

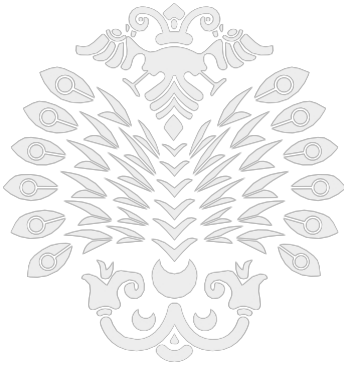
Local Response to Climate Change: Integrating Climate Action Plans and Spatial Plans

Local Coping with Climate Change: Integrating Climate Action Plans and Spatial Plans

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ABSTRACT

Due to the unique demographic, socio-economic, physical, environmental and institutional characteristics of each city, the degree of exposure to climate change-related hazards, sensitivity and coping capacity, in short, the level of vulnerability to the impacts of climate change varies. Due to city-specific vulnerabilities, it is important for local governments to take the urban context as a basis in their efforts to combat climate change. With their powers and responsibilities in urban infrastructure, housing, energy, transportation, open and green spaces, food security, disaster management, and urban health, local governments contribute to a great extent to reducing urban greenhouse gas emissions and making cities resilient against climate change-related disasters. In this context, it is considered that the most important tools of local governments in combating climate change are "local climate action plans" and "spatial plans". In this study, the scope of integrated local climate action plans and their (lack of) relationship with urban land use plans are revealed, the scope of the action plans prepared by metropolitan municipalities in our country and the extent to which they are associated with spatial plans are evaluated, and framework recommendations are developed on the integration of local climate action plans with spatial plans in the context of their success.

Keywords: Climate change, local climate action plan, mitigation and adaptation, urban land use plans, urban resilience

ABSTRACT

Due to the unique demographic, socio-economic, physical, environmental, and institutional characteristics of each city, the degree of exposure to climate change-related hazards, its sensitivity, and coping capacity, in short, the level of vulnerability to the effects of climate change varies. Due to city-specific vulnerabilities, it is important that local governments take the urban context as a basis in their efforts to combat climate change. Local governments, with their authorities and responsibilities in matters such as urban infrastructure, housing, energy, transportation, open and green spaces, food safety, disaster management, and urban health, have greatly contributed to reducing city-sourced greenhouse gas emissions and making cities resistant to climate change-related disasters. In this context, it is thought that the most important tools of local governments in the fight against climate change are "local climate action plans" and "spatial plans". In the study, the scope of the integrated local climate action plans and their relationship (incompatibility) with the urban land use plans were revealed, the scope of the action plans prepared by the metropolitan municipalities in our country and the extent to which they were associated with the spatial plans were evaluated, and framework suggestions were developed on the integration of local climate action plans with spatial plans in the context of their success.

Keywords: Climate change, local climate action plan, mitigation and adaptation, urban land use plans, urban resilience

Introduction

Climate change has various risks and impacts at global, national and local scales. At the local scale, cities are responsible for the increase in the amount of greenhouse gases emitted into the atmosphere, as well as the risks and impacts caused by this increase.



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are directly affected by the impacts of climate change. On the other hand, due to the context of each city, the sources of greenhouse gas emissions, the level of vulnerability and vulnerability, and the resilience or coping capacity against the impacts of climate change differ. In this respect, it is important to address climate change mitigation and adaptation measures at the local scale. Cities play a vital role in the global response to climate change by reducing greenhouse gas emissions and adapting to the impacts of a changing climate, and local governments are at the center of these efforts (United Nations Human Settlements Programme [UN-Habitat], 2015). Local governments contribute directly or indirectly to controlling/reducing urban greenhouse gas emissions and adapting to climate through their authorities and responsibilities in areas such as urban infrastructure, energy supply and management, air pollution, water pollution, urban transportation, public transportation, open green spaces, food security, physical planning, housing, disaster management, emergency preparedness, urban health, social assistance services (Talu, 2019).

It is thought that the most important tools of local governments in combating climate change at the local level are "local climate action plans" and "spatial plans", but in practice, not all local climate action plans are prepared in an integrated manner to include mitigation and adaptation targets and are not integrated with spatial plans, hinders the success of the local struggle. In order to reduce urban greenhouse gas emissions and make cities resilient to climate change-related impacts and disasters, it is argued that "climate-sensitive spatial plans" should be prepared and "integrated local climate (change) action plans" should be prepared. However, how "climate sensitive spatial plans" can be prepared is beyond the scope of this study. In this study, the scope of integrated local climate action plans and their (lack of) relationship with urban land use plans revealed, the scope of the action plans prepared by metropolitan municipalities in our country and the extent to which they are associated with spatial plans are evaluated, and as a result, framework recommendations on the integration of local climate action plans with spatial plans are developed. In the related literature (Öztürk Akbıyık and Arslan Selçuk (2023), who reveal the direction in which research trends on climate change have developed and how they have diversified in the literature) there are no studies that directly address the relationship between climate change action plans and spatial plans. For this reason, this study is expected to draw attention to the importance and necessity of the subject and guide future studies.

Relationship between Local Climate Action Plans and Urban Land Use Plans

Local climate action plans are a document that defines the responsibilities of city governments to combat climate , out their institutional identity and policy structure, and translates climate change mitigation and adaptation strategies into comprehensive/detailed concrete actions. Climate action planning provides city governments and their partners with strategic directionnew ideastools and a community of practice to address climate change while meeting long-term goals such as socio-economic development and environmental protection (Nations Human Settlements Programme [UN-Habitat], 2015). In the fight against climate change at the local level, mitigation policies (and mitigation action plans in this context) have initially dominated, especially within the framework of the energy efficiency principle of cities (Wheeler, 2008; Yılmaz & Işınkaralar, 2021). The results of mitigation policies or actions are taken in the long term and benefits at the global level, while adaptation policies or actions

Considering that the results are seen both in the short and long term and can provide direct benefits at the local level, the necessity of integrating mitigation and adaptation policies or actions for the success of combating climate change in cities has emerged over time. In this context, integrated local/urban climate action plans have come to the agenda with the vision of a low-carbon and climate-resilient city in the 2000s (Talu, 2019). However, it is seen that mitigation targets are more prioritized than adaptation targets in integrated urban climate action plans (Grafakos et al., 2020).

Integrated local climate action plans; to determine the greenhouse gas inventory of the cities related to sectors and thematic areas, to determine emission reduction targets by identifying priority sectors, to determine the impacts of climate change on the city and the vulnerabilities/vulnerabilities in sectoral and thematic areas against these impacts based on past data and projections for the future in relation to climate change, This includes identifying key risks and priority areas, assessing adaptive capacity, setting adaptation objectives, developing actions within a timetable for mitigation and adaptation, and monitoring and reviewing these actions.

The extent to which the mitigation and adaptation targets set in action plans can be realized, in other words, the extent to which they are integrated with spatial plans taking into account the urban context, is an important criterion for success. The principles and components developed by the United Nations Human Settlements Program (UN-Habitat) and the Climate Leadership Group for Major Cities (C40) to prepare a successful and quality climate action plan also point to this criterion.

UN-Habitat set "Guiding Principles Urban Climate Action Planning" at the Climate Change Conference in Paris. These are: ambitious, inclusive, equitable, comprehensive and integrative, relevant, actionable/manageable, evidence-based, transparent and verifiable. Based on the fact that different cities need different solutions, it is emphasized that these guidelines will help cities determine which tools to use in their specific contexts (United Nations Human Settlements Programme [UN-Habitat], 2015). Indeed, studies examining climate action plans (Baker et al., 2012; Damsø et al., 2016) have also emphasized the importance of effective public participation and place and context in improving the quality of local mitigation and adaptation plans.

In the "Climate Action Planning Framework" created by the Major Cities Climate Leadership Group in line with the objectives of the Paris Agreement, designed to recognize the diversity and individual contexts of cities and to be flexible; the basic components of a climate action plan are put forward and it is suggested that the components should be included in the city's climate action planning documents. Accordingly, the four key components are; Emission neutrality (developing a pathway and setting targets to achieve an emission-neutral city by 2050 at the latest), Resilience climate hazards (demonstrating how the city adapt and build resilience to climate hazards now and in future climate change scenarios), Inclusiveness and benefits (the social benefits expected from the implementation of the plan), engaging with the community to outline environmental and economic benefits and identify ways to ensure that these benefits are equitably distributed across the city's population), Governance and collaboration (detailing the city's governance, mandate and capacity, and working with the community to accelerate the realization of the city's mitigation goals and resilience objectives)

identify partners that need to be engaged) (C40 Cities Climate Leadership Group, [C40 Cities], 2019).

In line with the aforementioned principles and components, the main actionable tool for cities to improve their resilience to climate hazards in their own contexts is spatial plans. As a matter of fact, a significant portion of the mitigation and adaptation targets and measures in climate action plans focus on land use measures. In this case, it is important to integrate local climate action plans with spatial plans in the context of realizing mitigation and adaptation targets.

Climate strategies in local climate action plans provide guidelines for adapting to the global emissions target and set concrete targets for reducing GHG emissions and energy use, and increasing adaptive capacity, but fail to demonstrate to what extent or how the measures in climate action plans will achieve the targets. Although local climate action plans aim to reduce greenhouse gas emissions and adaptation, they miss to emphasize the importance of urban planning policies. In the limited number of studies evaluating the implemented local climate action plans in this context, it has been revealed that action plans and spatial plans are not associated.

For example, one study (Wilson, 2006) examined local authority planning policies for climate change adaptation in the UK and the key attitudes of planning professionals towards climate change, noting that spatial planning at the local level has a critical anticipatory role in promoting climate change adaptation. The study found that the wider implications of climate change risk have not yet been integrated into plans due to a lack of political support and the planning profession's lack of engagement with climate change. In a study examining 40 local climate change action plans in the USA (Tang et al. 2010) findings; local climate change action plans focus heavily on the built environment (e.g. energy, transportation, waste, and buildings) and pay little attention to the natural environment; that while these plans establish appropriate policies for communication and coordination, relatively few strategies are used for implementation; that local governments focus on outcomes (e.g. resource management strategies, tends to pay more attention to mitigating climate change impacts (e.g. transportation policies, energy strategies) rather than preparing for them (e.g. disaster-resilient land use and building codes), while land use and resource management strategies are not emphasized in action plans. Another study (Yalcin & Lefevre, 2012) noted that while climate action plans are a potentially powerful tool for implementing climate policies at the local level, they are not the only tool; authorities can integrate climate considerations using many different types of actions and regulatory or voluntary mechanisms; and that climate action plans still do not pay enough attention to mobility and urban planning issues. According to a study (Stone et al., 2012) assessing the potential effectiveness of local climate action plans in slowing the rate of warming in 50 US cities, the main driver of warming at the urban scale is the urban heat island effect and most climate action plans fail to directly manage land-based drivers of warming. In a study (Deetjen et al., 2018) evaluating the climate action plans of 29 major US cities, it was reported many US cities lack the density/parking plans needed to support building/transportation policy, indicating that many US cities lack the coherence necessary for climate action plans to succeed.

In the next section, it is shown that the climate change action plans prepared in our country are not sufficiently associated with urban land use plans.

Evaluation of Local Climate Change Action Plans Prepared by Metropolitan Municipalities

the high rate of urbanization in metropolitan areas in Turkey and the majority of the urban population living in metropolitan areas, the importance of increasing the resilience of metropolitan areas to climate change by reducing greenhouse gas emissions and adapting to climate impacts is evident.

In the Strategic Plan of the Ministry of Environment and Urbanization (2019-2023), it is stated that Climate Change Action Plans will be prepared for 7 regions, especially the Black Sea Region, in order to ensure adaptation to climate change and to take the necessary measures and the number of metropolitan municipalities whose local climate change action have been completed and approved by the Ministry will be 10 in 2021, 20 in 2022 and It is projected to be 30 in 2023.

14 metropolitan cities by 2023 (Ankara (2021), Antalya (2022), Bursa (2015), Denizli (2016), Gaziantep (2016), Hatay (2021), İstanbul (2021), İzmir (2020)(2017)Kayseri (2022), Kocaeli (2018), Muğla (2013), Şanlıurfa (2022), Trabzon (2019)) have progressed in climate action planning processes (greenhouse gas inventory, determination of strategies, identification of impacts, etc.) (Table 1). Apart from these, Adana, Aydın, Balıkesir, Diyarbakır, Erzurum, Konya, Malatya, Manisa, Mersin, Sakarya, Samsun and Tekirdağ Metropolitan Municipalities are in the process of preparing their climate change action plans.

When these action plans are analyzed;

- Local climate change action plans generally focused on GHG emission mitigation policies and were in the nature of "mitigation action plans" (Gaziantep, Hatay, Kahramanmaraş, Muğla), while integrated climate action plans addressing mitigation and adaptation policies and strategies started to be included in the action plans prepared later (Ankara, İstanbul, Kayseri, DenizliTrabzon),
- In general, greenhouse gas inventories were made in the housing, transportation, energy, industry, waste, agriculture-land use sectors, and climate change impacts were determined in more detail in the same sectors,
- differences between the year of preparation of the action plans and the target year according to the municipalities (between 11 and 16 years), the difference between the current emission values and the estimated emission values also differs according to the municipalities, this difference may be caused by many factors such as the size of the city, population, economic structure, sectoral greenhouse gas sources and emission amount, energy resources, land use, etc. When the current emission values, estimated emission values and targeted emission values are compared with each other, the estimated emission value is higher than the current and targeted emission value in most of the action plans. When the current emission values, estimated emission values and targeted emission values are compared with each other, the estimated emission value is higher than the current and targeted emission value in most of the action plans,
- The targeted emission values of the climate action plans of Ankara, Antalya, Bursa, İstanbulİzmir, İzmir, Kahramanmaraş, Kayseri, Muğla, Şanlıurfa and Trabzon are lower than the current emission values (Table 2),
- The sectors for which mitigation policies and strategies have been developed in action plans Urban Development/Built Environment, Transportation, Renewable Energy, Solid Waste and Wastewater Management, Industry, Services, Agriculture, Livestock and Forestry, Awareness Campaigns, Public Health,

Table 1.
Metropolitan Municipalities Climate Change Action Plans

Metropolitan	Action Plan	Year
Ankara	Ankara Province Local Climate Change Action Plan	2021
Antalya	Antalya Sustainable Energy and Climate Action Plan	2022
Bursa	Bursa Metropolitan Municipality Climate Change Action Plan	2015
Denizli	Denizli Climate Change Action Plan	2016
Gaziantep	Gaziantep Climate Change Action Plan	2016
Hatay	Hatay Greenhouse Gas Emission Inventory and Climate Change Action Plan	2020
Istanbul	Istanbul Climate Change Action Plan	2021
Izmir	Izmir Sustainable Energy and Climate Action Plan	2020
Kahramanmaraş	Kahramanmaraş Metropolitan Municipality Climate Change Action Plan	2017
Kayseri	Kayseri Climate Change Mitigation and Adaptation Action Plan	2022
Kocaeli	Kocaeli Greenhouse Gas Inventory and Climate Change Action Plan	2018
Mugla	Muğla Province Climate Change and Sustainable Energy Action Plan	2014
Sanliurfa	Şanlıurfa Metropolitan Municipality Climate Change Mitigation and Adaptation Action Plan	2022
Trabzon	Trabzon Sustainable Energy Action and Climate Adaptation Plan	2019

- In the climate action plans of Ankara, Antalya, Bursa, Denizli, İstanbul, İzmir, Kayseri, Kayseri, Kocaeli, Şanlıurfa and Trabzon, which include adaptation policies and strategies as well as mitigation in their action plans, sectors or thematic areas such as water management, management, public health, biodiversity, agriculture, forestry, land use, transportation, energy, industry are addressed within the scope of adaptation; adaptation policies and strategies are partially based on the context of the city (the city's unique demographic, socio-economic, physical, environmental and institutional characteristics),

- In these action plans, the institutions and organizations responsible and to be cooperated with are defined and the time plan is made,
- In the Ankara, Antalya, Bursa, Hatay and Istanbul action plans, it was stated that success indicators were determined (more specifically, in the Ankara action plan, explanations and justifications for the implementation of the data under the "Global Protocol on Community-Scale Greenhouse Gas Emissions Inventory" were included in the relevant sections. In the Antalya action plan, previous successful examples were taken into consideration and targets were set in this direction, and it was stated that they would be considered successful if realized. In the Bursa action plan, it is stated that the mitigation scenario determined for the target year shows that Bursa can realize growth by reducing its emissions and this will be considered a success. In addition, in this context, the cooperation between different institutions and sectors was shown as a success criterion for a report, and it was stated that this was achieved in the report in question, which was prepared with a participatory work. The success indicators of the Hatay action plan are included in the form of SWOT analysis and evaluation of the mitigation actions prepared within the scope of the report. It is stated that the success in the implementation of the Istanbul action plan will be ensured by the cooperation with all stakeholders, therefore the plan especially the practices of sectoral stakeholders), but it is evaluated that these indicators partially meet the principles or components of climate action plans specified in international studies ("Guiding Principles for City Climate Action Planning", "Climate Action Planning Framework").

Integrating Local Climate Action Plans with Spatial Plans

Integrating local climate action plans and land use plans means emphasizing that the mitigation and adaptation targets set in local climate action plans can be achieved through "climate-sensitive spatial plans" (in which spatial plans determine planning and construction decisions targeting mitigation and adaptation from the regional scale to the city and neighborhood scale as a result of analyses to be made and scenarios to be created based on local climate change risks and vulnerabilities). As a matter of fact, many policies in local climate action plans emphasize that urban areas

Table 2.
Current and Targeted Carbon Emission Values in Climate Change Action Plans

Metropolitan	Carbon Emission Year	Carbon Emissions (TCO ₂ e)	Carbon Emission Projection Year	Carbon Emission Projection	Reduction Target (%)	Projected Carbon Emissions (TCO ₂ e)
Ankara	2019	22,884,635	2030	30,255,654	28	21,784,070
Antalya	2019	10,683,551	2030	11,041,151	40	7,886,537
Bursa	2014	12,825,146	2030	18,052,448	31	12,455,963
Denizli	2016	7,502,667	2030	11,950,000	20	9,500,000
Gaziantep	2015	10,057,000	2030	13,976,000	20	11,181,000
Hatay	2017	6,393,055	2030	10,767,300	23	8,286,910
Istanbul	2019	50,888,653	2030	76,798,674	42	44,543,230
Izmir	2018	14,319,706	2030	17,691,125	43	9,973,640
Kahramanmaraş	2016	9,184,581	2030	10,605,452	25	7,887,839
Kayseri	2021	5,326,000	2035	6,204,000	48	3,211,000
Kocaeli	2016	25,098,626	2030	42,000,000	21	33,105,087
Mugla	2014	11,203,766	2030	11,066,190	22	9,070,566
Sanliurfa	2021	5,046,000	2035	6,658,000	55	2,998,000
Trabzon	2018	3,062,779	2030	4,120,246	36	2,623,595

changes in the way they are organized, i.e. focusing on land use measures. For example, almost every city residents to walk more, use public transport and bicycles to reduce dependence on private cars. This changing the way cities and even neighborhoods are planned, designed and built, i.e. climate strategies into land-use plans and urban design.

While institutional, legal, financial, technological, technical, etc. mitigation and adaptation policies, actions or strategies incentives for green buildings, infrastructure waste reduction and recycling water demand management, energy demand management, renewable energy generation, incentives for green economy industries, green procurement policies, public transportation options, etc.) developed in sectoral or thematic areas against climate change are important and necessary, spatial measures (urban land use decisions) are considered to be of primary importance in realizing climate action plan mitigation and adaptation targets.) are important and necessary, spatial measures (urban land use decisions) are considered to be of primary importance in the realization of climate action plan mitigation and adaptation targets.

There are a number of studies that reveal the relationship between local climate action plans and local land use plans in the relevant literature. For example, Tang et al. (2011) examined 40 local climate action plans and local land use plans in the USA and that local land use plans have much higher quality policy plan components than action plans. They emphasized that local land use plans pay little attention to climate change awareness, analysis, targets and implementation, but play a critical role in climate change mitigation and adaptation at the local level (e.g. growth boundary control, mixed land use, transportation, etc.). They noted that local climate change action plans mainly focus on reducing greenhouse gas emissions in the built environment, with little attention to natural resource management strategies. Some studies evaluating climate action plans (Bassett & Shandas 2010, Deetjen et al. 2018) have found that most climate action plans rely heavily on well-known land-use and transportation solutions to the climate challenge, such as green building codes, public transport, non-motorized transportation.

In a study on the effectiveness of climate action plans and their potential impacts on the shape of US cities (Race 2013) it was investigated how climate actions/strategies are integrated into cities' comprehensive plans. In the study, it is stated that successful climate action planning on how climate strategies/actions are integrated into urban planning policies and the role of the public and private sectors in planning and implementation. Climate action plan strategies and actions are linked to comprehensive urban plan policies, and climate action plan strategies affecting the comprehensive plan include land use patterns and densities, design, transportation planning, urban form, buildings and energy use, urban forest and ecosystems, carbon sinks, food and agriculture, waste, etc. It is emphasized that the inclusion of mitigation and adaptation actions in comprehensive plans will require optimizing the passive performance of cities and changing investment models. The research identifies the smart growth strategies used by cities to reduce greenhouse gas emissions and their relative effectiveness depending on the context of the cities. The studies reviewed in the research showed the importance of compressing growth into walkable cities with defined and fixed boundaries. According to the research, Climate Action Plans,

compact urban form can support walking, public transportation, energy efficient buildings and urban infrastructure.

Tang et al. (2010), for the quality of a local climate change action plan, local planners should analyze the impacts of climate change by reviewing the major emission sources in the planning area and linking these results to local planning policies; action plans identify critical thresholds in climate-sensitive sectors and analyze socio-economically and culturally differentiated vulnerabilities; local plans should identify constraints and stressors in climatic, economic, technological, institutional, social, legal and ecological domains; establish a long-term database of local climate and hydrology information for analysis; and review existing plans and regulations.

A study analyzing the Sustainable Energy and Climate Action Plans prepared by EU Municipalities (Scorza & Santopietro 2021) stated that these plans are designed as an urban planning the potential to increase the resilience of cities against climate change, develop adaptation/mitigation actions and increase the "environmental awareness" of relevant actors. From a planning perspective, it was stated that it has ushered in a new era of urban planning in Europe that meets the demand for planning in the implementation of sustainable regional development goals. It was assessed as unlocking existing ineffective planning systems and representing a practice of promoting viable framework projects for public and private investment.

Within the framework of the emphasis and recommendations of these studies, it is considered that analyses and actions are vital for a successful and quality climate action plan, and that these analyses and actions should overlap with the analyses and decisions of spatial plans. In this context, both in the climate action plan and in the analysis phase of (climate sensitive) spatial plans, the main emission sources causing climate change should be identified, future emission trends should be estimated, climate change scenarios should be created, risk and vulnerability analysis should be conducted (for this, data infrastructure should be enriched and constantly updated, necessary legal regulations should be made or revised, geographical information systems should be used, analysis tools and methods such as modeling and simulation should be used). At the action stage, in addition to institutional, legal, financial, technological, technical, etc. policies and actions related to mitigation and adaptation in climate action plans, spatial policies should be established, and it should be emphasized that these policies can be realized through spatial plans. In line with the analysis data and scenarios in spatial plans of all scales, planning and construction decisions should be developed with the target of mitigation and adaptation, taking into account the level of detail required by the scale.

When a general assessment is made; taking into account the analyses and decisions in plans such as environmental layout plan, transportation plan, master development plan etc. in local climate action plans and realizing climate change mitigation and adaptation targets do not make these climate action plans successful. It is important that the decisions in spatial plans such as environmental layout plan, transportation plan, master development plan etc. include climate change mitigation and adaptation strategies and are prepared in a climate sensitive manner.

In this context, action plans prepared by metropolitan municipalities in Turkey were evaluated within the framework of quality-success criteria (Table 3).

Table 3.
Evaluation of Climate Change Action Plans within the Scope of Quality-Success Criteria

Quality-Success Measure	Ankara	Antalya	Bursa	Denizli	Gaziantep	Hatay	Istanbul	Izmir	K.Marash	Kayseri	Kocaeli	Mugla	Sanliurfa	Trabzon
Establishing a relationship with spatial	✓	x	✓	x	x	x	x	✓	x	x	✓	x	x	✓
Combining greenhouse gas emission mitigation and adaptation strategies	✓	✓	✓	✓	x	x	✓	✓	x	✓	✓	x	✓	✓
Making decisions by creating tools in the context of the unique dynamics of cities	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓
Analyzing the impacts and consequences of climate change and	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Assessment of vulnerabilities due to climate change	✓	✓	✓	✓	x	✓	✓	x	✓	✓	✓	x	✓	✓
Physical planning approaches that include technological solutions	✓	✓	x	✓	✓	✓	✓	✓	x	✓	x	x	✓	✓
Following a collaborative model that ensures public participation	✓	x	✓	✓	x	✓	✓	✓	x	x	x	x	x	✓
Identification of responsible and cooperating institutions and	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Making a time plan and determining the investment	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

There are 5 metropolitan municipalities (Ankara, Bursa, Denizli, Izmir, Kocaeli, Trabzon) that have established a relationship with spatial plans in the action plan. *Ankara Province Local Climate Change Action Plan*; 1/100,000 scale Ankara Environmental Plan 2038 and 2023 Capital Ankara Master Plan, *Bursa Sustainable Energy and Climate Change Adaptation Plan*; Bursa 1/100 scale Provincial Plan and Bursa Municipality Master Transportation Plan, *Izmir Metropolitan Municipality Sustainable Energy and Climate Action Plan*; 1/25,000 scale Environmental Plan of Izmir Metropolitan Municipality, *Kocaeli Greenhouse Gas Inventory and Climate Change Action Plan*; Kocaeli Transportation Master Plan 2035 and Kocaeli Urban Transformation Master Plan, *Trabzon Sustainable Energy Action and Climate Adaptation Plan*; Ordu- Trabzon-Rize-Giresun-Gümüşhane-Artvin Planning Region 1/100,000 scale Environmental Plan Trabzon Environmental Plan. It is seen that these action plans take into account the spatial plan decisions, but it is not evaluated whether the spatial plans are prepared in a climate-sensitive manner by taking into account climate change scenarios and possible risks and impacts.

There are 10 metropolitan municipalities (Ankara, Antalya, Bursa, Denizli, İstanbul, İzmir, Kayseri, Kocaeli, Şanlıurfa, Trabzon) that have combined GHG emission mitigation and adaptation strategies in their action plans. However, the action plans of Gaziantep, Hatay, Kahramanmaraş and Muğla include only mitigation actions. It is positive to include mitigation and adaptation strategies together in climate action plans for building a resilient city, the inclusion of only mitigation actions is considered as a deficiency.

Making decisions by creating tools in the context of the specific dynamics of cities is included in all action plans except Ankara and Muğla action plans. For example, while obtaining climate projections for Denizli, HadGEM2-Es model used to obtain regional and local outputs. Izmir, CoM methodology was used to assess the risks and current situation of the city in the face of climate change. With this methodology, climate hazards that the city will be exposed to were defined risk and vulnerability assessments were made with climate data.

In all metropolitan cities that prepared action plans, sub-actions were created by analyzing the impacts and consequences of climate change. For example, trainings and workshops were organized at certain time intervals in the city of Bursa, and analyses were made by dividing the urban area, absolute protection areas, priority protection areas and habitable areas into regions with a sustainability approach. In this context, methods such as precedent increase, tax reduction, fee reduction were proposed to encourage building owners for sustainable practices in new settlement areas.

Assessment of vulnerabilities due to climate change in action plans was conducted in all major cities except Gaziantep, İzmir and Muğla. For example, in Kayseri, the negative impacts of climate hazards on the service sector, existing adaptive capacity and sectoral vulnerabilities were assessed. In Şanlıurfa, it is aimed to provide physical and social protection mechanisms for the vulnerable population in order to protect vulnerable segments of society. However, it is considered that there is a deficiency in the assessment since action plans focus more on socio-economic vulnerabilities rather than spatial vulnerabilities.

Physical planning including technological solutions in the action plans of all metropolitan cities except Bursa, Kahramanmaraş, Kocaeli and Muğla

approaches are available. In the city of Istanbul, applications such as reducing the risk of flash floods by making surfaces in parks and gardens in accordance with the "Permeable Concrete Technical Specification network modeling and scientific raw water modeling water resources according to structures, managing transmission lines and drinking water network with smart systems, etc. can be given as examples.

The action plans of Ankara, Bursa, Denizli, Hatay, İstanbul, İzmir and Trabzon metropolitan municipalities followed a collaborative process that ensured participation. This is considered to be an important deficiency in the action plans of metropolitan municipalities that do not adopt a participatory climate management model.

Responsible and cooperating institutions and organizations are identified in action plans in all metropolitan cities except Ankara. For example, Şanlıurfa, AFAD, ŞUSKİ (Şanlıurfa Water and Sewerage Administration and Şanlıurfa Metropolitan Municipality; in Antalya Antalya Metropolitan Municipality Antalya General Water and Wastewater Administration (ASAT, 6th Regional Directorate of Transport and Infrastructure Provincial Directorate of Environment and Urbanization district municipalities are among these institutions and organizations.

Timelines and investment programs in action plans are important for the feasibility of actions and were identified in all metropolitan cities except Ankara. Investments are generally related to transportation and technical infrastructure (such as construction of Park-and-Ride systems, investment in recycling infrastructures).

When Table 4, which evaluates the positive and negative aspects of the action plans prepared by metropolitan municipalities, is examined; conducting stakeholder and vulnerability analyses, using climate projections, updating data within the scope of environmental layout and master development plan, including mitigation and adaptation actions together and setting interim target years are evaluated as positive aspects. However, not including mitigation and adaptation actions together and not detailing adaptation actions, not establishing a relationship with spatial plans, not conducting vulnerability analysis and not ensuring public participation are considered as negative aspects.

Urban macroform, development direction of the city, sectoral investment areas, sensitive areas for absolute protection, reserve areas, disaster hazardous areas, risky areas, urban transformation areas, renewal areas, location of functions and relationship between functions, population density, transportation grading, quality, cross-section, route and connection of roads, public transportation route, size, distribution and relationship of open green areas, location and access of disaster response facilities and other social infrastructure areas, location of technical infrastructure areas, building conditions (parcel size, building layout, building setbacks or garden distances, building height, building floor area, etc.), location-specific detailed plan conditions, etc.), location-specific detailed plan conditions, etc. Issues that can be associated with the mitigation and adaptation target are determined by spatial plans at different scales.

In this context, climate action plan objectives such as reducing carbon emissions, reducing the urban heat island effect, ensuring energy efficiency, increasing resilience against climate change-related disasters (such as floods, droughts), increasing access to water and food can be spatially transformed into concrete planning and construction decisions. More precisely, preventing settlement and development in risky areas, ensuring compact urban development, mixed land use, planning of green-blue infrastructure, alternative transportation planning, protection of sink areas and

climate-smart cities can be built by increasing green buildings, cleaner energy, smart transportation, efficient resource allocation, more permeable surfaces, incorporating urban agriculture into plans, utilizing renewable energy, using urban transformation as an opportunity, etc. Therefore, a local climate action plan should aim to transform cities by implementing more green buildings, cleaner energy, smart transportation, efficient resource allocation, more permeable surfaces, improved infrastructure, healthy lifestyle strategies, etc. and provide an opportunity to change the zoning legislation accordingly.

Conclusion and Recommendations

Cities are under threat from climate change due to their growing population, economic activities, employment, diverse social segments, cultural assets, critical infrastructure and basic services. However, each city different types and levels of climate change risks, vulnerabilities and vulnerabilities due to its specific physical, social, economic, spatial and institutional conditions. In this context, each city's greenhouse gas inventory, adaptation capacity to climate change, intervention methods and tools will/should differ. Therefore, it is important that each city's climate action plan is prepared site-specific. In this study, local climate action plans, one of the most important tools of local governments in combating climate change, are examined in the case of metropolitan municipalities, and it is argued that one of the main criteria of a successful local climate action plan is its integration with spatial plans (and spatial plans should also be prepared in a climate-sensitive manner). In other words, it is thought that local governments, which have powers and responsibilities in areas such as urban infrastructure, housing, energy, transportation, open green spaces, food security, disaster management, and urban health, can contribute to a great extent to reducing urban greenhouse gas emissions and making cities resilient against possible disasters due to climate change by making climate action plans and zoning plans integrated, connected and harmonized with each other.

It was observed that only a few of the local climate action plans prepared by the metropolitan municipalities examined in the study were associated with spatial plans, and the relationship was limited to the consideration of population projections or basic plan decisions in the action plans. However, as stated in the relevant literature reviewed within the scope of the study, in addition to the necessity of preparing integrated climate action plans that include both mitigation and adaptation for combating climate change at the local level, it is thought that integrating climate action planning into long-term urban planning processes will increase the effectiveness of urban responses to the climate problem.

In this context, various recommendations can be listed. First of all, in the process of preparing both local climate action plans and development plans, greenhouse gas inventory, risk, vulnerability and impact/affectability analysis and climate scenarios should be conducted. As a result of these analyses and scenarios, starting from the sectors, areas and social segments with the highest emission, risk, impact/vulnerability and vulnerability levels on low-altitude coastlines, settlements in river beds, hot inland areas of the city, agriculture sector, tourism sector, elderly, disabled, children, By prioritizing (e.g. low-income groups) and assessing adaptive capacity (e. how many days the city's water reservoirs can last in drought situations, how much rainfall the stormwater system can handle at most), interrelated and compatible mitigation and adaptation strategies and actions should be developed and put into a timetable. In climate action plans

Metropolitan	Positive Aspects	Negative Aspects
Ankara	<ul style="list-style-type: none"> Conducting stakeholder analysis, vulnerability analysis, etc. within the scope of the action plan, Analyzing the scenarios published by IPCC and using the average of the RCP2.6, RCP4.5, RCP6.0 and RCP8.5 scenarios for the city and the projections obtained from the CMIP5 experiment, Updating or re-drafting of Environmental Plans and Master Plans include ecological analyses and long-term climate change scenarios. 	<ul style="list-style-type: none"> Lack of a time plan for the objectives and sub-actions identified in the action plan, The action plan is not included in the Ankara Metropolitan Municipality 2020 - 2024 Strategic Plan, Climate change mitigation actions are limited to the building and transportation sectors.
Antalya	<ul style="list-style-type: none"> Being the first metropolitan municipality to prepare a Sustainable Energy Action Plan to combat climate change, Reducing carbon emissions by 40% by 2030 and aiming for zero carbon by 2050, Including technological and ecological solutions for emission reduction in all sectors. 	<ul style="list-style-type: none"> Taking Turkey's National Contribution Declaration 2030 as the target year when determining mitigation and adaptation measures, and not setting intermediate target years, Failure to establish a relationship with spatial plans within the scope of the action plan.
Bursa	<ul style="list-style-type: none"> Participation in the European Covenant of Mayors (Covenant of Mayor) in 2016 and preparation of an action plan to combat climate change in the city, 2030 target, with emphasis the environmental layout plan and transportation plan, The action plan should be in line with the objectives and targets of the main documents prepared for the city such as BBB Transportation Master Plan, Environmental Plan, BEBKA 2014 - 2023 Regional Plan. 	<ul style="list-style-type: none"> Failure to revise the actions identified under the action plan to include technological solutions.
Denizli	<ul style="list-style-type: none"> Including detailed analyses in the action plan, including both mitigation and adaptation measures, Climate modeling and projections and forecasting the situation in the coming years, The fact that the action plan was one of the first to be prepared and played a pioneering role for other cities. 	<ul style="list-style-type: none"> Taking Turkey's National Contribution Declaration 2030 as the target year when determining mitigation and adaptation measures, and not setting intermediate target years, Failure to establish a relationship with spatial plans within the scope of the action plan
Gaziantep	<ul style="list-style-type: none"> Analyzing greenhouse gas emissions and possible climate change mitigation and adaptation policies in the action plan and being one of the first studies, Prioritization in line with the measures and sub-actions identified in the action plan. 	<ul style="list-style-type: none"> The target years set in the action plan expire and are not revised (2020 - 2023 Period), Failure to establish a relationship with spatial plans within the scope of the action plan, Not combining mitigation and adaptation actions in the action plan.
Hatay	<ul style="list-style-type: none"> The action plan is funded by the European Union and developed in partnership with UNDP, Raising awareness on climate change by identifying stakeholder groups, Action plan to include SWOT Analysis and indicators of success. 	<ul style="list-style-type: none"> Failure to establish a relationship with spatial plans within the scope of the action plan, No break between mitigation and adaptation actions in the action plan.
Istanbul	<ul style="list-style-type: none"> It includes the most strategies related to climate change among the action plans, Creating an "Extended Ambitious Scenario" by identifying a roadmap for action, Utilizing international methodologies (GPC, UAST) and adapting them to local conditions. 	<ul style="list-style-type: none"> Failure to establish a relationship with spatial plans within the scope of the action plan.
Izmir	<ul style="list-style-type: none"> Overlap with the "Izmir Green City Action Plan" developed under the action plan, Implementation of the action plan in line with the Covenant of Mayors (CoM) methodology all cities preparing Sustainable Energy and Climate Action Plans, Including technological and ecological solutions to reduce emissions from transportation. 	<ul style="list-style-type: none"> No analysis or multi-criteria assessment of the negative impacts of climate change.
K.Marash	<ul style="list-style-type: none"> Defining GHG mitigation in the action plan in a multidimensional way and linking it to social and economic activities, Including actions that overlap with the goals and objectives of the main documents prepared for the province and the region, such as the 2014 - 2023 Regional Plan prepared by DOĞAKA. 	<ul style="list-style-type: none"> Failure to establish a relationship with spatial plans within the scope of the action plan, No break between mitigation and adaptation actions in the action plan, The actions identified are part of or a continuation of an ongoing work or program.
Kayseri	<ul style="list-style-type: none"> Taking Turkey's National Contribution Declaration 2030 as the target year for mitigation and adaptation measures, as well as setting interim target years of 2035 and 2053, Conducting 3 separate surveys for risk and vulnerability analysis in the action plan, Use the methods recommended by the Global Compact of Presidents in the analysis. 	<ul style="list-style-type: none"> Failure to establish a relationship with spatial plans within the scope of the action plan, Lack of actions to ensure public participation.

(Continued)

Table 4.
Evaluation of Positive and Negative Aspects of Action Plans (Continued)

Kocaeli	<ul style="list-style-type: none"> It contains the most comprehensive information on carbon footprint calculation among action plans, To be in line with Kocaeli Metropolitan Municipality Strategic Plan (2015 - 2019), 2035 Kocaeli Transportation Master Plan Final Report and Kocaeli Province Urban Transformation Master Plan Research Report. 	<ul style="list-style-type: none"> Failure to detail the sectors in the adaptation actions, Actions are part of or a continuation of an ongoing work or program.
Mugla	<ul style="list-style-type: none"> The action plan the city's first carbon footprint report, The report is based on GPC standards (World Resources Institute and C40 Cities reporting framework for tracking climate performance). 	<ul style="list-style-type: none"> No break between mitigation and adaptation actions in the action plan, Actions do not include sub-actions, Actions are part of or a continuation of an ongoing work or program. Failure to establish a relationship with spatial plans within the scope of the action plan.
Saniurfa	<ul style="list-style-type: none"> Taking Turkey's National Contribution Declaration 2030 as the target year for mitigation and adaptation measures, as well as setting interim target years of 2035 and 2053, Detailed information on climate hazards, risk and vulnerability analysis, Use of the international CIRIS program for inventory calculations. 	<ul style="list-style-type: none"> Failure to establish a relationship with spatial plans within the scope of the action plan, Using only data from the last 4 years in emission calculations.
Trabzon	<ul style="list-style-type: none"> Preparation of risk and vulnerability assessment sheets under the action plan, Including GHG inventory as well as technical analysis and design. 	<ul style="list-style-type: none"> Taking Turkey's National Contribution Declaration 2030 as the target year when determining mitigation and adaptation measures, and not setting intermediate target years.

A pluralistic, participatory, solidaristic and egalitarian climate management model should be adopted in order to correctly identify the multifaceted problems arising from climate change, diversify solutions and accelerate implementation.

On the other hand, vertical and horizontal integration in local governments should also be ensured. In the context of vertical integration, concrete actions defined in the climate action plan should be compatible with different functional and strategic plans of local governments (such as municipal strategic plan, energy efficiency action plan, urban waste management plan, water management plan, transportation master plan, disaster plan, green infrastructure plan, urban drought plan, municipal investment program) and elements of combating climate change should be added to these plans. In the context of horizontal integration, concrete actions defined in the climate action plan should be carried out in cooperation with different thematic departments of the local government. For example, the municipality's departments operating in different areas such as zoning plan, water supply, wastewater treatment, solid waste, transportation, energy should be aware of each other's work on climate change and . It will not be possible to achieve mitigation and adaptation targets if climate action plans are not integrated with the basic functions of municipalities such as zoning public works and cannot shape their social policies (Istanbul Climate Change Action Plan Climate Scenarios, 2022). However, mutual cooperation and coordination with neighboring municipalities is also considered to be important, as problems and solutions related to climate change (such as drinking water supply, utilization of renewable energy sources) need to be considered regionally beyond municipal borders.

It is important that the actions defined in climate action plans are transformed into concrete plan decisions in zoning plans, and that climate action plans and zoning plans are prepared in a complementary manner. In this context, municipalities preparing both plans have important responsibilities. Protecting and increasing sink areas in the city, creating a green infrastructure network, cooling the city against the urban heat island effect, public transportation, cycling and walking, promoting energy production by utilizing the sun and wind, energy where it is consumed, reducing water and energy demand in the city

mitigation and adaptation goals and strategies defined in climate action plans, such as mitigation, taking measures against disasters such as floods, protecting public health against extreme weather events, ensuring food security, etc., can be realized through master development plans and implementation development plans to be prepared in a climate sensitive manner. On the other hand, it is considered important for the success of climate action plans that future population projections, sectoral development, proposed transportation and infrastructure decisions in zoning plans are also taken into consideration in climate action plans.

As a result, it is recommended that the climate action plans prepared by the metropolitan municipalities examined within the scope of the study should be renewed within the framework of the aforementioned recommendations for their success and applicability.

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