



KONYA BUILDING SECTOR DECARBONIZATION ACTION PLAN

EXTENDED SUMMARY

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WRI TURKEY
— ROSS CENTER



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About Project



Digital copies of the national roadmap and local action plans prepared within the scope of the project can be accessed through the QR code.

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ABBREVIATIONS

ABBREVIATION	DESCRIPTION
BEP	Building Energy Performance
BEP-TR	Building Energy Performance Application
BIM	Building Information Modeling
CO2	Carbon Dioxide
EIA	Environmental Impact Assessment
EPC	Energy Performance Certificate
EPD	Environmental Product Declaration
GEF	Global Environment Facility
GIS	Geographic Information Systems
HVAC	Heating, Ventilation, and Air Conditioning
KMM	Konya Metropolitan Municipality
LCA	Life Cycle Assessments
MoEUCC	Ministry of Environment, Urbanization and Climate Change
NZEB	Nearly Zero Energy Buildings
R&D	Research and Development
SuDS	Sustainable Urban Drainage Systems
UNEP	United Nations Environment Program
WRI	World Resources Institute
YES-TR	Green Certificate for Buildings and Settlements
ZCBA	Zero Carbon Building Accelerator



FOREWORD

Throughout its history, the Earth has experienced a wide range of spatial changes. We are currently experiencing one of these global changes that have shaped human history.

Virtually all scientific authorities agree that the world is gradually warming, and this warming is negatively affecting the quality of the air and vital ecological cycles. This phenomenon, known as global climate change, is considered one of the most significant environmental and socio-economic challenges threatening our century.



All observations indicate that global average temperatures are rapidly increasing, leading to unexpected weather events, significant glacier melting, and a rising average ocean and sea level. All these adverse consequences are largely attributed to the increasing levels of greenhouse gas emissions in our atmosphere due to human activities, which compels us to take serious measures.

Global climate change is a shared problem for all of humanity, and success can only be achieved by addressing it collectively and finding solutions together. Otherwise, in the near future, there may be even more significant problems with irreversible consequences.

As a result of the rapid changes in the climate, we expect more intense disasters such as desertification, floods, and hurricanes, the proliferation of climate-related health issues, and the direct or indirect adverse impact on all human activities.

This situation, created by human actions, can also be mitigated by human actions. Considering Türkiye's commitments under the Paris Agreement and our country's 2053 net-zero emissions target, we are aware of our responsibility to limit temperature increase to 1.5°C, and we are committed to creating just, equitable, and livable cities. In this regard, I wholeheartedly believe that all efforts carried out in our selected pilot city, Konya, related to local climate change adaptation strategies, action plans and building decarbonization, as part of the 'Strengthening Climate Change Adaptation Action in Türkiye' and 'Zero Carbon Building Accelerator Project', will benefit all of humanity and our world in the global fight against climate change.

I sincerely thank everyone involved in these efforts.

Uğur İbrahim Altay
Konya Metropolitan Municipality Mayor



CHAPTER 1

Introduction

Human-induced greenhouse gas emissions have made a notable contribution to global warming by increasing global surface temperatures by 1.1°C between 2011-2020 compared to the period between 1850-1900. Global greenhouse gas emissions continue to increase due to unsustainable energy consumption, changes in land use, and consumption and production habits at regional, national, and individual levels [1]. Compared to the pre-industrial era, a 2°C increase in global temperatures is projected to significantly elevate the risk of dangerous and potentially devastating changes on a global scale. It is expected to have serious adverse effects on the natural environment, human health, and well-being [2]. In this context, the Paris Agreement aims to establish a global framework for preventing the dangerous effects of climate change by limiting global warming to below 2°C and keeping it as close to 1.5°C as possible [3].

According to the International Energy Agency, the final energy consumption attributed to buildings' usage is responsible for approximately 30% of global values and contributes to 26% of global energy-related emissions. Out of this 26%, 8% directly originates from buildings, while

the remaining 18% results from indirect emissions associated with the production of electricity and heat energy needed by buildings [4]. A study conducted by the United Nations Environment Programme (UNEP) indicates that if countries do not take immediate action, energy consumption is projected to double by the year 2050 [5]. It is projected that approximately 70% of the world's population will live in cities by the year 2050. The increasing shift towards urban living implies a greater need for buildings in cities [6].

The building sector makes significant contributions to decarbonizing the global economy through enhancing energy efficiency, reducing energy demand, decreasing embodied carbon associated with the material use, and promoting low-carbon and renewable energy sources. The carbon footprint generated by a building throughout its entire life cycle encompasses all emissions, including the production of construction materials, transportation, construction, maintenance, repair and renovation processes, energy and water consumption during the building's use, demolition, recycling, and the separation of construction materials (Figure 1) [10].

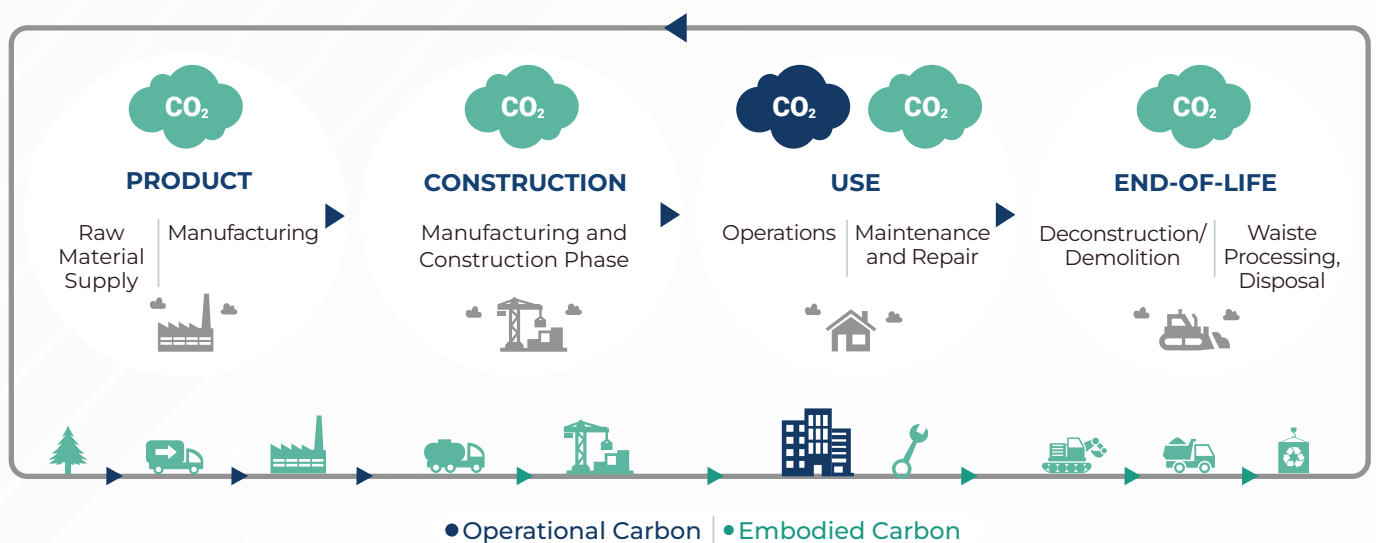


Figure 1. Building life cycle.

The energy consumed in the processes ranging from the extraction of construction materials to their transportation to construction sites, assembly, repair, maintenance, renovation, and eventual disposal at the end of their lifecycle is commonly referred to as "Embodied Energy." Meanwhile, the sum of carbon emissions generated during these phases is recognized as "Embodied Carbon." It is essential to note that "Embodied Carbon" encompasses emissions that arise not during a building's operational phase but during its construction, maintenance, and demolition procedures. These emissions represent a significant component of a building's overall environmental impact. Conversely, "Operational Carbon" emissions pertain to the greenhouse gas emissions originating from energy consumption during the operational phase of a building. This includes energy consumption for heating, cooling, ventilation, lighting, water usage, and the operation of various mechanical and electrical devices.

A zero-carbon building is defined as a highly energy-efficient building, meeting the remaining energy needs from on-site or off-site renewable energy sources. These buildings minimize operational and embodied carbon emissions throughout their life cycle, and any unavoidable

1.1 Vision and Objectives

In 2021, as part of the Zero Carbon Building Accelerator (ZCBA) project initiated by the World Resources Institute (WRI) and funded by the Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP), national roadmaps for decarbonizing the building sector were developed in Türkiye and Colombia. Within the framework of the project, local strategies and actions were formulated for the implementation of net-zero carbon buildings in pilot cities. Konya and Gaziantep were chosen as pilot cities from Türkiye. The ZCBA cities are actively working on implementing regulations and policies to ensure that all buildings are carbon-free by 2050 [9].

emissions are neutralized through carbon balancing. Additionally, it is crucial for Zero Carbon Buildings to be climate resilient [7]. These buildings offer users additional benefits such as improved indoor air quality, more comfortable living and working spaces, and lower energy bills. Today, there are architectural designs, construction practices, building materials, and sector-relevant technologies available to realize Zero Carbon Buildings.

The definitions and goals of zero-carbon buildings primarily reflect a strong commitment to increasing efficiency. In cases where renewable energy is not available or feasible, terms like "zero-ready" or "near-zero" may be used to signify that the building has done its best to approach zero energy [8].

It is crucial to recognize that buildings stand out as one of the most cost-effective emission reduction solutions available to address climate change. Every investment directed toward enhancing building efficiency leads to an approximate twofold reduction in energy supply costs. Despite the substantial potential it offers, the building sector has yet to fully realize approximately 80% of the economically viable global energy savings.

The Konya Building Sector Decarbonization Action Plan aims to promote the widespread adoption of "Zero Carbon-Ready Buildings" in Konya, which are characterized by significantly reduced energy consumption, high energy efficiency, and a low-carbon energy supply, making them highly efficient and climate-resilient throughout their life cycle. This document encompasses the current state of the local building sector in Konya and the actions developed for its decarbonization, including the scope, timelines, and responsibilities of relevant stakeholders. The action plan also suggests business models and pilot applications for the decarbonization of the building sector.

The implementation of the local Action Plan will contribute to climate change mitigation efforts at both the local and national levels, guiding cities and local governments as-

1.2 Local Objectives

In line with the "Türkiye Towards Green Development" goals, Konya Metropolitan Municipality (KMM) prepared the Greenhouse Gas Emission Inventory Report and Mitigation Action Plan, in 2021. According to the Greenhouse Gas Mitigation Action Plan, the target for greenhouse gas emission reduction in all buildings in Konya province is set at 10% by 2030 and 13% by 2050 compared to the reference scenario. The implementation of all sectoral greenhouse gas mitigation actions outlined in the action plan is expected to result in approximately 27% emission reductions by 2030 and approximately 35% by 2050 [10].

Within the scope of the "Climate-Friendly Carbon-Neutral Cities Project," KMM is engaged

in activities aimed at limiting fossil fuel usage, expanding green transport networks, increasing green areas, and promoting the use of environmentally friendly modes of transportation such as bicycles and scooters. The "Zero Waste Management System Plan for Konya Province," published in 2020, outlines various initiatives to be undertaken within buildings and campuses throughout the city [11].

As part of the "Strengthening Climate Change Adaptation Action in Türkiye Project," a Local Climate Change Adaptation Strategy and Action Plan is being developed for Konya. Given that the building sector is one of the largest sources of emissions, Konya has initiated decarbonization efforts in this sector, as well.





CHAPTER 2

Current State

2.1 Energy and Emission Profile

According to the Konya Province Greenhouse Gas Emission Inventory Report, published by KMM in 2021, the total greenhouse gas emissions in the province for the year 2019 were 11,211,198 tCO₂.eq. On a per capita basis, this translates to 5.02 tCO₂.eq per person.

When examining the sectoral breakdown of greenhouse gas emissions in Konya, it is evident

that the manufacturing industry and the construction sector were the highest contributors, accounting for 33% of emissions (3,699,196 tCO₂.eq). The second-largest source of emissions was residential buildings, with a 19% share (2,099,994 tCO₂.eq), followed by commercial and institutional buildings at 9% (1,030,728 tCO₂.eq). Altogether, the building sector represents 28% of the total emissions in Konya (Figure 2) [12].

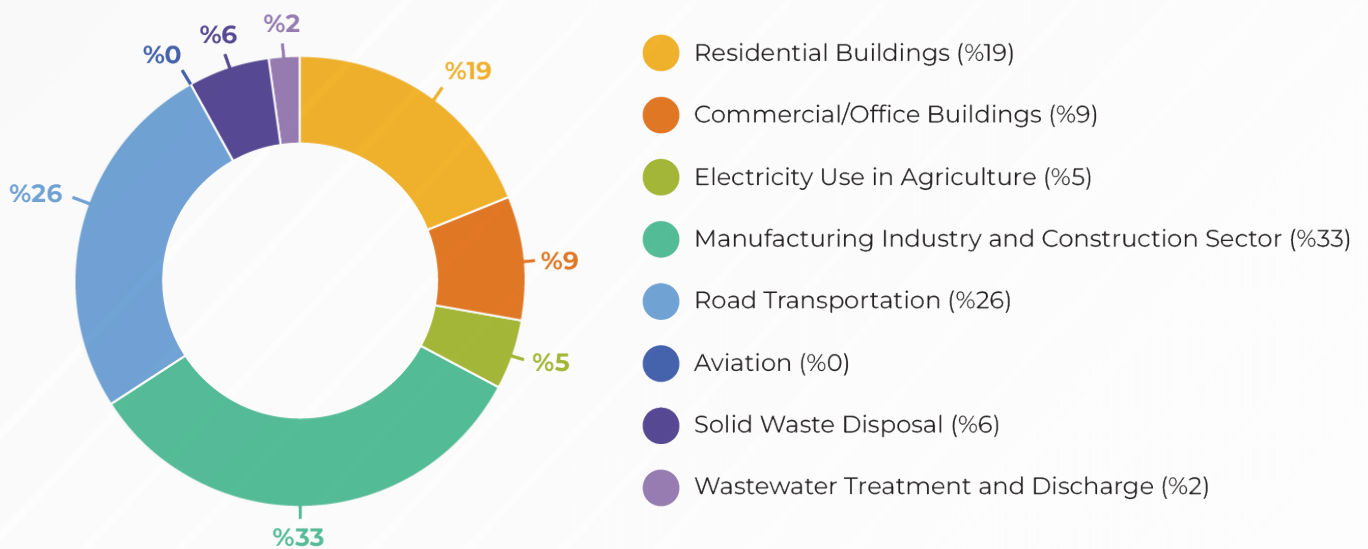


Figure 2. Emission distribution by source.

2.2 City Building Stock

As a result of the analyses conducted within the Konya Building Sector Decarbonization Action Plan, it is estimated that by the end of the year 2021, there were approximately 343,722 buildings within Konya Province. About 79% of this stock consists of residential buildings, while the remaining 21% comprises non-residential structures. The distribution of the building stock by year as of the end of 2021 is illustrated in Figure 3. Approximately 77% of the total stock was constructed prior to the year 2000, a period in which there were no national regulations governing

energy performance in buildings. Between the years 2000 and 2010, during which the requirements for thermal insulation standards for buildings were established in accordance with the national TS825 standard for thermal insulation requirements for buildings, roughly 9% of the building stock was built. After the introduction of the Building Energy Performance (BEP) Regulation in 2011, approximately 14% of the stock was constructed. A similar distribution pattern is observed when considering subcategories for residential and non-residential buildings.



Figure 3. Konya building stock distribution by years and building typologies.

According to the modeling study conducted, it is estimated that the total floor area of the building stock will reach 215,064,863 m² by the year of 2053. The development projection of the total building stock's total floor area for the years 2000-2053 is illustrated in Figure 4. It is anticipated that buildings constructed before the year 2000 will be demolished in the coming years in alignment with national urban renewal goals, and new buildings will be constructed in their place.

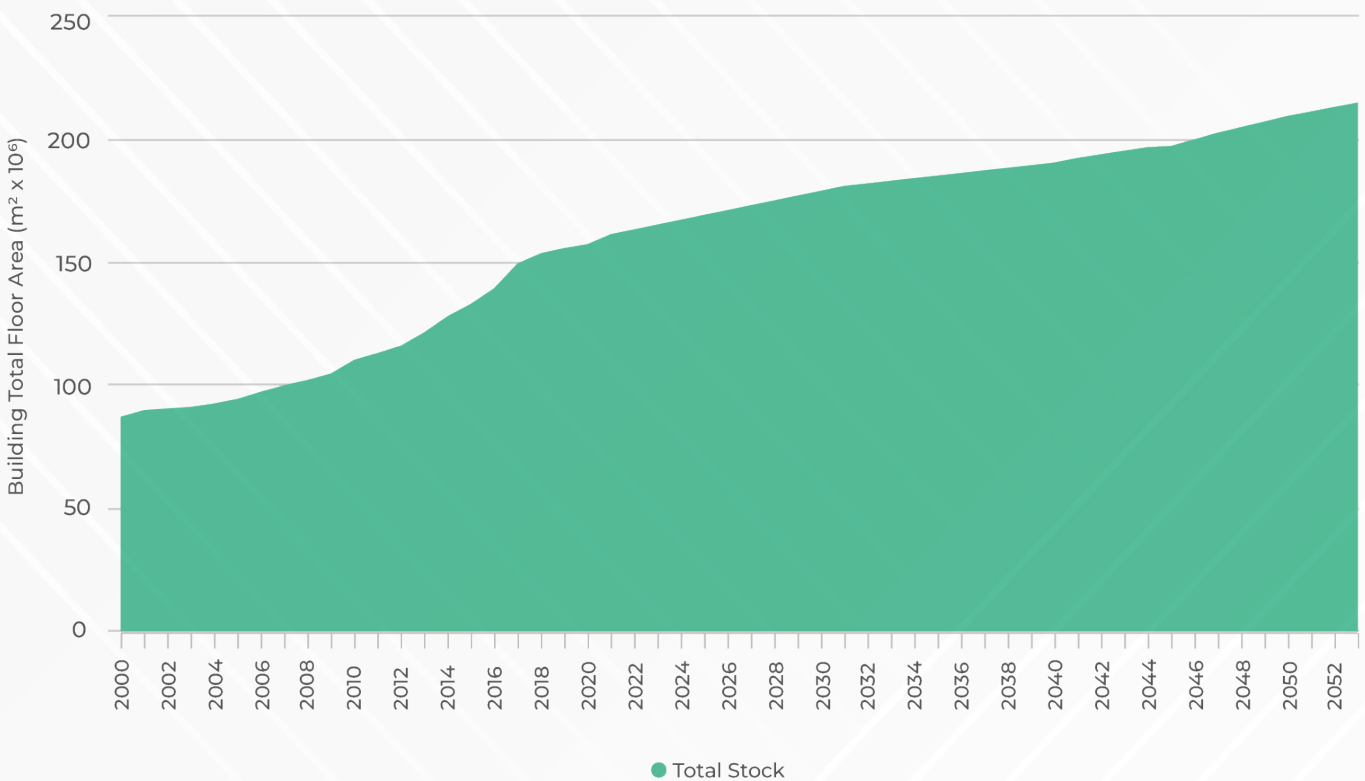


Figure 4. The projection of the building stock total floor area.

2.3 Seismicity

Türkiye is situated on the Anatolian Plate, which is highly active in terms of earthquakes, due to the convergence and interaction of the Eurasian, African, and Arabian plates, where severe earthquakes frequently occur. In the last century, Türkiye has experienced nearly 20 earthquakes with a magnitude of 7 or greater, some of which have resulted in severe effects classified as Violent-Extreme-Disastrous (IX-X-XI) on the Mercalli scale. This phenomenon places Türkiye at the top of the list of countries prone to earthquake damage in terms of tectonic activity and the risks posed by its building stock [13].

According to the "Konya Province Disaster Risk Reduction Plan" published in 2021, Konya prov-

ince's earthquake risk is distributed across areas identified as highly dangerous (16%), dangerous (17%), and safe (67%). Although there are significant faults of considerable length around Konya, there is little knowledge of destructive earthquakes caused by these faults in the known historical period. During the periods when earthquake records were maintained there was less seismic activity than expected in and around the city center of Konya, despite the tectonic characteristics of the region. While the probability is not high, it is recommended that the tectonic potential for a 6-6.5 magnitude earthquake is acknowledged, and the multi-story construction practices on Konya Plain's soft alluvial deposits are reassessed [14].





CHAPTER 3

Developing the Action Plan

This Action Plan developed for decarbonizing the building sector in Konya is based on a comprehensive methodology that includes literature review, stakeholder analysis, data collection and analysis, modeling, and projection studies, needs assessment, action definition and prioritization processes.

To identify stakeholders that can influence or be influenced by the policies and measures necessary for decarbonizing the building sector, a stakeholder map analysis was conducted.

Through collaborative efforts with stakeholders, an extensive survey and focus group meetings were conducted to evaluate several aspects of the building sector in Türkiye and Konya. These aspects include the legal regulations governing the building sector in Türkiye and Konya, the technical capacities of building

sector professionals, available sources of financing, the awareness levels of building sector stakeholders, and the technologies employed in building construction (including building materials, devices, and systems). These evaluations were carried out collectively and collaboratively. The current state of Konya's building sector was assessed, and the local needs and obstacles were identified. Recommendations for improvement were documented.

Following the research and stakeholder input, a draft list of actions for decarbonizing the building sector in Konya was prepared. The effects of these actions were evaluated, shared with KMM and, after further stakeholder consultation, the actions included in this plan were determined. Figure 5 illustrates the process and stages of the action plan's preparation.



Figure 5. The process and stages of preparing the action plan.

The gaps and barriers for decarbonizing the building sector were identified through surveys, focus group meetings, and local stakeholder meetings under various categories. Some of the prioritized gaps and barriers, and recommendations provided by the participants, are tabulated below.

Table 1. Gaps and barriers, and recommendations for the decarbonization of Konya building sector.

Gaps and Barriers	Recommendations
<p>Building Materials:</p> <ul style="list-style-type: none"> ● Lack of widespread production and dissemination of low-carbon building materials across the country. ● Insufficient emphasis on the use of local materials. 	<p>Policy:</p> <ul style="list-style-type: none"> ● Making renewable energy structures mandatory through laws and regulations (urban planning regulations, urban transformation law, etc.). ● Ensuring sustainable management and recycling of construction waste and debris through legislation.
<p>Construction Process:</p> <ul style="list-style-type: none"> ● Failure to implement measures for environmental protection outlined in Environmental Impact Assessment (EIA) reports. Low compliance of construction projects with regulations/standards. ● Increased costs hindering the construction of energy-efficient buildings. 	
<p>Building Design and Urban Planning:</p> <ul style="list-style-type: none"> ● Inadequate design for climate suitability. ● Architects and engineers lacking expertise in zero-carbon buildings. ● Lack of pilot building examples. 	
<p>Building Operational Phase:</p> <ul style="list-style-type: none"> ● Insufficient use of technology in building operations. ● Insufficient inspections. ● Lack of conscious consumption. 	
<p>Demolition and Recycling:</p> <ul style="list-style-type: none"> ● Lack of awareness in sustainable demolition, and removal of recycling processes due to limited time allocated for demolition. ● Lack of requirements for the reuse of the construction waste. ● Inadequate waste management processes related to addressing the waste generated during demolition and recycling. 	
<p>Renewable Energy:</p> <ul style="list-style-type: none"> ● Insufficient knowledge of how to benefit from renewable energy sources. ● Inadequate incentives for renewable energy usage. 	<p>Finance:</p> <ul style="list-style-type: none"> ● Providing discounts on electricity, water, etc. bills for buildings with energy performance certificates, based on a scoring system, to create incentives. ● Establishing a fund under the leadership of the relevant ministry to support incentives.
	<p>Technology:</p> <ul style="list-style-type: none"> ● Implementing energy efficiency classification for building materials. ● Developing domestic technologies for renewable energy usage. ● Planning urban and infrastructure systems to be recycle-friendly.
	<p>Technical Capacity and Awareness:</p> <ul style="list-style-type: none"> ● Assessing the necessary training needs of the municipality personnel. ● Organizing training programs Konya Metropolitan Municipality Vocational Training Courses (KOMEK) for the personnel and involving human resources departments more actively. ● Incorporating zero-carbon building-related content into university curricula.





CHAPTER 4

Emission Mitigation Measures

Various emission mitigation measures have been developed for Konya building sector, considering national regulations, national statistical data, official statements, expert opinions, and internationally accepted calculation methods in line with the baseline analysis. A mitigation portfolio has been created, consisting of nine mitigation measures aimed at effectively reducing emission during the building's operational phase and embodied carbon emissions. The mitigation portfolio includes the following measures:

- Constructing new residential and non-residential buildings as Nearly Zero Energy Buildings (NZEB*) in the 2023-2032 period, building new residential and non-residential buildings as Class A buildings in the 2033-2042 period, building new residential and non-residential buildings as Constructing new residential and non-residential buildings between 2043-2053 to be Net Zero Operational Carbon Buildings** and gradually renewing the stock by demolishing pre-2000 buildings and improving the energy efficiency of 2000-2010 buildings by 5% annually (up to 2043) through comprehensive renovations to achieve NZEB status (Mitigation Measures for Operational Carbon).
- Replacing low-efficiency refrigerators/washing machines/dishwashers used in homes with up-to-date technology and energy-efficient appliances at an approximate rate of 10% annually starting from 2023 (up to 2033) status (Mitigation Measures for Operational Carbon).
- Using low-carbon concrete/steel in new residential and non-residential reinforced concrete buildings starting from 2023. Achieving a 30% reduction by 2033 and 100% reduction by 2053 compared to 2023 status (Mitigation Measures for Embodied Carbon).



The implementation of the specified measures allows for a total reduction of 72 MtCO₂.eq in greenhouse gas emissions from 2023 to 2053. This corresponds to a 29% reduction compared to business-as-usual emissions. Moreover, 47% of emission reduction is achieved in the year 2053 (Figure 6).

*Buildings classified as NZEB (Nearly Zero Energy Building) must have an energy performance class of B or better in their Energy Performance Certificate, and at the same time, they should use at least 10% of the building's primary energy demand from renewable energy sources. During the transition period between January 1, 2023, and January 1, 2025, the minimum renewable energy rate of "10%" will be reduced to "5%", and the total building construction area specified as "2000 m²" will be applied as "5000 m²".

** Net Zero Operational Carbon Buildings are considered buildings balancing their annual operational carbon emissions with renewable energy sources.

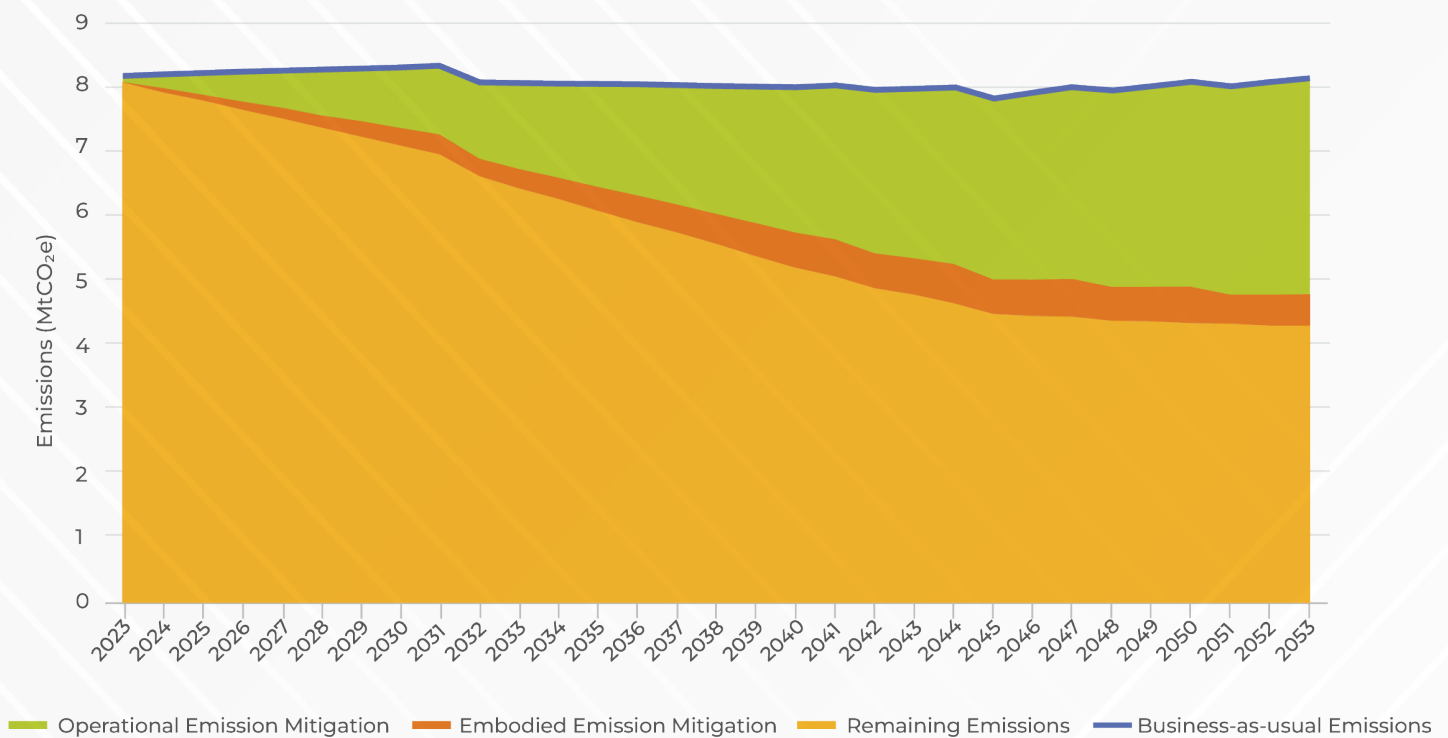
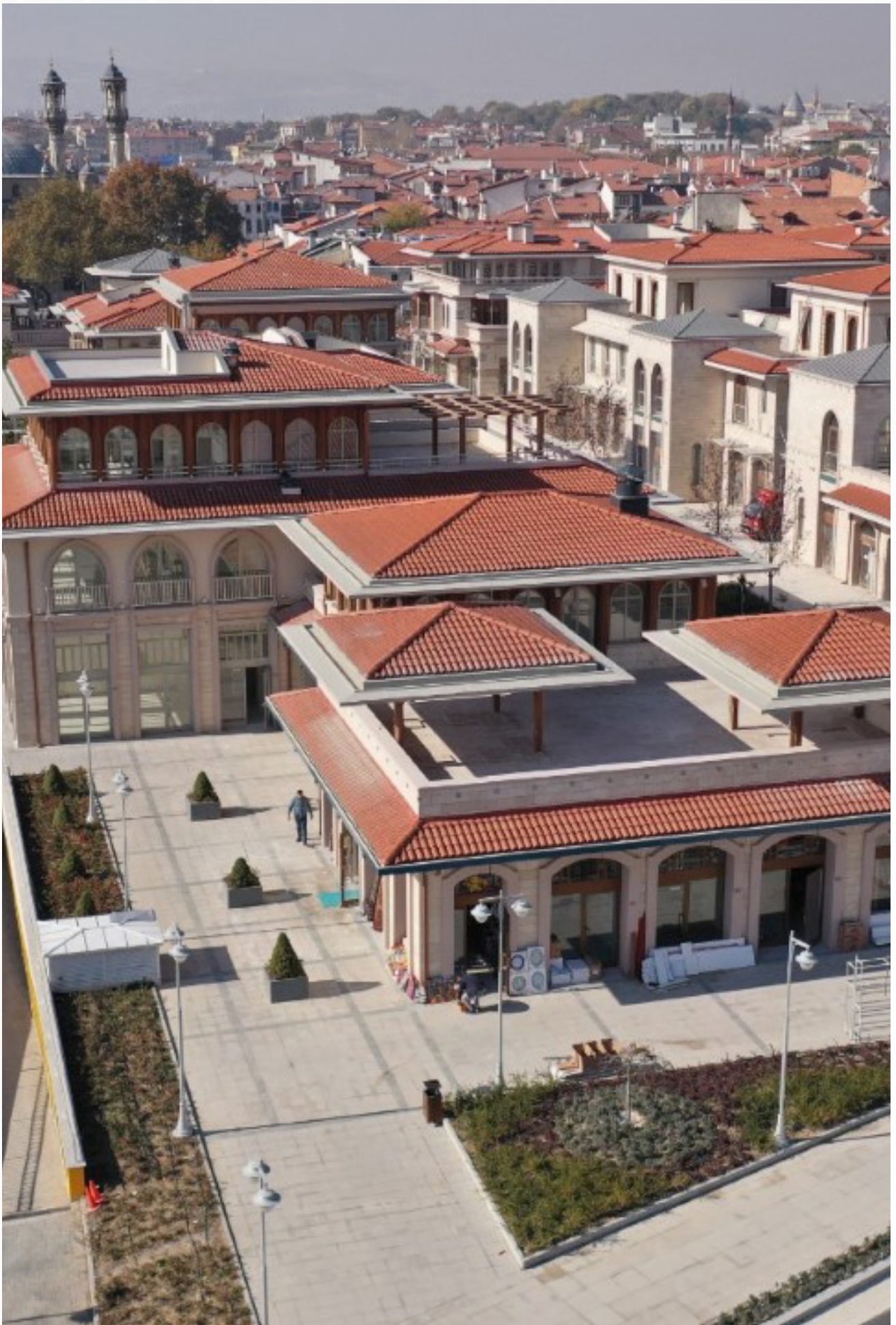


Figure 6. Operational and Embodied Carbon Mitigation Portfolio Results.



CHAPTER 5

Konya Building Sector Decarbonization Actions

Carbon emissions from the building sector occur throughout the life cycle of buildings, due to activities such as raw material extraction and material production, transportation, construction activities, maintenance, repair, material renewal during the building's life cycle, energy and water consumption during building use, demolition, and end-of-life processes of building materials. Worldwide, carbon emissions from buildings are roughly equivalent to about 39% of the total carbon emissions from all sectors. More than a quarter of these emissions are related to greenhouse gases associated with the production of building materials and construction activities [15].

According to the Greenhouse Gas Emissions Inventory report prepared in 2021 by KMM based on 2019 data, emissions from buildings

5.1 Building Materials

According to the Global Status Report published by Global ABC in 2018, buildings account for an 11% share of embodied carbon in global emissions [16]. This share corresponds to approximately 28% of the total carbon emitted over the lifecycle of a building.

Given the significant impact of embodied carbon, strategies to reduce it should be addressed in the early stages of building projects. As the projects advance, making design and implementation changes to reduce embodied carbon becomes much more challenging and costly.

Konya should collaborate with all stakeholders, both at the national and local levels, to reduce the potential for embedded carbon emissions from buildings. Within these collaborations, Konya can promote the use of Life Cycle Assessments (LCA) and Environmental Product Declarations (EPD) for commonly used building materials, incorporate modular and precast systems into projects, and encourage the use of local materials to reduce carbon emissions from transportation.

constitute 28% of the total emissions. On the other hand, greenhouse gas emissions from manufacturing industry and construction activities are responsible for 33% of the total emissions (Figure 2) [12]. In light of these statistics, it is evident that Konya city has a significant potential for reducing greenhouse gas emissions from buildings, building material production, and construction activities.

The Decarbonization Actions in the Building Sector have been prepared based on literature reviews, participatory workshop activities with stakeholders, online surveys, and one-on-one discussions with experts. Transformative actions are grouped under four main headings in the following sections: "Building Materials", "Existing Buildings", "New Buildings", and "Urban Planning and Resilience".

In the following sections, the proposed goals, targets, and transformative actions for Konya related to decarbonizing building materials, are presented.



5.1.1 Goals and Targets

Building materials have been examined with a focus on three primary goals, and the proposed actions are aligned with the strategic targets defined for the years 2030, 2040, and 2050 in the national roadmapping effort.

Goal #	Goal Description
BM1	Promoting Life Cycle Assessment (LCA) for building materials
BM2	Expanding the use of Environmental Product Declarations (EPD) for building materials
BM3	Reducing embodied emissions from building materials

Target #	Current State	2030 Target	2040 Target	2050 Target
BM.T1	Most building materials lack Life Cycle Assessment (LCA) analyses.	At least 40% of the main building materials used in construction projects have LCA.	At least 80% of commonly used building materials in construction projects have LCA.	At least 95% of all building materials used in construction projects have LCA.
BM.T2	Most building materials lack Environmental Product Declarations (EPD).	At least 40% of the main building materials used in construction projects have EPD.	At least 80% of the main building materials used in construction projects have EPD.	At least 95% of all building materials used in construction projects have EPD.
BM.T3	Adequate data on embodied emissions from building materials is not available.	40% reduction in embodied carbon emissions from building materials.	60% reduction in embodied carbon emissions from building materials.	Reducing embodied carbon emissions from building materials to net zero.

5.1.2 Actions

In this section, transformative actions to address carbon emissions resulting from building material use, as well as the target years for completing these actions, are presented.

The main actions are examined under the category of "policy", while supporting actions are provided under the categories of "finance," "technology," and "technical capacity and awareness."

5.1.2.1 Policy Actions

Action #	Action Description	Target Year
BM.PA1	Preparation and maintenance of inventories containing information about local building materials with Life Cycle Assessment (LCA) and Environmental Product Declarations (EPD) for materials produced in Konya and neighboring provinces.	2024
BM.PA2	Collaboration with building material producers to initiate and improve the application of Life Cycle Assessment (LCA) and Environmental Product Declarations (EPD).	2024
BM.PA3	Utilization of materials with Environmental Product Declarations (EPD) in new municipal buildings, along with the development of specifications.	2026
BM.PA4	Development of specifications for the use of local building materials and materials with Environmental Product Declarations (EPD) in all municipal procurements and tenders.	2030
BM.PA5	Incentivizing the use of materials with Environmental Product Declarations (EPD) in all new buildings.	2030
BM.PA6	Prevention of the demolition of existing buildings that can be economically extended through deep retrofit and structural reinforcement.	2024
BM.PA7	Development of specifications for the use of local and materials with Environmental Product Declarations (EPD) in municipal buildings that will be renewed through deep retrofit and structural reinforcement.	2026
BM.PA8	Incentivizing the use of local materials and materials with Environmental Product Declarations (EPD) in all renewed buildings through deep retrofit and structural reinforcement.	2026
BM.PA9	Amendment of public building specifications to encourage the use of low clinker content cement and concrete.	2026
BM.PA10	Regular acquisition of sustainability reports from the cement, concrete, and steel industries serving the building sector in Konya and the encouragement of their environmentally friendly use.	2026
BM.PA11	Inclusion of modular and precast systems in the specifications of municipal buildings by KMM to incentivize their use, along with the production of prototype projects promoting precast and modular systems by 2025.	2025
BM.PA12	Incentivizing the use of the Green Certificate for Buildings and Settlements (YeS-TR) guide as a reference for material selection in buildings.	2024
BM.PA13	Incentivizing the use of recycled and reused materials.	2030

5.1.2.2 Finance Actions

Action #	Action Description	Target Year
BM.FA1	Developing financial resources for local producers to increase the number of EPDs for local materials.	2026
BM.FA2	Allocating financial resources for research and development (R&D) to reduce the environmental impact of local materials.	2030
BM.FA3	Developing financial resources for R&D efforts for the use of modular and precast systems in construction.	2030
BM.FA4	Developing financial resources for local R&D projects related to the recycling and reuse of construction and demolition waste.	2030

5.1.2.3 Technology Actions

Action #	Action Description	Target Year
BM.TA1	Establishing a Building Information Modeling (BIM) library that includes construction materials commonly used in Konya and surrounding provinces, along with their environmental impacts.	2026
BM.TA2	Promoting and conducting R&D activities to reduce the adverse environmental effects associated with the production of local materials.	2028
BM.TA3	Promoting and conducting R&D activities aimed at the use of modular and precast systems in construction.	2028
BM.TA4	Promoting and conducting R&D projects related to the recycling and reuse of construction and demolition waste.	2028
BM.TA5	Employing new technology and high-efficiency machinery and transport vehicles in construction and demolition processes.	2028

5.1.2.4 Technical Capacity and Awareness Actions

Action #	Action Description	Target Year
BM.TCA1	Conducting technical capacity-building and awareness-raising initiatives for the municipality, industry representatives, and other stakeholders to enhance knowledge on sustainability in construction materials. This includes areas such as EPDs, green certification systems, national and international standards, best practice examples, and more.	2025
BM.TCA2	<p>The Konya Metropolitan Municipality and district municipalities to provide relevant departments with technical capacity-building training on Sustainable Practices in Building Materials, which should include the following topics and similar subjects:</p> <ul style="list-style-type: none"> - Building Information Modeling (BIM) - Material-related embodied carbon and calculation tools - Life cycle assessment - Sustainable architecture - Innovative methods, modular, and precast systems in construction - Green building certifications (e.g., Green Building Certification for Buildings and Settlements - YeS-TR) - Structural retrofit - Deep retrofit of energy efficient renovations 	2025

5.2 Existing Buildings

Operational carbon emissions in buildings refer to the greenhouse gas emissions resulting from all the energy sources required during the operational phase, including heating, cooling, ventilation, lighting, water consumption, and other mechanical and electrical equipment. Operational greenhouse gas emissions from buildings constitute approximately 27% of the global emissions and 72% of the total building-related emissions. Approximately one-third of these emissions are attributed to the use of fossil fuels within buildings, while two-thirds stem from electricity consumption [16].

A portion of greenhouse gas emissions generated during the operational phase of buildings is also attributable to the release of refrigerants used in cooling systems and heat pumps into the atmosphere. Emissions stemming from leakages and uncontrolled releases during the use and disposal of refrigerants constitute approximately 2% of global greenhouse gases. [17].

To accelerate the mitigation of greenhouse gas emissions from existing buildings and reach net zero, improvements in building envelope, enhanced efficiency of heating, cooling, and lighting systems to reduce consumption, expedited transition to electrification, and increased utilization of renewable energy are necessary. Conducting a comprehensive building inventory study at the city level urgently and rapidly increasing Energy Performance Certificate (EPC) documentation will establish a fundamental framework, enabling the establishment of realistic goals and facilitating monitoring efforts.

In the following sections, the proposed goals, targets, and transformative actions for Konya related to decarbonizing existing buildings, are presented.

5.2.1 Goals and Targets

Existing Buildings have been examined with a focus on five primary goals, and the proposed actions are aligned with the strategic targets defined for the years 2030, 2040, and 2050 in the national roadmapping effort.

Goal #	Goal Description
EB1	Implementing energy-efficient transformation of existing buildings.
EB2	Increasing energy and water efficiency in buildings during their operational phase, reducing household waste production.
EB3	Minimizing energy consumption during demolition processes, ensuring the most efficient transportation and disposal of demolition waste.
EB4	Maximizing the recycling of construction material waste generated during demolition and renovation works.
EB5	Preventing leakage and ensuring controlled disposal of refrigerants used in HVAC systems and other equipment.

Target #	Current State	2030 Target	2040 Target	2050 Target
EB.T1	12% of existing buildings are EPC-rated.	Expanding the EPC documentation to 50% of existing buildings.	Expanding the EPC documentation to 100% of existing buildings.	
EB.T2	There is no mandatory requirement for a minimum level of energy efficiency in existing buildings.	Retrofitting 40% of existing buildings to achieve the Nearly Zero-Energy Building (NZEB) target.	Retrofitting 70% of existing buildings to achieve the Nearly Zero-Energy Building (NZEB) target.	Retrofitting 100% of existing buildings to achieve the Nearly Zero-Energy Building (NZEB) target.
EB.T3	There is no mandatory requirement for using alternative water sources (e.g., rainwater, greywater) in existing buildings.	Retrofitting 40% of existing buildings for using alternative water sources.	Retrofitting 70% of existing buildings for using alternative water sources.	Retrofitting 100% of existing buildings for using alternative water sources
EB.T4	The recycling rates for construction and demolition waste are considerably low.	Increasing the recycling rate of construction and demolition waste to 20%.	Increasing the recycling rate of construction and demolition waste to 40%.	Increasing the recycling rate of construction and demolition waste to 70%.

5.2.2 Actions

In this section, transformative actions to address carbon emissions resulting from existing buildings, as well as the target years for completing these actions, are presented.

The main actions are examined under the category of "policy", while supporting actions are provided under the categories of "finance," "technology," and "technical capacity and awareness."

5.2.2.1 Policy Actions

Action #	Action Description	Target Year
EB.PA1	Generating an building inventory to determine the current state of the building stock; the inventory to include, at a minimum, the construction year, floor area, purpose, structural/seismic performance, and energy performance rating.	2026
EB.PA2	Identification and transformation of informal and abandoned buildings found during the inventory of the existing building stock.	2026
EB.PA3	Completing the transition from high carbon-emission fuels (e.g., Coal) used for heating in residences to lower-emission fuels (e.g., natural gas).	2026
EB.PA4	Expansion of energy monitoring in municipal buildings.	2025
EB.PA5	Expansion of energy monitoring in non-municipal buildings.	2025
EB.PA6	Development of comprehensive retrofit programs for improving energy efficiency in municipal buildings (insulation, windows, air tightness, lighting, etc.).	2024
EB.PA7	Development of comprehensive retrofit programs for improving energy efficiency in non-municipal buildings (insulation, windows, air tightness, lighting, etc.).	2028
EB.PA8	Increasing the use of photovoltaic and/or solar thermal systems in municipal buildings.	2026
EB.PA9	Increasing the use of photovoltaic and/or solar thermal systems in non-municipal buildings.	2026
EB.PA10	Incentivizing the use of high-efficiency appliances in residences and offices (e.g., household appliances, office equipment, etc.).	2025
EB.PA11	Incentivizing of rainwater harvesting and greywater recycling practices.	2025
EB.PA12	Encouragement of waste separation methods to reduce household mixed solid waste.	2024
EB.PA13	Replacement of refrigerants used in climate control systems in municipal buildings with next-generation and low-GWP (Global Warming Potential) refrigerants, and establishment of regulations for the safe disposal of current gases without causing greenhouse gas effects.	2028
EB.PA14	Replacement of refrigerants used in climate control systems in non-municipal buildings with next-generation and low-GWP (Global Warming Potential) refrigerants, and establishment of regulations for the safe disposal of current gases without causing greenhouse gas effects.	2028
EB.PA15	Enhanced compliance with national regulations for the environmentally friendly management, recycling, and disposal of demolition and excavation waste, along with efforts to improve recycling processes.	2024
EB.PA16	Establishment of educational teams in municipal governments to provide technical information for behavior changes to promote energy efficiency among building users.	2024

5.2.2.2 Finance Actions

Action #	Action Description	Target Year
EB.FA1	Establishing green financing and incentive programs (e.g., Green Incentive Program) in collaboration with financial institutions for comprehensive and energy-efficient renovations of existing buildings.	2027
EB.FA2	Establishing local green financing programs for urban transformation.	2027
EB.FA3	Increasing Energy Performance Contracts in energy efficiency applications.	2030
EB.FA4	Developing financial resources for the comprehensive renovation of municipal buildings.	2028
EB.FA5	Developing financial resources to enhance processes for recycling construction waste materials in support of a circular economy.	2028

5.2.2.3 Technology Actions

Action #	Action Description	Target Year
EB.TA1	Widespread utilization of energy modeling tools to support comprehensive renovations of existing buildings.	2024
EB.TA2	Developing an assessment tool and mechanism within the Green Incentive Program for measuring building compliance (e.g., inclusion of the BEP-TR Building Energy Performance Application).	2024
EB.TA3	Conducting R&D activities to devise innovative design and implementation methods tailored to local conditions in Konya (social, cultural, geographic, climatic, etc.) for the comprehensive renovations of existing buildings.	2027
EB.TA4	Integrating innovative technologies required for construction waste transformation and disposal into municipal solid waste disposal facilities.	2024
EB.TA5	Developing a joint monitoring system with relevant service providers (e.g., MEDAŞ, KOSKİ, Enerya) for tracking energy and water consumption in buildings.	2024
EB.TA6	Developing smart applications for building users to monitor and improve domestic waste, energy, and water consumption.	2024
EB.TA7	Utilizing innovative technologies (e.g., satellite imagery, drones, GIS tools, thermal cameras) to support current building stock surveying efforts.	2027
EB.TA8	Encouraging the use of new technology and fuel-efficient, low-emission machinery and transportation vehicles in demolition and excavation operations.	2027

5.2.2.4 Technical Capacity and Awareness Actions

Action #	Action Description	Target Year
EB.TCA1	Developing national and international partnerships to leverage best practices for the decarbonization of existing buildings.	2025
EB.TCA2	Conducting collaborative efforts with district municipalities and neighborhood councils to create awareness programs promoting energy-efficient behavior in the community (e.g., smartphone applications, practical training of building users by energy efficiency instructors, establishment of a consultation desk).	2025
EB.TCA3	Conducting public communication campaigns on sustainability, energy efficiency, renewable energy, and other technologies (in municipal public spaces, public transportation vehicles, stations, screens, billboards, etc.).	2024

5.3 New Buildings

Every new building added to the building stock will have an impact on both operational carbon emissions resulting from energy and water consumption during the usage period and embodied carbon emissions, throughout the life cycle of building materials. Taking measures during the planning, design, and construction phases and enhancing the effectiveness of inspection mechanisms are necessary to minimize these emissions.

Policies related to energy-efficient design, the use of renewable energy sources, and sustainable material usage should be implemented to minimize the impact of new buildings

on greenhouse gas emissions. Furthermore, building permit and inspection processes should be improved to reduce carbon emissions throughout the entire life cycle of buildings. The proliferation of documentation and certification systems, the increase in electrification rates in final energy usage, and the reduction of water consumption and waste generation in all processes should be targeted to reduce carbon emissions.

In the following sections, the proposed goals, targets, and transformative actions for Konya related to decarbonizing new buildings, are presented.



5.3.1 Goals and Targets

New Buildings have been examined with a focus on six primary goals, and the proposed actions are aligned with the strategic targets defined for the years 2030, 2040, and 2050 in the national roadmapping effort.

Goal #	Goal Description
NB1	The dissemination of integrated building design, construction, and management standards to increase resource efficiency and reduce carbon emissions throughout the entire life cycle of buildings.
NB2	Enhancement of energy efficiency, electrification, and the use of renewable energy in architectural and mechanical design.
NB3	The widespread adoption of green building certification systems.
NB4	Material selection in accordance with sustainability standards and the increased use of low-carbon structural systems.
NB5	Increasing the effectiveness of building permit processes and preventing unauthorized and non-compliant constructions.
NB6	Reduction of energy and water consumption and waste generation during the construction process.

Target #	Current State	2030 Target	2040 Target	2050 Target
NB.T1	Local incentive program or guiding manual to support environmentally-friendly practices in buildings is not available.	Creating an environmentally friendly practice guide and incentive program for buildings tailored to local conditions. 40% of the new buildings built to environmentally friendly criteria through incentives.	70% of the new buildings built to environmentally friendly criteria through incentives.	100% of the new buildings built to environmentally friendly criteria through incentives.
NB.T2	Regulation or target related to electrification in buildings is not available.	40% of new buildings with 100% electrification capacity.	70% of new buildings with 100% electrification capacity.	100% of new buildings with 100% electrification capacity.
NB.T3	EPC rating requirements per total floor area: - EPC-C for buildings < 2000m ² and - EPC = NZEB for buildings > 2000m ² .	All new public buildings to be constructed in accordance with the current NZEB criteria.		

Target #	Current State	2030 Target	2040 Target	2050 Target
NB.T4	Green building certifications (e.g., YeS-TR) used on a voluntary basis.	New public buildings to be constructed in accordance with YeS-TR criteria.		
NB.T5	Regulations limiting emissions originating from building materials are not available.	20% of the building materials used in construction with low embodied carbon content	50% of the building materials used in construction with low embodied carbon content	80% of the building materials used in construction with low embodied carbon content

5.3.2 Actions

In this section, transformative actions to address carbon emissions resulting from new buildings, as well as the target years for completing these actions, are presented.

The main actions are examined under the category of "policy", while supporting actions are provided under the categories of "finance," "technology," and "technical capacity and awareness."

5.3.2.1 Policy Actions

Action #	Action Description	Target Year
NB.PA1	Encouraging the use of life cycle assessment and energy modeling in new building projects.	2025
NB.PA2	Adopting green building standards for all new constructions in urban renewal projects.	2024
NB.PA3	Establishing a Green Incentive Program to promote eco-friendly practices in new buildings.	2024
NB.PA4	Promoting "Green Procurement" criteria for public tenders, encouraging the use of sustainable materials with Environmental Product Declarations (EPDs).	2025
NB.PA5	Encouraging the use of low-carbon structural systems (e.g., wood, adobe, earth constructions) in new public buildings owned by the municipality.	2024
NB.PA6	Developing specific ecological building design guidelines tailored to Konya's climate conditions, including recommendations for project management, material selection, passive design strategies, shading systems, heating and cooling, lighting, building envelope insulation, and mechanical systems.	2025
NB.PA7	Implementing Building Information Modeling (BIM) in new public buildings for integrated design.	2025
NB.PA8	Promoting the use of BIM-based integrated design in large-scale new constructions like shopping centers, business centers, residences, hospitals, and schools.	2025

Action #	Action Description	Target Year
NB.PA9	Enhancing the effectiveness of existing regulatory mechanisms for BEP (Building Energy Performance) compliance in energy-efficient building design.	2025
NB.PA10	Improving the efficiency of existing regulatory mechanisms to ensure that construction processes align with design intentions.	2025
NB.PA11	Designing all new public buildings owned by the municipality to meet at least the Nearly Zero Energy Building (NZEB) criteria.	2024
NB.PA12	Designing new municipal buildings according to YeS-TR (or equivalent) green building certification criteria.	2024
NB.PA13	Promoting energy-efficient building design.	2024
NB.PA14	Achieving 100% electrification in new municipal buildings owned by the municipality	2025
NB.PA15	Increasing the share of renewable energy in new municipal buildings.	2024
NB.PA16	Incentivizing the increased use of renewable energy sources in all new buildings in Konya.	2025
NB.PA17	Encouraging the integration of renewable energy sources (e.g., Solar, Wind, Heat Pumps) into integrated design.	2024
NB.PA18	Encouraging the selection of construction machinery and transportation vehicles for demolition and construction based on efficiency, fuel type, and carbon emissions while also working on legal regulations and their inclusion in public tenders.	2025
NB.PA19	Incentivizing reduced water usage during construction and the use of alternative water sources such as rainwater and treated water, while also generating on related legal regulations.	2025
NB.PA20	Establishing sufficient facilities for the disposal and recycling of construction waste materials, improving the capacities of existing facilities.	2025
NB.PA21	Ensuring effective monitoring of the collection and disposal of construction waste materials.	2024

5.3.2.2 Finance Actions

Action #	Action Description	Target Year
NB.FA1	Utilizing existing national and international financial programs supporting the green economy.	2025
NB.FA2	Prioritizing funding for sustainable, energy-efficient, and environmentally friendly designs in new municipal buildings.	2025
NB.FA3	Developing incentive programs for sustainable buildings, emphasizing low environmental impact materials, renewable energy, and energy-efficient design.	2025
NB.FA4	Creating green financing programs for new constructions, including urban renewal projects, in collaboration with financial institutions (Multilateral Development Banks, Ministries, other financial institutions)	2024

5.3.2.3 Technology Actions

Action #	Action Description	Target Year
NB.TA1	Promoting the widespread use of life cycle assessment tools for evaluating building sustainability.	2025
NB.TA2	Encouraging the adoption of energy modeling tools in building design and construction.	2025
NB.TA3	Developing an assessment tool within the Green Incentive Program to measure building compliance.	2025
NB.TA4	Collaborating with academic institutions to conduct research and development (R&D) and practical implementation in the field of sustainable buildings, tailored to the Konya region's specific geography (Low-carbon material applications, smart buildings, efficient appliances, smart monitoring systems, advanced HVAC systems, renewable energy integration, etc.)	2027
NB.TA5	Utilizing thermal cameras during inspections to assess the thermal permeability of building envelopes.	2025
NB.TA6	Increasing the use of innovative technology to monitor and enhance construction processes (e.g. drone-based construction progress tracking).	2024
NB.TA7	Promoting the widespread adoption of Building Information Modeling (BIM) systems for construction planning, reducing application errors and delays.	2024
NB.TA8	Making BIM usage mandatory, starting with public buildings.	2026
NB.TA9	Encouraging the use of low-emission advanced-technology construction machinery and transportation vehicles for construction activities.	2025

5.3.2.4 Technical Capacity and Awareness Actions

Action #	Action Description	Target Year
NB.TCA1	<p>Developing ecological building design guidelines specific to Konya's climate.</p> <ul style="list-style-type: none"> - Integrated building design - Sustainable materials - Sustainable architecture - Renewable energy systems and their integration into building systems - Electrification in buildings - Waste management <p>(Guidelines to include recommendations for project management, material selection, passive design methods, shading systems, heating and cooling, lighting, insulation, and the selection of mechanical systems.)</p>	2025
NB.TCA2	<p>Raising awareness and provide training in the following areas, to enhance the capacity of municipal departments, industry representatives, and other stakeholders:</p> <ul style="list-style-type: none"> - Building Information Modeling (BIM) - Sustainable materials - Solid waste, construction waste disposal, and recycling - Circular economy - Life cycle assessment in buildings - Renewable energy and electrification - Sustainable architecture - Innovative construction methods - Green certifications 	2024
NB.TCA3	<p>Conducting communication campaigns to raise awareness among citizens about sustainable buildings, energy efficiency, sustainable materials, smart buildings, and related topics.</p>	2024
NB.TCA4	<p>Raising awareness within the municipal organizations regarding renewable energy, and innovative practices and materials in the National Construction and Installation Unit Price Catalog published by the Ministry of Environment, Urbanization and Climate Change (MoEUCC).</p>	2025

5.4 Urban Planning and Resilience

In recent times, urbanization is occurring at an unprecedented rate, with living spaces transforming into urban areas more rapidly than ever before. According to UN Habitat data, the global urbanization rate has increased fivefold between 1950 and 2011 [18]. Today, approximately 55% of the world's population resides in urban areas. By 2030, it is projected that this proportion will reach 70%, and by 2050, an estimated 2.5 billion more people will join the

global population, leading to an anticipated urban population rate of 90% [19].

Buildings, which constitute a vital component of urban systems, already consume approximately 40% of global energy and are responsible for nearly one-third of global greenhouse gas emissions. Greenhouse gas emissions from transportation, on the other hand, make up around 25% of total emissions,

and if current conditions persist, this percentage is expected to rise to 40% [20].

"Resilience" against climate change can be built through mitigation and adaptation actions, ensuring urban systems' robustness against climate impacts. Increasing energy efficiency in all urban activities and transitioning from fossil fuels to alternative and renewable energy sources for the remaining energy consumption, support the mitigation strategies.

The development of "adaptation" strategies for new and changing conditions due to climate change is of significant importance in the fight against climate change. Adaptation methods refer to the adjustments made in ecological, social, or economic systems in response to existing or anticipated climatic events and their impacts, enhancing the systems' resilience against climate effects.

Increasing the resilience of Konya city and its buildings to the impacts of climate change

through nature-based and sustainable methods will contribute equitably to demographic needs and societal development. Establishing an inclusive, flexible, and disaster-prepared urban structure is possible through comprehensive efforts. To achieve this, local policies need to be developed enhancing urban resilience. All sector stakeholders must collaborate harmoniously. Climate risks and urban vulnerabilities should be considered in the planning of the city, including data on population density and projections, urban carbon sink areas, and their spatial distribution. Additionally, continuous monitoring of data through tools like geographic information systems (GIS) is essential. Early risk reduction measures should be implemented based on the insights derived from this continuous monitoring.

The following sections list the goals, targets, and transformative actions for Konya proposed to enhance decarbonization and resilience in the areas where urban, natural, and building systems intersect.

5.4.1 Goals and Targets

Urban Planning and Resilience have been examined with a focus on seven primary goals, and the proposed actions are aligned with the strategic targets defined for the years 2030, 2040, and 2050 in the national roadmapping effort.

Goal #	Goal Description
UP-R1	Enhancing urban climate and disaster resilience
UP-R2	Increasing the climate and disaster resilience of existing and new buildings
UP-R3	Preserving green spaces and the main ecological structure while restoring degraded areas
UP-R4	Designing public spaces, urban infrastructure, and transportation systems in harmony with the ecological structure
UP-R5	Integrating regional alternative and renewable energy production facilities into urban planning
UP-R6	Ensuring maximum soil infiltration of rain and floodwaters through Sustainable Urban Drainage Systems (SuDS)
UP-R7	Eco-friendly and sustainable management of urban waste, contributing to a circular economy

Target #	Current State	2030 Target	2040 Target	2050 Target
UP-R.T1	Climate resilience criteria are not included in urban planning.	Preparing a guide with criteria related to the preservation of green areas and the main ecological structure, incorporating these criteria into urban renewal and replanning processes. Increasing urban green spaces and implementing pilot projects to reduce heat island effects.	Restore and rehabilitate 50% of the main ecological structure. Designing urban green spaces in balance with carbon sequestration needs addressing urbanization-related carbon emissions. Introducing heat island and green space calculation criteria in new development projects.	Restore and rehabilitate 100% of the main ecological structure. Designing urban green spaces in balance with carbon sequestration needs addressing urbanization-related carbon emissions. Introducing heat island and green space calculation criteria in new development projects.
UP-R.T2	Local policy and incentive system supporting the climate-resilient design and construction of new buildings are not available.	Developing and disseminating a Climate Resilient Building Design Guide specific to Konya. Ensuring that climate resilient design criteria are used in 40% of newly constructed buildings through incentives.	Ensuring that climate resilient design criteria are used in 70% of newly constructed buildings through incentives.	Ensuring that climate resilient design criteria are used in 100% of newly constructed buildings through incentives.
UP-R.T3	Local policy and incentive system supporting the climate-resilient renovation of existing buildings are not available.	Developing climate-resilient renovation criteria for existing buildings and promoting climate resilience practices in earthquake strengthening projects. Renovating 40% of existing buildings to enhance climate resilience through maintenance and refurbishment efforts.	Renovating 70% of existing buildings to enhance climate resilience through maintenance and refurbishment efforts.	Ensuring 100% of existing buildings are climate-ready and resilient to climate change impacts.
UP-R.T4	Capacity-building efforts and action plans for climate-resilient planning in public spaces, infrastructure, and transportation activities exist but are not widely implemented. The city has existing bicycle usage and bike lanes. There are also examples of rail systems.	Developing regulations and pilot projects for enhancing urban resilience, promoting energy efficiency, using durable and low-carbon materials in public spaces, infrastructure, and transportation activities. Conducting pilot projects for transitioning to alternative fuel vehicles (such as electric or hydrogen) in public transportation. Expanding bicycle usage.	Developing regulations and pilot projects for enhancing urban resilience, promoting energy efficiency, using durable and low-carbon materials in public spaces, infrastructure, and transportation activities. Achieving a transition to alternative fuel vehicles in public transportation by 50%. Continuous expansion of bicycle usage.	Developing regulations and pilot projects for enhancing urban resilience, promoting energy efficiency, using durable and low-carbon materials in public spaces, infrastructure, and transportation activities. Achieving a transition to alternative fuel vehicles in public transportation by 100%. Continuous expansion of bicycle usage.

Target #	Current State	2030 Target	2040 Target	2050 Target
UP-R.T5	In Konya, there is an existing solar energy power plant with a capacity of approximately 1300 MW. City-scale renewable energy projects are not widespread.	Carrying out pilot projects to facilitate and promote on-site renewable energy generation, as well as district heating and cooling systems, in urban planning efforts.	Developing regulations to incorporate on-site renewable energy generation and district heating&cooling systems into urban planning activities, and implementing these practices in new developments.	The completion of the transformation to renewable energy and district heating and cooling systems in all settlements.
UP-R.T6	Limited infiltration of rainwater due to impermeable hard surfaces, creating flood risks, inadequately replenishing groundwater sources, and ongoing drought risks.	Increasing infiltration of rainwater by creating more permeable surfaces through sustainable urban drainage systems (SuDS). Conducting pilot projects to achieve a 40% rate of rainwater reaching the ground through SuDS.	Implementing regulations for the use of SuDS, rehabilitating existing impermeable areas within the city, and achieving a 50% rate of rainwater reaching the ground through SuDS.	The rehabilitation of all existing drainage systems, making the use of SuDS mandatory through regulations, and achieving a 60% rate of rainwater reaching the ground through SuDS.
UP-R.T7	Limited recycling of urban waste and building demolition waste. Insufficient capacity for disposal and recycling in case of sudden rise of demolition waste (e.g. natural disasters, earthquakes).	Achieve a 40% recycling and reuse rate for urban waste by establishing appropriate collection and separation areas and facilities, and by improving the existing ones.	Achieving a 60% recycling and reuse rate for urban waste and increasing the capacity for biomass energy production.	Achieving an 80% recycling and reuse rate for urban waste and maximizing biomass energy production capacity.

5.4.2 Actions

In this section, transformative actions proposed for decarbonization in the Urban Planning and Resilience processes, as well as the target years for completing these actions, are presented.

The main actions are examined under the category of "policy", while supporting actions are provided under the categories of "finance," "technology," and "technical capacity and awareness."

5.4.2.1 Policy Actions

Action #	Action Description	Target Year
UP-R.PA1	Increasing carbon sink areas in the city center and implementing these practices in harmony with urban regeneration projects.	2024
UP-R.PA2	Handling urban planning in a way that supports the building energy performance criteria specified in the BEP regulation aiming "Energy-Efficient Urban Planning" (e.g., evaluating building orientation, form, height, inter-building gaps, etc.)	2024
UP-R.PA3	Introducing urban planning regulations enforcing balanced design of carbon emission sources and carbon sink areas	2024
UP-R.PA4	Integrating urban transportation systems for reducing vehicle traffic and congestion to lower carbon emissions, enhancing infrastructure for rail systems and bicycle usage.	2025
UP-R.PA5	Introducing regulations to support the integration of urban renewable energy generation systems into urban planning practices.	2025
UP-R.PA6	Introducing regulations to support the integration of district heating and cooling into urban planning practices.	2024
UP-R.PA7	Selecting vegetation, trees, and landscaping elements based on climate and regional characteristics, and enhancing the effectiveness of inspection mechanisms in urban landscaping projects.	2024

5.4.2.2 Finance Actions

Action #	Action Description	Target Year
UP-R.FA1	Establishing green financing programs for alternative and renewable energy, district heating and cooling systems, integrated rail transportation, bicycle usage, and energy-efficient lighting projects through collaboration with financial institutions (Multilateral Development Banks, Ministries, and other financial organizations).	2025
UP-R.FA2	Allocating institutional resources to expedite energy-efficient urban planning practices.	2025

5.4.2.3 Technology Actions

Action #	Action Description	Target Year
UP-R.TA1	Collaborating with academia on R&D efforts related to the widespread adoption of carbon capture technologies in urban areas.	2024
UP-R.TA2	Developing a monitoring and reporting system for tracking urban carbon emissions.	2025
UP-R.TA3	Conducting mapping, risk management, and climate change vulnerability assessments with the support of Geographic Information Systems (GIS).	2025

5.4.2.4 Technical Capacity and Awareness Actions

Action #	Action Description	Target Year
UP-R.TCA1	Collaborating with local and foreign cities and municipalities conducting similar projects, including partnerships, protocols, and reciprocal site visits. Organizing training and capacity-building initiatives for municipal staff to enhance their knowledge in innovative, environmentally friendly, and climate-resilient urban planning.	2025
UP-R.TCA2	Providing technical training for urban planning experts on urban carbon sources and management.	2025
UP-R.TCA3	Increasing the capacity within the municipalities for energy-efficient and ecological urban planning and conducting workshops with universities.	2025
UP-R.TCA4	Providing emission monitoring training for units responsible for emission tracking.	2025
UP-R.TCA5	Providing training for relevant departments on Geographic Information Systems (GIS) usage.	2025

5.5 Cross-Cutting Topics

5.5.1 Gender Equality

One of the 17 Sustainable Development Goals developed by the United Nations, addressing environmental protection, climate crisis action, fair wealth distribution and peace, is "Gender Equality" (Goal 5) aiming to achieve gender equality and empower all women and girls. Additionally, Goal 10 "Reduced Inequalities" aims to reduce inequalities within and among countries [21].

This action plan for decarbonizing the building sector in Konya has been developed with consideration for gender equality. Efforts should be made to ensure the involvement of women leaders, managers, and technical experts in the responsible stakeholder groups for implementing these actions. Additionally, it is of great importance to consider and monitor gender and social equality within the beneficiary group in the employment processes, workforce participation, technical capacity development, and awareness-raising efforts that will be conducted throughout the implementation activities. Improving gender and social equality, which is currently relatively insufficient in the construction sector, requires fair support for all relevant stakeholder groups.

Recommended actions that institutions and organizations can implement to promote gender equality in the sector are presented below:

- Promoting diversity in the recruitment process.
- Ensuring equal pay and benefits for all employees.
- Providing comprehensive training and professional development programs.
- Facilitating active participation of all genders.
- Supporting businesses owned by women.
- Advocating for both gender and social equality.

5.5.2 Stakeholders and Institutional Structure

The decarbonization of the building sector relies greatly on the roles, responsibilities, and possible collaborations that all stakeholders in the sector will undertake to achieve Konya's and consequently Türkiye's emission reduction targets. Some key stakeholders in the Konya building sector are presented below.

- Governorship of Konya
- Ministry of Environment, Urban Planning, and Climate Change Provincial Directorate
- Meram Electricity Distribution Inc.
- Enerya Konya Gas Distribution Inc.
- (TMMOB) Union of Chambers of Turkish Engineers and Architects, Chamber of Architects Konya Branch
- TMMOB Chamber of Civil Engineers Konya Branch
- TMMOB Chamber of City Planners Konya Branch
- TMMOB Electrical Engineers Association Konya Branch
- TMMOB Chamber of Mechanical Engineers Konya Branch
- TMMOB Chamber of Environmental Engineers Konya Branch
- Konya Chamber of Industry
- Konya Chamber of Commerce
- Universities in Konya Province
- National and International Financial Institutions
- The Scientific and Technological Research Council of Türkiye (TÜBİTAK)
- Mevlana Development Agency, Konya
- Konya Contractors Association
- Local Material Producers
- Building Sector Associations

In Konya Metropolitan Municipality, climate change-related activities are conducted by the Climate Change and Zero Waste Department. Figure 7 illustrates the organizational structure that will be directly involved in the action plan implementation activities [22].

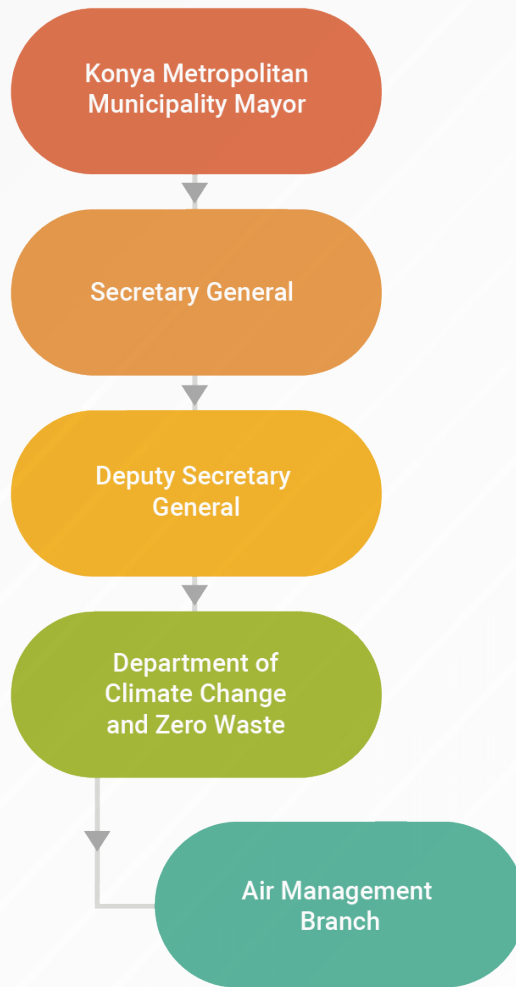


Figure 7. Organizational Structure of the municipal departments and offices involved in Konya Building Sector Decarbonization Action Plan.



CHAPTER 6

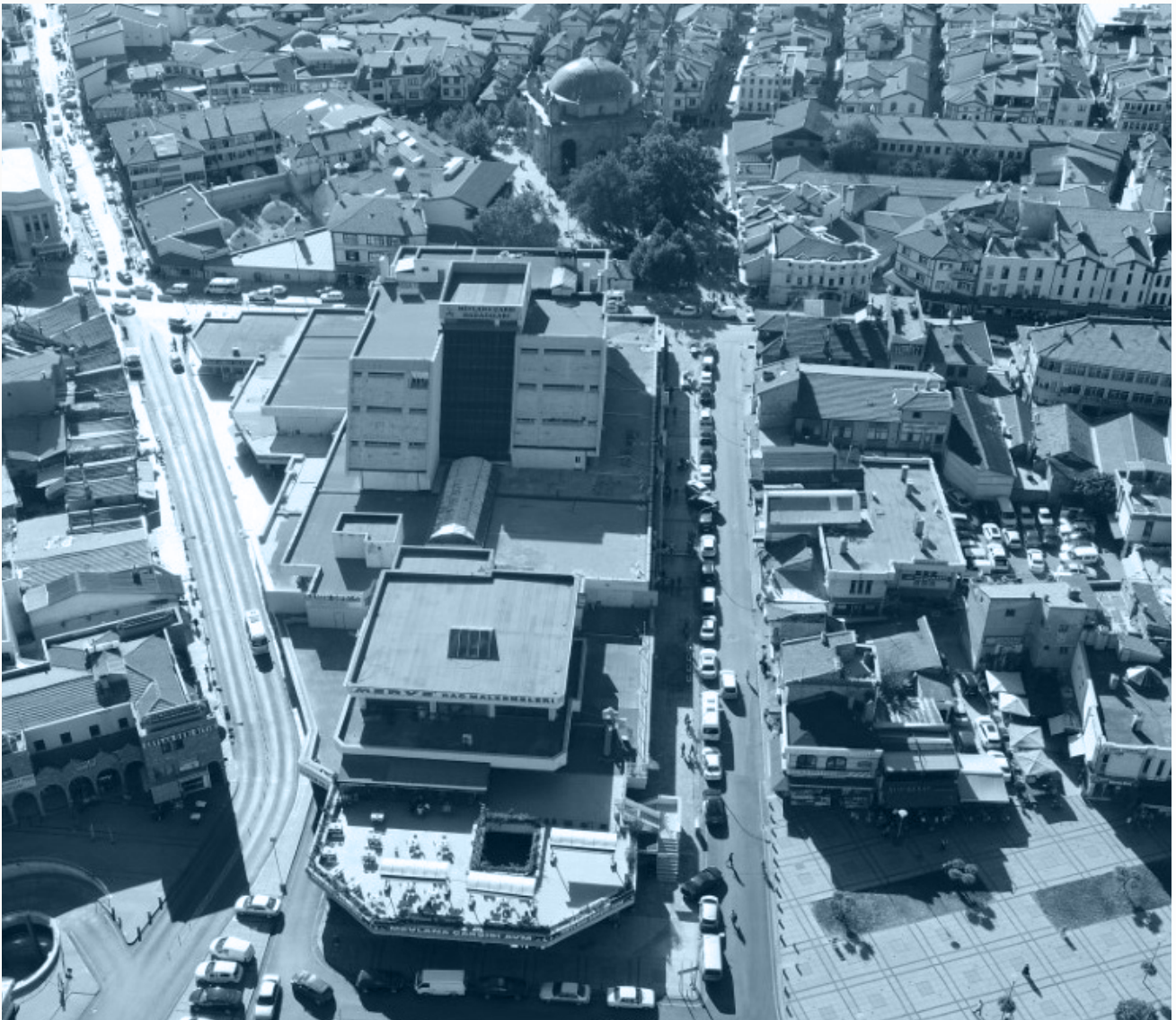
Implementation of the Action Plan

The building sector, being one of the highest energy-consuming sectors, is considered a priority area in national and local climate change mitigation efforts. The successful implementation of the recommendations presented in this action plan for decarbonizing the building sector in Konya, is of utmost importance.

Several key steps need to be taken to effectively implement the Action Plan and achieve decarbonization in the building sector. Firstly, a coordination team will be established within Konya Metropolitan Municipality to monitor and report on the progress of the action plan. Subsequently, efforts will be accelerated to create a detailed building inventory in the city, with a focus on prioritizing technical capacity-building actions within the first two years.

Collaborations with international financial institutions will be developed to create incentive programs in line with Konya's vision and strategic goals. Furthermore, projects will be developed, and pilot initiatives will be conducted to expedite the transformative impact of the actions.

This action plan, developed under the Zero Carbon Building Accelerator Project, serves as a local complement to Türkiye Building Sector Decarbonization Roadmap. The short, medium, and long-term actions outlined in this document will promote an environmentally friendly, climate-resilient, and adaptive urban and societal transformation, aligning with national goals and target, facilitating the dissemination of the city- and country-wide transformation.





CHAPTER 7

Monitoring and Evaluation

The monitoring and evaluation activities will be overseen by a dedicated coordination team within the Konya Metropolitan Municipality. This team will be responsible for the systematic collection of data and the management of a standardized reporting process concerning the efficacy of reduction measures and actions. An effective communication plan will be developed to facilitate data collection through robust engagement with internal municipal departments and external sector stakeholders. As the need arises, formal protocols will be employed between stakeholders.

The monitoring and evaluation activities will be conducted within the framework of **two principal categories**:

1. Monitoring of Mitigation Measures

This category will encompass the continuous monitoring of the performance of reduction measures and the evaluation of their influence on carbon emissions. Annual updates to emission calculations will be executed, and carbon emissions derived from both operational and

embodied sources within the building stock will be periodically reported via a monitoring tool developed as part of the project. This tool will serve to compare the current state with the future projections.

2. Monitoring of Decarbonization Actions

A direct linkage exists between decarbonization actions and mitigation measures, as many of these actions manifest as numerical reflections of the implemented mitigation measures. Under this monitoring category, the progress of decarbonization actions will be tracked across 4 stages, namely "Initiation," "Planning," "Implementation," and "Completion". Percentage completion of the actions will be continually monitored and periodically reported. This methodology will facilitate an evaluation of the individual impact of each action, the pace of overall progress, and the prospect of attaining the predefined targets.

The monitoring and evaluation processes will serve as a critical tool to measure the success of the action plan and to take corrective measures when necessary, ensuring transparent progress toward the decarbonization goals and targets of the building sector.

Monitoring and evaluation activities will be built upon the following key steps:

- Determination of Performance Indicators
- Data Collection and Monitoring
- Establishment of a Baseline
- Progress Reports
- Evaluation and Improvement
- Stakeholder Feedback





CHAPTER 8

Pilot Project Proposal

The Konya Metropolitan Municipality aims to implement an exemplary pilot project “Green-Certified Konya City Library Project”, which will serve as a model for new or renovated public buildings in the Konya province.

Project Overview and Objectives

The Konya Metropolitan Municipality is set to construct a library complex in the Selçuklu district of Konya, with a total construction area of approximately 13,555 m². The library complex will have the capacity to accommodate up to 1,700 people simultaneously across 18 units. The complex includes the Main Library building, with approximately 5,700 m² of seating area, as well as a restaurant, reading rooms, a conference hall, family and children's sections, cafeterias, municipal units, and other facilities. The library building is planned to be awarded a green building certificate in adherence with the national Green Certificate for Buildings and Settlements (YeS-TR) sustainability criteria.

The Green Certified Konya City Library project aspires to become an exemplary public building in the region by offering low operational costs, energy savings, healthier indoor and outdoor environments, and prioritizing human well-being.

Project Implementation

The Konya City Library building will be constructed as a sustainable and green exemplar building in accordance with YeS-TR. Analyses, reporting, and applications aligned with the YeS-TR sustainability criteria conducted during this project will not only serve as a capacity-building exercise for local stakeholders in the building sector, but also create awareness within the industry.

Integrated building design, indoor environmental quality analysis, life-cycle assessments for building materials, energy usage and efficiency-oriented designs, and initiatives in water and waste management will be undertaken. The building will collect credits according to the achieved sustainability levels. To conduct this multidisciplinary work, professionals from various fields of expertise will need to be involved, such as architects,

mechanical engineers, civil engineers, environmental engineers, interior designers, electrical engineers, electrical-electronics engineers, energy modeling experts, energy systems engineers, and mechatronics engineers.

Connection with the Business Model

The model for the Green-Certified Konya City Library project, aligned with the principles of sustainability, traceability, and green certification criteria, will be eligible for various financial support programs provided by National and International Development Banks, commercial banks, and similar financial institutions. Various financial institutions supporting green technologies and the green economy also offer advantageous financing options for high-efficiency technologies, systems that minimize energy consumption, technologies that generate energy from renewable sources, and applications that conserve water and other resources.

Intended Outcome

The Green-Certified Konya City Library building and its complex will serve as an exemplary project, promoting climate and environmentally friendly practices, offering a sustainable and healthy public space, supporting sustainable material production, supply, and construction activities, employing energy-efficient technology, and facilitating cross-sectoral experience and knowledge sharing. This project will thus contribute to Konya's building sector's decarbonization goals as a beacon of best practices.

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KONYA BUILDING SECTOR DECARBONIZATION ACTION PLAN

EXTENDED SUMMARY

DECEMBER 2023



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