations indicate that Type 1-transparent nudge of proximity concerns regarding having a wind energy facility at the living environment is higher in closer distances (0-500m) (Likert mean: 4.2), and tend to decrease in further distances to wind energy facilities (Likert means respectively in 500m-1km: 3.3 and 1km+: 3.4). Participants living beyond 1 km distance to wind energy facilities do not agree on unfairness or endurance issues (Likert means respectively: 2.0 and 1.8) regarding wind energy facilities. However, participants settled at the closer distances to wind energy facilities find having wind energy facilities at the vicinity unfair (Likert means respectively 500m-1km+: 4.7; 0-500m:5.2). Yet, they somewhat disagree the feeling of endurance regarding the problems created by others (Likert means respectively: 500m-1km+: 3.7; 0-500m:3.9). Regardless of their distance to the existing wind energy facility, participants do not agree with Type 2-nontransparent nudges as being in a mental position where opposition against wind energy emerges because of others' negative opinions (Likert means respectively 0-500m: 2.6, 500m-1km: 2.3, 1km+: 1.8). Analysis indicates that participants have a tendency on having public benefits expectations provided within the context of Type 2 – transparent nudges as they settle further away from wind energy facilities (Likert means respectively, 0-500m: 4.4, 500m-1km: 4.5, 1km+: 4.8). Interestingly, this tends to gradually increase as the distance from the wind energy facility increases.

The analyses are also carried out for the participants' NIMBY attitude assessments according to the differentiating locational characteristics of the research sites. The analysis regarding the Type 1 – transparent nudges including proximity concerns considered together with unfairness and endurance issues of wind energy development, show that participants at the locations with more natural values coinciding with settlement areas tend to disagree having wind energy facilities in the vicinity (Likert means respectively: "forest+shore+settlement" Ovacık: 4.7; "shore+settlement" Germiyan: 5.0, and "forest+shore" Kozbeyli, Mordoğan: 6.3). However, participants at the locations with less natural characteristic, tend to agree more to have wind energy facility at the vicinity (Likert means respectively, "settlement" Yaylaköy: Likert mean: 2.9, "archeological site" Karaköy: 3.0, "forest+grassland" Atçılar: 3.0). On the contrary, although Zeytineli is a natural value "shore" area, it represents disagreement (Likert mean: 2.6) for the proximity concerns regarding NIMBY attitude.

The analysis on the participants' unfairness attitudes show that participants find wind energy facilities to be built at the vicinity of their settlement unfair almost in all locations (Likert means respectively, forest+grassland Atçılar: 6.3, "shore+settlement" Germiyan: 6.2, "forest+shore+settlement" Ovacık: 5.6, “forest+shore” Kozbeyli, Mordoğan: 5.0, “settlement” Yaylaköy: 4.5). Atçılar has grassland as the locational characteristic and unfairness assessments are the highest in this research site. This may be a result of the impact of wind energy facilities on husbandry which is de main economic activity of the area. Germiyan, Ovacık, Kozbeyli and Mordoğan settlements are naturally valuable locations, concerned about the loss of natural land; and Yaylaköy is a settlement area concerned about having wind energy facility in their living areas. Interestingly, although being naturally and culturally valuable areas, Zeytineli a “shore” area, and Karaköy as an “archeological site” location tend to disregard unfairness attitude (Likert means repectively: 3.6 and 3.5). The participants’ assessments on proximity concerns and feelings of unfairness and endurance are inconsistent especially in Atçılar.

Participant assessments in naturally valuable (forest, shore, grassland) areas show a feeling of endurance against the consequences of the problem created by others (Likert means respectively, forest+grassland Atçılar: 5.4, “forest+shore” Kozbeyli, Mordoğan: 5.0, “shore+settlement” Germiyan: 4.6, “forest+shore+settlement” Ovacık:4.2). Although Yaylaköy is a settlement area, Zeytineli and Karaköy are naturally and culturally valuable areas, participants in these locations disagree such a mental state of endurance (Likert means respectively 3.2, 3.0 and 2.7).

The co-movement psychology in terms of Type 2 – nontransparent nudges is not valid for participants at nearly all of the locations (Likert means respectively: “archeological site” Karaköy: 1.6; “settlement” Yaylaköy: 1.5; “shore” Zeytineli: 2.0, “shore+settlement” Germiyan: 3.0, “forest+shore+settlement” Ovacık: 3.0, “forest+grassland” Atçılar: Likert mean: 3.6), except forest+shore locations Kozbeyli and Mordoğan (Likert mean: 4.7).

The provision of public benefits considered in terms of type 2-transparent nudges are commonly agreed in all locations (Likert means respectively, “forest+shore” Kozbeyli, Mordoğan: 7.0, “shore” Zeytineli: 5.2, “shore+settlement” Germiyan: 5.1, “forest+shore+settlement” Ovacık: 4.4, forest+grassland Atçılar: 4.4 and “archeological site” Karaköy: 4.1). However, participants in Yaylaköy at the “settlement” location are not in search for public benefits (Likert mean: 3.8). Interestingly, in case of public benefits, Zeytineli shows rather active stand instead of its passive attitude towards other NIMBY concepts.

Although participants in Kozbeyli and Mordoğan sites haveing “forest+shore” locational characteristics “do not prefer” wind facilities in their living environment, their evaluations may convey the generalized conception of public opposition. Moreover, independent from the distance to the closest wind facility, NIMBY effect is observed more in locations with higher natural values such as forest, shore. Germiyan, Kozbeyli and Mordoğan sites come forward with strong NIMBY evaluations.

On the other hand, locational analyses indicate that in contrast with the closer ones, areas taking place within 500m - 1 km and above 1km distance such as Kozbeyli, Mordoğan, Germiyan, Zeytineli, with higher natural characteristics are showing stronger reactions on justice and provision of social benefit issues. Especially Atçılar (in 500m-1km distance) presents a significant opposition about the justice which can be related with the existence of wind energy facilities at the grassland where animal husbandry is taking place as the main economic activity.

This may be due to the sociopolitical culture of İzmir as introduced in detail in chapter 6. The sociopolitical structure of İzmir indicates that the community shows strong reactions against such energy investments. The locations where such reactions are concentrated (e.g. Urla, Karaburun, Mordoğan, Çesme, Foça, Aliağa) corresponds with the research sites of the study.

Table 7.14 Nuding Categories and The Evaluation of NIMBY Attitude According to The Differentiating Distances to Wind Energy Facility and Locational Characteristics

Nudge type	**Type 1 – transparent**	**Type 1 – transparent**	**Type 1 – transparent**	**Type 2 – transparent**	**Type 2 – nontransparent**
	Proximity "Can be built somewhere else but not in my vicinity."	**Unfairness** **"**I find it unfair."	**Endurance** **"**I feel like 'I' endure the consequences of the problem created by others."	**Public benefits** "I don't want unless any public benefits are provided specific to my settlement."	**Co-movement** "I don't want because others don't want too."
GENERAL	3.8	4.8	3.7	4.6	2.5
DISTANCE					
0-500m	4,2	5,2	3,9	4,4	2,6
500-1km	3,3	4,7	3,7	4,5	2,3
1km +	3,4	2,0	1,8	4,8	1,8
LOCATIONAL CHARACTERISTICS					
Shore	2,6	3,6	3,0	5,2	2,0
Settlement	2,9	4,5	3,2	3,8	1,5
Forest +cultural site (Archeological Site)	3,0	3,5	2,7	4,1	1,6
Forest + Shore	6,3	5,0	5,0	7,0	4,7
Shore + Settlement	5,0	6,2	4,6	5,1	3,0
Forest + grassland	3,0	6,3	5,4	4,4	3,6
Forest + Shore + Settlement	4,7	5,6	4,2	4,4	3,0

*(**Agree/disagree**: 1: "I totally disagree"; 2: "I disagree"; 3: "I somewhat disagree "; 4: "does not matter"; 5 "I somewhat agree"; 6: "I agree "; 7: "I totally agree")*

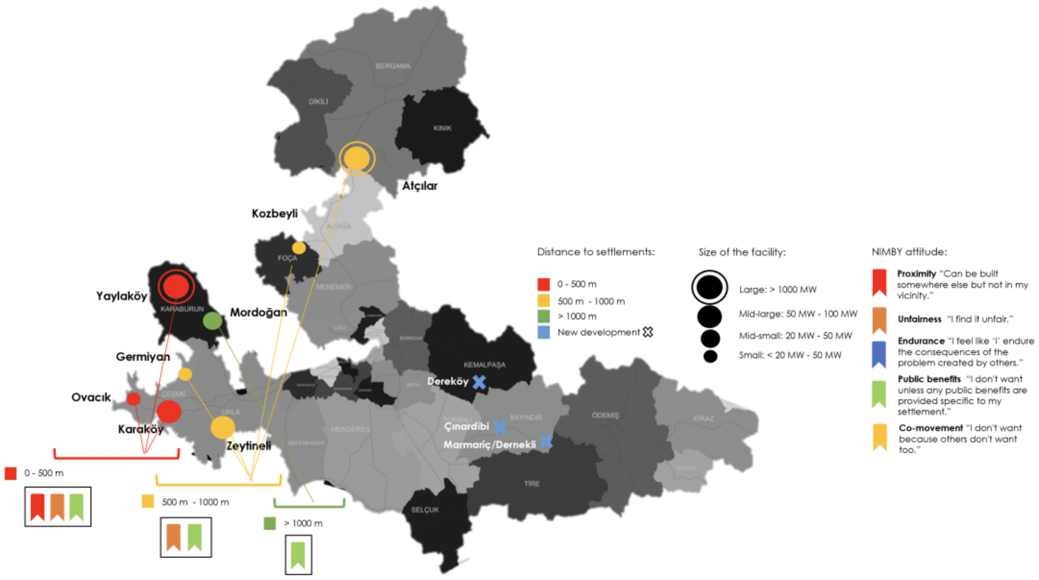

Figure 7.5. Distribution of NIMBY attitudes according to the distance to the wind energy facility

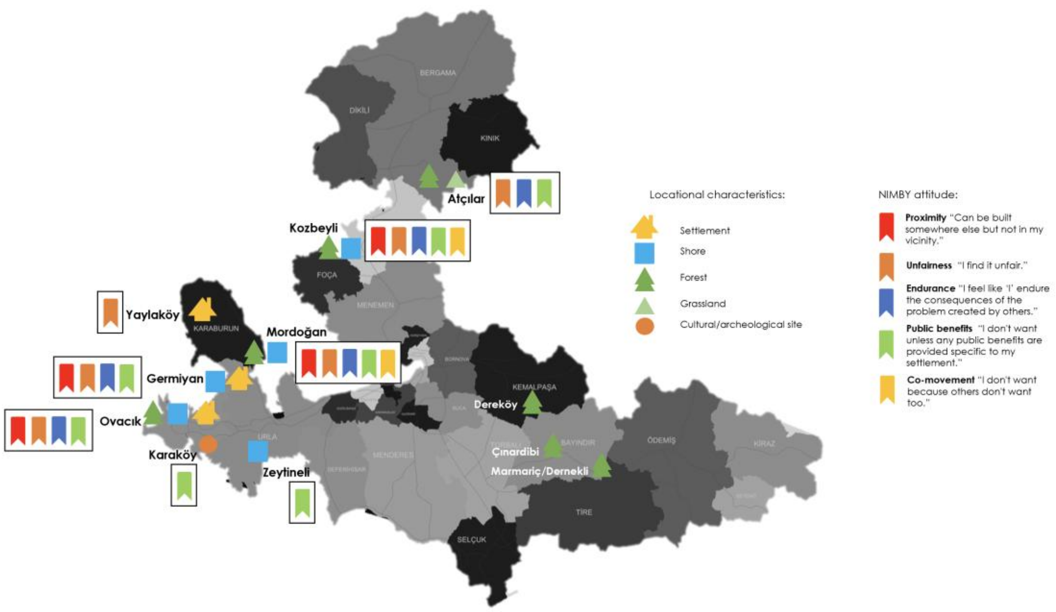

Figure 7.6. Distribution of NIMBY attitudes according to the locational characteristics

The study also analyzes how participants' NIMBY attitude assessments differ within the nudging context according to the gender (women and men) and age groups (18-24; 25-65; 65+ years old) (Table 7.15). The analyses illustrate that for the proximity concerns, unfairness and endurance concept considered within Type 1- transparent nudges both women and men tend to show similar evaluations of disagreement (Likert means respectively, proximity: women: 3.7 men: 3.5, unfairness: women: 3. men: 5.8 and endurance: women: 3.6 men: 3.8). The only dissimilarity is about unfairness. Men tend to have stronger unfairness judgments than women.

Both women and men disagree the co-movement judgment regarding the Type 2-nontransparent nudges, in terms of being influenced from others' views on wind energy development (Likert means respectively 2,6 and 2,2). On the other hand, the analysis indicates that both women and men tend to agree on having public benefits within the context of the Type 2-transparent nudges (Likert means respectively women: 5.2, men: 4.8). Although analysis do not show that women having a perception of an unfair situation, they agree on having public benefits regarding wind energy facilities at their vicinity.

The analysis of the NIMBY attitude according to age groups illustrate that assessments tend to be compatible within each age group. The Type 1-transparent nudges as of proximity concerns with respect to having a wind energy facility somewhere but not at the vicinity, is found to be invalid in all age groups with the highest assessment in middle-aged group (Likert means respectively young: 3.5, middle aged: 3.8, elderly: 3.2). The participants in all age groups find having a wind energy facility at the vicinity of their living environments unfair where middle aged group has the highest assessment value (Likert means respectively, young: 4.2, middle aged: 4.9, elderly: 4.8). The feeling of endurance increases with the increasing age, although assessments that they endure the consequences of the problem created by others change "somewhat disagree" in young and middle-aged participants to "does not matter" in elderly (Likert means respectively 3.0, 3.8 and 4.1). The Type 2-nontransparent nudges regarding co-movement attitude have similar evaluations in each age group. In this respect, the participants in each age group “do not agree” that their opposition against wind energy facilities is in relation with the others’ attitudes (Likert means respectively, young: 2.6, middle aged: 2.1, elderly: 2.9).

Analysis of the Type 2-transparent nudges represented as provision of public benefits illustrate that participants in all age groups agree on having public benefits about wind energy facilities at the vicinity (Likert means respectively, young: 4.2, middle aged: 4.6, elderly: 4.6).

Table 7.15 Nuding Categories and The Evaluation of NIMBY Attitude According to The Gender and Age Groups

Nudge type	**Type 1 – transparent**	**Type 1 – transparent**	**Type 1 – transparent**	**Type 2 – transparent**	**Type 2 – nontransparent**
	Proximity “Can be built somewhere else but not in my vicinity.”	**Unfairness** **“**I find it unfair.”	**Endurance** **“**I feel like ‘I’ endure the consequences of the problem created by others.”	**Public benefits** “I don't want unless any public benefits are provided specific to my settlement.”	**Co-movement** “I don't want because others don't want too.”
GENDER GROUPS					
Women/Female	3,7	3,6	3,6	5,2	2,6
Men/Male	3,5	5,8	3,8	4,8	2,2
AGE GROUPS					
18-24 years old	3,5	4,2	3,0	4,2	2,6
25-65 years old	3,8	4,9	3,8	4,6	2,1
65+ years old	3,2	4,8	4,1	4,6	2,9

Agree/disagree*: 1: "I totally disagree"; 2: "I disagree"; 3: "I somewhat disagree "; 4: "does not matter"; 5 "I somewhat agree"; 6: "I agree "; 7: "I totally agree")*

7.2.3 Multi-Level Nudging Framework Analysis Within The Type and Transparency Context

There is a complex, multi-level nudging process in wind energy transition. The global context nudges both national level public authorities and investors. National level policies and incentives provided by the public authorities nudge investors and inhabitants. They also nudge inhabitants through regional and local level plans nudge inhabitants. This happens as either automatic or prompted choice for wind energy development through either transparent or non-transparent manner. Following Table 7.16 summarizes the multi-level nudging framework of the actor groups in wind energy transition at international, national and regional levels in relation to the context of İzmir.

On the one hand, automatic choice for wind energy development is often nudged in a top-down direction. International agreements impact national decisions, and the national configuration of new contextual settings makes wind energy development available. Additionally, new energy production with the use of other energy sources is also locally suggested to become a national policy. On the other hand, prompted choice for wind energy development is also often stimulated in a top-down direction through legal, strategic and informative mechanisms. The bottom-up direction comes as a demand for inclusive policies and actions to re-frame the wind energy context at the national level.

Table 7.16 Multi-Level Nudging Framework for Wind Energy Transition According to Type and Transparency Contextualization

	TYPE 1 [Not Reflective]	
TRANSPARENT	Automatic Choice **New Impulse Creation** *creating changes in a defined setting	**International to National** *Agreements on renewable energy transition and decrease in carbon emission to catalyze decision makers, investors and inhabitants - Kyoto protocol - Paris Agreement - Energy Dialogue between EU *Provision of wind energy related R&D influencing investors and inhabitants
NON-TRANSPARENT	Automatic Choice **New Context Creation** *creating a setting default for automatic choice	**National to Regional and Local** *Determination of wind energy development sites - Renewable Energy Resource Areas (YEKA) system **Local to National** *Demand of a new setting for energy production - the use of resources other than wind energy

Table 7.16 (continued)

	TYPE 2 [Reflective]	
TRANSPARENT	Prompted Choice **Contextual Association** *providing legal-financial frameworks-incentives **information provision** *providing factual information *providing a specific message for prompted choice	**National to Regional** *Provision of guiding policy documents at national level nudging all actor groups (investors, civil society organizations and inhabitants) - The National Development Plans - Climate Change Strategy and Action Plan - The National Renewable Energy Action Plan of Turkey *Provision of incentives and support mechanisms - YEKDEM, tax exemptions, free-of-charge services - YEK-G System: recording and documenting the characteristics of each 1 MWh of renewable energy supplied by the licensed renewable energy developers **Regional to Local** - Regional strategy documents by Regional Development Agencies **National to Local** *Promotion of renewable energy information, campaigns - Green tariff - YEK-G System: recording and documenting the characteristics of each 1 MWh of renewable energy for consumers **Local to National** *Demand for the provision of governmental incentives and inclusive policies on wind energy (participation, public benefits)
NON-TRANSPARENT	Prompted Choice **Information Selection** *simplification / context re-framing	**International to Local** *Provision of selected wind energy related R&D information **National to Local** *Provision of selected wind energy related information in terms of its environmental, economic, sensory and technological impacts *Provision of social and economic benefits by investors to the locality - Construction of roads - Public buildings - Supply of energy needs - Employment of local people **Local to National** * Provision of selected wind energy related local contextual preferences through civil platforms *Self-organized actions (legal channels /protests/unity)

The global renewable energy context nudge decision makers at the international level. The category of these nudges is **Type 1 – Transparent** nudges where global context provides the creation of a “new impulse” within the energy production and consumption patterns in terms of “creating changes in a defined setting” through international agreements. The reviewed documents indicate that Turkish decision-makers are primarily nudged by the global climate change and sustainability context in terms of orienting the national energy perspectives. The globally binding documents such as Kyoto Protocol and Paris Agreement nudge Turkish national policies since the early 2000s. Similarly, energy dialogue developed between Turkey and EU nudges national energy approaches. The global wind energy context nudges national investors by providing opportunities for research and development on the technology to be used wind energy sector (e.g. wind turbine designs, micro-siting techniques; health impact researchs).

Within this framework, decision-makers nudge other actor groups through **Type 2 – transparent** nudges where public authorities provide legal-financial frameworks, incentives and information regarding wind energy development and transition. In this respect, public authorities set national goals, produce guiding policies, strategy documents, plans, and prepare legal frameworks to support renewable energy transition. The National Development Plans, Climate Change Strategy and Action Plan, The National Renewable Energy Action Plan of Turkey are the main guiding policy documents at the national level nudging all other actor groups particularly in the investors of the private sector, civil society organizations and inhabitants. On the other hand, at the regional level, the preparation of regional strategy documents by Regional Development Agencies lead the spatial plans at the local level, and thereby, nudge inhabitants, subject to direct impacts of the plans. Additionally, wind energy investors are nudged by the provision of incentives and support mechanisms such as YEKDEM (support for using domestically produced components), tax exemptions, and free-of-charge services for wind energy development. Moreover, providing renewable energy information and promoting campaigns such as the Green tariff enacted by public authorities also nudge inhabitants.

While an automatic response is activated through transparent actions, this study asserts that there are also nontransparent forces that result in impulse for favoring wind energy development. This is most seen at the regional level. Decision-makers nudge investors and inhabitants within the context of wind energy with **Type 1 – nontransparent** actions at the regional level by determining appropriate sites for wind energy development. They do that by showing Renewable Energy Resource Areas (YEKA) for investment throughout the country. Although YEKA is a product of renewable energy policies, it restructures the geographical boundaries of a new context in which wind energy development can take place.

Additionally, civil society initiatives also nudge investors and inhabitants in both top-down and bottom-up directions. The findings of focus group, in-depth interviews and field work indicate that civil society organizations may be selecting information and re-framing the context in a way that decreases the value of wind energy development by assigning a negative meaning to wind. This is also done on the other direction, however, through diffusing an international and national discourse in favor of renewable energy particularly with a connation of cleaning the air. An image of a turbine, symbolizing a world that effectively combat with environmental problems, particularly climate change, is included on the cover pages of many documents, circulating in global and national institutional settings. In this respect, civil society organizations nudge investors and inhabitants through **type 2 – nontransparent** actions by providing selected information on the environmental, economic, sensory and technological impacts of wind energy. Moreover, the results of the fieldwork illustrate that wind energy investors nudge inhabitants through **type 2 – nontransparent** actions. To do that, they reframe the impact of wind energy development, this time, by providing social and economic benefits to the locality such as construction of roads, public buildings, supplying energy needs, and employing local people.

This study asserts that all actors through their actions nudge inhabitants. While decision makers nudge them by implementing policies and plans, civil society organizations nudge them by giving information, and investors by providing benefits. The findings of the study regarding the assessments of NIMBY attitude and solution suggestions of the inhabitants confirm that inhabitants are in search for

Type 2 – transparent nudges. They intend to determine the limitations and setback distances within a legal framework, challenge governmental incentives on wind energy, and demand for information, participation and provision of public benefits. They also emphasize the **Type 2 – nontransparent** nudges by re-framing the expression of public opposition against wind energy development in terms of collective movements (legal channels /protests/unity). The Type 1-non-transparent nudges are mentioned regarding the use of other resources than wind energy signify, since a new setting is recommended for the energy production. However, they are not in favor of Type 2 – transparent nudges as supporting cooperative structure for wind energy production or paying extra for electricity from wind energy.

CHAPTER 8

FINAL COMMENTS AND DISCUSSION

This study explored the public opposition context of the wind energy transition process which incorporates social and technical dimensions at multiple levels: international, national, regional and local. To do that the study extracted the wind energy development process in the Turkish context, and identified the socio-spatial sensitivity issues (environmental, economic, sensory and technological) in wind energy transition at a local scale in the case of İzmir. In order to better understand the possible conditions, triggering the involved actors in wind energy transition and explain the underlying reasons for the social dynamics of public opposition, the study adopted the theory of nudging. In this respect, the study mapped the process of wind energy development, assessed the previously defined socio-spatial sensitivities and NIMBY attitude criteria in the case study area; and examined group differences regarding wind energy preferences as well as the sensitivities according to the differentiating distances to the wind energy facilities, locational characteristics, gender and age groups. The study also developed a multi-level nudging analysis framework for the wind energy transition.

The results of the study made important contribution in various ways, theoretical, methodological, and practical professional. On the other hand, the study also opened up new areas of further inquiry. The following sections will highlight these points.

8.1 Long, Intricate, Bureaucratic, Multi-Actor, Top-Down Process of Wind Energy Development and the Needs Within the Planning Context

The findings of the study show that the wind energy development process is a long, intricate, bureaucratic, and multi-actor process which is carried out basically in the form of solely licensing the wind energy facilities. The wind energy transition occurs in pursuit of top-down approaches where central authorities take the leading role and yet, fail constructing the coordination with regional and local level spatial plans. The growing gap between "social" concerns and central authorities' wind energy development decisions taken without a consideration of these concerns creates a legitimate basis for the society to react. In this respect, the process of energy generation from the wind calls for a socially and locally sensitive approach in addition to technical solutions.

To support that, wind energy planning should be facilitated through public participation and communication. Although participatory planning processes are legally defined, participation opportunities and mechanisms in wind energy development process remain limited (e.g. EIA public meetings and plan suspension periods). The only objection tool of the society remains as the legal lawsuits about 1) land expropriation 2) the plan of the wind energy development site after it is approved.

An inclusive spatial planning system integrating local level niche solutions and responding the local sensitivities should be adopted. In addition, a feedback mechanism from the bottom to the up should be established, and thereby, local level plans should be in communication with upper level plans within an iterative manner both physically (e.g. site selection for wind energy facilities), and communicatively (e.g. dialogue with inhabitants) contexts.

Additionally, although socio-technical transitions of historical, emergent technologies present a relatively smooth and straight narrative; this study reveals a rather complicated, non-linear process in wind energy transition within the context of sustainability transitions requiring a sophisticated approach. In fact, Geels (2002) suggests changing the landscape and patchwork of regimes with feedbacks from local niches, but this research indicates that this does not work properly in wind energy processes. Local actions remain at the reaction level in terms of opposing the wind energy facilities rather than offering niche solutions. This may be due to the community's perception of wind energy facilities as a danger threatening their lives with an intense emotional relation. The only one area where the patchwork of regimes has changed with the local niche movements is the enactment of the decision to have EIA reports obligatory for all the wind farms, that used to be necessary for the wind farms only with 50MW and above capacities. However, the cumulative effect is still not considered. Thus, there is not a complete regime change responding to local sensitivities.

8.2 An Alternative Approach: Planning Through Nudging

Considering the findings of the study that the wind energy development process incorporates a variety of nudges implemented by numerous local, regional, national and international level actors, approaching the context of planning through the nudging perspective may provide an alternative planning framework. The existing wind energy development system is stimulated with a variety of nudges by local, regional, national and international actors for automatic and prompted choices regarding wind energy deployment through legislation, agreements, policies and plans. These nudges impact the actors as well as their actions, yet, results in a negative attitude in the local context as that wind energy development should stop. The top-down interventions nudging wind energy investors but disregarding inhabitants' sensitivities at the local level lead to growing public oppositions, discontentments and disappointments in the society. Accordingly, when wind energy development process does not consider this, establishing dialogue alone remains inadequate.

Nudging theory may guide the construction of a mechanism involving all actor groups at all levels through positively activating the nudging areas while maintaing a fair development for all. For instance, creating a “public benefit mechanisms” (e.g. holding a share in an energy facility in the locality; meeting the electricity expenses) provided upon an agreement with local people may help ensure a smooth wind energy development process. In the case of İzmir, having locally owned energy cooperatives instead of a large energy company or a foreign investor in the area may help resolve the public opposition against wind energy development (Haggett and Toke, 2006; Warren and McFadyen, 2010; Slattery et.al., 2013; Mulvaney et.al., 2013; Sonnberger and Ruddat, 2017). Although this was not highly accepted by the respondents of this research, there may be a knowledge gap or the lack of a powerful stimulus to establish these mechanisms in the site. Above all, this or other working and meaningful niche solutions may be designed together in a process of dialogue and communication.

However, in order for the local people in İzmir to engage in energy cooperatives, there needs to be a positive attitude developed towards wind energy at the first place. The existing opposition against wind energy developments shows that even cooperatives may not be the solution for the research areas. The opposition may still continue in those areas due to the growing mega scale and widespread investments in contrast with the meaning and mission of local cooperatives that should have been small scale and useful for the locality (Figure 8.1).

Figure 8.1. Photos of local protests against wind energy facilities in İzmir (from the Hürriyet archive: 2017–2018)

On the other hand, nudging theory can be taken as an ideological stand which is "paternal liberalism", and “nudging” can be used as a “strategy” to persuade people in various subjects within an urban planning context. However, it is obviously not realistic to seek a persuasion mechanism for each and every subject. In this respect, some implementations (e.g. large-scale energy investments) should either not exist or stop. For instance, social and spatial saturation for wind energy development that has been reached to its limits in İzmir may not allow the development of such a mechanism in any case. When considered central governments enable the siting of wind energy facilities in naturally and culturally important areas through top-down nudges (e.g. plan decisions), bottom-up responses become reactive rather than pro-active. Then, they search for the channels to nudge upper level actors. In order to facilitate nudging mechanisms effectively in both directions, adopting a constructivist approach by both the local people and the central government is vital. Currently, in the İzmir case, as to achieve a constructive nudging environment local communities require a certain period of time to adapt to the effects of wind energy development and to allow new developments. On the other hand, for a nudging mechanism to work appropriately, it is essential for the actors in each and every level to reach a certain level of social and technical capacity. Movements that are concentrated only around emotional reactions fail in creating strong and sustainable nudging mechanisms, which, in turn, fails in action. In other words, nudging requires knowledge to work, especially when emotional reactions are negative, one can only reverse them through rational thinking provided through appropriate mediums.

8.3 Reframing the Site Selection Criteria According to Socio-Spatial Sensitivities

Turkish planning legislation provides limited regulations that are sensitive to the site selection of wind energy facilities with respect to human settlements, socio-economic activity areas, and naturally and culturally special areas. Yet, the study revelas that socio-spatial sensitivities are salient within 1 km and above distance from wind energy facilities. With an assumption that socio-spatial sensitivities co-exist by affecting each other, even only one sensitivity area is salient at a distance of more than 1 km indicates that wind energy facilities should be located in a distance above 1 km from settlements, natural and culturally valuable areas, socio-economic activity areas (e.g. agriculture: plant production, husbandry areas). When sensitivities are considered individually, this research confirms that the noise affect is salient within 1 km distance, wind energy facilities should be located above 1 km distance for noise disturbances. Moreover, micro level noise analysis should be examined for the site selection of wind energy facilities (e.g. micro geographic analysis: shore, forest, background noise, wind conditions). The consideration of the effect of single wind energy facility is not adequate. When more than one facility resides in closer distance, all facilities create an accumulated effect. Although a recent IEA amendment issued in 2022 that the EIA is required for all wind energy facilities regardless of the facility's size and capacity; the cumulative effect is not included. The accumulated effect of wind energy facilities should be considered in the site selection of nearby facilities.

Although the emphasis on "above 1 km" seem to delimit the socio-spatial implications of wind energy developments into a spatial dimension, findings of this research confirm the spatial codes and sensitivity areas studied in different countries. Despite the potentially occurring power relations of local politics, this study affirms that the distance of mega infrastructures from living sites seem to play a vital role in the occurrence of discomfort in the society.

Additionally, mechanisms regarding the provision of public benefits (e.g. holding a share in an energy facility in the locality; meeting the electricity expenses) should be developed agreed with local people.

Respectively, the study reveals that wind energy production creates a sensitivity in the society about natural life, agriculture (plant production), animal husbandry, image, noise, health, magnetic field and the number of turbines in İzmir. The socio-spatial sensitivities significantly correspond with the international literature sensitivities on natural life and noise (e.g. Cavallaro and Ciralo, 2005; Lee et.al. 2020; Aydın et.al., 2013; Bakker et.al., 2012). The sensitivity on natural life is valid for all distances from wind energy facilities (0-500m, 500m-1km, 1km+), among all gender and age groups. Higher sensitivity on natural life is identified in locations with natural values such as forest, shore and grassland areas. Noise impact is felt specifically up to 1 km distances from wind energy facilities, valid for both women and men, specifically in middle-aged group. Participants in shore (Germiyan) and grassland (Atçılar) areas feel higher noise impacts. Differing from the previous research indicating that seashores with wind and wave background noise, cause less noise annoyance (Dai et.al., 2015), Germiyan shows higher noise sensitivity. On the other hand, corresponding with the literature, Atçılar with lower background noise is more sensitive to wind turbine noise. Additionally, the research findings also highlight İzmir specific sensitivities on agriculture (plant production) and husbandry that are rarely studied in international literature. The numerical results and insights of the participants indicate that wind energy facilities affect agriculture (plant production) and animal husbandry as the local economic activities within 1km distances, especially for the elderly age group. Germiyan and Atçılar show the highest sensitivity in terms of impact of wind energy facilities on agriculture and husbandry. Germiyan is a shore area close to settlement; and Atçılar is grassland area. The felt impact may be related with both settlements' locational characteristics and cultural profiles in terms of public opposition. Visual sensitivities are mainly felt in closer distances (0-500m), and significantly decreases in distances beyond 1 km. Locations with visual sensitivities include natural values as forest, shore, grassland. Sensitivities on health issues are relatively lower in all distances. However, participants in grassland area Atçılar and elderly age group indicate higher health concerns. The felt impact may also be related to the settlement's cultural profiles in terms of public opposition. The findings of the study reveals that there is a sensitivity regarding the number of turbines surrounding the settlements. The numerical ratings and insights of the participants reveal the existence of a cumulative effect caused by the siting of wind energy facilities next to each other. The disturbance is much higher than the affect of the sum and it is felt untolerable by the community. The in-depth findings of the study illustrate a significant difference that some participants' evaluations about the sensitivities are based on what they heard from others, not reflecting their experiences. Therefore, considering the the proportion of primary school graduates in the sample, which is more than half, the findings may also justify the intent to share not what is experienced but what is collectively recognized.

The study also indicates that NIMBY attitude exists up to 1 km distance, and significantly decreases beyond 1 km distance. Having a wind energy facility at the vicinity is unfair for the participants in shore+settlement (Germiyan) and forest+grassland (Atçılar) settlements. Correspondingly, the participants in these locations feel like they endure the consequences of the wind energy facility problem caused by others. Unfairness is valid especially for men, middle aged and elderly age groups. On the other hand, there is an expectation for the provision of public benefits to the locality in return for having a wind energy facility in all distances. In addition to this, relatively higher values are found among women, middle aged and elderly age groups and in forest+shore (Germiyan) location.

Apart from the statistical agreement/disagreement values that the study found, the fieldwork experience indicated that inhabitants of research sites, in fact, totally disagree with any wind energy related issue due to accumulated effect of the wind energy facilities. Although a recent IEA amendment issued in 2022 that the EIA is required for all wind energy facilities regardless of the facility's size and capacity; the cumulative effect is not included. Additionally, this contextual and experiential saturation lead growing public opposition against wind energy developments. Accordingly, application of such a research also alarmed the local society's concerns during the fieldwork that it is sponsored by the wind energy industry and that its purpose is to manipulate the local reality in favor of wind energy development. Consequently, they set barriers for the construction of any common ground opportunity for communication.

The study has started with an intention to understand the wind energy transition process by looking at the pieces of the whole process. But the field experience showed that the research should rather adopt a holistic approach in order to see all the interactions taking place between actors and that the whole is more than the sum of its parts. This research shows that wind energy development process works with a variety of actors on multiple levels (international, national, regional, local) through a nudging system via legislation, agreements, policies and plans. Yet the existing system results in a negative attitude in the local context and that wind energy development should stop. When wind energy development process does not consider this, only a communication dialogue remains insufficient. In this respect, nudging theory may support the construction of such a mechanism that is working for all the actor groups at all levels through looking at the areas to nudge.

It is obvious that the existing planning system falls short to explain the dynamics and impulses of such a big scale, internationally driven and nationally supported wind energy development process and fails to overcome the local level challenges. The top-down approaches nudging wind energy investors, yet disregarding local level sensitivities of the inhabitants leads growing public opposition, and discontentment and disappointment in the society. In this respect, a more inclusive spatial planning system allowing incorporation of the local level niche solutions by responding the sensitivities at the local level should be developed. This also calls for the construction of a brand new public participation and communication mechanism, other than the one that the communicative rationality provides. Local level plans should be in communication with upper level plans within an iterative context during both physical (e.g. site selection for wind energy facilities), and communicatively (e.g. dialogue creation between inhabitants), since the whole system is stimulated with a variety of nudges by national international actors, for automatic and prompted choices regarding wind energy deployment. The communication context should consider the nudges that impact the actors' as well as their actions.

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Yenilenebilir Enerji Kaynak Alanları Yönetmeliği (Renewable Energy Resource Areas Regulation), Official Gazette Publication on 9/10/2016.

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PUBLICATIONS

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