Challenges of Climate Adaptation and Mitigation Planning in a Global South Urban Management System: Evidence from Tehran, Iran

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Keywords	Unintegrated urban management, mitigation and adaptation plan, net zero
City Population	9,000,000
City Area	730 km^2
City GDP	15,912 billion USD
Climate Zone	BSk (cold semi-arid)
ARC3.3 Linkage	Urban Climate Governance

Introduction. The Paris Agreement (COP21) seeks to foster global solidarity in limiting the increase in the global average temperature to 2°C, and even better to 1.5°C above pre-industrial levels, in order to prevent dangerous climate change risks (Tanneberger et al., 2021). At the local level, cities are key for reaching net zero goals through their contributions to transnational climate networks, urban sustainability innovations, and formulating climate mitigation plans (Mendes, 2022; Van Der Heijden, 2019). However, urban management structures in the Global South face various hurdles and barriers in formulating mitigation and adaptation plans, and structural and procedural reforms are necessary to move towards urban climate governance (Daniere et al., 2019; Pazhuhan, 2016). In Iran, the impact of climate change-induced events is inextricably linked with the existing structural vulnerability of the urban population. Their preparedness for, responding to and recovering from climate shocks cannot be achieved without addressing the various barriers in the urban management structure. Challenges in institutionalizing climate planning in Global South countries have gained little attention in the concurrent literature (Pazhuhan, 2023).

To address this gap in both international and domestic literature, and to shed light on the challenges for adaptation and mitigation capabilities of Iran, particularly in Tehran's municipality, this study aims to 1) investigate Tehran's urban management environment and structure, and 2) assess the capacity of the Tehran municipality to move towards an urban climate governance approach.

Study Area. Tehran, located on the southern slopes of the Alborz Mountains range and built on the ancient city of Rey (Fig. 1), has been the capital of Iran for the past two centuries (Ramyar et al., 2019). Tehran is divided into 22 districts based on municipal service areas. The city's surface area consists of a combination of mountain and plain, with an altitude ranging from 945 to 2244 meters above sea level.

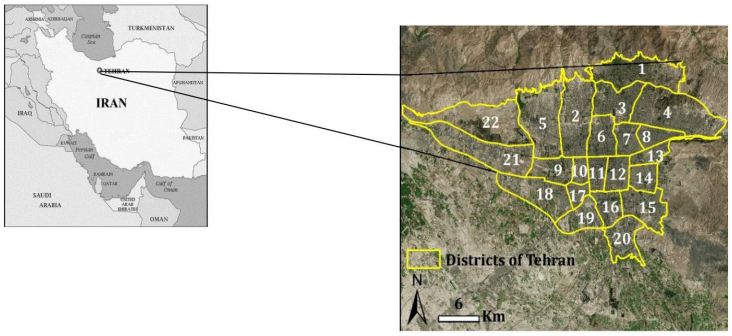

Figure 1. *The geographical situation and administrative divisions of Tehran city. Source: Author based on Ghasemi et al., 2017 and Pazhuhan et al., 2023*

Analysis, Evaluation, and Implementation

Data Collection. The main methodological approach used for data collection was reviewing secondary data sources. Accordingly, various data collecting methods were utilized to fulfill the research goal so that to cover the first goal, investigating Tehran's urban management environment and structure, international and domestic literature on urban climate governance, focusing particularly on Iran, were reviewed. Moreover, formal urban planning and policy documents published by the government and Tehran municipality were investigated and the structure and elements of the Tehran municipality organization and related government institutions through the lens of climate adaptation and mitigation necessities were analyzed.

So as to address the second goal, assessing the capacity of Tehran municipality to move towards an urban climate governance approach, facts reported in peer reviewed articles published by domestic researchers, as well as managerial reports produced for the Tehran municipality, have been extracted and

classified to analyze the concurrent circumstances of Tehran's capabilities for formulating urban climate adaptation and mitigation plans. Finally, to complete data needed for investigating legal barriers local governments in Iran face (e.g., Tehran municipality) to formulate and implement climate adaptation and mitigation plans, a low-research-oriented method was used to identify the critical bottlenecks in the national and local law bodies, thus detecting their inefficiencies and inadequacies.

Results. Tehran's urban management structure is affected by a centralized and single-structured government model, where the central government holds significant decision-making power and formulates policies and decisions for all provinces, cities, and villages in the country (Ketabchy, 2021). While this is crucial to integrate adaptation planning into all levels of planning as a prerequisite for establishing climate policies (Lyles et al., 2018), this issue is not a national priority for the central government, and there is no room for it at regional or local levels. According to Boostani & Sadeghiha (2022), non-cooperation approaches at management levels and traditional up-down urban planning systems are two main organizational and political uncertainties that have respectively paralyzed Tehran's urban management system to reach a low carbon city goal. Moreover, as Rafieian & Sheikhi (2015) asserted in Iran's general planning system and in Tehran's urban planning system, the connections between climate change adaptation, mitigation, good urban planning, risk reduction and management, and environmental concerns is not fundamentally established nor understood deeply.

As a result, the climate issue is not a local planning and policy priority since municipalities must follow the government's policies and political tendencies. Municipalities also have limited authority in terms of urban law-making, except in some areas of local fees. Furthermore, there is no cohesive and law defined cooperation between municipalities and government branches in cities (Fig. 2). This has been detrimental to climate adaptation and mitigation planning at the city level. Although the national government is responsible for financing large-scale and long-term urban civic projects, such as fresh water and gas piping, strengthening urban infrastructure against natural hazards, financial constraints, and the lack of a national vulnerability plan and climate policy often prevent these necessary investments for boosting resilience from being realized (Research and Planning Center of Tehran municipality, 2021). Additionally, as Lalehpour (2016) argues, organizational segregation in the urban planning and management system at all territorial scales has led to sectoral planning and budgeting without spatial integration. As a result, city planning, which is crucial for cities to adapt to climate change (Pelling et al, 2015) and the focal point of integration of adaptation and mitigation (IPCC, 2018), particularly in Tehran, lacks statutory tools and supportive regulations for playing its role in the mitigation and adaptation process.

Urban management systems in Tehran are dispersed amongst 24 local and central government branches in which each institute has its own plan and budget coming from the central government without necessarily considering local needs and demands (Meshkini et al., 2021). From an institutional point of view, there is no lawful and obligatory platform for urban organizations in Iran, both municipal and governmental, in terms of designing and implementing climate change adaptation and mitigation plans. Hence, they act in a non-integrated way and their missions cover particular areas of city affairs with subsequently no organization taking responsibility for the totality of the city (Pazhuhan, 2023).

Moreover, Tehran does not include climate adaptation and mitigation strategies into its formal planning documents, as the comprehensive urban planning model (the formal planning approach in Iran) focuses on just physical land use issues, without concern for climte resilience (Soroushan et al., 2022). Tehran's last master plan was introduced by the Ministry of Road and Urban Development (MRUD) in association with Tehran municipality in 2007 and has highlighted 12 strategies issues within the Tehran metropolitan region, two of

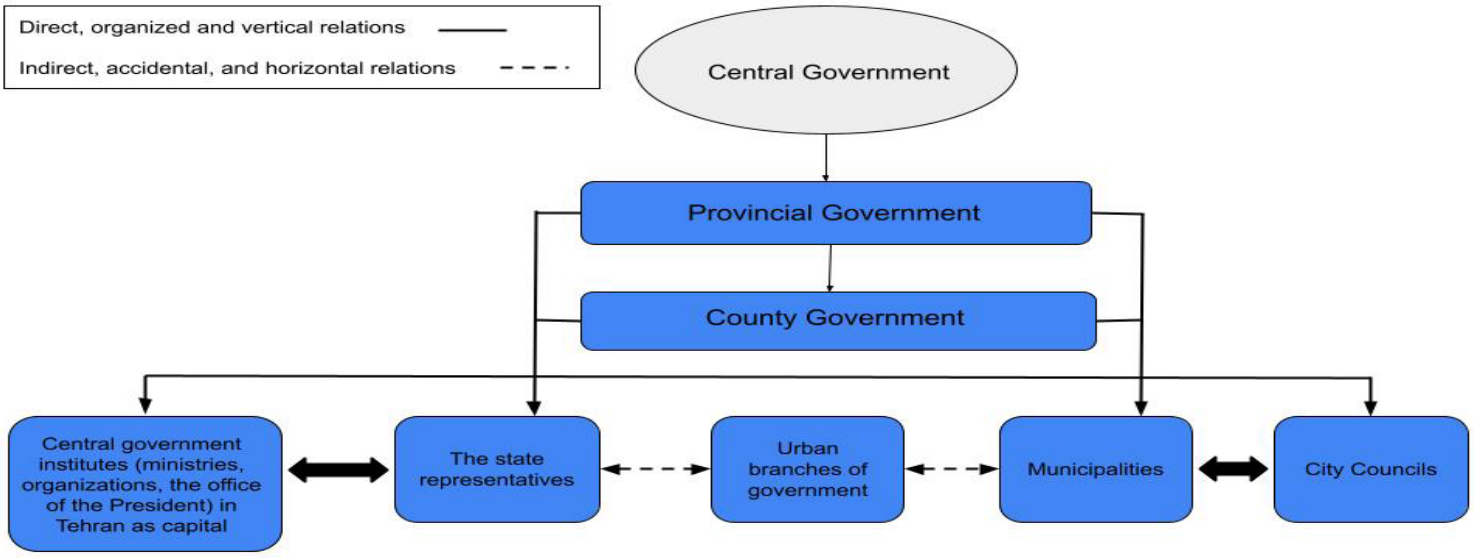

Figure 2. *The vertical structure of decision making/taking power in Iran.*

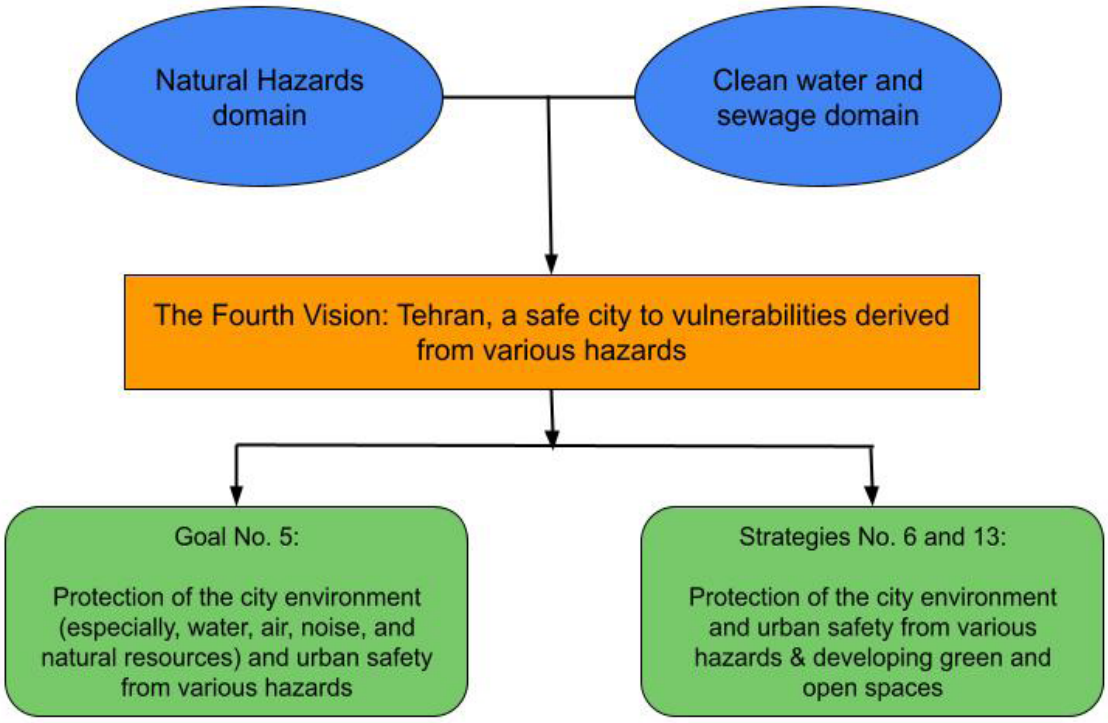

Figure 3. *Climate change-related visions and goals in the last Tehran master plan (2007) Source: Author based on Tehran master plan, 2007*

which are indirectly related to climate change, including natural hazards and water/sewage problems (Tehran Municipality, 2007). Furthermore, in one of the visions formulated for the city, Tehran is imagined as a safe city against the vulnerabilities caused from various hazards (Fig. 3).

While these indirect goals of enhancing city resilience have been mentioned in the city master plan, there is no climate adaptation and mitigation action plan prepared to fulfill the goals. Indeed, no institutional power in Tehran's urban management structure has been made to boost the organizational ability to contribute to the net zero world goal. This lack is partly rooted in the physical approach of the comprehensive urban planning model that relegates all the city problem solving into land use guidance and zoning regulations (Mashhadi Moghaddam & Rafieian, 2020).

Meanwhile, many studies (e.g., Moghadas et al., 2019; Asadzadeh et al., 2015 and Pazhuhan et al., 2023) have shown that the city of Tehran is severely vulnerable to climate change risks, while its overall resilience level is conspicuously low, and has been decreasing over time (Fig. 4). Nevertheless, no climate adaptation and mitigation plan has even been prepared for managing such weak resilience.

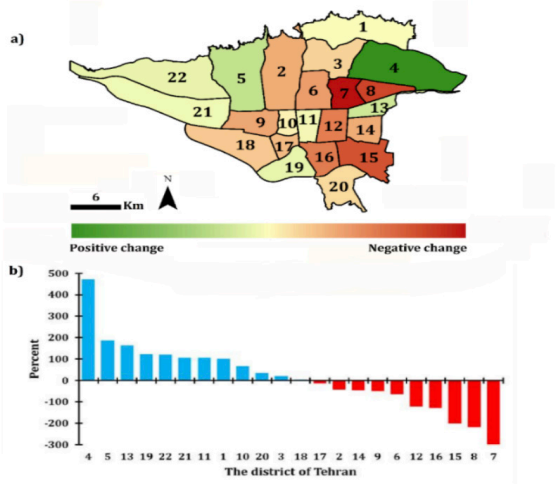

Figure 4. *Baseline Resilience Indicators for Communities (BRIC) index changes from 2006 to 2016: (a) Positive to negative changes in resilience status spectrum and (b) Positive and negative changes in resilience status based on percentage. Source: Pazhuhan et al., 2023*

Discussion and Conclusion. The capacity for urban climate governance in some countries in the Global South, including Iran, is limited and faces significant obstacles, hindering the ability of local management to develop mitigation and adaptation plans. Although there may be some national climate policies formulated by national agencies, they are just paperwork since regional nor local levels of government are engaged in preparing them, as local climate planning necessities are also not considered. Tehran, as the most populous city in Iran, is a prominent example, as the city is vulnerable to climate change risks such as flash floods, heatwaves, and severe droughts,

yet no climate adaptation and mitigation plans have been prepared (Abdoli et al., 2021; Moghadas et al., 2019; Mansouri Daneshvar et al., 2019).

The absence of integrated urban climate governance, which is crucial for effective climate adaptation and mitigation planning, remains a challenge for Tehran's urban management (Pazhuhan, 2023). As Faryadi (2023) argues, climate governance in Iran is not participatory and polycentric. Instead, it includes ad hoc climate policies and projects that are based on a command and control and hierarchical model in which limited national institutes make all the climate policies without participation from local organizations. Furthermore, the legal system of Iran has not given local authorities and urban institutes the legal duty to formulate and implement climate plans (Faryadi, 2023).

Indeed, as many have concluded (e.g., Mahmoudi Kordi et al., 2023; Mansouri Daneshvar et al., 2019; Abdollahi & Faryadi, 2010), although the national climate change office at the department of environment in the government has been established, the vision and strategies that this office has proposed only includes a report for international agencies and are not applicable for regional and local organizations, as these strategies have been formulated in closed-doors without stakeholder engagement and various barriers, such as international sanctions, water and energy mismanagement, and legal problems for climate planning prevent these visions and strategies from being realized. Additionally, Tehran municipality, the most influential local institution in the city's urban management system, lacks the necessary qualifications to formulate and implement climate plans due to the lack of priority at both the national and local levels, and the lack of attention of municipal managers to the potential risks of climate change for the city.

Furthermore, the centralized planning and management structure in Iran results in the central government formulating national and regional priorities and conveying them through five-year national plans, spatial plans, and other governmental plans without meaningful participation from local authorities (Laws and Regulations Research Center of Iran, 2020). The findings of this study indicate that the Tehran urban management system and the Tehran municipality, at its core, function poorly and lack the capacity to build the necessary resilience to climate change risks due to the unintegrated and fragmented urban management structure in the city, as well as the lack of political will and apathy of city authorities towards climate change. With respect to inter-organizational coordination, the absence of laws and regulations for climate planning and preparedness among all urban management bodies in Tehran represents a significant challenge.

Additionally, the fragmented sectoral function of each organization in planning, as well as the neglect of budgeting and climate preparedness plans, further exacerbate this issue. As a result, even in the most optimistic scenario, urban management institutions in Tehran tend to undertake ad-hoc projects without a comprehensive vision for climate adaptation and mitigation. This finding is consistent with Mycoo's (2014) argument that cities in the developing world, which are highly vulnerable to CC, are not only constrained by limited adaptive capacble to climate change, are not only constrained by limited adaptive capacity due to scarce financial and managerial resources, but also lack the necessary political will at various governance levels.

Policy Recommendations. The findings of the present study reveal some drawbacks in planning and management systems of Global South countries for embedding climate adaptation and mitigation in their formal planning documents at urban and local levels. At the same time, the results of the study urge for the formulation and implementation of policies to not only make room for climate plans, but also for the prevention of future risks by having no plans for adapting to climate disasters and mitigating GHG emissions in a country that ranked as the highest contributor in the Middle East.

Therefore, the first policy recommendation is integrating urban planning and management systems, at least in terms of climate planning, since this kind of planning needs all urban institutional cooperation and policy prioritization. The second would be building institutional capacities for urban climate adaptation and mitigation planning and policy making, as the results of the present study also showed the central government planning system and Tehran municipality lacks a climate planning approach in preparing urban and local urban plans. The last suggestion is to monitor the resilience index situation in Tehran over time by city authorities and formulate climate plans for managing the situation. Indeed, since Fig. 5 showed, while Tehran districts were severely vulnerable to climate change risks, their resilience level has been decreasing over time. These policy recommendations would be actionable for all cities in the Global South that have unintegrated urban management systems like Tehran.

Furthermore, additional research is also suggested for scholars in Iran and Middle Eastern countries to delve more into the urban planning and management structures of their countries and cities through the lens of climate adaptation and mitigation planning requirements, as this is a very effective method to provide deeper and clearer understandings of bottlenecks within those systems, in order to embed effective climate plans within their planning and management frameworks

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Additional Data

- **Population Density:** 11,600 people/km^2
- **Gross National Income (GNI):** 4,650 USD (Higher-Middle Income)
- **Gini Coefficient:** 34.8
- **Human Development Index (HDI):** 0.780 (High)
- **Type of Climate Intervention:** Hybrid