THE ROLE OF LOCAL GOVERNMENTS IN CLIMATE CHANGE ADAPTATION: ACHIEVEMENTS AND BARRIERS IN THE TURKISH CASE

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ABSTRACT

THE ROLE OF LOCAL GOVERNMENTS IN CLIMATE CHANGE ADAPTATION: ACHIEVEMENTS AND BARRIERS IN THE TURKISH CASE

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Global warming is manifesting visible consequences at regional and local scales. Cities are considered among major contributors of climate change while also being a victim of it. It is vital to anticipate the adverse impacts of climate change in cities and take appropriate actions to prevent or minimize the damage they may be exposed. The Mediterranean Basin, in which Turkey is located, is one of the regions with the highest vulnerability to climate change. Turkey's First National Communication on Climate Change prepared in 2007 specifies the impacts of climate change in Turkey as; increasing summer temperatures, decreasing winter precipitation in western provinces, loss of surface water, increased frequency of droughts, land degradation, coastal erosion and floods. Climate problem is global but its solution is local. Municipalities are in charge of controlling and managing various processes in urban areas which may affect GHG emissions and climate vulnerability as part of urban planning and management processes. However existing studies and implementations are far from being affective in terms of climate change adaptation. The purpose of this study is to investigate barriers, inadequacies and achievements

on climate change adaptation from the conjuncture of different types of local governments, based on a literature review and a case study involving questionnaire with the experts from three kinds of municipalities (metropolitan, provincial and metropolitan district) in Turkey. Therefore, main questions of the thesis are as follows: “What are the reasons for lack of enough actions by municipalities to ensure adaptation to climate change?” and “Are these reasons vary according to the scale or political context of the municipality?”. In this context; lack of capacity and citizen demand, budget constraints, lack of coordination between units/directorates within the municipality, limited cooperation with other municipalities, insufficiency of sanctions or support of central government and inadequate legislation are determined as the main barriers towards an effective adaptation in the Turkish context. Reasons also differ by political parties and scales of municipalities.

Keywords: Climate change, climate change adaptation, local governments, climate policy, Turkey

ÖZ

İKLİM DEĞİŞİKLİĞİNE ADAPTASYON SÜRECİNDE YEREL YÖNETİMLERİN ROLÜ: TÜRKİYE ÖRNEĞİNDE KAZANIM VE ENGELLER

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Küresel ısınma bölgesel ve yerel ölçekte görünür bir biçimde sonuçlarını göstermektedir. Kentler iklim değişikliğinin hem önemli bir tetikleyicisi hem de kurbanıdır. Kentlerde iklim değişikliği nedeniyle meydana gelebilecek tehditleri önceden belirleyerek en aza indirmek veya engelleyebilmek için adım atılması çok önemlidir. Türkiye'nin de içinde yer aldığı Akdeniz Havzası, iklim değişikliği açısından etkilenebilirliği en yüksek bölgelerdendir. 2007 yılında hazırlanan Türkiye'nin İklim Değişikliği 1. Ulusal Bildirimi'nde iklim değişikliğinin Türkiye üzerindeki etkileri; artan yaz sıcaklıkları, batı illerinde kış yağışlarının azalması, yüzey suyunun kaybedilmesi, kuraklık yaşanma sıklığının artması, arazi bozulması, kıyısal erozyon ve seller olarak belirtilmiştir. İklim sorunu küreseldir, fakat çözümü yereldedir. Belediyeler, kentsel planlama ve süreçlerin bir parçası olarak, sera gazı emisyonlarını ve iklim hassasiyeti gibi çeşitli kentsel süreçleri kontrol etmek ve yönetmekle yükümlüdürler. Ancak, yapılan mevcut çalışmalar ve uygulamaların iklim değişikliğine adaptasyon kapsamında etkili olmadığı görülmektedir. Bu çalışmanın amacı, literatür taraması ile birlikte Türkiye'deki üç tür belediyeden

(büyükşehir, il ve büyükşehir ilçe) uzmanlarla yapılan anket çalışmasına dayanarak iklim değişikliği adaptasyonu ile ilgili engelleri, yetersizlikleri ve kazanımları farklı belediye türlerinin konjonktüründen belirlemektir. Dolayısıyla, tezin ana soruları şu şekildedir: "Belediyelerde iklim değişikliğine uyum konusunda yeterli çalışma bulunmamasının sebepleri nelerdir?" ve "Bu nedenler belediyenin ölçeğine veya siyasi durumuna göre değişiyor mu?" Bu kapsamda; kapasite eksikliği, vatandaş talebi azlığı, bütçe kısıtlamaları, belediyedeki birimler/ müdürlükler arasında koordinasyon eksikliği, diğer belediyelerle kısıtlı işbirliği, merkezi hükümetin yaptırım veya desteğinin yetersiz olması ve yetersiz mevzuat Türkiye örneğinde etkin bir uyumun önündeki ana engeller olarak belirlenmiştir. Bunun yanı sıra, bu engellerin belediyelerin ölçeklerine ve siyasi partilere göre farklılık gösterdiği de görülmüştür.

Anahtar Kelimeler: İklim değişikliği, iklim değişikliğine uyum, yerel yönetimler, iklim politikası, Türkiye

To my parents

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LIST OF ABBREVIATIONS

ABBREVIATIONS

AKP	Justice and Development Party
CBCC	Coordination Board on Climate Change
CHP	Republican People's Party
COP	Conference of the Parties
DCCEE	Department of Climate Change and Energy Efficiency
EEA	European Economic Area
EPA	Environmental Protection Agency
EU	European Union
GHG	Greenhouse Gas
HDP	Peoples' Democratic Party
ICLEI	International Council for Local Environmental Initiatives
INDC	Intended Nationally Determined Contribution)
IPCC	Intergovernmental Panel on Climate Change
MHP	Nationalist Movement Party
MoEU	the Ministry of Environment and Urbanization
NAPA	National Adaptation Programmes of Action
NGO	Non-governmental Organization
OECD	Organisation for Economic Cooperation and Development
TMN	Transnational Municipal Networks
TOBB	The Union of Chambers and Commodity Exchanges
TUSIAD	Turkish Industry and Business Association
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization

LIST OF SYMBOLS

SYMBOLS

CH_4	Methane
CO_2	Carbon Dioxide
Gt	Gigatonnes
H_2O	Water Vapor

CHAPTER 1

INTRODUCTION

1.1. Content of the Study

The important impacts of continually occurring extreme climate events in Turkey that are observed asserts the climate change is a critical issue for Turkish cities over the next decades. The Mediterranean Basin in Turkey is among the regions that are highly vulnerable to climate change. The First National Communication on Climate Change in Turkey designates the impacts of climate change in Turkey as; increasing summer temperatures, decreasing winter precipitation in western provinces, loss of surface water, increased frequency of droughts, land degradation, coastal erosion and floods. According to the definition of the Intergovernmental Panel on Climate Change (IPCC) climate change is "a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer". Updated reports of IPCC and other research clearly confirm the influence of humankind on climate change (Zhang et. al., 2011; Pall et al., 2011; IPCC, 2017).

IPCC (2007) defined adaptation as "adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities". Early mitigation actions reduce the impacts of climate change and associated adaptation needs. Even so, although the lowest stabilisation scenarios would be occured, adaptation is necessary in the short and longer terms. But there are barriers, limits and costs of adaptation actions and policies that vary between sectors and regions.

Cities are considered among the major contributors of climate change while also being victims of it. It is vital to anticipate the adverse impacts of climate change in

cities and take appropriate actions to prevent or minimize the damage they may be exposed.

The reasons of why cities occupy a central position in the adaptation agenda are as follows (Carter et. al., 2015);

- The majority of the world's population now live in urban areas,
- Because of high population densities, cities have large numbers of poor and elderly people. So, the number of affected people from insufficient infrastructure, inadequate urban design and climate hazards are high,
- Cities create unique micro-climates because of their impermeable structure and affect their surrounding areas with urban heat island effect.

Accordingly, responsibilities of municipalities gain importance for climate policy. Because, the problem is global but the solution needs to be local. Municipalities are in charge of controlling and managing various processes in cities, which may affect greenhouse gas (GHG) emissions and climate vulnerability as part of urban planning and management. However, existing studies and implementations are far from being effective in terms of climate change adaptation in Turkey (Balaban and Şenol-Balaban, 2015). There may be many reasons for insufficiency of policies and actions.

This study aims to find out the barriers and dynamics behind the lack or inadequacy of local actions and policies for climate change adaptation in Turkey. The study also discusses the solutions of this problem and as well as the achievements occurred so far.

1.2. Aim and Scope of the Study

The purpose of this study is to investigate the barriers, inadequacies and achievements on climate change adaptation from the conjuncture of different types of local governments, based on a literature review and a case study involving questionnaire survey with the experts from three kinds of municipalities (metropolitan, provincial and metropolitan district) in Turkey.

Therefore, the main research questions of the thesis are as follows;

- "What are the reasons for lack of enough actions by municipalities to ensure adaptation to climate change?" and
- "Are these reasons vary according to the scale or political context of the municipality?"

Answers to these questions will guide local governments to understand the challenges and possible solutions to adapt to climate change in their localities.

Moreover, in order to understand the history and current situation of climate change adaptation in Turkey, questions below were asked to the participants of the survey:

- Does your municipality have an action plan for climate change adaptation?
- Is there any action (plan, project, activity, etc.) that your municipality have done/is doing or planning to do for climate change adaptation?
- When did your municipality start to take actions for climate change adaptation?
- Who supported/is supporting/will support climate change adaptation actions of your municipality?
- Which of the following sectors involve these studies and actions?
- What is your rate of consideration when you evaluate your climate change adaptation activities among your other municipal activities?
- Are there any special unit(s) in your municipality working on climate change?
- What conditions/ factors/ drivers are needed in order to increase your municipality's actions on adaptation to climate change?

In the light of the above research inquiries, the main hypothesis of this research is as follows: "There are many reasons for the existing barriers to climate change adaptation and these barriers vary according to the scale or political context of the

municipality". In order to test this hypothesis; the thesis is structured in a particular way, details of which is presented below.

In the second chapter, a brief review of the literature on climate change problem in terms of adaptation and mitigation is presented. Then, the impacts of climate change in Turkey is discussed. This discussion is followed by the examination of the role of the cities in the global climate problem.

In the third chapter, climate policy in Turkey is reviewed in the light of international and national policies. Then, the role of central and local governments in national legislation is examined.

In the fourth chapter, the case study analysis and main findings of the case study are presented and discussed in detail.

In the discussion and conclusion chapter, research findings are further elaborated. Recommendations are made in order to promote adaptation projects in terms of what kind of policies should be implemented. Moreover, on the basis of this thesis, a future research possibility is also discussed.

1.3. The Methodology of the Research

The research design of this study contains mainly case study analysis. Methodology of the research can be seen at Figure 1.1. In this context, firstly, literature review has been carried out on the climate problem and climate policy. Secondly, content of the questionnaire survey is designed. It comprises yes/no type, open-ended, multiple choice and rating (likert) scale questions. The detailed information about survey design is given in the following section. Thirdly, municipalities is determined to conduct the survey. 30 metropolitan municipalities, 61 provincial municipalities and 150 of the most populous district municipalities in Turkish metropolitan cities have been chosen and listed. The limitations of the research is that the number of municipalities are too many, which makes physical transportation to all is both costly

and time constrained. Therefore, a survey was conducted to understand the general profile.

To conduct the survey, the communication data of the experts who are employed in the Department of Environmental Protection and Control or Department of Parks and Gardens of concerning municipalities is collected. The fundamental criterion for those experts to be allowed to participate in this research was their awareness on climate change adaptation goals and capacities, i.e. an objective perception on evaluating the performance of their own municipalities. The reason of choosing these directorates is the regulations of these directorates are directly related to address climate change.

Face to face meetings are realized with the accessible ones (some municipalities of Ankara and the municipalities that attended the meetings about climate change in Ankara). As data collection method, e-mail correspondence and phone interviews are used to communicate with other municipalities. After that, the information obtained was analyzed in order to achieve the aim of the study. To analyze statistically the results of two proportions such as metropolitan district and metropolitan municipalities or CHP and AKP municipalities, z-test is used. It is aimed to find differences and similarities between different responses. In conclusion, research findings are presented and a discussion is made.

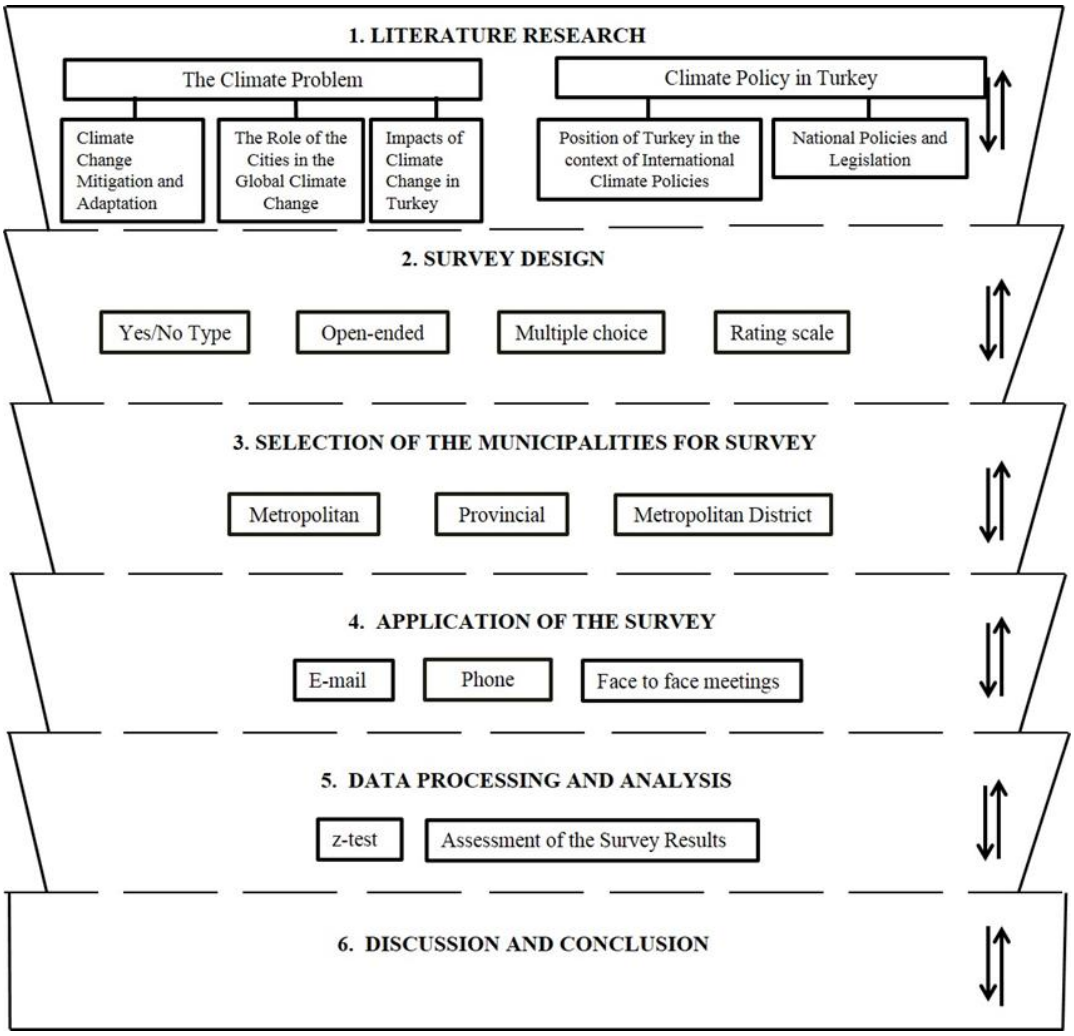


Figure 1.1. Methodology of the research

1.3.1. Survey Design

This section accounts for the discussions on the design of the questionnaire survey implemented. The whole list of the questions is clearly expressed at the end of this dissertation as an attachment (see Appendix I). The queries for gathering information from the municipal organizations have intentionally been selected for clarifying the following considerations:

- To identify the major difficulties/barriers that the local governments (i.e. municipalities in Turkey) faced within the process of adaptation to climate change

- To identify differences among different political parties and different scale of municipalities (metropolitan, provincial and district) within the scope of difficulties/barriers that the local governments faced with in the process of adaptation to climate change
- To verify the expected problems and search for possible solutions to them.

The survey given in the Appendix 1 has been carried out with the experts who are employed in the Department of Environmental Protection and Control or Department of Parks and Gardens of the concerning municipalities. As mentioned above, the fundamental criterion for those experts to be allowed to participate in this research was their awareness on the climate change adaptation goals and capacities, i.e. an objective perception on evaluating the performance of their own municipalities.

The overall number of questions was 14 at the original draft of the survey where the content of the survey involves a variety of distinct styles of these questions: (i) yes/no type, (ii) open-ended type, (iii) multiple choice type and (iv) rating scale type. Nevertheless, some parts of the survey are not expected to be responded unless they have exact correspondence to relevant situations:

- The representatives of municipal organizations should respond all of the questions if they have an action plan for adaptation to climate change and any other plan, project, activity, etc. in the same purpose.
- If the corresponding municipal organizations have not prepared an action plan regarding their compliance with the climate change, they should reply to 13 questions.
- If the municipality has not prepared any plan, project, activity, etc. to adapt to climate change besides not having an intention do to so, the number of questions required to be answered become 11.
- In case the municipal organization does not have any particular unit(s) working on climate change, a total of 13 questions of the survey should be respond to.

CHAPTER 2

THE CLIMATE PROBLEM

2.1. Climate Change

The climate system is a very complex system consisting of five components (atmosphere, land, ocean, ice and biosphere). The climate system evolves in time under the influence of its own internal dynamics and external factors. External factors include volcanic eruptions, solar variations and human-induced changes in atmospheric composition. The driving force for climate is energy from the Sun (IPCC, 2007).

According to IPCC (2007), the radiation balance of the Earth can change, if;

- "The incoming solar radiation changes (e.g., by changes in Earth's orbit or in the Sun)
- The fraction of solar radiation that is reflected changes (e.g. by changes in cloud cover, atmospheric particles or vegetation)
- The longwave radiation from Earth back towards space (e.g. by changing greenhouse gas concentrations)"

The atmosphere and surface of the Earth intercept solar radiation, about a third of it is reflected, the rest is absorbed. The Earth, must radiate the same amount absorbed before back to the space. Much of this radiation emitted by the land and ocean is absorbed by the atmosphere and reradiated back to the Earth. This process is called as the greenhouse gas (GHG) effect. The GHG effect is essential for the life on Earth because it keeps the Earth warm. Otherwise, the average temperature of the Earth's surface would be below the freezing point of water. On the other hand, human activities with the beginning of the industrialized era, increased the burning fossil fuels and destruction of the forests. These causes have intensified the natural

greenhouse effect and contributed to global warming (IPCC, 2007). After encountering a number of catastrophic natural disasters over the last decades and monitoring the outcomes of scientific investigations accelerated in the recent years, it is confirmed that there has been no doubt about the existence of a global climate change (Zhang et. al., 2011; Pall et al., 2011).

In the Fourth Assessment Report of IPCC (2007), it is reported that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level". As the most commonly used descriptions in the related literature, two separate particular definitions are proposed to characterize the climate change by IPCC and United Nations Framework Convention on Climate Change (UNFCCC).

The definition of IPCC (2018a) describes the climate change as "a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity". Similarly, an analogous definition suggested by UNFCCC (1992) have expressed the phenomenon as "a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods". Although both definitions have become valid in the field, there is only a slight distinction in their respective arguments about the reasons for the climate change.

With respect to the possible causes of climate change, UNFCCC evidently mentioned the impact of human activity on the climate change. On the other side, IPCC did not first provided an apparent conclusion as inferred from their initial reports. With the updated reports in the recent years, on the other hand, they clearly highlighted the influence of humankind on the climate change. Their manifested statements at each renewal of IPCC reports can be sorted (in chronological order) as follows:

- The IPCC report of 1990 claims that natural variability may be the main reason behind climate change.
- The IPCC report of 1995, identifies one of the key findings of the report as, the observations suggest “a discernible human influence on global climate”.
- In the IPCC report of 2001, there was a stronger evidence that most of the warming observed over the last 50 years may be attributed to human activities.
- The IPCC report of 2007, it is confirmed that human activities have already influenced the climate. And it has been declared that, recent anthropogenic emissions of green-house gases are the highest in the history.

Fifth Assessment Report of IPCC (2014) claims that each of the last 30 years has become gradually warmer at the surface of the Earth than any previous decade since 1850. Figure 2.1-a shows the period between 1983 and 2012 which is the warmest 30-year period of the last 1400 years in the Northern Hemisphere. Average global temperature data of land and ocean surface together show that temperature increased by 0.85°C between 1880 and 2012. Between 1901 and 2010 sea level increased by the mean value of 0.19 m globally (Figure 2.1-b). The increase rate of sea level since the 1850s has been larger than the mean rate of the previous two thousand years. Economic and population growth after pre-industrial era have triggered increasing of anthropogenic GHG emissions with the rate that has not been seen before in the last 800,000 years (Figure 2.1-c). These GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Between 1750 and 2011, cumulative anthropogenic CO_2 emissions absorbed by the atmosphere were 2040 ± 310 $GtCO_2$ as can be seen in Figure 2.1-d. About 40% of the emissions have remained in the atmosphere (880 ± 35 $GtCO_2$); the rest was stored on land and in the ocean. The ocean has absorbed about 30% of the emitted anthropogenic CO_2 which increases the acidic rate of the ocean.

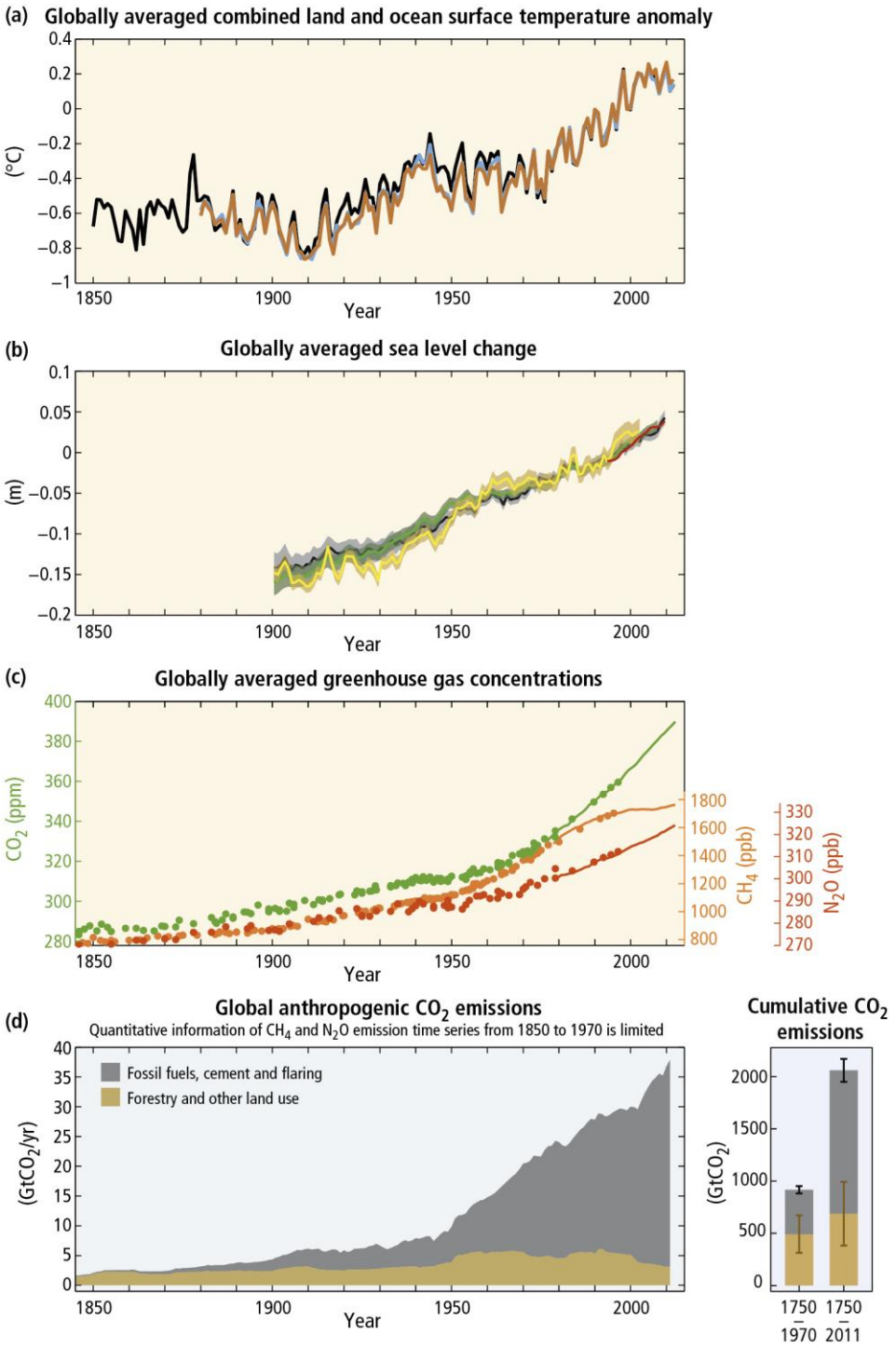


Figure 2.1. Global measurements of land and ocean surface temperature, sea level change, greenhouse gas concentrations and anthropogenic CO_2 emissions between 1850 to 2012.

Source: (IPCC, 2014)

Observed trends, in terms of increases in heat waves and heavy precipitation events, have a high possibility, intensifying over the 21st century (IPCC, 2007b). Societies and ecosystems are estimated to be under an important risk which will be caused by extreme weather and climate events (IPCC, 2012). Greenhouse gas emissions, deforestation rates, and the response of ecosystems to climate change will create the degree of future climate change (Carter, 2015). In IPCC Special Report (2018b), human activities are estimated to cause global warming with a range of 0.8°C to 1.2°C above pre-industrial levels. And it is believed that, if it stays business-as-usual, it can reach 1.5°C between the years 2030 and 2052.

Climate change causes negative impacts on air, water, plants, animals, economy, agriculture and health (VijayaVenkataRaman et. al., 2012). Also, global markets will be disrupted, climate refugees will increase and there will be social and economic negative effects. Therefore, it is not enough to know how the earth system will be affected by the climate change problem. The ecological, economic and social consequences of this problem should also be interpreted. In this sense, mitigation and adaptation gain importance.

2.1.1. Climate Change Mitigation

Mitigation is a human activity that aims to decrease the further concentration of GHGs by reducing the sources of fossil fuel use or increasing the quality and quantity of carbon sinks. By the help of adaptation, mitigation actions help realization of the objectives expressed in the UNFCCC (IPCC, 2014). By effective mitigation, further concentration of GHGs can be decreased, delayed or prevented (IPCC, 2007). Early mitigation actions can prevent further increases of GHGs and reduce adaptation needs (IPCC, 2007).

Cities are important within the process of implementing the mitigation actions. Cities are responsible for approximately 25% of global energy use and energy related GHGs because of their population levels. Therefore, adoption of low emission strategies will be realized there (Gouldson et al., 2015; IPCC, 2014; UN DESA, 2014; WHO, 2014; Mi et. al., 2019). In this sense, cities have to conduct their

mitigation implementations about urban development, energy use and efficiency, environment, human health, and ecosystem with an integrated approach (Gouldson 2016; Mi et. al., 2019).

Climate change mitigation policies mostly divided into two categories; quantity and price based mechanisms. Carbon emission trading is the example of quantity based mechanism. In this method, every country have a limit on emission permit and they can buy or sell their permits in the market. Carbon or energy consumption tax is the example of price based mechanism. Ton of CO_2 emission fee is fixed in this method (Mi et. al., 2019).

However, IPCC (2014) stated that many cities have institutional, financial and technical gaps in mitigation field to switch to low emission development (Gouldson 2016). The technical gaps are (Mi et. al., 2019);

- "Lack of sufficient GHG emissions data at urban level;
- Lack of scientific understanding of the roles of urban sectors in mitigating climate change;
- Lack of scientific understanding of the dynamics between sustainable development and climate change mitigation in cities;
- Lack of scientific understanding of how cities choose climate change mitigation strategies and local actions".

To combat these inadequacies -especially institutional and financial gaps-, effective multi-level interactions across vertical governance are needed. Management plans of the cities are often reflection of the international frameworks and agreements (Anguelovski and Carmin, 2011; Franzén, 2013; Schreurs, 2010; Gouldson, 2016).

2.1.2. Climate Change Adaptation

Mitigation and adaptation deserve the same priority to combat climate change (Rosenzweig et al., 2010; IPCC, 2014; Pancost, 2016). However, in solution process, mitigation is mostly used than adaptation both in governmental and non-

governmental actions (Liu et al., 2008). However, adaptation would be necessary and inevitable even if the lowest stabilization scenarios are occurred (IPCC, 2007). Climate change adaptation is described in IPCC (2007) as "adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities." According to this definition, climate change adaptation is defined as the management of climate risk and it is not purely anthropocentric or it is not merely future oriented (Carter, 2015).

There are many reasons to evaluate adaptation as a very important issue. First, even if the effects of human-induced climate change are ignored, climate's natural variability should be taken into account. Second, when the importance of human-induced climate change is considered, some degree of adaptation will be crucial even if all anthropogenic GHG emissions were halted. Because, there are time lags between rises in GHGs concentration and climate change, and climate change and effects on natural resources. Third, mitigation and adaptation should be considered together to fight the effects of climate change. Fourth, the potential cost of adaptation will help to assess the costs associated with no action and, therefore, promote decision makers to limit GHGs (IPCC, 1990). Finally, carrying out some adaptation measures at an early period can reduce the costs of retrofitting infrastructure at a later stage (IPCC, 2007).

In addition to these reasons, cities are face to face with increasing extreme effects of climate change day by day (Aerts et al., 2014; Birkmann et al., 2016; IPCC, 2012; Mechler and Schinko, 2016), for example, rising sea levels increase flood risk in the cities nearby the sea, inducing potentially serious results for urban socio-economic, ecological and infrastructure systems (Hallegatte et al., 2013; Little et al., 2015; Vousdoukas et al., 2018), heat waves and urban heat island effect affects public health negatively (Shen et al., 2016; Ward et al., 2016; Founda and Santamouris, 2017; Mora et al., 2017). Therefore, adaptation should be implemented immediately, because it is an important factor of the long-term global response to climate change in order to care for people, livelihoods and ecosystems (UNFCCC, 2019).

Adaptation planning and policy have been studied mostly at the national level before, such as through National Adaptation Programmes of Action (NAPAs) (Tompkins, 2005; Agrawal, 2008). But, the impacts of climate change are experienced locally. So, climate vulnerability analysis at local and place-based solutions gain importance (Measham, 2011). After this realization, awareness to adaptation at the local level has increased rapidly in recent years.

Adaptation solutions differ according to the specific context of a community, country or region. There is no single solution to adapt to climate change. Adaptation can contain early warning systems for cyclones, flood defense barriers, redesigning communication systems, producing climate friendly crops etc. (UNFCCC, 2019). Green infrastructure, sustainable land use and planning, and sustainable water management are adaptation options for urban areas (IPCC, 2018b). Successful adaptation necessitates sustainable and successful relationship between all stakeholders. These are; national, regional, multilateral and international organizations, public and private sectors, civil society and other relevant stakeholders (UNFCCC, 2019).

Adaptation process should have feedback mechanism. First, climate impacts, vulnerability and risks should be assessed. Second, adaptation goals, strategies, actions and actors should be planned. After that adaptation action should be implemented. At these stages, transparent and participatory approach considering vulnerable groups, communities and traditional knowledge of indigenous people should be followed. Then action effectiveness should be monitored. If there is a problem to sustain effectiveness, action can be updated (Figure 2.2) (UNFCCC, 2019).

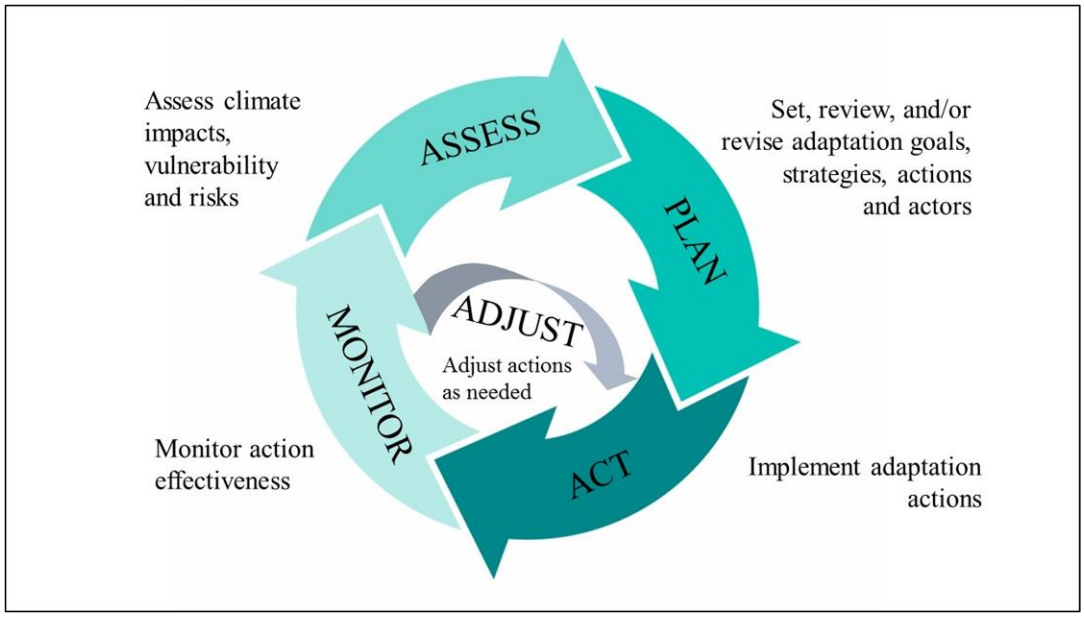


Figure 2.2. Climate change adaptation cycle

Source: Adapted from UNFCCC (2019)

There are many adaptation options. Table 2.1 provides examples of planned adaptation options/strategies and key barriers by sector. Some planned adaptation is taking place limitedly. Almost all of the adaptation activities have various factors. These are; economic development and poverty reduction. And these factors are placed within sectoral, regional and local planning items such as water management planning, sustainable tourism management, coastal defense etc. The key barriers of these strategies contain financial, technical, technological, physical capacity problems (IPCC, 2007).

Table 2.1. Adaptation options/strategies and key barriers by sector.

Sector	Adaptation Option/Strategy	Key Barriers
Water	Rainwater harvesting, re-using water, desalination, irrigation efficiency	Financial, human resources and physical barriers
Agriculture	Adjustment of planting dates and crop variety; improved land management	Technological and financial barriers; access to new varieties; markets
Infrastructure	Protection of existing natural barriers and creation of seawalls, storm surge barriers, wetlands to protect against flooding	Financial and technological barriers; availability of relocation space
Health	Improved climate-sensitive disease management and safe water	Limits to human tolerance (vulnerable groups); knowledge limitations; financial capacity
Tourism	Sustainable tourism management; such as diversification of tourism attractions and revenues; shifting ski slopes to higher altitudes; artificial snow-making	Appeal/marketing of new attractions; financial and logistical challenges; potential adverse impact on other sectors (e.g. artificial snow-making may increase energy use)
Transport	Realignment /relocation; design standards and planning for roads, rail and other infrastructure to cope with warming and flooding	Financial and technological barriers
Energy	Reduce dependence on single sources of energy, strengthening of distribution infrastructure and underground cabling, reduced dependence on single sources of energy with using renewable sources	Access to viable alternatives; financial and technological barriers; acceptance of new technologies

Source: Adapted from IPCC (2007)

2.2. Impacts of Climate Change in Turkey

Turkey's Fifth Communication under UNFCCC, prepared in 2013, mentioned that the impacts of climate change in Turkey in the detail of regions. According to the monthly mean air temperature and monthly total precipitation data recorded by the Turkish Meteorological Services from 1950 to 2010; across Turkey, there is a

significant trend of warming Mediterranean Region of Turkey experienced statistically significant warming trends in winter. Trends observed in the Marmara, Aegean, Mediterranean, Central Anatolia and southeastern Anatolia region experienced an increasing trend in spring mean air temperatures. Especially Istanbul have statistically significant result because of urban heat island effect. In summer, almost all stations experienced increasing trend in air temperature. Autumn mean air temperatures also revealed a warming trend mostly in the Aegean, Mediterranean and Central Anatolia region (MoEU, 2013).

In precipitation trends, decreasing (drying) is observed in winter and spring totals in the Marmara, Aegean, Mediterranean, southeastern Anatolia and in the inner and southern sub-regions of the Central and Eastern Anatolia regions. In summer, both increasing and decreasing trends of precipitation have been experienced. With the exception of the southeastern corner of Turkey, all regions have experienced increasing precipitation in autumn. When annual rainfall trends are evaluated, it is observed that annual total precipitation has decreased over the western and southern regions of Turkey. Contrary to this, Tekirdağ, Istanbul and northern and eastern sub-regions of the Central and Eastern Anatolia regions have experienced increasing precipitation (MoEU, 2013). Tayanç et. al (2009) also found that, in the period of 1950-2004, the variability of urban precipitation series is generally larger than the rural ones, so, urban areas can experience more frequent and severe droughts and floods.

According to the results of measurements of sea level in the Levantine Sea, Cretan Sea and south of the Aegean Sea of the Eastern Mediterranean Sea Basin; an average increase of +1.57 mm/year with a +1.89 mm/year increase in the average maximum and +1.36 mm/year increase in the average minimum is determined (Öztürk, 2011).

According to climate change projections for Turkey prepared by Istanbul Technical University Eurasia Earth Sciences Institute, big rises in surface temperature will be seen in the years between 2041 and 2070. Nearly 1.5°C increase in winter and an increase of 2.4°C in summer across Turkey is expected. Winter temperature is expected to rise by around 3.5°C and summer temperature is expected to rise by 6°C

for surface temperatures by the end of 21st century. The highest temperature increase in winter will be seen in the eastern interior regions of Turkey, and the highest temperature increase in summer will be seen in the southern and southeastern regions of Turkey. Between the years 2011 and 2040, it is projected that most of the regions in Turkey will experience 30% increase in winter and spring precipitation. In the period between the years 2041 and 2070 precipitation amount in winter is expected to decrease by up to 20% in the southern and western regions of Turkey. However, precipitation amount is expected to increase in the northern regions in both seasons. Northwestern parts of the Anatolia will experience heavy precipitation days (up to 10 days) for the first 30 year period. In the periods 2041 to 2070 and 2071 to 2099 heavy rain days number is expected to decrease in the Mediterranean and southeastern Anatolia regions. By the end of the 21st century, number of hot days (temperature is higher than 35 °C) in the southeastern Anatolia region and coastal areas of the Mediterranean region will be increased (MoEU, 2013).

In the light of the above information, the impacts of climate change and vulnerability of regions and sectors in Turkey can be seen at Table 2.2 (MoEU, 2012).

Table 2.2. The impacts of climate change and vulnerability of regions and sectors in Turkey

Impacts of climate change	Intensity	Vulnerable regions in Turkey	Vulnerable sectors in Turkey
Modification of river/ basin regimes	Low	All regions	Ecosystem services and biodiversity
Diminishing of surface waters	Medium	Western Anatolia Region	Agriculture, water distribution infrastructure
Scarcity of usage water	High Medium	İstanbul, Ankara, Aydın, Nevşehir, Bursa Afyon, İzmir, Kayseri, Muğla, Manisa	Urban areas Agriculture, industry, energy
Floods	Medium	Black Sea and Southeastern Anatolia regions	Agriculture, human health
Soil salinity	Low	Mediterranean, Black Sea and Aegean regions	Tourism, ecosystem services, biodiversity, marine products
Loss of quality of soil	Medium	Southwestern Anatolia Region	Agriculture, human health, health of wetlands
Coastal erosion	Low	Black Sea Region	Fishing, unemployment
Degradation of marine ecosystems	Low	Mediterranean, Black Sea and Aegean regions	Ecosystem services and biodiversity
Forest fires	Medium	Western Anatolia Region	Tourism, agriculture
Migration of species to survive	Low	Mediterranean Region	Tourism, agriculture, food security
Decreasing agricultural productivity	Medium	Mediterranean and Aegean Region	Agriculture, food security
Decreasing seafood products	Low	Mediterranean Region	Agriculture, food security, water distribution networks

Source: (MoEU, 2012)

2.3. The Role of the Cities in the Global Climate Change

There is a two-way interaction between climate change and urban areas. Cities are both part of the climate problem and important part of the solution as well (Table 2.3.) (Balaban, 2012; Bulkeley, 2013). Cities are central to global climate change adaptation, mitigation and the implementation of low-carbon development strategies (Mi et. al., 2019). There are many reasons why cities occupy a central position in the climate change agenda and suffer from climate hazards (Carter, 2015).

Table 2.3. Cities as part of the Climate Change Problem and Part of the Solution

Cities as part of the climate problem	**Cities as part of the climate solution**
▪ Over 90% of the cities have developed in locations that may be vulnerable to change, including in coastal areas and on rivers ▪ In 2019, over 55 % of the world's population lived in cities ▪ By 2050, 68% of the world's population will be lived in cities ▪ Cities consume over two-thirds of the world's energy ▪ Cities have creating over 70% of global CO_2 emissions and responsible for over 60% of all GHG emissions ▪ Rapid urbanization is leading to important urban challenges that will be escalated by climate change ▪ By 2030, over 80% of the increase in global energy-related CO_2 emissions	▪ Municipal authorities have population lived in cities responsibility for many processes that shape urban vulnerability and affect GHG emissions at the local level ▪ Municipalities have a democratic mandate from local populations to address issues that affect the city ▪ Municipalities have a history of addressing issues of sustainable climate development ▪ Municipalities can act as a 'laboratory' for testing innovative approaches ▪ Municipal authorities can act in partnership with private and civil society sectors ▪ Cities represent high concentrations of private-sector actors with growing commitment to act on climate change ▪ Cities provide arenas within which civil society is mobilizing to address climate change

Source: Adapted from Bulkeley (2013)

Firstly, rapid and continual urbanization is set to define and shape the 21st century. Cities, face with rapid urbanization with population migrating from rural to cities and this change of place requires new accommodation areas, more impervious surfaces, more energy consumption and GHG emissions (Forman and Wu, 2016).

Urbanization also affects carbon cycle, sustainable land use and water cycle. Cities are responsible for three quarters of global energy consumption and greenhouse gas (GHG) emissions (Bulkeley, 2013; IPCC, 2014; UN DESA, 2014; WHO, 2014; Gouldson et al., 2016). In addition to this, compared to rural people, urban people consume more energy largely generated by fossil fuels. In 2019, over 55% of the world's population lives in urban areas, and it is expected to increase to 68% by 2050 (UN, 2018).

Secondly, the structure of cities generates specific microclimates that impact variables like temperature and wind. For instance, the urban heat island effect is characterized by the development of noticeably higher temperatures in cities compared with rural. Santamouris (2013) stated that urban heat island effect can increase air temperature in an urban area between 5 and 15 ^{o}C (Mohajerani, 2017). The heat island is the result of a reduction in vegetation and evapotranspiration, a higher prevalence of dark surfaces such as buildings and asphalt roads with low albedo, impervious built surfaces and increased emission of heat from anthropogenic activities (Carter, 2015; Mohajerani, 2017).

Thirdly, because of their social, economic and political issues such as interconnected networked infrastructure, high population densities, thousands of poor and elderly people, cities are threatened by climate change (EEA, 2012; Carter, 2015).

In addition to these; currently more than half of the world's population lives in coastal areas (Huang-Lachmann, 2016). Cities, traditionally built in coastal locations or on riverbanks, are vulnerable to climate change impacts (Vermeer and Rahmstorf, 2009; Bulkeley, 2013). 75% of the world's major cities are at risk of exposure to flood; 26 cities including megacities Tokyo, Shanghai, Hong Kong, Mumbai, Calcutta, Karachi, Buenos Aires, St Petersburg, New York, Miami, London and İstanbul (Stern, 2006; Huang-Lachmann, 2016; UN, 2018).

Nonetheless, cities, which are wealth and innovation centers, also have resources and tools that can be used to address climate change challenges (Rosenzweig et al., 2010). Municipal authorities have responsibility for urban land planning and participatory approaches that are effective tool for climate change mitigation and adaptation (Naess et al., 2005; Smith et al., 2009; DCCEE, 2010; Bulkeley, 2013; Xu et. al., 2019). It is stated by Agrawal (2008) that there are three particular roles of local governments in terms of climate adaptation. Responses to local impacts should be structured, vulnerability responses from both individuals and collectives should be mediated and the delivery of resources to enable adaptation should be governed (Measham, 2011).

CHAPTER 3

CLIMATE POLICY IN TURKEY

3.1. Position of Turkey in the context of International Climate Policies

The issue of climate change gained importance and began to take part in scientific and political agendas in the early 1980s in the world (Paterson, 1996). UNFCCC, the landmark international agreement to address climate change, was agreed in 1992. The most important objective of the convention is to stabilize GHGs in the atmosphere at a level that would 'prevent dangerous anthropogenic (human induced) interference with the climate system' and to adapt to the potential effects of climate change (UNFCCC, 1992).

Turkey became a party to the UNFCCC on May 24, 2004. Until the Seventh Conference of Parties (COP) in Marrakesh in 2001 (COP7), Turkey was included in both Annex I and Annex II as an Organisation for Economic Cooperation and Development (OECD) country. However, unlike the other nations included in both Annexes, the contribution of Turkey among the global GHG emissions was lower and also Turkey was having important socio-economic development challenges. Therefore, Turkey was removed from Annex II, and Decision 26 enshrined an invitation to all parties to recognize the special conditions, which place Turkey in a different position from other Annex I countries at the COP7 meeting. This process is the reason of why Turkey became a party to the UNFCCC later than other OECD countries. After that, on August 26, 2009 Turkey officially became a party to the Kyoto Protocol (MoEU, 2018). In 1997 the Kyoto Protocol was established. The Protocol committed thirty-eight industrialized countries to reduce GHG emissions by an average of 5.2 per cent below 1990 levels during the period 2008–2012, and established a set of flexible mechanisms through which individual national targets could be reached (Bulkeley, 2013). Turkey does not have emission reduction targets under the Kyoto Protocol. However, national communication documents have been

prepared and submitted by the national government. The last communication submitted was Turkey's Seventh National Communication in 2018 (MoEU, 2018).

The Paris Agreement, which signed in 2015 at COP 21, has an important role in the international climate policy. The Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so (UNFCCC, 2019). Paris Climate Agreement was signed on 22 April 2016 by Turkish Government. On the other hand, the liabilities of the Paris Agreement will only be binding for Turkey when the Turkish Parliament ratifies the new climate agreement (MoEU, 2018). The Turkish National Government has still not ratified the Paris Agreement.

Much of the existing climate change governance literature focuses on the global level. Less attention has been paid to regional, national and sub-national levels (Doelle et. al., 2012). However, in Paris Agreement adaptation is recognized as a global challenge faced by all with local, subnational, national, regional and international dimensions (UNFCCC, 2019). But, Intended Nationally Determined Contribution (INDC) prepared by Turkey contains plans and policies only about mitigation policy. There is no commitment to adaptation in the report presenting Turkey's INDC. "Increasing sink areas and preventing land degradation" commitment under the Forestry title is the only one. Despite all these current disasters and droughts, adaptation measures are still not taken by the central government in international climate change arena.

The importance of involvement of local governments to the international climate change actions is already accepted by the international climate change community, especially in the COP decisions and Paris in 2015. As stated in the Seventh National Communication, the level of awareness regarding the role of local authorities in the fight against climate change has been increasing in Turkey over the last decade, including both mitigation and adaptation actions. The Global Covenant of Mayors is the world's largest movement for local climate and energy actions. Currently, there

are 22 Municipalities (6 of which is Metropolitan Municipalities) that are signatory to the Global Covenant of Mayors for Climate and Energy Initiative.

C40 Cities Climate Leadership Group (C40) gathers world's megacities (more than 80 countries) to address climate change and to reduce GHG emissions and climate risks. The Local Governments for Sustainability (ICLEI) establishes a global network of more than 1500 cities in 86 countries committed to build a sustainable and low-carbon future (Mi et. al., 2019). Istanbul is the member of C40. 11 Municipalities in Turkey (3 of which is Metropolitan Municipality) are members of ICLEI and 11 Municipalities (4 of which is Metropolitan Municipality) that are members of Eurocities (Table 3.1). These networks have provided collaboration between the world's cities to learn from each other's experiences and share the innovative solutions (Bouteligier, 2013; Balaban and Şenol-Balaban, 2015).

Table 3.1. Transnational Municipal Networks (TMNs) work on climate change

TMN	Launched in	Geographic reach	Goals	Member cities in Turkey
Eurocities	1986	Europe	To reinforce the important role of local governments in the multilevel governance structure	Beylikdüzü, Beyoğlu, Gaziantep, Istanbul, Izmir, Kadıköy, Konya, Mezitli, Osmangazi, Pendik, Serdivan
ICLEI (Local Governments for Sustainability	1990	Global	To connect local and regional governments with leading peers, national governments, the European Commission, the United Nations, business, academia, finance and NGOs	Çankaya, Fındıklı, Gaziantep, Izmir, Kadıköy, Kartal, Konya, Seferihisar, Seydikemer, Şişli, Tepebaşı
Energy Cities	1990	Europe	To accelerate the energy transition of Europe	Bornova, Büyükçekmece, Gaziantep, Karşıyaka, Nilüfer, Seferihisar
C40- Cities Climate Leadership Group	2005	Global	To support cities to collaborate and share knowledge and drive sustainable action on climate change	Istanbul
Global Covenant of Mayors for Climate & Energy	2016	Global	To serve cities and local governments by mobilizing and supporting climate and energy action in their communities by working with city/regional networks, national governments, and other partners	Yenimahalle, Bolu, Çorlu, Sakarya, Gaziantep, Pendik, Bayındır, Şişli, Bağcılar, Bursa, Izmir, Çankaya, Maltepe, Nilüfer, Tepebaşı, Antalya, Kadıköy, Seferihisar, Bornova, Eskişehir, Karşıyaka (Izmir), Karşıyaka (Erdek-Balıkesir)

Source: Prepared by the author with regard to data provided in TMNs' own websites

3.2. National Policies and Legislation

The national government of Turkey has been taking legal and institutional steps towards climate change ever since 2000 despite the fact that it has joined the international climate regime as an official party later than many other nations (Balaban and Şenol-Balaban, 2015). Foundation of a Coordination Board on Climate Change in 2001 is among such steps as a first one on the purpose of coordinating the public sector's activities on climate change mitigation and adaptation. The board was restructured in 2004, 2010 and 2012 after Turkey has become a party to the UNFCCC and the Kyoto Protocol (MoEU, 2018).

Turkey has established the Coordination Board on Climate Change (CBCC) in 2001. After becoming a party to the UNFCCC, the CBCC was restructured and the number of participant institutions was expanded. The members of the CBCC are: "Ministry of Science, Industry and Technology, Ministry of Environment and Urbanization (Coordinator), Ministry of Foreign Affairs, Ministry of Economy, Ministry of Energy and Natural Resources, Ministry of Food, Agriculture and Livestock, Ministry of Development, Ministry of Finance, Ministry of Forestry and Water Works, Ministry of Health, Ministry of Transportation, Maritime Affairs and Communication, Undersecretariat of Treasury, Turkish Union of Chambers and Commodity Exchanges (TOBB) and Turkish Industry and Business Association (TUSIAD)". There are 11 technical working groups established under the CBCC (MoEU, 2018).

3.2.1. The Role of Central Government

In Turkey, climate change studies and responsibilities are shared by multiple ministries. Nonetheless, The Ministry of Environment and Urbanization, General Directorate of Environmental Management undertakes the biggest responsibility.

According to 644 numbered Decree Law on Duties of The Ministry of Environment and Urbanization, Article 8 Sub-article "m" stated that, General Directorate of Environmental Management's one of the duties are "to ensure coordination with

other institutions and organizations in order to establish plan, policies and strategies for the implementation of measures related to the depletion of the ozone layer and global climate change".

There are two departments related to climate change in General Directorate of Environmental Management (Figure 3.1).

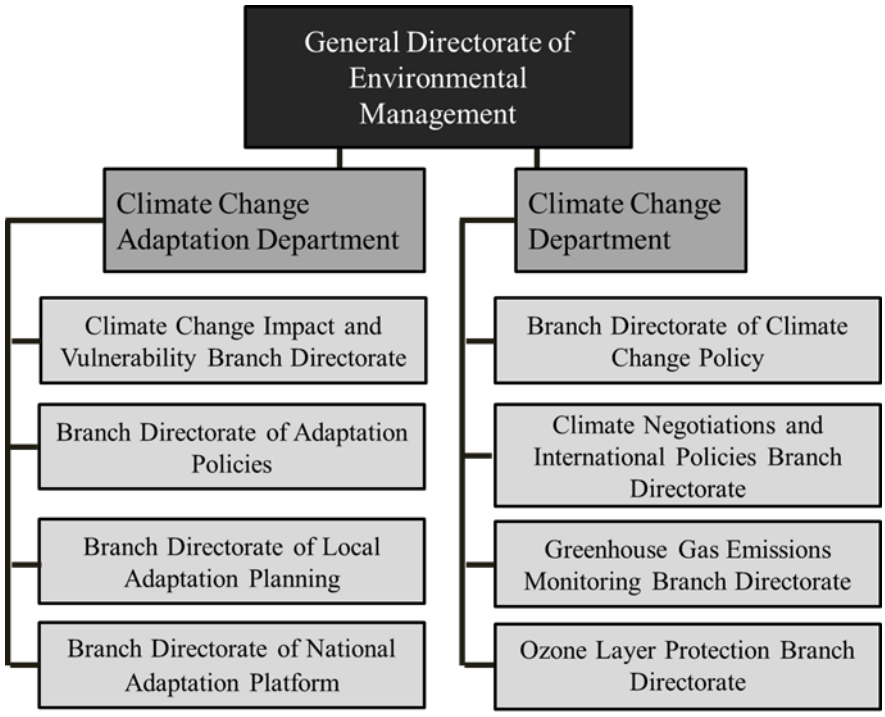


Figure 3.1. Organizational Chart of Departments related to climate change in General Directorate of Environmental Management

Source: Prepared by the author with regard to data provided in MoEU (2019)

The documents for climate change policy in national scale which also support Turkey's INDC includes;

- "10th National Development Plan,
- National Strategy on Climate Change (2010-2020),
- National Climate Change Action Plan (2011-2023),
- National Strategy on Industry,

- Strategy on Energy Efficiency,
- National Strategy and Action Plan on Recycling,
- National Legislation on Monitoring, Reporting and Verification of GHG emissions,
- National Smart Transportation Systems Strategy Document (2014-2023) and its Action Plan (2014-2016)".

In terms of these institutional and legal reforms and documents, Turkey is not far behind other nations. Key plans and policy documents have already been prepared. However, it is not clear that these documents have led to positive outcomes in practice (Balaban and Şenol-Balaban, 2015).

3.2.2. The Role of Local Governments

Cities have been gradually involved in climate chance administration development after the early 90's by putting the climate change related issues on their agendas (Bulkeley et al., 2012). Local authorities being listed among the nine major groups in Agenda 21 document which has a significantly devoted chapter to the role of local governments in sustainable development is the primary reason of this involvement (UNCED, 1992).

Municipalities have significant and varied roles in relation to urban planning, building, transportation and the supply of energy, water and waste services that shape existing patterns of vulnerability and the production of GHG emissions. Given these powers, and their democratic mandate as the local level of government, municipalities can therefore be seen as in a position to address the challenges of mitigating and adapting to climate change (Schauser et al., 2010).

Yienger (2002) defined the reason of why local governments are critical in the process of combating to climate change as;

- Own and operate buildings, vehicles and facilities such as recreational, infrastructural and water supply and treatment, which directly consume large quantities of fuel and electricity,
- Manage and operate landfills and waste treatment plants, which are major sources of methane,
- Authorized by law to make land use plans. Therefore, they decided to locations of residential, recreational, car parking and commercial areas,
- Have regulatory influence or responsibility for making buildings energy efficient,
- Set vehicle registration fees, and quotas; enforce age restrictions on vehicles; maintain public transport and policies,

And also;

- Own and manage sink areas such as parks, ponds and water retention areas.

The legislation for municipalities in Turkey does not have a holistic law in terms of mitigation and adaptation to climate change. There are only laws and regulations that contain these issues separately. One of the problems in the management of local governments in Turkey, the differences between names and regulations of the directorates' in each municipality. Therefore, there may be problems in creating a common language. The directorates of the municipalities working towards adaptation to climate change are also different. Department of Environmental Protection and Control or Department of Parks and Gardens are generally working related to climate change.

The laws authorizing local governments indirectly about climate change are shown in the Table 3.2. These laws are selected because of their content about municipalities, disaster risk management and environmental planning. There are other laws or legal documents that indirectly relate municipalities to climate problem but the ones listed on the following table are the most important and direct ones.

Table 3.2. The laws authorizing local governments indirectly about climate change

Law No	Law Name	Official Gazette Date
5909	Environment Law	11.08.1983
3194	Law on Development Planning and Control	09.05.1985
5216	Law on Metropolitan Municipalities	10.07.2004
5393	Municipality Law	13.07.2005
6360	The Establishment of Fourteen Metropolitan Municipalities and Twenty-seven Districts and Amendments at Certain Law and Decree Laws	06.12.2012
6306	Law on Transformation of Areas under Disaster Risk	15.12.2012

Source: Official Gazette (2019)

Among these laws, 5909 Environment Law, 3194 Law on Development Planning and Control, 5216 Law on Metropolitan Municipalities and 6306 Law on Transformation of Areas under Disaster Risk contributes positively to the fight against climate change, while the 6360 The Establishment of Fourteen Metropolitan Municipalities and Twenty-seven Districts and Amendments at Certain Law and Decree Laws and 5393 Municipality Law has both positive and negative contributions:

- 5909 Environment Law, Article 3 Sub-article "b" stated that, "In all kinds of activities in the fields of protection of the environment, prevention of environmental degradation and removal of pollution; Ministry and local authorities cooperate with professional chambers, unions and non-governmental organizations where necessary." Sub-article "e" stated that, "The right to participate in the establishment of environmental policies is essential. Ministry and local authorities; is obliged to create an environment of participation in which professional chambers, unions, non-governmental organizations and citizens shall exercise their right to environment. "Article 9 Sub-article "a" stated that, "The biodiversity that constitutes the natural

environment and the protection of the ecosystem with this diversity are essential. The principles of conservation and utilization of biological diversity are determined by taking the opinions of local governments, universities, non-governmental organizations and other relevant organizations." This law, support the participatory planning of environment. To protect environment and biodiversity as a participatory way is the essential point of these articles. Even if not being directly related with the climate change, this is an important law in terms of explaining the duties that local governments should give importance to nature conservation in Turkey.

- 3194 Law on Development Planning and Control Article 8, Sub-article "h", stated that, "The Ministry can prepare energy efficient, climate sensitive, and ecological plans and projects related to the settlements within the scope of said law,...". Even though it is not stipulated by law, it is a positive step to point out that energy efficient, climate sensitive and ecological plans and projects related to the settlements can be made. This statement promoted the climate change adaptation and mitigation projects in the settlements.
- 5216 Law on Metropolitan Municipalities Article 7, Sub-article "i", stated that, "In accordance with the principle of sustainable development, ensure the protection of the environment, agricultural land and water basins; plant trees; …". This statement emphasized the protection part of sustainable development. And it leads to metropolitan municipalities for climate change adaptation methods like as protecting and increasing green areas.
- 5393 Municipality Law, Article 14 Sub-article "a", stated that, municipalities "Shall provide or cause to provide services in the following areas: urban infrastructure facilities such as land development planning and control, water supply, sewer and transport; geographic and urban information systems; environment and environmental health, sanitation and solid waste; firefighting, emergency aid, rescue and ambulance services; urban traffic; tree planting, parks and green areas; housing; culture and art; social services and social aid; This law states that municipalities have the power to assist in sectors including climate change adaptation and mitigation and post-disaster relief".

Article 15, Sub-article "e", stated that, municipalities shall have the following powers and privileges: "…supply potable, utility and industrial water; ensure the disposal of waste water and rainwater; establish or cause to establish and operate or cause to operate necessary facilities for that purpose; and operate or cause to operate spring water facilities…" Considering the rain water as something to be disposed of by the law, it is quite erroneous in terms of adaptation to climate change and water cycle. With the rain harvesting, the water will be absorbed by soil, the groundwater will be fed and the water cycle will be normalized, thus, water quality in both urban and rural areas will be improved and healthier ecosystems will be established (Tokuş and Özdemir, 2017, p.9). Rain harvesting is also a recommended method in IPCC 4th Assessment Report for adapting to climate change.

- With the 6360 The Establishment of Fourteen Metropolitan Municipalities and Twenty-seven Districts and Amendments at Certain Law and Decree Laws, Metropolitan and district municipalities were provided with the opportunity to provide all kinds of activities and services to support agriculture and animal husbandry. But this law, on the other hand, threatens rent in rural areas. It has removed the obstacles to the development of the sink areas that are important for adaptation.
- 6306 Law on Transformation of Areas under Disaster Risk, Article 18, sub-article 1, stated that, "According to the characteristics of the area, it is essential for plans to be made for that application area to reduce the risk of disaster, to improve, protect and develop the physical environmental conditions, to ensure the social and economic development, to energy efficiency and climate sensitivity are essential to improve quality of life." This law is directly mentioned climate sensitivity.

Although the legislation for local governments does contain the above-mentioned laws, the actions on adaptation to climate change in Turkey still remains a political choice.

Table 3.3. Details of climate change adaptation action plans in Turkey

Name of Municipality	Main titles	Date	Prepared by
Bursa Metropolitan	• Urban heat island effect • Urban water bodies • Public health • Green spaces, biodiversity and green corridors	2017	• Municipalities' own experts • Private Sector
Istanbul Metropolitan	• Public health • Land use, Forestry, Biodiversity and Agriculture • Waste Management • Energy Production and Distribution • Transportation and Logistic • Water Management • Infrastructure • Buildings • Tourism, Trade and Socio-cultural Structure • Industry	2018	• Municipalities' own experts • Universities • NGOs • Municipal Unions • Private Sector • International Institutions
Kadıköy	• Public health • Green spaces and corridors • Urban heat island effect • Rain and water system	2018	• Municipalities' own experts • Universities • NGOs • Municipal Unions • Private Sector • International Institutions

Source: Prepared by the author with regard to data provided in municipalities' own websites

The contents of Climate Change Adaptation Action Plans prepared by 3 municipalities in Turkey can be seen at Table 3.3. Action plans of İstanbul Metropolitan and Kadıköy Municipality have been prepared in a participatory way. However, Bursa Metropolitan Municipality Action Plan was prepared by the municipality's own experts and the private sector.

CHAPTER 4

THE CASE STUDY ANALYSIS

As described in the previous chapters, a questionnaire survey was designed for metropolitan, provincial and district municipalities and conducted to 76 experts who works at departments related to climate change (such as Department of Environmental Protection and Control or Department of Parks and Gardens) in the municipalities. This chapter is dedicated to the assessment of the survey results. While interpreting the answers given to the questions, those replies were examined under four main sections. In the first section (Section 4.1), titled as Municipalities' profiles and their relationship with climate change, the replies given to the quesitons 1,2, 3, 4, 5, 11, 12 and 13 will be evaluated. Secondly, planned or realized projects to adapt to climate change by municipalities will be analyzed from the perspective of supporters and sectors in the section 4.2. This section comprises of interpreting the answers given to questions 6,7,8 and 9. Thirdly, the reasons and recommendations for lack of adequate actions in municipalities on adaptation to climate change will be assessed in the Section of 4.3. The Section 4.3, consist of the analysis of replies to question 10 and 14 (see Appendix I). Finally, findings and discussion will be assessed in section of 4.4.

4.1. Municipalities' Profiles and Their Relationship with Climate Change

The survey was sent to the municipalities that are of these types: 30 metropolitan municipalities, 61 provincial municipalities and 150 of the most populous district municipalities in metropolitan cities. The collaborating ones, i.e. returning to the requested survey, can be listed as follows: 23 of those metropolitan municipalities, 8 provincial municipalities and 45 of the district municipalities in metropolitan cities. Table 4.1 reveals the collaboration rates with respect to distinct types of these

municipalities. As inferred from the table, the questionnaire left unanswered by municipalities that are comparably undersized among others.

Table 4.1. Participation rate of municipalities

Municipality	**Percentage of participation**
Metropolitan	76,7
Provincial	13,1
District of the metropolitan municipality	30

When all of the participant municipal organizations are analyzed in terms of their governing/ruling party, the relative proportions could be observed as follows: 46.7% of the overall attendees are from the AKP (Justice and Development Party) whereas 37.3% of the participants are from CHP (Republican People's Party). That is to say the greatest majority of our participants are the municipalities administered either by AKP or CHP. Definitely, the remaining minority of the attendees consists of organizations governed by the rest of the important political actors, i.e. 2.7% of them are from MHP (Nationalist Movement Party), and another 12% of the participants are from HDP (Peoples' Democratic Party). Besides, 1.3% of the participants are independent, i.e. individuals not associated with any of these parties. Note that these governing parties were selected at the local elections in 2014 and proceeded to administer the concerning municipal organizations until the next local elections which was done in 2019. It is important to notice the only exception here that the trustees had been appointed to 77.8% of the HDP municipalities in 2016.

When the individual response rates of the parties are inspected, the percentage of participation rates has been observed as in the Table 4.2. Despite the fact that almost half of the serviceable data was gathered from the municipal organizations managed by AKP, their actual response rates are relatively smaller as compared to the other parties. The reason for this contradictory statistic is AKP was overwhelmingly ruling a large number of municipalities at the preceding local elections.

Table 4.2. Participation rate of political parties (Based on the situation before the 2019 local elections)

Political party of municipality	Percentage of participation
Independent	100
HDP*	50
CHP	43,75
AKP	27,9
MHP	10,5

*Trustees have been appointed to 77.8% of the HDP municipalities

Thus, even if their response rates are low, their municipalities still comprise the biggest majority of our data. Furthermore, the participation of independent municipalities may first be considered as very satisfactory since it is 100% on the Table 4.2. However, this is because only 1 municipality (an independent type) was requested and then respond to that request.

In this section, the effective capacity of the municipalities and their consideration about the adaptation to climate change will be discussed in detail.

To begin with, the fundamental conclusion to overall data was that the municipal organizations are moderately aware of the problem of climate change, but not generally well prepared for its way out. Much factual interpretations could be made based on the collected data and the distribution of the given answers. According to the results deduced from the survey, the following findings can be explicated:

It can be easily stated that all of the participant municipal organizations has some thoughts about the problem of climate change. According to the given replies to Question 2, all of the municipalities participating to the survey agree that climate change is an important problem. However, according to the answers given to the Questions 3, 9 and 13 (See Appendix I); it is observed that there is a confusion about the meaning of climate change adaptation. The exact term, i.e. adaptation to climate change, refers to the actions to do when adapting to the possible consequences of climate change. On the other hand, 37% of the participants expressed alternative

replies that can be categorized under mitigation. To be more clear, those participants pointed out the implementations for renewable energy, energy efficiency, transportation, solid waste management, and air pollution issues as particular precautions. But, such actions are related to mitigation (rather than adaptation) of climate change.

According to the answers given to the question 4, 18 municipalities stated that they have climate change adaptation plans, however 3 of them (Bursa Metropolitan Municipality, Istanbul Metropolitan Municipality and Kadıköy Municipality) really have.

Most of them only have sustainable energy action plans. Istanbul Metropolitan and Kadıköy Municipality have prepared their climate change adaptation plans with a participatory way in 2018. Their climate change adaptation plans have been prepared with the help of municipalities' own experts, universities, non-governmental organizations (NGOs), municipal unions, private sector and international institutions. However, Bursa Metropolitan Municipality has prepared its climate change adaptation plan by the municipality's own experts and private sector in 2017.

According to the responses of the questionnaire, evaluation rates in terms of attaching importance to climate change adaptation activities among the other municipal activities by municipalities are given at Figure 4.1. Climate change adaptation actions are not enough at most of the municipalities. 77% of the municipalities attended to the survey give importance to climate change adaptation among their other municipal activities under 64% (less important plus not important).

When we look at the respondent's municipality categories, both metropolitan and district municipalities of metropolitans give importance to climate change among their other municipal activities (Figure 4.2). But, it is obviously seen that, district municipalities of metropolitan areas give less importance or does not give importance to climate change adaptation activities among their other municipal activities. The main implication inferred from the graph is that, metropolitan municipalities pay more attention to climate change adaptation studies among their other municipal activities than district municipalities.

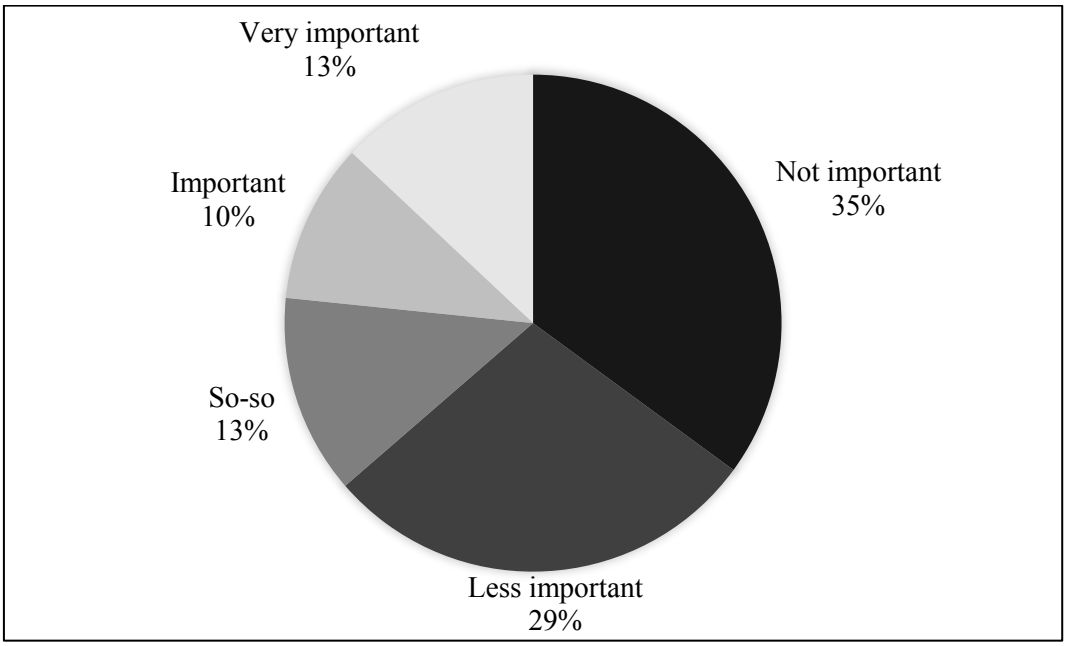


Figure 4.1. Municipalities' evaluation rates in terms of attaching importance to climate change adaptation activities among other municipal activities

According to Figure 4.3, it is seen that, municipalities of CHP give importance to climate change adaptation studies among other municipal activities more than AKP municipalities. It can be easily said that, to give importance to climate change studies among the municipalities' other municipal activities is also a political issue.

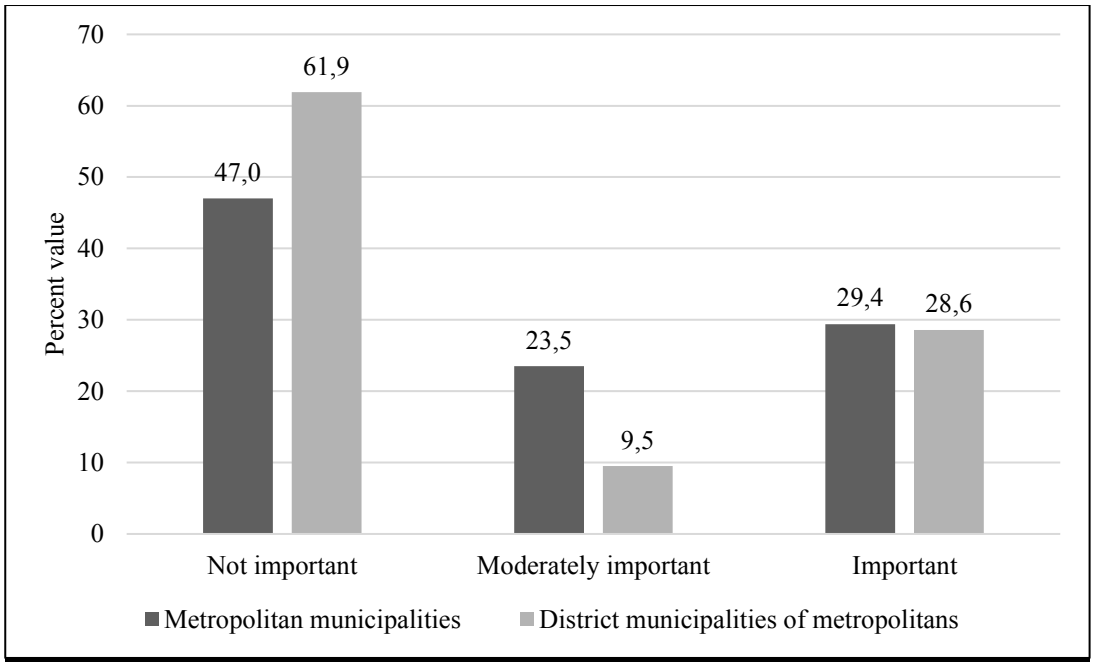


Figure 4.2. Importance rates given to climate change studies among other municipal activities by district municipalities of metropolitans and metropolitan municipalities

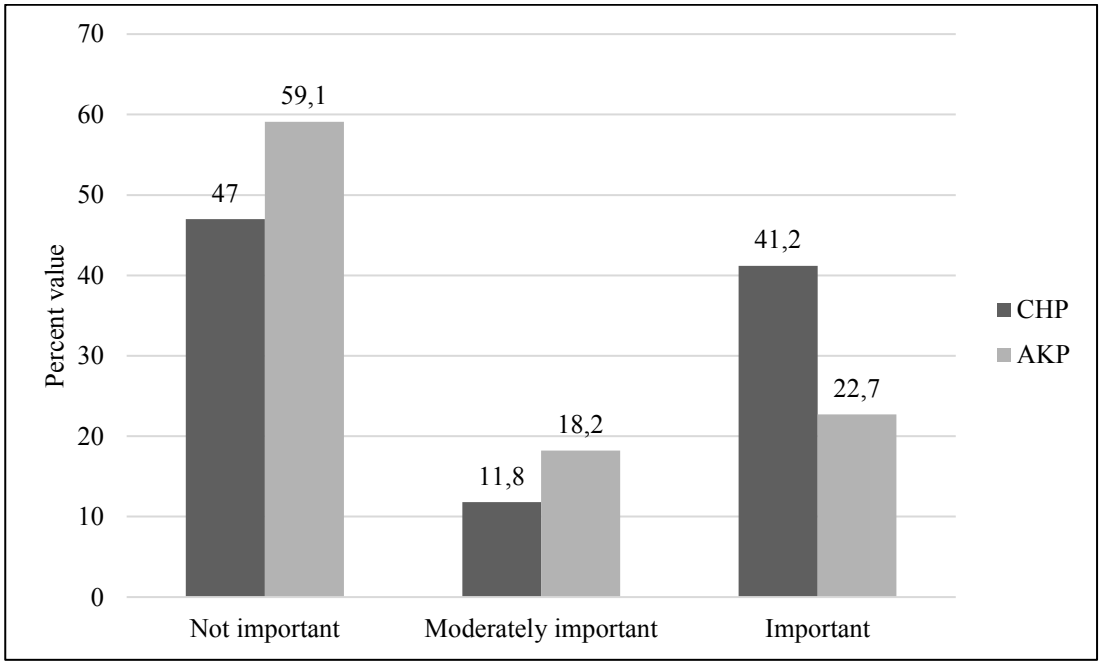


Figure 4.3. Importance rates given to climate change studies among other municipal activities by municipalities of CHP and AKP

According to the answers given to the question 12, 22% of the municipalities that have participated to the survey have special unit(s) in the municipality working on climate change. 47% of the municipalities are metropolitan district municipalities, 41% of the municipalities are metropolitan municipalities and 12% are provincial municipalities. As the number of provincial municipalities that attended to the survey was low, the percentage of provinces in this question is also low. However, the fact that metropolitan and district municipalities have close percentages is an important result. 65% of them belongs to CHP, 29% of them belongs to AKP and 6% of them belongs to MHP municipalities. It can concluded that, municipalities of CHP give more importance to set up special unit(s) working on climate change than other political parties.

When the relationship between Question 6 (Is there any action (plan, project, activity, etc.) that your municipality have done/is doing or planning for climate change adaptation?) and Question 12 (Are there any special unit(s) in your municipality on climate change?) is analyzed, it is seen that 61% of the municipalities that do not have a special unit on climate change do not have a plan, project or activity about adaptation to climate change. All of the municipalities that have a special unit, have already made some studies or actions about climate change adaptation obviously. In this context, it can be concluded that the absence of special units in municipalities does not affect the studies negatively. However, these special units promote the studies. Because establishing these special units shows how much importance is given to this topic by municipalities.

When the relationship between Question 11 (What is your rate of consideration when you evaluate your climate change adaptation activities among your other municipal activities?) and Question 12 is analyzed, it is seen that municipalities with special unit working on climate change give importance to climate change studies more than municipalities without special climate change unit naturally (Figure 4.4).

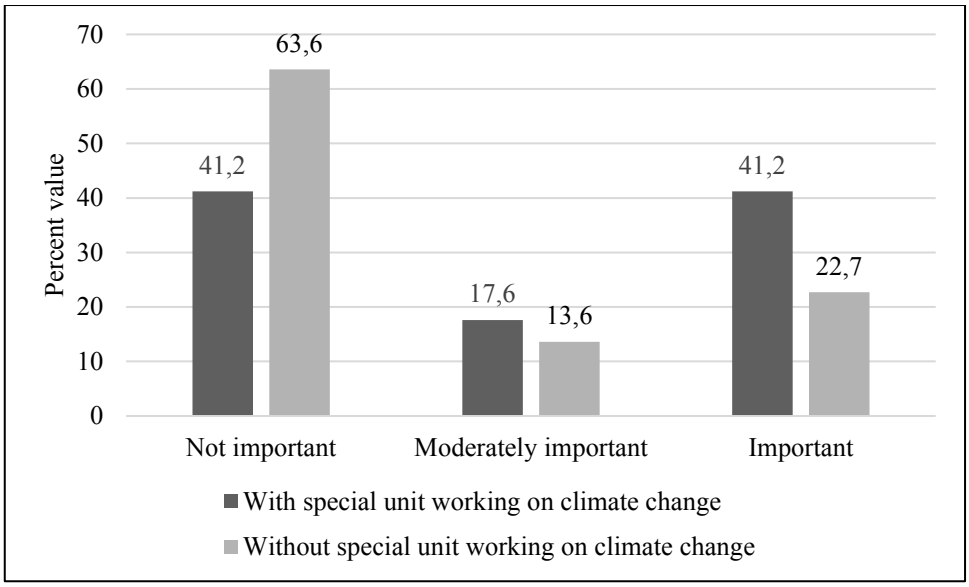


Figure 4.4. Importance rates given to climate change studies among other municipal activities by municipalities with or without special unit working on climate change

4.2. Planned or Realized Projects to Adapt to Climate Change by Municipalities

Half (50.6%) of the municipalities have plan, project, activity etc. about climate change adaptation or they are planning to do such works in future. These are 17 metropolitan, 1 provincial, 21 metropolitan district municipalities.

Climate change adaptation studies have been initiated by Eskişehir Metropolitan Municipality in 1999. As is seen in the graph, every year the number of municipalities working on climate change adaptation increases (Figure 4.5). When political parties, geographical locations and types of municipalities that are working on climate change adaptation are examined, no significant results could be drawn in the distribution depending on the years.

The supporters of climate change adaptation studies in municipalities consist of many institutions. The results (see Figure 4.6) have demonstrated that 82% of the municipalities that attended to the survey utilize their own budget to fund climate change adaptation studies. Municipalities' cooperation with municipality union(s) about climate change is quite weak. In fact, municipal unions are established to solve

common problems of municipalities that share the same geography. Therefore, if the budget of the municipality unions is also used for climate change, the solution will be more effective as it will contribute to the same regional municipalities.

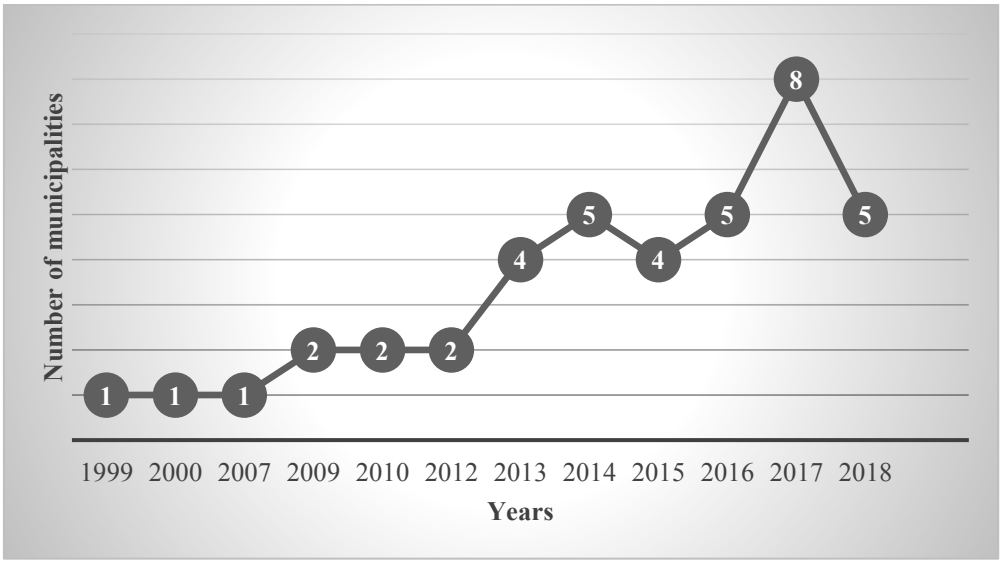


Figure 4.5. Numbers of municipalities working on climate change adaptation by years

International grant programs supported/is supporting/will support the 43.6% of the municipalities' climate change adaptation actions. It is an advantage for municipalities that the majority of international grants include environmental grant schemes (Figure 4.6).

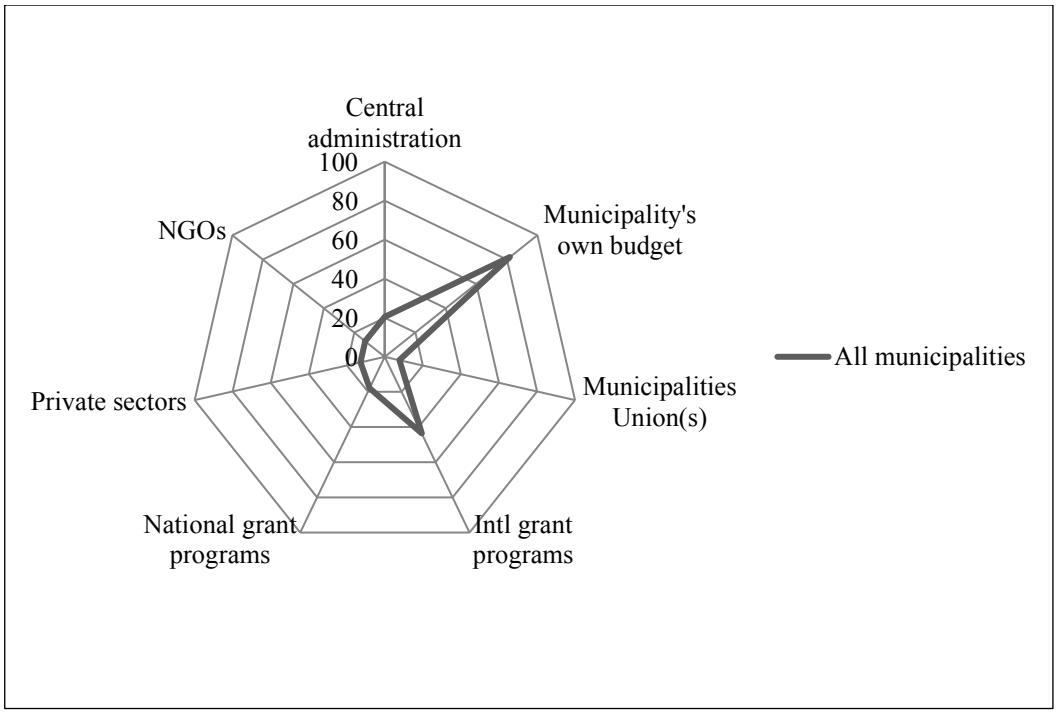


Figure 4.6. Percent of grants and institutions supported/is supporting/will support the municipalities' climate change adaptation studies

90.5% of the metropolitan district municipalities and 70.6% of the metropolitan municipalities (among the ones that attended to the survey) are found to provide climate financing with their own budgets as it was shown in Figure 4.7.

While 65% of the metropolitan municipalities provide climate financing from international grant programs, only 29% of the district municipalities of metropolitans provide climate financing from them for climate change adaptation. Metropolitan municipalities utilize from international grant programs due to their administrative capacity besides their own resources (Figure 4.7).

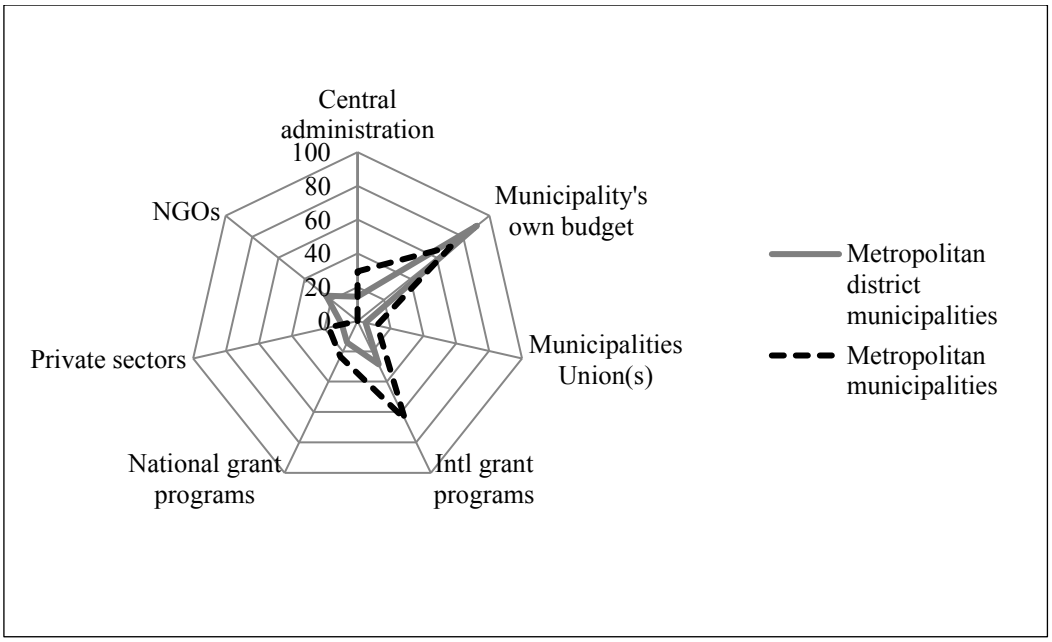


Figure 4.7. Percent of grants and institutions supported/is supporting/will support the district or metropolitan municipalities' climate change adaptation studies

However, other sources of finance vary according to the political parties. District municipalities of CHP utilized from international and national grant programs and collaborated with private sector, NGOs and municipalities union(s) more than district municipalities of AKP (Figure 4.8). 87.5% of the district municipalities that have special units on climate change are CHP municipalities. In this context, it has been observed that the presence of specialized units on climate change in municipalities is beneficial for the establishment of partnerships in the studies related to climate change and benefiting from grant projects. 88.9% of district municipalities of AKP provide climate financing from their own budgets. Their secondary finance source is central government at the rate of 22.2%.

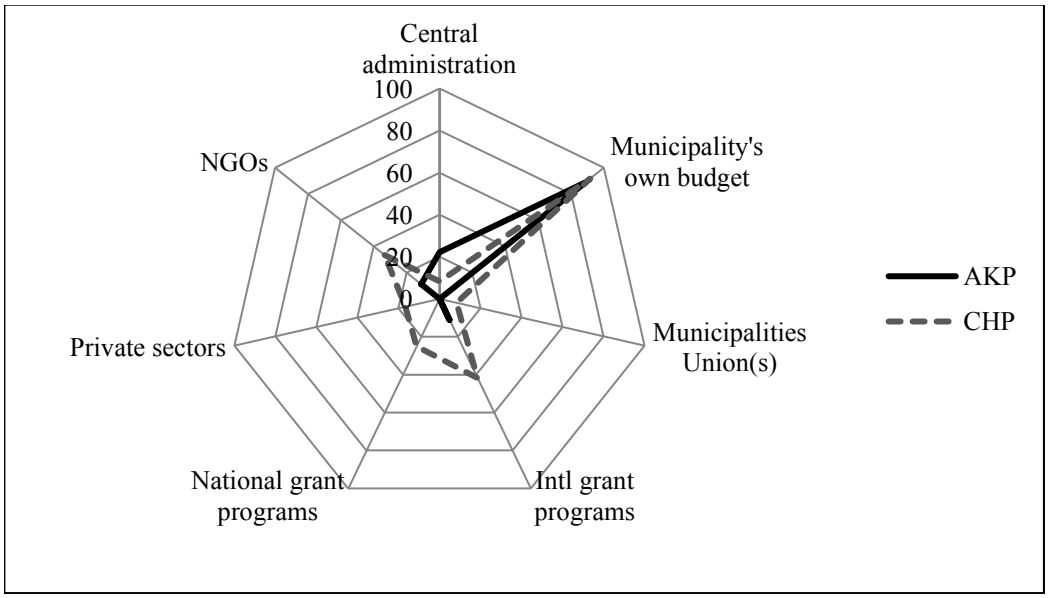


Figure 4.8. Grants and institutions that support district municipalities of AKP and CHP for climate change adaptation

Metropolitan municipalities of CHP have been supported by all stakeholders except central administration (Figure 4.9). Since the CHP is an opposition party, it cannot benefit from the central government's climate finance as much as AKP municipalities. On the contrary, metropolitan municipalities of AKP have been supported by their own budgets (75%) and central administration (41.7%). Both district and metropolitan municipalities of AKP have been supported more than CHP municipalities by the central administration. These questionnaire results show that again climate policy is in a sense a political issue in the Turkish context.

It has been observed that the Municipal Unions have almost no support for adaptation to climate change both metropolitan or district municipalities.

NGOs do not support metropolitan municipalities (Figure 4.9), but they support district municipalities. These findings reveal that in general, NGOs in Turkey work in relatively smaller scales.

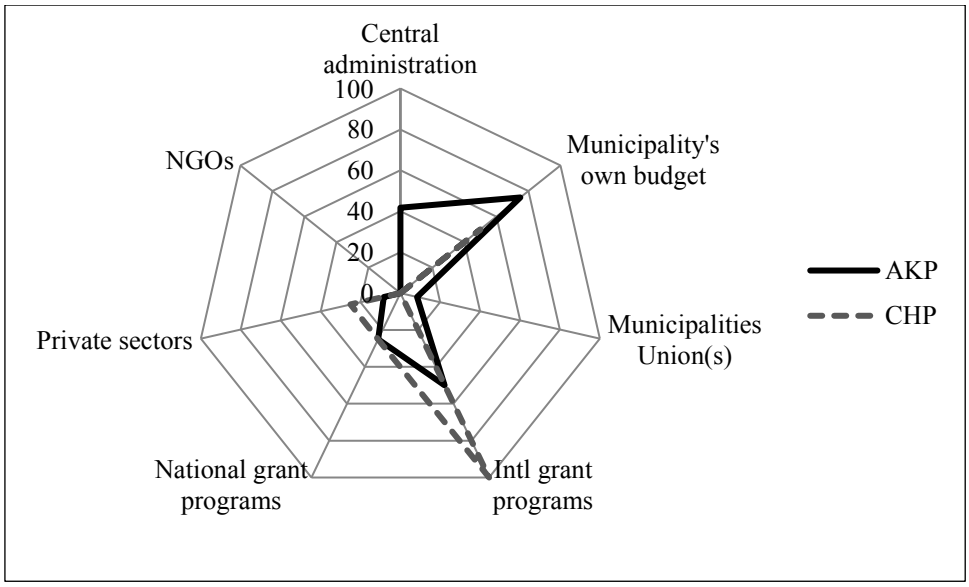


Figure 4.9. Grants and institutions that support metropolitan municipalities of AKP and CHP for climate change adaptation

All the metropolitan municipalities of CHP that attended to the survey have been supported by international grant programs (Figure 4.9). This consequence is the result of the demand for international grant programs' applications and competence of preparing project proposal and project management.

According to the given replies to question 9, urban green areas (66.7%), urban infrastructure (61.5%) and structure/building/housing (53.8%) sectors have mostly been studied by all municipalities in order to adapt to climate change (Figure 4.10).

Only urban green areas have been studied more by district municipalities than metropolitans (Figure 4.11). Water management is the most studied sector within other sectors by metropolitan municipalities. The reason is that, water management authority belongs substantially to metropolitan municipalities.

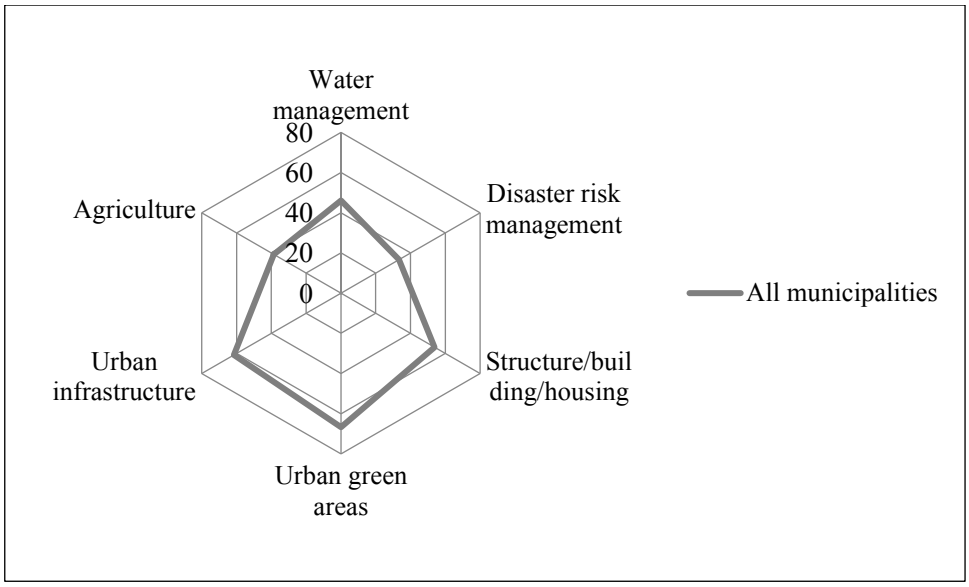


Figure 4.10. Sectors involve climate change adaptation studies in all municipalities

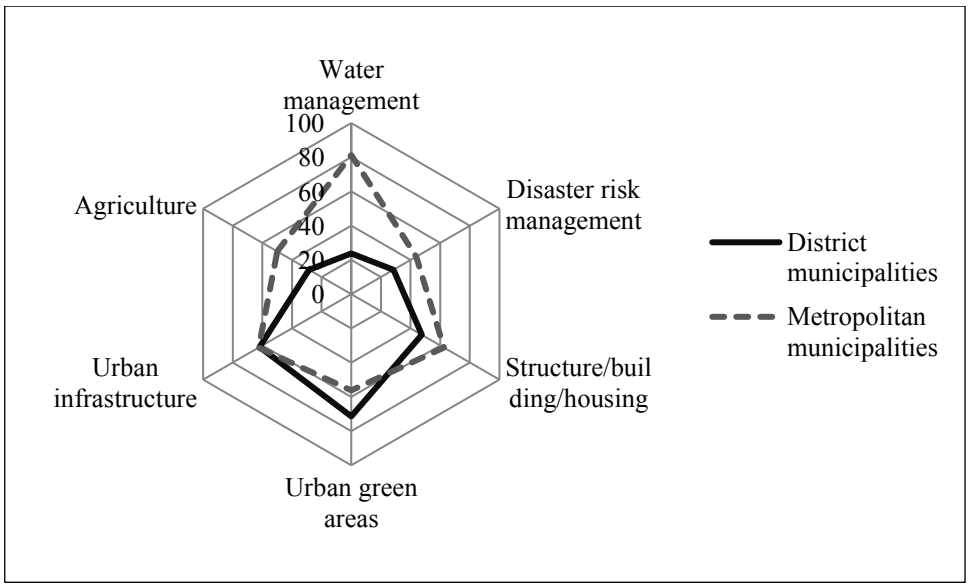


Figure 4.11. Sectors involve climate change adaptation studies in district and metropolitan municipalities

Both political parties do not give enough importance neither disaster risk management nor water management (Figure 4.12). This shows that no lessons have been learned from climate disasters in Turkey.

It is seen that district municipalities of AKP have made climate change adaptation actions about agriculture more than district municipalities of CHP (Figure 4.12). This might be due to district municipalities of AKP returned to the questionnaire were from the agricultural districts such as Akçadağ/Malatya and Havran/Balıkesir.

Water management (25%), structure/building/housing (58.3%), urban green areas (83.3%) and urban infrastructure (66.6%) have mostly been studied by district municipalities of CHP more than district municipalities of AKP (Figure 4.12). However, these sectors are the responsibility of all municipalities in terms of climate change adaptation.

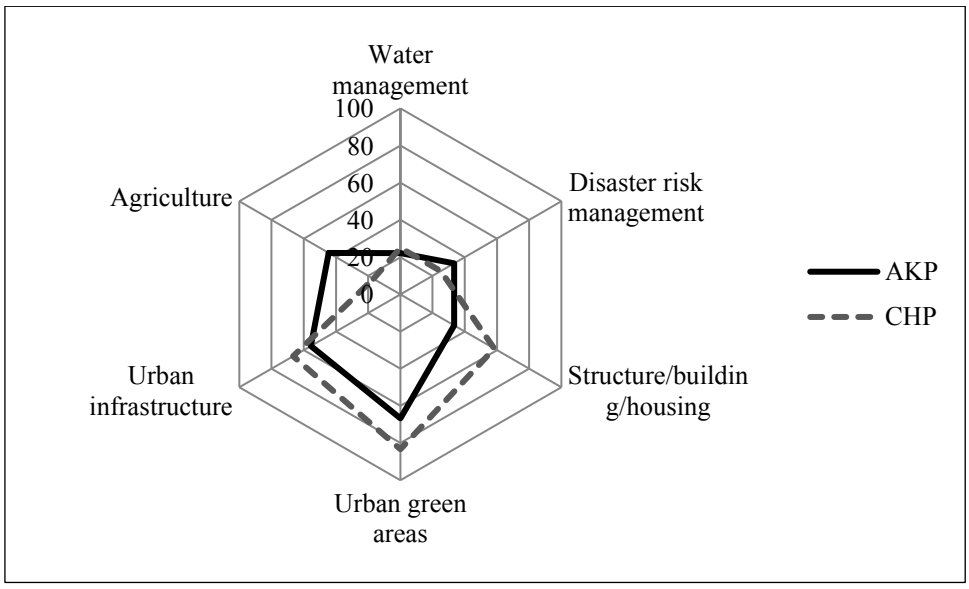


Figure 4.12. Sectors involve climate change adaptation studies in district municipalities of AKP and CHP

Water management, agriculture, urban infrastructure have mostly been studied by metropolitan municipalities of CHP more than metropolitan municipalities of AKP (Figure 4.13).

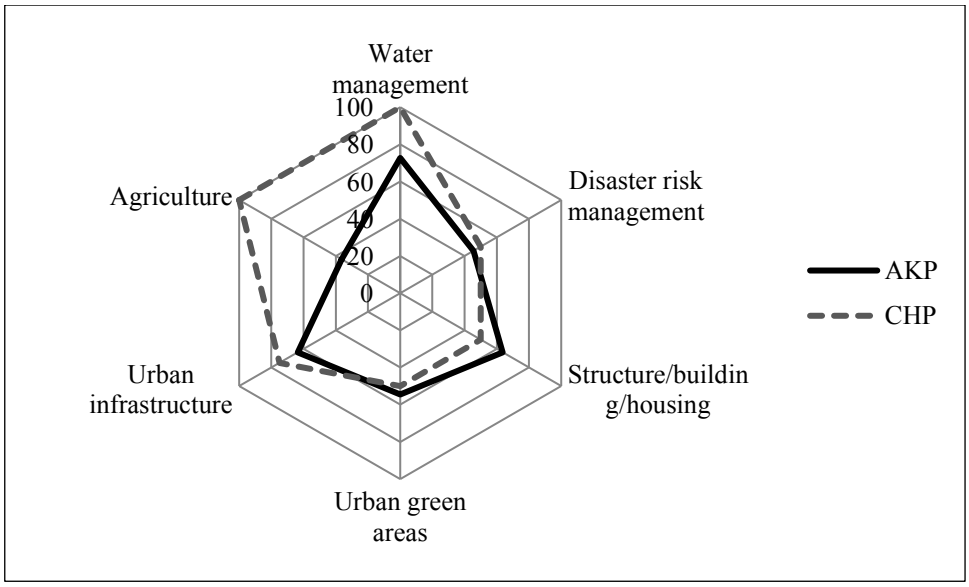


Figure 4.13. Sectors involve climate change adaptation studies in metropolitan municipalities of CHP and AKP

4.3. Reasons and Recommendations for Lack of Adequate Action in Municipalities on Adaptation to Climate Change

The answers to this question are very important as they address the solutions of problems in the practices for adaptation to climate change. This question is conducted with a likert scale.

In order to see the data used in the figures in this section neatly, Table 4.3 is prepared. In this context; the responses of the municipalities were analyzed according to their answers to question 6 and 10 and the of the municipality.

The answers to this question are very important as they address the solutions of problems in the practices for adaptation to climate change. This question is conducted with a likert scale.

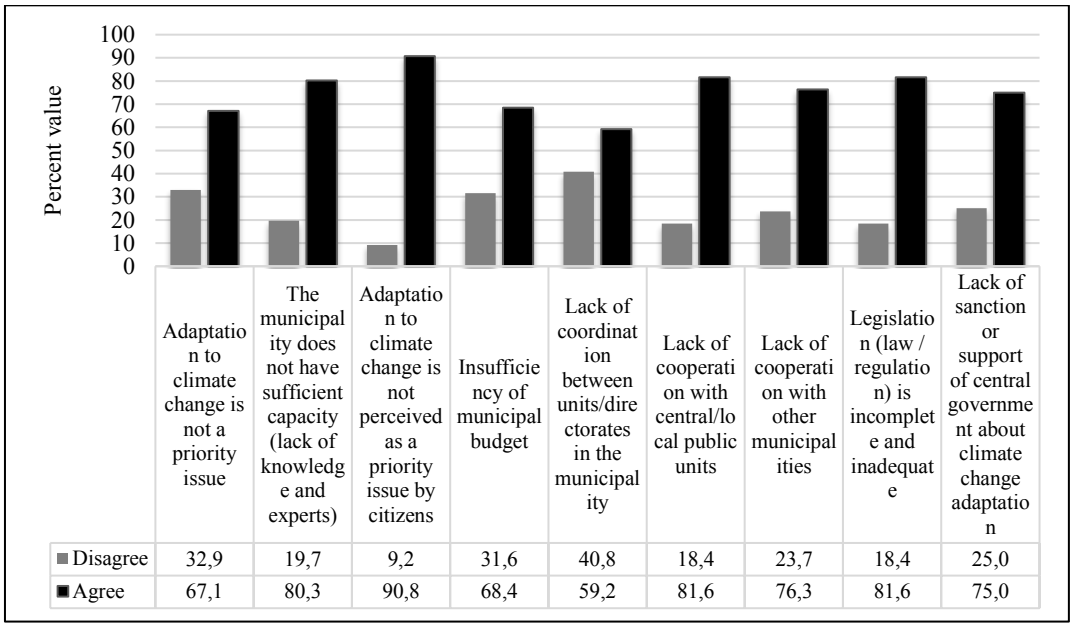
In order to see the data used in the figures in this section neatly, Table 4.3 is prepared. In this context; the responses of the municipalities were analyzed according to their answers to question 6 and 10.

Majority (90.8%) of the municipalities has replied to the survey as agree for "adaptation to climate change is not perceived as a priority issue by citizens" (Figure 4.14). This result shows that the municipalities do not want to take the responsibility of not having any studies on this issue. The second priority of the municipalities for insufficient actions on adaptation to climate change is both "Lack of cooperation with central/ local public units" and "Legislation is incomplete and inadequate". Both of these answers have the same percentage of 81,6%. The third priority of the municipalities for insufficient actions on adaptation to climate change is lack of knowledge and experts in the municipalities (Figure 4.14). It can also be seen that coordination between units/directorates in the municipality is not a problem for the municipality itself. So that, the most important conclusion that can be drawn here, if the problem of knowledge and capacity of the municipalities about climate change adaptation and legislation problem are solved, projects can be carried out quickly. Working in coordination with other departments is an important issue for climate change studies because of its interdisciplinary structure.

If we compare all the municipalities and the municipalities that answered question 6 as "Yes"; the first two priorities are the same with different rates. Moreover, percentages of the municipalities that answered question 6 as "Yes" are higher than the percentages of all municipalities (Figure 4.15). The priority is "adaptation to climate change is not perceived as a priority issue by citizens" with the percentage of 92,3%. The second priority is inadequate and incomplete legislation with a percentage of 87,2%. The third priority is the lack of cooperation with central/local public units with a percentage of 84,6%. From these results, it is understood that these are the most common difficulties faced in the implementation phases by the municipalities that have studied about climate change adaptation.

Table 4.3 The data used in the figures in this section

			District Municipalities	Metropolitan Municipalities
Question 10: What are the reasons for lack of enough actions by municipalities to ensure adaptation to climate change?	**A.** Adaptation to climate change is not a priority issue **B.** The municipality does not have sufficient capacity (lack of knowledge and experts) **C.** Adaptation to climate change is not perceived as a priority issue by citizens **D.** Insufficiency of the municipal budget **E.** Lack of coordination between units/directorates in the municipality **F.** Lack of cooperation with central/local public units **G.** Lack of cooperation with other municipalities **H.** Legislation (law/ regulation) is incomplete and inadequate **I.** Lack of sanction or support of central government about climate change adaptation **J.** Other	**Strongly agree/ Agree**	Figure 4.14, Figure 4.15, Figure 4.16, Figure 4.17, Figure 4.18, Figure 4.20, Figure 4.21	Figure 4.14, Figure 4.15, Figure 4.16, Figure 4.17, Figure 4.19, Figure 4.20, Figure 4.21
		Strongly disagree/ Disagree	Figure 4.14, Figure 4.15, Figure 4.16	Figure 4.14, Figure 4.15, Figure 4.16
Question 6: Is there any action (plan, project, activity, etc.) that your municipality have done/ is doing or planning to do for climate change adaptation?		**Yes**	Figure 4.14, Figure 4.15, Figure 4.17, Figure 4.18	Figure 4.14, Figure 4.15, Figure 4.17, Figure 4.19
		No	Figure 4.14, Figure 4.16, Figure 4.17, Figure 4.18, Figure 4.20, Figure 4.21	Figure 4.14, Figure 4.16, Figure 4.17, Figure 4.19, Figure 4.20, Figure 4.21



	Adaptation to climate change is not a priority issue	The municipality does not have sufficient capacity (lack of knowledge and experts)	Adaptation to climate change is not perceived as a priority issue by citizens	Insufficiency of municipal budget	Lack of coordination between units/directorates in the municipality	Lack of cooperation with central/local public units	Lack of cooperation with other municipalities	Legislation (law / regulation) is incomplete and inadequate	Lack of sanction or support of central government about climate change adaptation
Disagree	32,9	19,7	9,2	31,6	40,8	18,4	23,7	18,4	25,0
Agree	67,1	80,3	90,8	68,4	59,2	81,6	76,3	81,6	75,0

Figure 4.14. Reasons for lack of adequate actions by municipalities on adaptation to climate change remarked by all municipalities

The municipalities' that replied question 6 as "No" priority is the same with the municipalities that have the studies about climate change adaptation (that replied question 6 as "Yes"). But, the other two priorities are different. These are "lack of knowledge and experts in the municipalities" (83,8%) and "lack of cooperation with central/local public units" (78,4%) (Figure 4.16). It is understood from this fact that the main reason for not working on climate change adaptation is the lack of knowledge and experts.

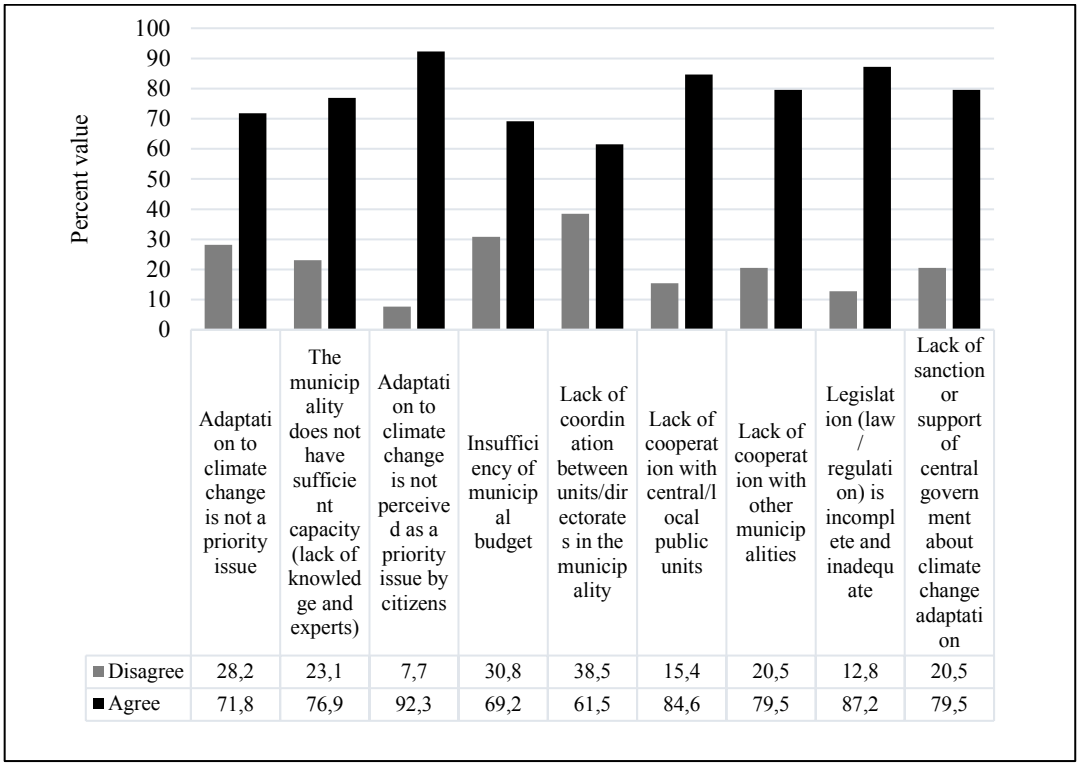
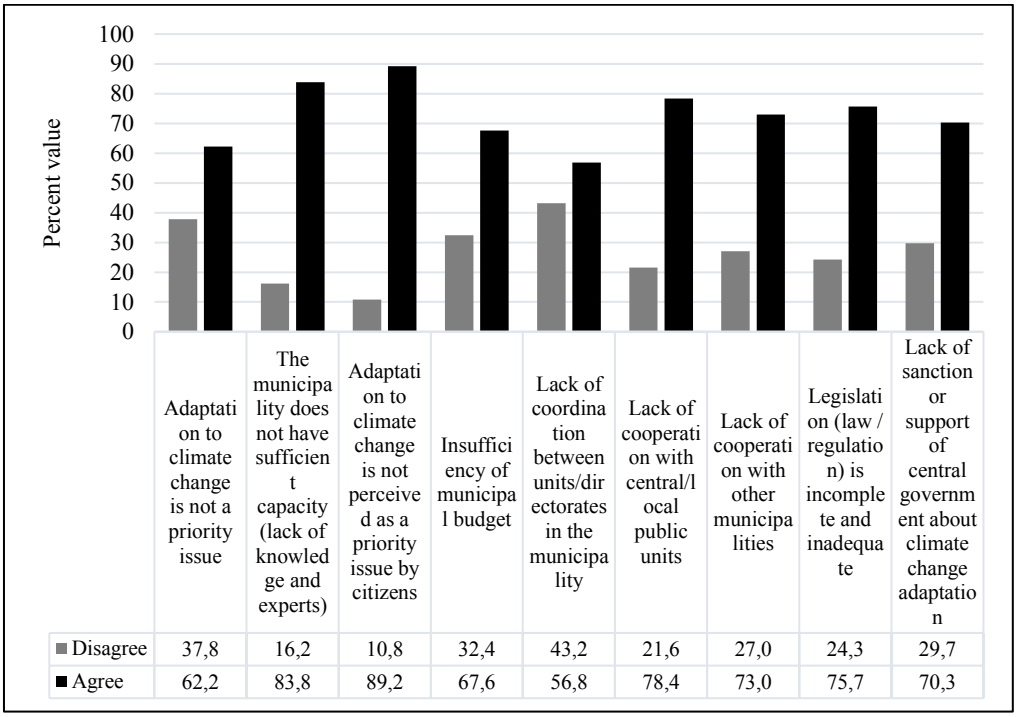


Figure 4.15. Reasons for lack of adequate actions by municipalities on adaptation to climate change remarked by municipalities replied question 6 as "Yes"

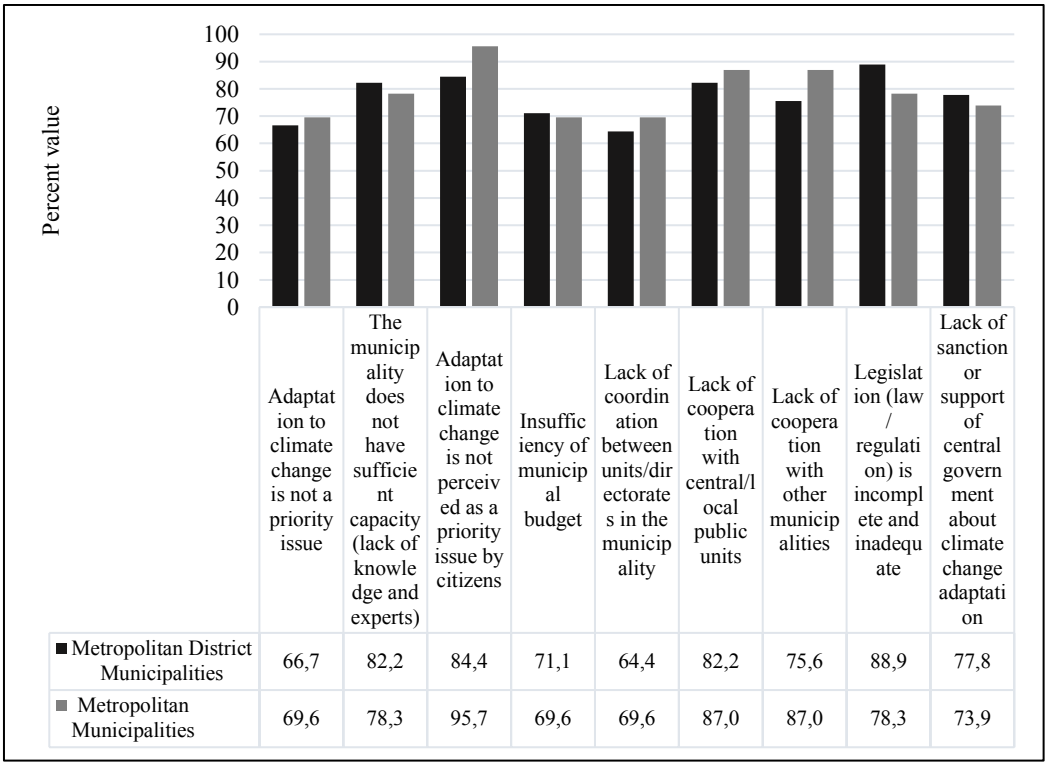
According to Figure 4.17, in metropolitan municipalities, the first reason for the lack of adequate actions on adaptation to climate change was the lack of citizen demand (95,7%), while in metropolitan district municipalities the first reason was the incomplete and inadequate legislation (88,9%). This result may be explained by the fact that differences in the authority in legislation. Metropolitan municipalities' responsibilities are more than metropolitan district municipalities.

According to the results of z-test (Table 4.4), there is not significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan and metropolitan district municipalities. Because value of $p > 0.05$ in all the options.



	Adaptation to climate change is not a priority issue	The municipality does not have sufficient capacity (lack of knowledge and experts)	Adaptation to climate change is not perceived as a priority issue by citizens	Insufficiency of municipal budget	Lack of coordination between units/directorates in the municipality	Lack of cooperation with central/local public units	Lack of cooperation with other municipalities	Legislation (law / regulation) is incomplete and inadequate	Lack of sanction or support of central government about climate change adaptation
Disagree	37,8	16,2	10,8	32,4	43,2	21,6	27,0	24,3	29,7
Agree	62,2	83,8	89,2	67,6	56,8	78,4	73,0	75,7	70,3

Figure 4.16. Reasons for lack of adequate actions by municipalities on adaptation to climate change remarked by municipalities replied question 6 as “No”



	Adaptation to climate change is not a priority issue	The municipality does not have sufficient capacity (lack of knowledge and experts)	Adaptation to climate change is not perceived as a priority issue by citizens	Insufficiency of municipal budget	Lack of coordination between units/directorates in the municipality	Lack of cooperation with central/local public units	Lack of cooperation with other municipalities	Legislation (law / regulation) is incomplete and inadequate	Lack of sanction or support of central government about climate change adaptation
Metropolitan District Municipalities	66,7	82,2	84,4	71,1	64,4	82,2	75,6	88,9	77,8
Metropolitan Municipalities	69,6	78,3	95,7	69,6	69,6	87,0	87,0	78,3	73,9

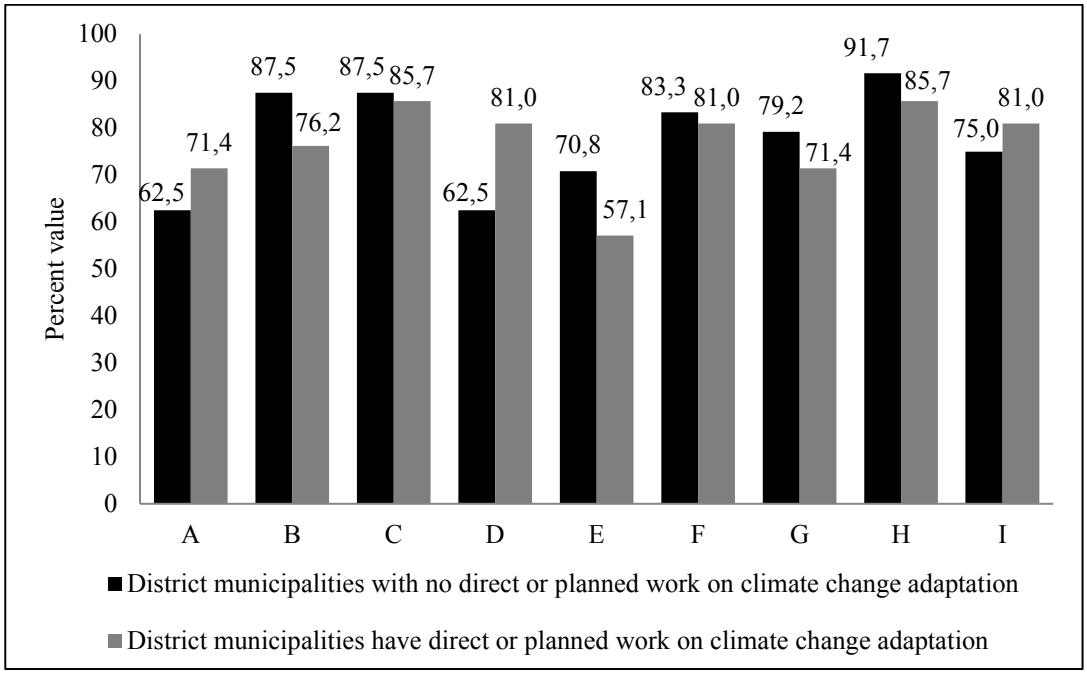
Figure 4.17. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by district and metropolitan municipalities replied question 10 as “Agree” and “Strongly agree”

Table 4.3. Z-test results of "the reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by district and metropolitan municipalities replied question 10 as 'Agree' and 'Strongly agree'"

		A	B	C	D	E	F	G	H	I
District Municipalities	Proportion (p1)	0.66	0.82	0.84	0.71	0.64	0.82	0.75	0.88	0.77
	Sample size (N1)	45	45	45	45	45	45	45	45	45
Metropolitan Municipalities	Proportion (p2)	0.69	0.78	0.95	0.69	0.69	0.87	0.87	0.78	0.73
	Sample Size (N2)	23	23	23	23	23	23	23	23	23
	Value of z	-0.24	0.39	-1.30	0.17	-0.41	-0.52	-1.15	1.08	0.36
	Value of p	**0.80**	**0.68**	**0.19**	**0.86**	**0.68**	**0.59**	**0.25**	**0.28**	**0.71**

A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

According to Figure 4.18, "incomplete and inadequate legislation" and "adaptation to climate change is not perceived as a priority issue by citizens" are the main reasons for lack of adequate actions in municipalities on adaptation to climate change for district municipalities both have studies on climate change adaptation or not. There are significant differences between the two kinds of district municipalities. The priority of district municipalities with no direct or planned actions on adaptation to climate change is the insufficient capacity (lack of knowledge and experts) in the municipalities. However, district municipalities having direct or planned actions on climate change adaptation have other priorities. According to the results of z-test (Table 4.5), there is not significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan district municipalities have and have not direct or planned actions on adaptation to climate change. Because value of $p > 0.05$ in all the options.



A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

Figure 4.18. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by district municipalities replied question 10 as “Agree” and “Strongly agree” and question 6 as “Yes” and “No”

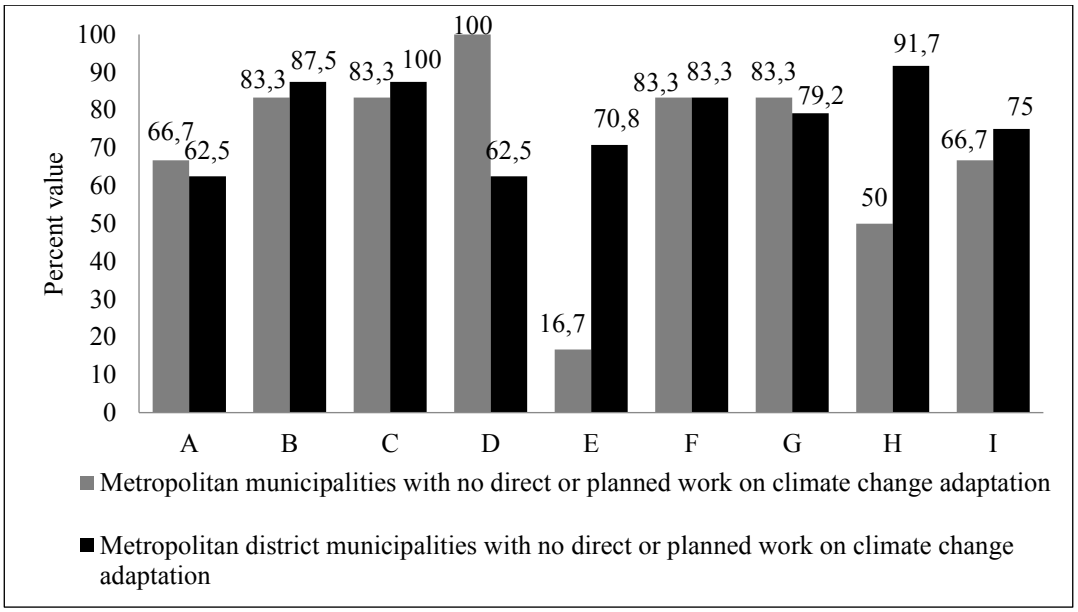
Table 4.4. Z-test results of "the reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by district municipalities replied question 10 as 'Agree' and 'Strongly agree' and question 6 as 'Yes' and 'No'"

		A	B	C	D	E	F	G	H	I
District M. replied Q6 as No	Proportion (p1)	0.62	0.87	0.87	0.62	0.70	0.83	0.79	0.91	0.75
	Sample size (N1)	24	24	24	24	24	24	24	24	24
District M. replied Q6 as Yes	Proportion (p2)	0.71	0.76	0.85	0.81	0.57	0.81	0.71	0.85	0.81
	Sample size (N2)	21	21	21	21	21	21	21	21	21
	Value of z	-0.63	0.95	0.19	-1.39	0.90	0.17	0.62	0.62	-0.48
	Value of p	**0.52**	**0.33**	**0.84**	**0.16**	**0.36**	**0.86**	**0.53**	**0.53**	**0.63**

A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

Figure 4.19 showed that metropolitan municipalities with no direct or planned actions on climate change adaptation replied question 10 as "Agree" and "Strongly Agree" and question 6 as "Yes" and "No" think that the main reason (100%) for lack of adequate actions in municipalities on adaptation to climate change is insufficiency of municipal budget. Z-test results show that (Table 4.6), two kind of metropolitan municipalities have different opinions on this issue. This result may be explained by the fact that the municipalities have different budget priorities, in other words, the budget is used in different sectors. On the other hand, the metropolitan municipalities have direct or planned actions on climate change adaptation replied question 10 as "Agree" and "Strongly Agree" and question 6 as "Yes" and "No" think that the main

reason (100%) is “adaptation to climate change is not perceived as a priority issue by the citizens”. The reason behind the answer that is given by the metropolitan municipalities working on climate change adaptation may be due to the fact that citizens do not pay enough attention to the studies on climate change adaptation that had been done before. But, according to z-test results in spite of the fact that p value is 0.08 (this may be due to the fact that the sample size is too small), two kind of metropolitan municipalities have different opinions.



A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

Figure 4.19. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan municipalities replied question 10 as “Agree” and “Strongly agree” and question 6 as “Yes” and “No”

Table 4.5. Z-test results of the "reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan municipalities replied question 10 as 'Agree' and 'Strongly agree' and question 6 as 'Yes' and 'No'"

		A	B	C	D	E	F	G	H	I
Metropolitan M. replied Q6 as No	Proportion (p1)	0.66	0.83	0.83	1	0.16	0.83	0.83	0.5	0.66
	Sample size (N1)	6	6	6	6	6	6	6	6	6
Metropolitan M. replied Q6 as Yes	Proportion (p2)	0.70	0.76	1	0.58	0.64	0.88	0.88	0.88	0.76
	Sample size (N2)	17	17	17	17	17	17	17	17	17
	Value of z	-0.18	0.35	-1.7	1.91	-2.02	-0.31	-0.31	-1.93	-0.47
	Value of p	**0.85**	**0.72**	**0.08**	**0.05**	**0.04**	**0.75**	**0.75**	**0.05**	**0.63**

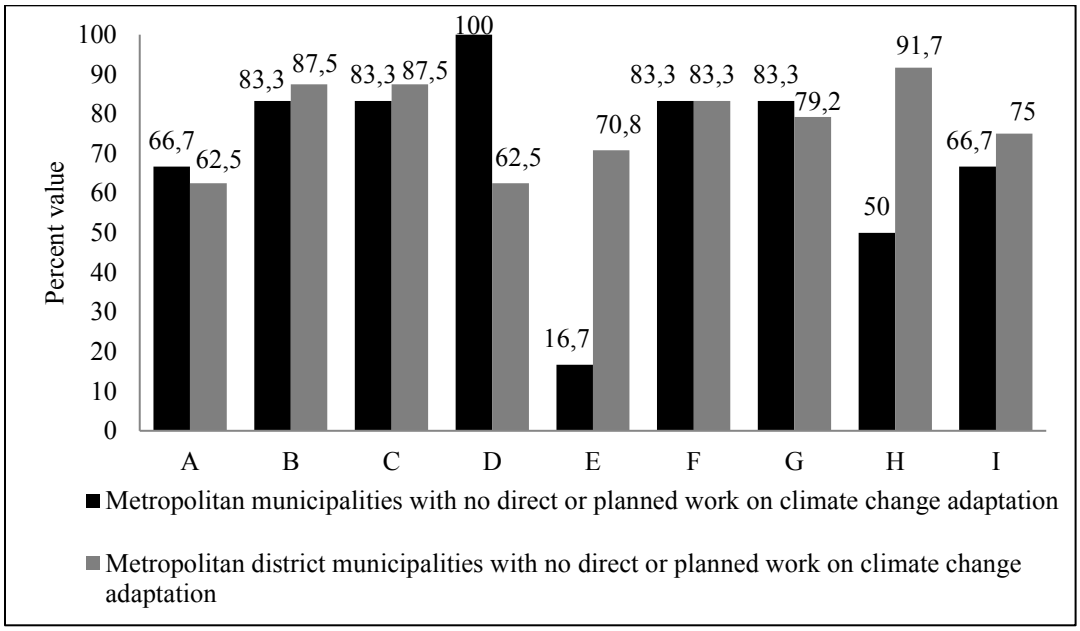
A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

The interesting thing in Figure 4.19 is that 64,7% of the metropolitan municipalities that have direct or planned actions on climate change adaptation do not think that they have a lack of coordination between units/directorates in the municipality, while 16,7% of the metropolitan municipalities that have no direct or planned actions on climate change adaptation do not think that they have a lack of coordination between units/directorates in the municipality. Z-test results also support these rates (Table 4.6). The p value of "Lack of coordination between units/directorates in the municipality" is 0.04, less than 0.05, therefore there is a significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan municipalities have or have not direct or planned actions on adaptation to climate change. The reason behind 16,7% rate maybe since they have not

experienced any coordination problem with other municipal activities before. In that point, we can conclude that the reason behind this answer is may be due to the fact that climate change adaptation is an interdisciplinary study. Because of being an interdisciplinary issue, climate change is studied in more than one department in the municipalities. Therefore, it is predicted that the coordination problem between units/directorates in the municipalities will increase as the studies on climate change increase.

If we compare metropolitan district municipalities and metropolitans with no direct or planned actions on climate change adaptation replied question 10 as "Agree" and "Strongly agree", we can conclude that district municipalities of metropolitans have given the priority to "Lack of coordination between units/directorates in the municipality" with the rate of 70,8% and "Legislation (law/ regulation) is incomplete and inadequate" with the rate of 91,7% which are more than metropolitan municipalities. Unexpectedly, it is seen that metropolitan municipalities with no direct or planned actions on climate change adaptation have given "insufficiency of municipal budget" as the reason of inadequate studies on climate change adaptation with the rate of 100% (Figure 4.20). On the contrary, metropolitan district municipalities that have direct or planned actions on adaptation to climate change have given more priority (81%) to "insufficiency of municipal budget" more than metropolitan municipalities (58,8%) (Figure 4.21). That is to say, metropolitan municipalities that do not study on climate change see the municipal budget as an excuse for not studying.

According to z-test results (Table 4.7), p values of "Lack of coordination between units/directorates in the municipality" and "Legislation (law/ regulation) is incomplete and inadequate" are 0.01, less than 0.05, so there is a significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan and metropolitan district municipalities that have no direct or planned actions on climate change adaptation. Unexpectedly, metropolitan district municipalities have given more priority to them.



A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law / regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

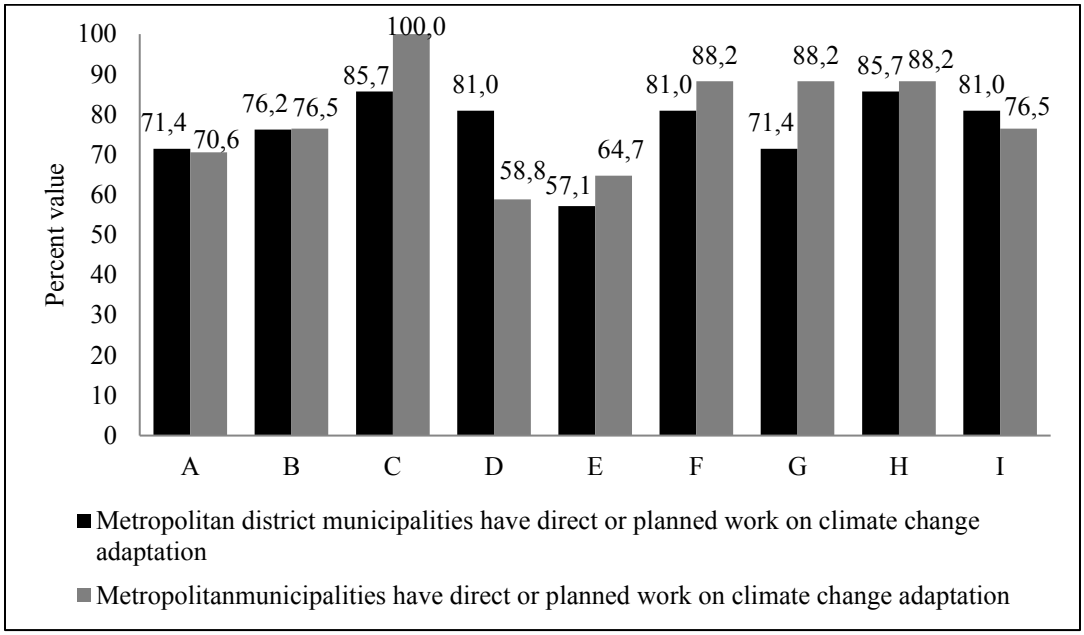
Figure 4.20. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of metropolitans replied question 10 as “Agree” and “Strongly agree” and question 6 as “No”

Table 4.6. Z-test results of the "reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of metropolitans replied question 10 as 'Agree' and 'Strongly agree' and question 6 as 'No'"

		A	B	C	D	E	F	G	H	I
District M. replied Q6 as No	Proportion (p1)	0.62	0.87	0.87	0.62	0.70	0.83	0.79	0.91	0.75
	Sample size (N1)	24	24	24	24	24	24	24	24	24
Metropolitan M. replied Q6 as No	Proportion (p2)	0.66	0.83	0.83	1	0.16	0.83	0.83	0.5	0.66
	Sample size (N2)	6	6	6	6	6	6	6	6	6
	Value of z	-0.18	0.25	0.25	-1.80	2.40	0	-0.21	2.38	0.44
	Value of p	**0.85**	**0.80**	**0.80**	**0.07**	**0.01**	**1**	**0.82**	**0.01**	**0.65**

A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law/ regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

According to the results of z-test (Table 4.8), there is not significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan district and metropolitan municipalities have direct or planned actions on adaptation to climate change. Because value of $p > 0.05$ in all the options.



A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law/ regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

Figure 4.21. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of metropolitans replied question 10 as “Agree” and “Strongly agree” and question 6 as “Yes”

Table 4.7. Z-test results of the "reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of metropolitans replied question 10 as 'Agree' and 'Strongly agree' and question 6 as 'Yes'"

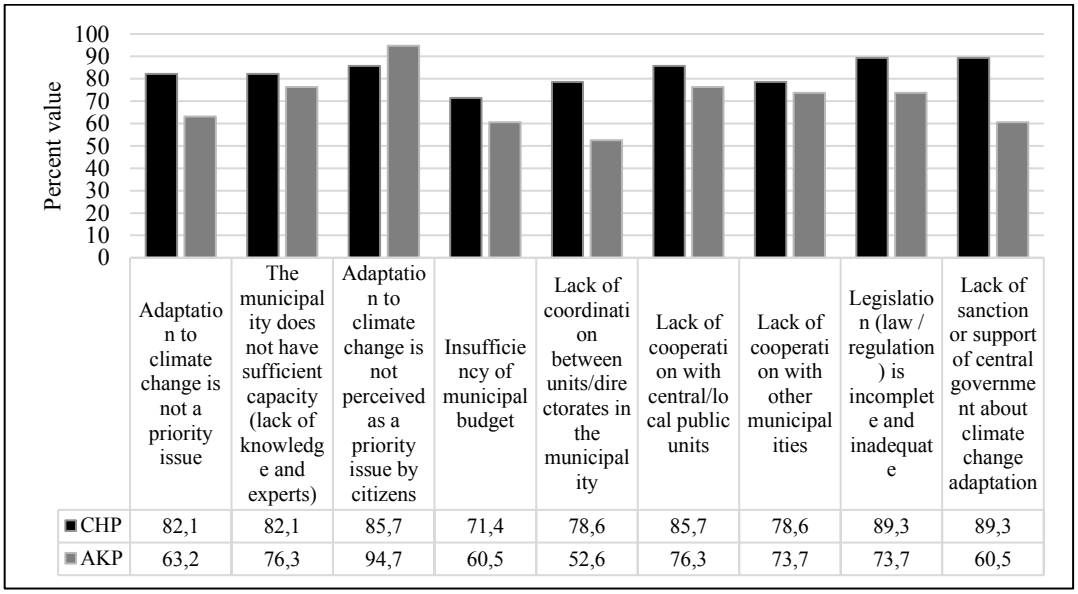
		A	B	C	D	E	F	G	H	I
District M. replied Q6 as Yes	Proportion (p1)	0.71	0.76	0.85	0.81	0.57	0.81	0.71	0.85	0.81
	Sample size (N1)	21	21	21	21	21	21	21	21	21
Metropolitan M. replied Q6 as Yes	Proportion (p2)	0.70	0.76	1	0.58	0.64	0.88	0.88	0.88	0.76
	Sample size (N2)	17	17	17	17	17	17	17	17	17
	Value of z	0.06	0	-1.66	1.54	-0.43	-0.58	-1.27	-0.26	0.37
	Value of p	**0.94**	**1**	**0.09**	**0.12**	**0.65**	**0.55**	**0.20**	**0.78**	**0.71**

A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law/ regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

In general, responses of question 10 do not show significant changes with respect to parties (Figure 4.22). The most important differences are;

- Only the rate of "Adaptation to climate change is not perceived as a priority issue by citizens" is more than (94,7% to 85,7%) the municipalities of CHP for the municipalities of AKP.
- "Legislation (law/ regulation) is incomplete and inadequate" and "Lack of sanction or support of central government about climate change adaptation" are the first reasons for municipalities of CHP for lack of adequate actions in municipalities on adaptation to climate. Again, this data shows that central government acts politically while supporting municipalities. P value of "Lack of sanction or support of central government about climate change adaptation" also supports this result statistically (Table 4.9).

- P value of “Lack of coordination between units/directorates in the municipality” is 0.03, less than 0.05. So, there is a significant difference among the reasons for lack of adequate actions on adaptation to climate change in metropolitan and metropolitan district municipalities of CHP and AKP (Table 4.9).



	Adaptation to climate change is not a priority issue	The municipality does not have sufficient capacity (lack of knowledge and experts)	Adaptation to climate change is not perceived as a priority issue by citizens	Insufficiency of municipal budget	Lack of coordination between units/directorates in the municipality	Lack of cooperation with central/local public units	Lack of cooperation with other municipalities	Legislation (law / regulation) is incomplete and inadequate	Lack of sanction or support of central government about climate change adaptation
CHP	82,1	82,1	85,7	71,4	78,6	85,7	78,6	89,3	89,3
AKP	63,2	76,3	94,7	60,5	52,6	76,3	73,7	73,7	60,5

Figure 4.22. Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of metropolitans replied question 10 as “Agree” and “Strongly agree” and question 6 as “Yes”

Table 4.8. Z-test results of the "Reasons for lack of adequate actions in municipalities on adaptation to climate change remarked by metropolitan and district municipalities of CHP and AKP replied question 10 as 'Agree' and 'Strongly agree'

		A	B	C	D	E	F	G	H	I
CHP Municipalities	Proportion (p1)	0.82	0.82	0.85	0.71	0.78	0.85	0.78	0.89	0.89
	Sample size (N1)	28	28	28	28	28	28	28	28	28
AKP Municipalities	Proportion (p2)	0.63	0.76	0.94	0.60	0.52	0.76	0.73	0.73	0.60
	Sample size (N2)	38	38	38	38	38	38	38	38	38
	Value of z	1.68	0.58	-1.21	0.92	2.16	0.90	0.46	1.59	2.60
	Value of p	**0.09**	**0.55**	**0.22**	**0.35**	**0.03**	**0.36**	**0.64**	**0.10**	**0.009**

A: Adaptation to climate change is not a priority issue B: The municipality does not have sufficient capacity (lack of knowledge and experts) C: Adaptation to climate change is not perceived as a priority issue by citizens D: Insufficiency of municipal budget E: Lack of coordination between units in the municipality F: Lack of cooperation with central/local public units G: Lack of cooperation with other municipalities H: Legislation (law/ regulation) is incomplete and inadequate I: Lack of sanction or support of central government about climate change adaptation

When we examine the question 10 in detail (Figure 4.23), the district municipalities of metropolitans of two political parties have given opposite responses to "Lack of coordination between units/directorates in the municipality" option. District municipalities of metropolitans of CHP think that there is a lack of coordination between units/directorates in the municipality, and this is the reason for lack of adequate actions in municipalities on adaptation to climate change. District municipalities of metropolitans of AKP consider the exact opposite. But interestingly, metropolitan municipalities of AKP and CHP are agree with district municipalities of metropolitans of CHP (Figure 4.24).

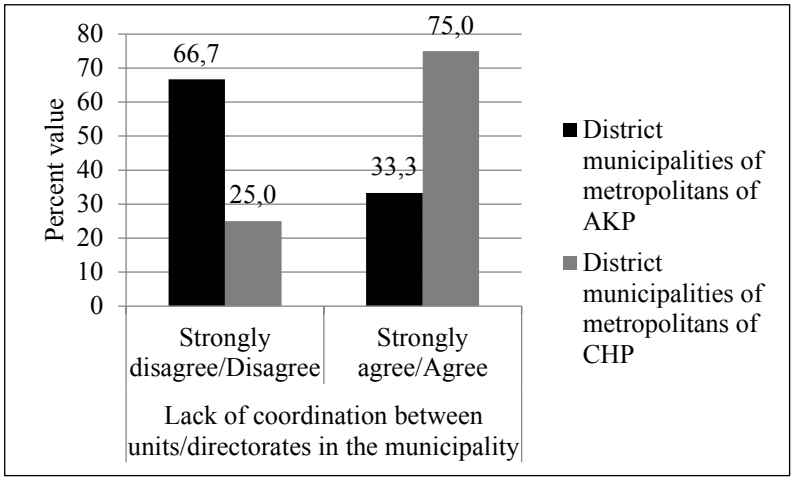


Figure 4.23. Percent of the district municipalities of metropolitans of AKP and CHP that replied "Lack of coordination between units/directorates in the municipality" option in the question 10

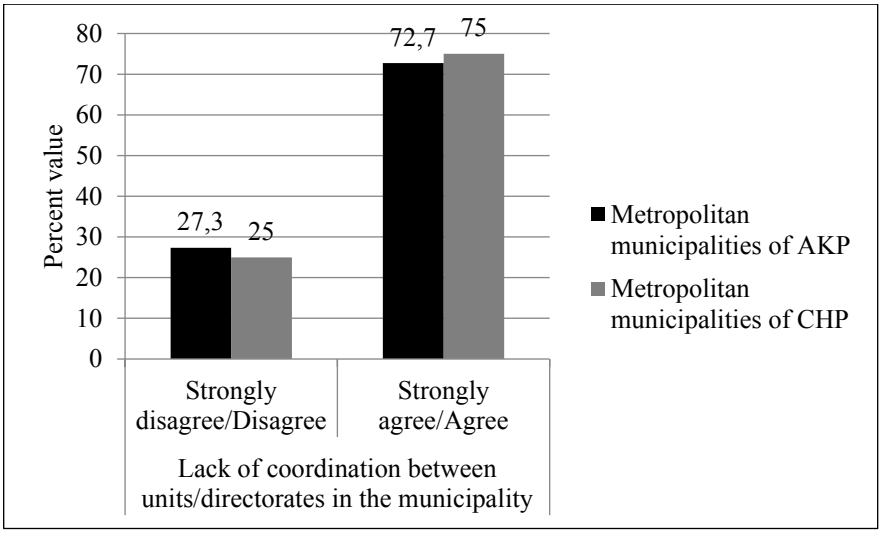


Figure 4.24. Percent of the metropolitan municipalities of AKP and CHP that replied "Lack of coordination between units/directorates in the municipality" option in the question 10

4.4. Overall Discussion

This chapter focused on the results of the questionnaire survey conducted with experts working in metropolitan, provincial and metropolitan district municipalities.

Although the survey was sent to 30 metropolitan municipalities, 61 provincial municipalities and 150 of the most populous district municipalities in metropolitan cities, only 76 of them have returned.

The reason for this may be due to;

- Lack of interest in survey studies or,
- Lack of sufficient knowledge and actions on climate change in the municipalities.

Because, although the survey was sent to all municipalities at the same time, it was seen that the municipalities study on climate change had returned in the first order. The provinces made insufficient returns. So that, it is not considered in most graphs, as it would be insufficient for interpretation. Data of MHP and HDP are not included at all of the graphs by the same reason. Besides, trustees have been appointed to 77.8% of the HDP municipalities.

All of the municipalities participating to the questionnaire agree that climate change is an important problem. And, every year the number of municipalities studying on climate change adaptation increases. However;

- Only 3 of them have prepared climate change adaptation plan,
- 77% of the municipalities give importance to climate change adaptation among their other municipal activities under 64%,
- Only 50.6% of the municipalities have plan, project, activity etc. about climate change adaptation or they are planning to do and
- It is observed that there is a confusion about the meaning of climate change adaptation. Misunderstanding of difference between climate change adaptation and mitigation is the proof of insufficient knowledge about climate change.

One of the most significant finding to emerge from this study is that giving importance to climate change studies is a political issue:

- Municipalities of CHP pay attention to climate change actions among other municipal activities more than AKP municipalities,
- District municipalities of CHP utilized from international and national grant programs and collaborated with private sector, NGOs and municipalities union(s) more than district municipalities of AKP. 88.9% of district municipalities of AKP provide climate financing from their own budgets. Their secondary finance source is central administration at the rate of 22.2%
- Metropolitan municipalities of CHP have been supported by all stakeholders except central administration. Since the CHP is an opposition party, it cannot benefit from the central government's climate finance. On the contrary, metropolitan municipalities of AKP have been supported by their own budgets (75%) and central administration (41.7%).

With this survey results, many problems which experienced in adaptation to climate change in Turkey are determined. Studies on water management, agriculture and disaster risk management by the municipalities are quite weak. Turkey has recently been experiencing floods which causes loosing life and goods. The only way to mitigate the impacts of flood disasters is to increase climate change adaptation actions.

According to the vast majority of the municipalities, the reason behind the lack of studies about adaptation to climate change is that citizens do not give priority to climate change adaptation. However, when we examine the answers in detail, it is seen that those who do not study on climate primarily give this answer. So, it is estimated that this issue is presented as an excuse by the municipalities. Insufficiency of the municipal budget is likewise used as an excuse by the municipalities. While the metropolitans have climate studies say that they have not budget problems, municipalities that do not have climate studies say that they have budget problems.

Legislation problem is an another important issue. The issue of climate change is hardly ever addressed in the legislation. The regulation does not contain any sanctions for the application. In other words, studies on climate change are left to the

initiative of the municipalities. For this reason, the studies are inadequate and/ or temporary.

The other problem is coordination problem between units/directorates in the municipality. Climate change adaptation is an interdisciplinary issue. Because of being an interdisciplinary issue, climate change adaptation should be studied in more than one department in the municipalities. According to the survey results, it is predicted that the coordination problem between units/directorates in the municipalities will increase as the studies on climate change increase.

This study set out to determine the reasons for lack of adequate actions in municipalities on adaptation to climate change. Considering the results presented above, the following solutions to increase actions on adaptation to climate change can be given:

- The first important requirement is the municipality have to give importance to climate change adaptation issue.
- Then, special unit working on climate change should be established. According to the survey results, all of the municipalities that have a special unit conducting studies on climate change, had already made studies about climate change adaptation obviously. Establishing these special units shows how much importance is given to this topic by municipalities.
- Special unit working on climate change should be in coordination with other related departments in the municipality.
- This unit should provide all related directorates with technical information on climate change. This unit should include adaptation to climate change in the plan decisions of other directorates.
- Municipalities' cooperation with municipality union(s) about climate change is quite weak. In fact, municipal unions are established to solve the common problems of municipalities that share the same geography. Therefore, if the budget of the municipality unions is also used for climate change, the solution will be more effective as it will contribute to the same regional municipalities.

- The central government should provide equal financial support to each municipality on the scale, without distinction of political party.

Metropolitan municipalities utilize from international grant programs due to their administrative capacity besides their own resources. District municipalities should also benefit from the grant programs by increasing their capacity to work on project writing and implementation. It is an advantage for municipalities that the majority of international grants include environmental grant schemes. Therefore, more municipalities should apply for grant schemes. Even the project preparation process is a stage that increases the capacity of municipalities to know about climate change.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Summary of the Research

In recent years, the impacts of climate change have been experienced in several cities in Turkey. These impacts are increasing summer temperatures, loss of surface water, droughts, and floods. The prevailing opinion in the adaptation literature is that 'adaptation is local' because the impacts of climate change are experienced locally. Therefore, 'place-based' approaches to climate change adaptation is needed (Adger and Kelly, 1999; Cutter et al., 2000; Turner et al., 2003; Measham et. al., 2011).

In international and national documents, mitigation is mentioned more than adaptation. The same result can be seen in many countries' INDC (Intended Nationally Determined Contribution) Reports. For instance, climate change adaptation is mentioned only one sentence in Turkey's INDC Report. In addition to this, there are no laws or regulations forcing national and local governments in Turkey to develop specific policies about climate change.

In short, although adaptation to climate change is very important, it has not received the sufficient attention from the municipalities in Turkey. This was the starting point of the study. However, local governments have responsibilities for adaptation such as providing a diverse array of non-regulatory services including storm water management, community education, public health, fire prevention, recreation and taxation (Measham et. al., 2011). The Netherlands is a country where urban responses to climate change are increasing. However, even in this country, there are differences in local climate policies between the biggest 25 municipalities (den

Exter, 2015). In Turkey, the development of the policy is at the very beginning phase like in some other countries (Balaban and Şenol-Balaban, 2015).

In order to find out the reasons for lack of adequate actions on climate change adaptation, a research based on literature review, questionnaire survey and face to face interviews have been conducted. The replies given to 14 questions by different kinds of municipalities have been analyzed by considering their political parties, types of municipalities and their replies to some questions such as:

- Question 6: Is there any action (plan, project, activity, etc.) that your municipality have done/ is doing or planning to do for climate change adaptation?
- Question 10: What are the reasons for lack of enough actions by municipalities to ensure adaptation to climate change?

The survey is designed to measure municipalities' policies to adapt to climate change, not for the physical implementation of these policies.

The findings regarding the survey and the recommendations for policymaking are described in the section below.

5.2 Research Findings & Recommendations for Policymaking

It was seen that the municipalities that have been working on addressing climate change were the ones that returned to the survey promptly and in the first submission. It is observed that the municipalities with late returns did not have any practice about climate change. From this, it can be concluded that the municipalities that did not return to the survey are those which do not care about climate change and do not have any particular actions.

Although, half (50.6%) of the municipalities have a plan, project, activity etc. about climate change adaptation or they are planning to do such actions in future according to the survey results, in reality, it can be deduced that it is lower than 50.6%. In addition, cities with a large population are under greater responsibility for and threat

from climate change, so it can be concluded that they have carried out more projects on climate change.

The results demonstrate that climate change was widely accepted as an important issue by local governments. But the importance of adaptation and the methods of implementation are still poorly understood. Betsill and Bulkeley (2007) claim that, local governments in developed and developing countries encounter almost the same difficulties while fighting against climate change. According to the survey results, the possible main barriers can be determined as follows:

5.2.1. Lack of Capacity

Adaptation issue is not fully understood by municipalities. The returns to the questions asking for existence of an adaptation action plan is misunderstood. They think that it is the same plan with a sustainable energy plan or involved in it. 15 of 18 municipalities mentioned that they have a climate change adaptation action plan. But they have sustainable energy plan actually. These municipalities have a lack of experts on climate change. Awareness of the decision-makers and experts should be increased to strengthen technical capacity at the local level.

5.2.2. Lack of Citizen Demand

The responsibilities of the municipalities extend from urban design to infrastructure, from recycling to waste management. Crabbé and Robin (2006) claim that the issue of climate change considered unimportant among other municipal activities by local citizens. However, all the tasks of the municipality should be done in the light of adaptation, not as a separate job. “Adaptation to climate change is not perceived as a priority issue by citizens” is the reason given by the municipalities as the highest score. The reason of this can be;

- different agenda items (economy, terror, etc.) or
- lack of knowledge about climate change by citizens.

According to a survey conducted by MoEU in 2012, 12.9% of people aged 15-69 years living in Turkey do not have any idea about climate change, 39.5% defines

climate change as seasonal change, 13.5% defines climate change as drought/ thirst, 9.3% defines as disturbance of the weather conditions. The rate of those who associate climate change with global warming is 6%. So, it can be concluded that, the level of knowledge of citizens about climate change is very weak. However, people do not take long term challenges like climate change into consideration as a rule even if they are informed basically since unemployment, poverty, societal polarization etc. are numerous urgent and short-term problems they are managing (Balaban and Şenol-Balaban, 2015).

To sustain demand from society, awareness should be increased by including the public in meetings and implementation stages of climate change related actions. As can be seen from the survey results, the local response is very important. There is no excuse for municipalities when there is citizen response/demand. In any case, if a central regulation is established, municipalities cannot use the citizen demand as an excuse.

5.2.3. Lack of Sufficient Budget

According to the survey results, especially metropolitan municipalities have given "insufficiency of municipal budget" as the reason of inadequate studies on climate change adaptation. Renewal of existing projects in accordance with adaptation have of course high cost. However, if new projects are designed as including adaptation perspective, in some cases even the cost can be reduced. The budget will not be created as long as climate adaptation is perceived as an additional work.

For example, in parks, walkways, impermeable layers such as expensive stones and asphalt prevent the water from being absorbed by the soil and increase the emission as it is a petroleum product. Therefore it is not sustainable. Instead, when the material formed by turning the tree branches into small pieces is used, the water will be absorbed by the soil and adaptation will be designed and the cost will be very low. In other words, when the budget is allocated to climate-friendly projects instead of non-climate-friendly projects, there is no case that the budget is not sufficient.

5.2.4. Lack of Coordination between Units/Directorates in the Municipality

To create a common language, a special unit studying on climate change should be established and it should be in coordination with other related departments in the municipality. This unit should support participatory process with workshops, seminars, etc. It should be known that climate change adaptation is a cross-sectoral issue (Measham et. al. 2011, p. 905). Therefore, the special unit working on climate change should create coordination between all related directorates.

5.2.5. Lack of Cooperation with other Municipalities

The fact that the directorates and units in the municipalities are different in each municipality causes problems in the distribution of powers and in forming a common language among the municipalities. The names and responsibilities of the directorates are different in general. If the same directorates establish in the municipalities, the cooperation with other municipalities can be created.

5.2.6. Incomplete and Inadequate Legislation

In this study, it was found that there was insufficient actions when left to the initiative of the municipalities. Legislation with sanctions for all municipalities about climate change adaptation should be prepared. Each municipality has directorates with different names working on climate change, they all prepare their own regulations.

5.2.7. Lack of Sanction or Support of Central Government about Climate Change Adaptation

The central government should provide equal climate financing and technical support to municipalities regardless of party separation. It should provide more finance and technical support to the municipalities most affected by climate disasters. But according to the survey results, the central government acts politically while supporting municipalities. AKP municipalities have been supported by the central government more than CHP municipalities.

5.2.8. Overall Discussion

According to Barnett et al. (2015), "limits" are also important besides "barriers" for climate change adaptation. They also stated that identifying processes apart from factors is important to combat climate change adaptation. Balaban and Şenol-Balaban (2015) points institutional barriers in local governments because of the insufficiency in the institutions responsible for developing adaptation policies. In this research, the institutional barriers faced by the local governments in Turkey can be seen clearly from the questionnaire survey result.

According to the research conducted by MoEU in 2012, although citizens have an idea of climate change, their level of knowledge is insufficient. The causes of climate change and the precautions to be taken are not known sufficiently by the citizens (MoEU, 2012). It can be seen the same result in this research. The municipalities have attended to the survey agree that "adaptation to climate change is not perceived as a priority issue by the citizens".

The presence of institutional and citizen demand barriers as well as significant economic barriers cause the challenges in terms of adaptation to climate change. Bai (2007) argues the presence of an incapability to deal with global environmental issues in the most cities in developing countries. Turkey, as a developing country, has the same barriers. However, climate change adaptation actions do not require excessive financial resources.

There are also vertical and horizontal coordination barriers to manage adaptation studies. It is stated by Balaban and Puppim de Oliveira (2014) that "a departmental approach" was the main reason for organizational problems which led to a lack of coordination between various levels of a municipality. The relationship between municipalities, regional authorities and national government is referred as vertical coordination; on the other hand, the relationship between separate agencies and policy divisions in municipal governments is referred as horizontal coordination (Bulkeley, 2009). In Turkey, the vertical coordination differentiates among political parties. Horizontal coordination is insufficient in Turkey but is increasing among

some municipalities such as Nilüfer Municipality because of its successful experience about citizen assemblies.

In conclusion, there are many reasons for the lack of sufficient actions on climate change adaptation. But, some local governments have adaptation studies despite the fact that their low budget and insufficient number of experts. Therefore, the first and foremost condition for sufficient actions on adaptation to climate change is that the municipalities should give priority to this issue. Then, the climate change adaptation action plan should be prepared and implemented with all stakeholders.

5.3 Recommendations for Future Researches

As stated before, the questionnaire survey was sent to the municipalities that are of these types: 30 metropolitan municipalities, 61 provincial municipalities and 150 of the most populous district municipalities in metropolitan cities. But, only 23 of those metropolitan municipalities, 8 provincial municipalities and 45 of the district municipalities in metropolitan cities have returned. In future research can be carried out with the support of ministries or municipal unions. In this way, returns to the survey may be more than this result.

In addition, municipalities with climate change adaptation action plans (Istanbul, Kadıköy and Bursa) can be studied in detail. Also, their adaptation action plans can be analyzed in detail in terms of the relation with other plans, sustainability and feasibility.

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APPENDICES

A. The survey

1. Which of the following groups is your municipality included?

a) Metropolitan municipality
b) Provincial municipality
c) District municipality

2. Do you think climate change is an important problem?

a) Yes

b) No

3. What does the concept of adaptation to climate change mean to you? Please explain briefly.

……
……

4. Does your municipality have an action plan for climate change adaptation?

a) Yes

b) No

5. If the answer to question 4 is "Yes", who made the contribution to the preparation of the climate change adaptation action plan? (You can mark more than one - Please specify the name of the institution/department)

a) Municipality's own experts
b) Universities
c) Non-governmental organisations
d) Municipalities Union(s)
e) Private sector
f) International institutions
g) Other

6. Is there any action (plan, project, activity, etc.) that your municipality have done/ is doing or planning to do for climate change adaptation?

a) Yes

b) No

If the answer to question 6 is "Yes", please answer questions 7, 8 and 9.

If your answer to question 6 is "No", please go to Question 10.

7. When your municipality's climate change adaptation studies have started? (Please write the planned year for planned activities)

……

……

8. Who supported/is supporting/will support these actions?

(You can select more than one option - Please specify the name of the institution/department)

a) Central administration
b) Municipality's own budget
c) Municipalities Union(s)
d) International grant programmes (EU, UN etc.)
e) National grant programmes (Development agencies etc.)
f) Private sector
g) NGOs
h) Other

9. Which of the following sectors involve these studies? (You can mark more than one - Please specify the title of the works and start/end dates)

a) Water management
b) Disaster risk management
c) Structure/building/housing
d) Urban green areas
e) Urban infrastructure
f) Agriculture
g) Other

10. What are the reasons for lack of enough actions by municipalities to ensure adaptation to climate change? Please tick.

	Strongly agree	Agree	Disagree	Strongly disagree
Adaptation to climate change is not a priority issue				
The municipality does not have sufficient capacity (lack of knowledge and experts)				
Adaptation to climate change is not perceived as a priority issue by citizens				
Insufficiency of the municipal budget				
Lack of coordination between units/directorates in the municipality				
Lack of cooperation with central/local public units				
Lack of cooperation with other municipalities				
Legislation (law/ regulation) is incomplete and inadequate				
Lack of sanction or support of central government about climate change adaptation				
Other				

11. What is your rate of consideration when you evaluate your climate change adaptation activities among your other municipal activities?

a) 0%-5%
b) 5%-25%
c) 25%-50%
d) 50%-85%
e) 85%-100%

12. Are there any special unit(s) in your municipality working on climate change?

a) Yes

b) No

13. If the answer to question 12 is "Yes", what are the name(s) and working subjects of this unit (s)?

……
……

14. What conditions/ factors/ drivers are needed in order to increase your municipality's actions on adaptation to climate change?
……
…….