Gaziantep Green City Action Plan

Prepared by AECOM for:

Gaziantep Metropolitan Municipality
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In association with:

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Foreword

Fatma Sahin
Mayor of Gaziantep Metropolitan Municipality

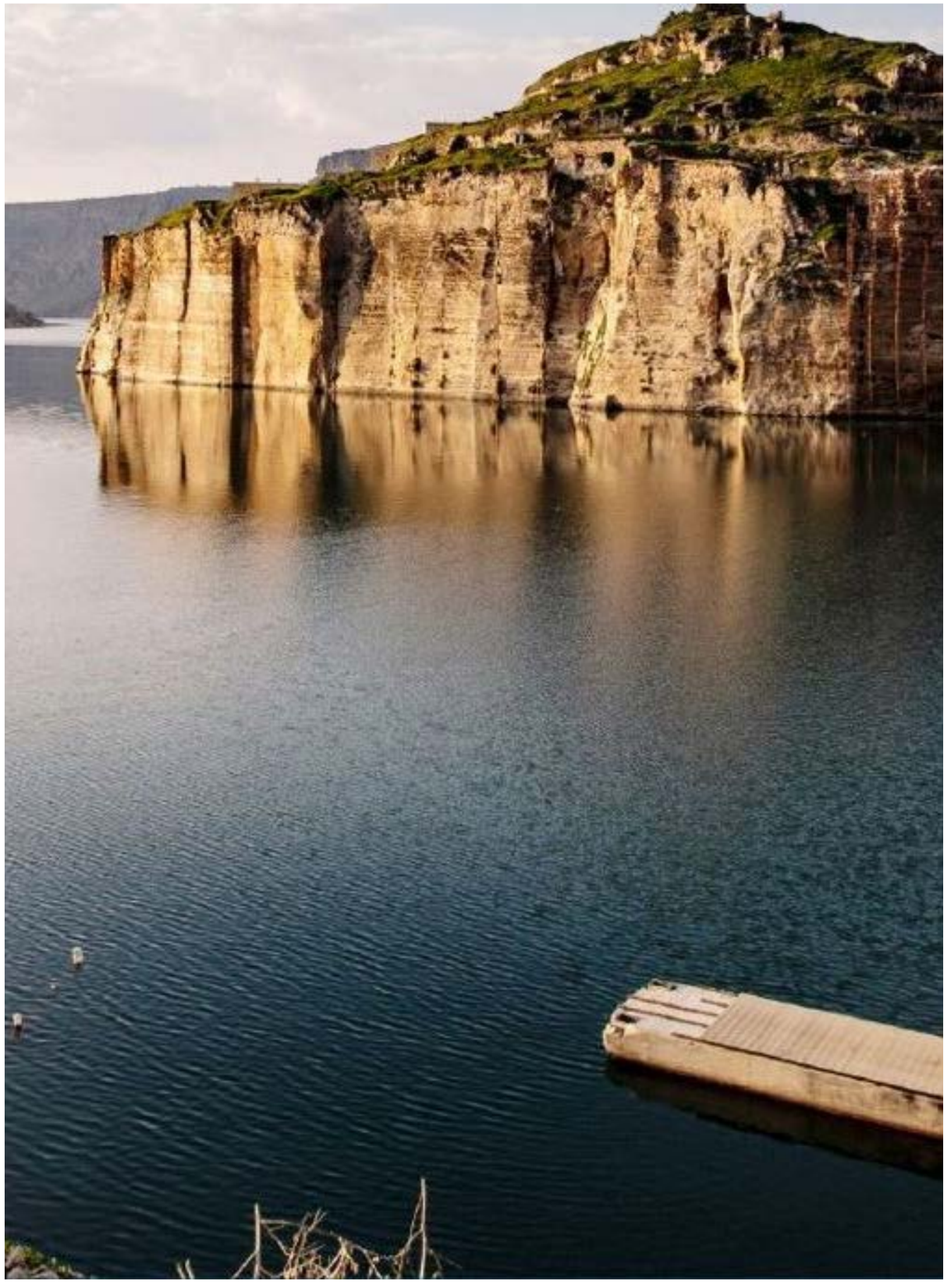
The adverse consequences of global climate change are intensifying at a pace surpassing predictions, resulting in the disruption of social, economic, and environmental systems on a global scale. Today, the urgency posed by the global climate crisis necessitates swift and decisive 'transformation' action. Scientific evidence underscores the imperative to rapidly curtail greenhouse gas emissions from human activities, particularly from fossil fuel consumption.

Climate action at the local level is one of the areas of great interest to the scientific community today, given that cities accommodate a substantial portion of the world's population, and contribute significantly (70%) to the greenhouse gas emissions driving climate change. Cities, while being a leading source of the problem due to their increasing energy consumption, also hold the key to solutions. Local governments are starting to play a pivotal role, embarking on developing and implementing their strategies to augment state-level efforts to tackle issues across the wide range of services areas they cover.

Since 2011, Gaziantep Metropolitan Municipality has been proposing a range of strategies to address the climate crisis, align with national efforts to reduce greenhouse gas emissions, and fortifying Gaziantep, making it a more resilient and equitable city by mitigating and adapting to both current and anticipated climate change impacts. Over the past 12 years, the municipality has prioritised its initiatives in energy efficiency, renewable energy, and climate change, leading as an example for other municipalities. In this context, our municipality is proud to have been among the first to take steps towards a more sustainable future in Turkiye and will continue to progress efforts, continuously venturing into new initiatives on a daily basis.

In line with this dedication, our municipality enhanced its goals and took part in the Green Cities Programme of the European Bank for Reconstruction and Development. The Green City Action Plan prepared under the programme outlines a set of integrated, effective, and feasible actions to guide Gaziantep's urban development towards a more sustainable and resilient future. These measures serve as a catalyst for our ambitious Green City Vision for 2050, a vision we aim to realise through collaborative and innovative approaches that engage the entire community. The Gaziantep Model, developed in line with these goals and vision, is aimed to be an example for other cities.

The actions developed in this report, aim to transform Gaziantep into a sustainable and resilient city against climate change. It will be approved by our Council, before being put into action. We will continue to be a model municipality for our country by carrying out the implementation and monitoring of the actions in the report, advancing our journey towards a greener and more sustainable future.



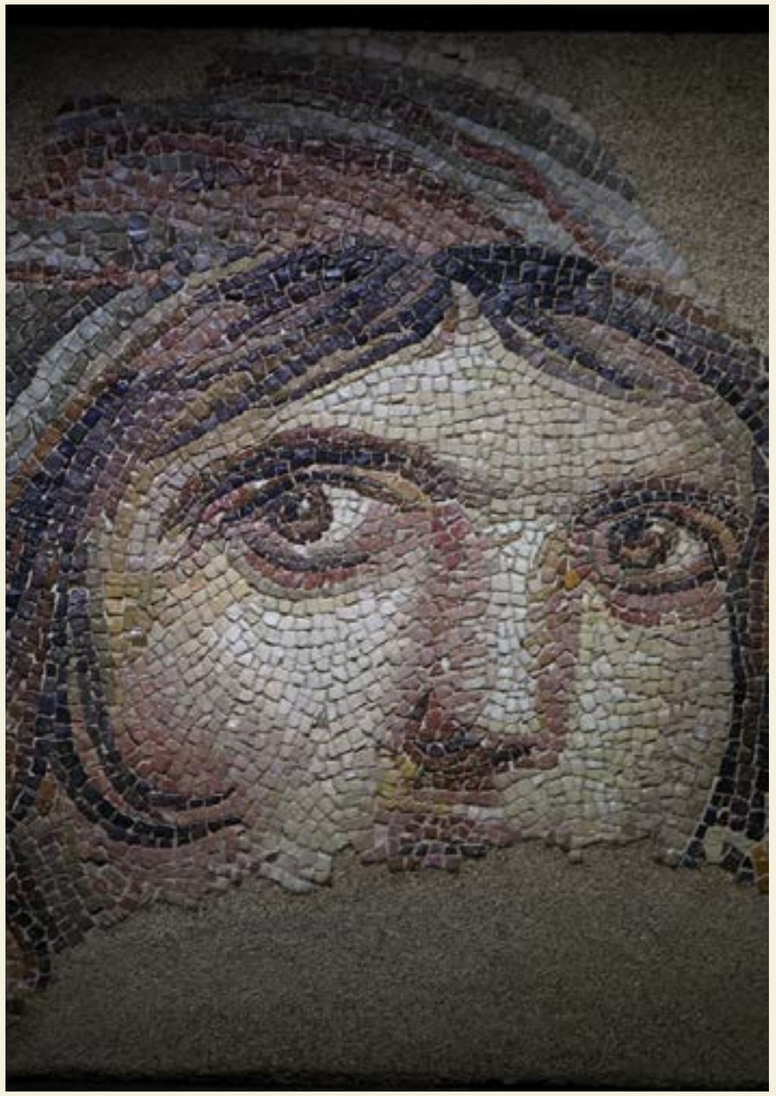
Contents

List of Acronyms

Acronym	Meaning
ADKNS	Address-Based Population Registration System
AFAD	Disaster And Emergency Management Presidency
BAU	Business As Usual
BESS	Battery Energy Storage Systems
BOD	Biochemical Oxygen Demand
BOT	Build-Operate-Transfer
BOTAS	Petroleum Pipeline Corporation
BREEAM	Building Research Establishment Environmental Assessment Method
BRT	Bus Rapid Transit
CBD	Central Business District
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CSR	Corporate Social Responsibility
DSFZ	Dead Sea Fault Zone
DSI	State Hydraulic Works (Turkiye)
EAFZ	Eastern Anatolian Fault Zone
EBRD	European Bank For Reconstruction And Development
EDAS	Electricity Distribution Inc
EE	Energy Efficiency
EPC	Energy Performance Certificate
EUR	Euro
GASKI	Gaziantep Water And Sewerage Administration
GAZDAS	Gaziantep Region Natural Gas Distribution Companies
GAZIBIS	Gaziantep E-Bike Sharing Company
GAZIRAY	Gaziantep Light Railway System
GAZIULAS	Gaziantep Metropolitan Road Transport Agency
GCAP	Green City Action Plan
GDP	Gross Domestic Product
GDPR	Eu's General Data Protection Regulation
GHG	Greenhouse Gas
GIS	Geographic Information Systems

Acronym	Meaning
GMM	Gaziantep Metropolitan Municipality
GMM Enerji	GMM Energy Company
ICT	Information And Communication Technology
IDA	Ipekyolu Development Agency
IFI	International Financial Institution
ILBANK	Turkish Development Bank
IMP	Impact Monitoring Plan
IO	International Organisation
IT	Information Technology
IZ	Industrial Zones
JICA	Japan International Co-Operation Agency
KGM	Department Of Highways
MW	Megawatt
NDC	Nationally Determined Contribution
OIZ	Organised Industrial Zone
PM	Particulate Matter
PMP	Progress Monitoring Plan
PPP	Public-Private-Partnerships
PSR	Pressure-State-Response
PV	Photovoltaic
RDF	Refuse-Derived Fuel
RES	Renewable Energy Source
SECAP	Sustainable Energy And Climate Action Plan
SYGM	Department Of Water Management
TAR	Technical Assessment Report
TCDD	Turkish State Railways
tCO_2e	Tonnes Of Carbon Dioxide Equivalent
TEDAS	Toroslar Electricity Distribution Inc
TEIAS	Turkiye Electricity Transmission Inc
TMP	Transportation Masterplan
TOKI	Housing Development Administration Of Turkiye
TRY	Turkish Lira
TURKSTAT	Turkish Statistical Institute (Tuik)
USD	United States Dollar
UKOME	Gaziantep Metropolitan Municipality Transportation Coordination Centre

Executive Summary



Executive Summary

Urban areas are vibrant hubs crucial to societal growth, serving as primary drivers of social, economic, and technological advancement. With approximately half of the global population residing in cities, these urban centres require substantial resources to cater to diverse demands for infrastructure and key services. However, this reliance leads to substantial environmental consequences. In response to this challenge, the European Bank for Reconstruction and Development (EBRD) formulated the Green Cities Programme, envisioning a more sustainable and improved future for urban areas and their inhabitants.

Gaziantep Metropolitan Municipality (GMM) joined the **Green Cities Programme** in 2021, building on the on prior successful collaboration with EBRD, illustrated through the development of the **city's 2016 Climate Change Action Plan**. Through this programme, GMM have been supported to develop a Green City Action Plan (GCAP), which is a comprehensive action plan aimed at achieving a sustainable and resilient urban future. Even in spite of the tragic earthquakes that took place on 6 February 2023, GMM continued to dedicate attention to the GCAP to help build a sustainable and resilient city for the future. As the sixth-largest urban area in Turkiye, Gaziantep faces the challenges of rapid population growth, climate impacts, and environmental pollution. The GCAP for Gaziantep combines infrastructure investments and policy interventions to guide urban development while striving for **net-zero emissions by 2050**, aiming to address both environmental challenges, as well as challenges presented in the aftermath of the recent earthquakes.

Table 1. Gaziantep's Green City Challenges

WATER	· Long-term water insecurity · Potentially high energy use from future water supply · Lack of/enforcement of standards for treated wastewater for use in irrigation
ENERGY	· Lack of capacity in energy system · Inadequate/unintegrated investment planning · Increasing energy consumption needs · High investment cost of natural gas interventions
SOLID WASTE	· Lack of source separation for households or commercial buildings · Lack of adequate facilities for hazardous waste disposal and incineration · Implementation/enforcement of regulations on disposal of animal waste
TRANSPORT	· Increasing use of private vehicles · Lack of integration across different public transport modes · Lack of lanes dedicated exclusively to public transport and micro mobility vehicles (bicycle and scooters) · Lack of car parks and parking lots
LAND USE	· Lack of long-term planning · Insufficient green, open spaces · Empty sites/brownfield sites in existing settlements · Unavailable or unaffordable housing · Public transport system do not serve medium-term needs
BUILDINGS	· Lack of up-to-date buildings data · Lack of standards/enforcement of Energy Performance Certificates · Use of GHG emitting and polluting energy sources · Unsuitable, unsafe buildings
INDUSTRIES	· Environmental hazards generated by industries · Weak and overly bureaucratic institutional structure · Lack of incentives for proper wastewater/solid waste management in OIZs
CLIMATE ACTION	· Inadequate innovative measures, non inclusive plans and strategies · Lack of integrated approach to adaptation planning · Lack of data for understanding the impacts of climate change · Pressure of rapid population growth on the infrastructure

AECOM. 2023. GCAP Gaziantep Technical Assessment Report.

The GCAP focuses on key sectors shaping Gaziantep's urban landscape, including **Energy, Water, Solid Waste, Transport, Land Use, Buildings, Industries**, and **Climate Action**, and considers how cross-cutting themes such as climate change, gender inclusion, and smart maturity affect these sectors. With a detailed action plan and support from the EBRD, Gaziantep aims to transform its urban fabric and improve its citizens' quality of life, reflecting a visionary commitment to sustainable urbanization.

The development of this document followed the EBRD methodology, systematically assessing environmental challenges through the **Pressure-State-Response framework**. This process emphasized stakeholder engagement with input from over 145 of stakeholders over 13 months. Launched in April 2022, preparatory activities for this GCAP identified strategies and stakeholders, leading to a Stakeholder Engagement Workshop and subsequent technical meetings. The Technical Assessment, informed by Sectoral Meetings and stakeholder interviews, identified specific challenges (Table 1) and intervention opportunities. Stakeholder input further refined draft Strategic Goals (Table 2) and co-created Green City Visions, later endorsed by the GCAP Steering Committee.

Gaziantep's Green Vision:

In 2050, Gaziantep will be...

A resilient and green city serving as an example of local climate action that works in a collaborative and innovative manner to sustainably and resiliently manage its natural resources, foster a high quality of life for all residents, and has achieved net zero emissions.

Table 2. Gaziantep's Strategic Goals

WATER	i) Sustainably manage water resources to build long-term water security ii) Reduce the rate of non-revenue water and per capita consumption iii) Climate-proof the water sector, including through nature-based solutions iv) Enhance resilience to flood risk v) Promote water re-use
ENERGY	i) Eliminate the use of coal for heating ii) Increase efficiency across the energy system iii) Improve resilience of energy infrastructure iv) Maximise the share of renewable energy and fuels within the energy system
SOLID WASTE	i) Promote zero-waste initiatives ii) Increase uptake of waste segregation in residential areas iii) Minimize the amount of waste ending up in a landfill iv) Incentivise sustainable management of hazardous waste
TRANSPORT	i) Decarbonize the transport sector ii) Connect all residents across the city with public transport iii) Make the city a micro-mobility champion iv) Minimize the use of private vehicles v) Enhance the use of smart solutions for transport
LAND USE	i) Promote urban development along a climate-resilient and low carbon pathway ii) Increase access and quality of green spaces for residents and visitors in the city iii) Foster neighbourhood identity and raise public awareness through land use planning iv) Improve access for all residents to urban amenities v) Foster natural and cultural heritage and biodiversity
BUILDINGS	i) Ensure availability of up-to-date data on building stock ii) Minimise GHG emissions from residential and commercial buildings iii) Incentivise take-up of green building measures in construction iv) Achieve net zero emissions from all municipal and public buildings v) Promote safe, affordable, and near-zero emission housing
INDUSTRIES	i) Minimize environmental impact of industrial growth ii) Improve data collection and monitoring of industrial emissions iii) Incentivise transition towards low-carbon industrial development iv) Increase the share of industrial energy consumption from renewables v) Improve efficiency of resource use in industrial production vi) I mprove disposal and management of industrial waste
CLIMATE ACTION	i) Leverage natural assets to improve resilience to climate hazards ii) Improve collaboration, coordination, and integration for climate action iii) Explore new technologies for carbon emission management iv) Reduce vulnerability of disadvantaged groups against climate change v) Improve resilience of agriculture and food systems to climate change

Source: AECOM 2023. GCAP Gaziantep: Vision and Objectives.

An extensive list of over 100 potential actions was compiled that aligned with the Green City Vision and Strategic Goals while also tackling the challenges posed by each sector. A thorough evaluation of these actions was undertaken, which included a review of their potential to improve outcomes across socio-economic dimensions and overarching themes like gender and social inclusion, as well as other criteria. The actions within the longlist were reviewed with sector specialists from EBRD and GMM to identify opportunities to consolidate similar actions, improve or enhance impact from actions. From this initial longlist of actions, **31 Green City Actions were prioritised for further development over the next five years** – these are outlined in Table 3 and discussed in more detail in Chapter 4. Nearly all of them include some or directly targeting the cross-cutting themes of climate action, smart maturity, gender and social inclusion.

It is estimated that **EUR 70 million[1] are required for development and advisory support** for Gaziantep's GCAP actions. Capital expenditures are estimated at EUR 2.82 billion and operational expenditures over the first 5 years are estimated at EUR 260 million[2].

Although based on only limited local data and assumptions informed by international best practice, the carbon emissions reductions for the GCAP actions are estimated to be **1,099,810 tCO_2e per annum**[3] – making a direct contribution to Türkiye's Nationally Determined Contribution (NDC). Additionally, several of the proposed actions contribute to indirect positive effects and/or have the potential for significant upscaling beyond initial pilot activities, which allows for further carbon emission reductions, particularly in the medium-to-long term beyond the timeframe of this GCAP.

In addition to those environmental benefits, it is estimated that several of the GCAP actions have the potential for job creation, with an estimated **13,855 new jobs**[4] being created through the construction, operation and maintenance works, as well as green economy services linked to several of the GCAP actions.

Concluding this GCAP report is the Implementation and Monitoring Plan that will be used to track progress on the implementation of the **31 Green City Actions**. The GMM GCAP Coordinator will have overall responsibility of the progress implementation plan, providing bi-annual updates, with the Green Champions responsible for updating their respective actions; and it will be reviewed regularly at the GMM GCAP Coordination Unit meeting. Having this concise Progress Monitoring Plan and Impact Monitoring Plan facilitates the tracking of GCAP action implementation and outcomes, involving stakeholders from the public sector, private sector, and civil society.

1 Note at the time of writing the exchange rate was EUR 1 – TRY 28.8 (September 5, 2023)
2 Note – these figures do not take into account the data for Action LU5. See Section 5 for further information.
3 Note – these figures do not take into account the data for Action LU5. See Section 5 for further information.
4 Note – these figures do not take into account the data for Action LU5. See Section 5 for further information.

Table 3. GCAP Gaziantep Actions - Summary Table

Sector	Action ID	Action Title	GCAP Action Classification	Cross-Cutting Themes/ Co-Benefits			Estimated Costs (Euro)			Estimated Carbon Emissions Reduction (Annual tCO_2e)
				Climate Action	Gender and Social Inclusion	Smart Maturity	CapEx (Euro)	OpEx over 5 years (Euro)	Development/ Advisory (Euro)	
WATER	WA1	Develop an Integrated Plan for Water Resources Management	Strategies, plans, and programmes	Directly targeted	Some elements	Some elements	N/A	N/A	375,000	No direct reduction expected as this is a 'soft' action.
	WA2	Introduce Standard Processes for Data Collection and Monitoring of Ground and Surface Water	Monitoring, data collection, analysis, and studies	Directly targeted	No direct links	Some elements	350,000	52,500	335,000	No direct reduction expected as this is a 'soft' action.
	WA3	Transition to Net Zero Wastewater Treatment	Capital Investment	Directly targeted	No direct links	Directly targeted	20,000,000	2,000,000	1,600,000	40
	WA4	Conduct a Study on Authorised Unbilled and Unauthorised Consumption and Develop a Phased Reduction Plan	Monitoring, data collection, analysis, and studies	Directly targeted	Some elements	Directly targeted	7,000,000	700,000	250,000	No direct reduction expected as this is a 'soft' action.
ENERGY	ENG1	Identify Feasible Battery Energy Storage (BESS) Opportunities	Investment-related feasibility study	Directly targeted	Some elements	No direct links	N/A	N/A	150,000	No direct reduction expected as this is a 'soft' action.
	ENG2	Strengthening Existing Electricity Systems Against Natural Disasters and Developing an Alternative Energy Storage System in Case of Disasters	Investment-related feasibility study Capital Investment	Directly targeted	Some elements	No direct links	5,200,000	780,000	614,000	N/A[5]
	ENG3	Wind Power Plant Feasibility Study and Development	Investment-related feasibility study Capital investment	Directly targeted	Some elements	No direct links	30,000,000	4,500,00	2,525,000	20
SOLID WASTE	SW1	Feasibility Study for a 2-bin Waste Separate System for Households	Investment-related feasibility study	Directly targeted	Some elements	Some elements	N/A	N/A	220,000	N/A[6]
	SW2	Build a New Energy Plant Which Can Utilise RDF	Capital Investment	Directly targeted	No direct links	No direct links	41,055,000	6,158,250	3,323,850	N/A[7]
	SW3	Carry Out Feasibility Studies for Collection and Valorisation of Organic Waste	Investment-related feasibility study Other investment	Directly targeted	Some elements	No direct links	6,255,000	900,000	210,000	406,650 (from the pilot)
	SW4	Inventorise Sources of Hazardous Waste Production Within Gaziantep and Develop a Hazardous Waste Management Plan	Investment-related feasibility study	Directly targeted	Directly targeted	Directly targeted	N/A	N/A	500,000	No direct reduction expected as this is a 'soft' action
TRANSPORT	T1	Continue Expansion of the Active Travel & Micro Mobility Network	Strategies, plans, and programmes	Directly targeted	Some elements	Some elements	N/A	N/A	500,000	No direct reduction expected as this is a 'soft' action
	T2	Congestion Reduction Programme	Strategies, plans, and programmes	Directly targeted	Directly targeted	Some elements	N/A	N/A	250,000	No direct reduction expected as this is a 'soft' action
	T3	Bus Fleet Upgrade and Charging Infrastructure	Strategies, plans, and programmes Capital Investment	Directly targeted	Directly targeted	Some elements	83,875,000	12,581,250	200,000	8,570
	T4	Continue Expansion of the Railway Network	Capital Investment Investment-related feasibility study Monitoring, data collection, analysis, and studies	Directly targeted	Directly targeted	Some elements	2,176,000,000	217,600,000	45,020,000	668,050
LAND USE	LU1	Develop An Integrated Landscape and Biodiversity Management Strategy	Strategies, plans, and programmes	Directly targeted	Some elements	Some elements	N/A	N/A	250,000	No direct reduction expected as this is a 'soft' action
	LU2	Pilot a Sustainable, Mixed-Use, Mixed Income Housing Development	Capital Investment	Directly targeted	Directly targeted	No direct links	100,000,000	10,000,000	8,000,000	2,100
	LU3	Plan and Pilot 'Resilience Parks'	Capital Investment	Directly targeted	Directly targeted	No direct links	7,500,000	750,000	850,000	N/A[8]
	LU4	Implement a Meanwhile Uses Programme	Strategies, plans, and programmes	Directly targeted	Directly targeted	No direct links	175,000	75,000	165,000	No direct reduction expected as this is a 'soft' action.
	LU5	Ecological Village Project	Capital investment	Directly targeted	Directly targeted	No direct links	4,939,680*	N/A*	90,000*	1,408*

* See notes in Action LU5 In most cases, a conservative approach was used to estimate the carbon emissions for these actions, in order to avoid overestimating the emissions. It is anticipated where feasibility studies are being undertaken as part of the action, that the capital costs being determined following this study.

5 Not possible to calculate on the basis of existing data.
6 Not possible to calculate on the basis of existing data.
7 Not possible to calculate on the basis of existing data.
8 Not possible to calculate on the basis of existing data.

2023 Green City Action Plan (GCAP) Gaziantep

Sector	Action ID	Action Title	GCAP Action Classification	Cross-Cutting Themes/ Co-Benefits			Estimated Costs (Euro)			Estimated Carbon Emissions Reduction (Annual tCO_2e)
				Climate Action	Gender and Social Inclusion	Smart Maturity	CapEx (Euro)	OpEx over 5 years (Euro)	Development/ Advisory (Euro)	
BUILDINGS	B1	Develop a Digital Buildings Database	Other Investment Monitoring, data collection, analysis, and studies	Directly targeted	Some elements	Directly targeted	75,000	11,250	285,000	No direct reduction expected as this is a 'soft' action.
	B2	Develop Feasible Approaches for Improving Compliance with Building Standards	Organisational measure Monitoring, data collection, analysis, and studies	Directly targeted	Some elements	Some elements	N/A	N/A	100,000	No direct reduction expected as this is a 'soft' action.
	B3	Incentivise Low-Carbon Heating and Cooling and Energy Efficiency in Residential Buildings	Capital Investment	Directly targeted	Some elements	Some elements	312,500,000	N/A	700,000	N/A[9]
	B4	Retrofit or Reconstruct Public Buildings for Improved Energy Performance	Capital Investment	Directly targeted	Some elements	Some elements	23,200,000	2,320,000	1,360,000	1,560
INDUSTRIES	IN1	Digital Data Management Centre for Environmental Monitoring	Monitoring, data collection, analysis, and studies	Directly targeted	No direct links	Directly targeted	120,000	12,500	170,000	No direct reduction expected as this is a 'soft' action.
	IN2	Establish a Renewable Energy Generation Industrial Zone	Capital investment	Directly targeted	No direct links	No direct links	N/A[10]	N/A	350,000	N/A[11]
	IN3	Enforcing Business Accountability for Environmental Non-Compliance	Standards, guidelines, and regulations	Some elements	Directly targeted	Some elements	N/A	N/A	175,00	No direct reduction expected as this is a 'soft' action.
CLIMATE ACTION	CA1	Climate-Smart Irrigation and Renewable Energy Systems	Capital Investment	Directly targeted	Some elements	Directly targeted	7,412,500	1,111,875	661,000	12,820
	CA2	Integrated and Evidence-Based Climate Action Planning in Gaziantep	Monitoring, data collection, analysis, and studies	Directly targeted	Directly targeted	Directly targeted	N/A	12,500	175,000	No direct reduction expected as this is a 'soft' action.
	CA3	Develop a Study on Carbon Capture, Utilization and Storage	Monitoring, data collection, analysis, and studies	Directly targeted	No direct links	No direct links	N/A	N/A	200,000	No direct reduction expected as this is a 'soft' action.
	CA4	Raising Awareness on Sustainable Consumption in Gaziantep	Behavioural measure	Directly targeted	Directly targeted	Some elements	N/A	N/A	150,000	No direct reduction expected as this is a 'soft' action.

* See notes in Action LU5 In most cases, a conservative approach was used to estimate the carbon emissions for these actions, in order to avoid overestimating the emissions. It is anticipated where feasibility studies are being undertaken as part of the action, that the capital costs being determined following this study.

9 Not possible to calculate on the basis of existing data.
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1

Introduction

Gaziantep’s Green City Action Plan (GCAP) contains an integrated, impactful and feasible set of infrastructure investments and policy interventions that look to foster a high quality of life for all residents, as well as guide urban development along a sustainable and resilient pathway and support the city’s goal of achieving net-zero emissions by 2050.

Background

Gaziantep is the sixth-largest urban area in Turkiye and a dynamic metropolis, renowned for its gastronomy, culture, and rich historic heritage. **Its urban core is one of the largest industrial hubs in the region and the rural periphery is a centre for agricultural production.** Located approximately forty kilometres from the border with Syria, the city has strong supply chain and cultural links with cities in the broader region and is considered **Turkiye's trade gateway to the Middle East**. Since 2011, when it became the **first urban administrative unit in Turkiye to develop policies addressing climate change**, Gaziantep has continued demonstrating leadership on urban climate action in the region.

Long-term trends and recent events have underscored the need for mainstreaming climate action within Gaziantep's urban development. The city's location in a semi-arid region with scarce water resources makes Gaziantep particularly **exposed to the impacts of climate change**. While Gaziantep has already been one of the fastest growing urban areas in the world since the 1970s, **population growth has been unprecedented over the last decade**, driven by the city's hosting of nearly 450,000 refugees displaced by the Syrian Civil War. **Industrial production** is the economic engine of Gaziantep's prosperity, but also **drives environmental pollution** and is the source of nearly **40% of the greenhouse gas emissions in the city**.

To address these challenges and continue its pioneering role on urban climate action, the **Gaziantep Metropolitan Municipality (GMM)** joined the **European Bank of Reconstruction and Development's (EBRD) flagship Green Cities Programme** in 2021. The Green Cities Programme is an urban sustainability initiative providing **over €5 billion in support to more than 60 cities across EBRD's countries of operation**. Gaziantep is one of the 5 cities included in EBRD's Green Cities Programme in Turkiye (the other cities are Izmir, Ankara, Bursa and Istanbul). The programme supports cities to address their key environmental challenges by **supporting investments in sustainable infrastructure and development of suitable policy and capacity-building measures.** After the devastating earthquakes that struck the region of South-eastern Anatolia on 6 February 2023, the GCAP also incorporates **structural strengthening measures** into the variety of relevant actions. Gaziantep's membership in the Green Cities Programme builds on prior successful collaboration with EBRD, illustrated through the development of the **city's 2016 Climate Change Action Plan.**

As part of the Green Cities Programme, the EBRD has supported the **GMM with the development of this Green City Action Plan (GCAP)**. The GCAP includes **detailed actions, both infrastructure investments and policy interventions, that will support GMM guide urban development and structural strengthening along sustainable pathways, in response to its key environmental challenges.** Actions in the GCAP are designed to be **implemented by GMM and entities within its administrative remit, with downstream support from the EBRD and other partners**. A Consultant Team led by AECOM with GREEN Engineering as the local technical partner has supported the EBRD and GMM with the preparation of this GCAP.

The development of this GCAP follows a **comprehensive, evidence-led, and consultative assessment of environmental performance and identification of priority challenges** carried out using the EBRD's Pressure-State-Response (PSR) assessment framework. It covers the **eight sectors** that shape Gaziantep's urban built environment: **Energy, Water, Solid Waste, Transport, Land Use, Buildings, Industries, and Climate Action.** The assessment also covered performance on the cross-cutting themes of **climate change, gender and social inclusion, and smart maturity** across these eight sectors.

The GCAP is structured under the following sections:

1. **Introduction:** summarising the process leading to the development of this GCAP.

2. **City Baseline:** highlighting the geographic, climatic, governance, demographic and economic context that shape Gaziantep's urban development, and the key environmental and sectoral challenges that have informed the development of actions within this GCAP.

3. **Green City Vision and Strategic Goals:** capturing Gaziantep's ambition of the future state of the city in 2050, and areas of focus for each of the eight GCAP sectors in response to the Green City Challenges and Vision.

4. **Green City Actions:** consisting of detailed descriptions of 31 infrastructure investments and policy interventions that Gaziantep can begin implementing within 5 years, to help achieve its vision for 2050.

5. **Implementation and Monitoring:** outlining key roles and responsibilities for implementation of Green City Actions and approaches to monitor and evaluate progress and impact.

Development Process

The **development process for Gaziantep's GCAP followed EBRD's Green City Action Plan Methodology,** which uses the 'Pressure-State-Response' (PSR) framework to systematically assess the **causal linkages between the baseline environmental performance in a city ('state'), the key drivers within urban built environmental sectors that contribute to this performance ('pressure') and infrastructure or policy interventions in these sectors that mitigate the negative impacts ('response').** In line with the goal of **an evidence-led and consultative approach** to developing the GCAP, the process looked at **optimising engagement with key stakeholders in Gaziantep at strategic points of the process** as summarised below.

01

Inception and Preparation

The GCAP development process was officially **launched on 7 April 2022 at an event co-organised by GMM and EBRD.** A Focal Point from GMM began working with the Consultant Team from May 2022 on preparatory activities, including **identifying key strategies, plans and technical documents to inform the baseline Technical Assessment, gain a holistic understanding of Gaziantep's urban development context, and identify key stakeholders** to engage at various points of the development process.

A key part of this stage was organising and conducting the **first Stakeholder Engagement Workshop**, which looked to create awareness of the GCAP process, gather insights on sectoral performance and key environmental challenges in the city. The Workshop was attended by 94 participants, including stakeholders from the public and private sector, civil society, and academia. Following the Workshop, a series of **technical meetings with sectoral experts within GMM** were conducted for detailed discussions on key literature to inform the technical assessment, and sources for quantitative and qualitative data that could enrich the technical analysis.

02

Identification of Green City Challenges

Following the First Stakeholder Engagement Mission in July 2022, a group of **international and local sectoral experts carried out a baseline Technical Assessment**. This assessment encompassed an evaluation of the policy landscape, performance of the municipality against its environmental indicators, and critical key cross-cutting themes such as climate change, social inclusion and smart maturity. Results from the first Stakeholder Engagement Workshop and Technical Meetings informed the technical assessment; and based on this, the **key challenges, and opportunity areas for intervention for each of the eight GCAP sectors were identified.**

These challenges and opportunity areas were **validated with senior GMM staff and representatives from relevant government and non-government organisations at in-person Sectoral Meetings,** held in Gaziantep between 31 October and 2 November 2022. The Sectoral Meetings were attended by 64 participants in all. At the end of each Meeting, participants collectively determined through voting and discussion the key Green City Challenges for each sector. Key findings from the baseline assessment, including identification of key environmental and sectoral challenges City Challenges emerging from this process are included in Chapter 2 of this document.

03

Co-creation of Green City Vision and Strategic Goals

Following the sectoral meetings to validate Green City Challenges, an in-person **Workshop with the GCAP Technical Committee** was organised on 3 November 2022, attended by 15 participants. In addition to members of the GCAP Technical Committee, the Workshop was attended by GMM focal points for the GCAP, and academic and private sector stakeholders.

Workshop participants **validated and fine-tuned draft Strategic Goals for the eight GCAP sectors** which were developed by the Consultant Team based on the baseline assessment and discussions at the Sectoral Meetings. Participants **responded to a draft Green City Vision developed by the Consultant Team** based on existing GMM strategic documents and co-created two additional draft Green City Visions that could inform GCAP development.

The draft Green City Vision and Strategic Goals for each sector were then **reviewed and endorsed by the GCAP Steering Committee** at a meeting held on 3 November 2022 and finalised in December 2022. Both the draft and final Green City Vision and Strategic Goals are included in Chapter 4 of this Report.

04

Development of Green City Actions

After the completion of the Green City Vision and Strategic Goals, the Consultant Team compiled **an extensive list of around 100 potential actions.** These actions were designed to align with the Green City Vision and Strategic Goals while also tackling the challenges posed by each sector. A thorough evaluation of these actions was undertaken, **considering various criteria.** These included their **potential to improve outcomes across socio-economic dimensions and overarching themes like gender and social inclusion.** Additionally, the feasibility of execution within the GCAP's five-year span was assessed, alongside their capacity to yield environmental, social, and economic co-benefits.

Actions within the longlist were reviewed with **sector specialists from EBRD and GMM** to identify opportunities to consolidate similar actions, improve or enhance impact from actions. From this initial longlist of actions, **31 Green City Actions were prioritised for further development,** included in Chapter 4 of this report.

In late 2023, Gaziantep Metropolitan Municipality will begin implementing this Green City Action Plan. To support effective and efficient implementation of actions, **an Implementation and Monitoring Plan was developed in consultation with GMM and EBRD**, drawing on lessons learnt from previous GCAPs **and the specific governance context for delivery of Green City Actions in Gaziantep** – included in Chapter 5 of this document. With a view to addressing capacity gaps for delivery of the GCAP in GMM, the Consultant Team will **support GMM with training sessions on green procurement, nature-based solutions, and spatial approaches to climate risk assessments** to support effective implementation of the GCAP.

Key Milestones

NOV '21 — Gaziantep joins the Green Cities Programme

APR '22 — GCAP Launch Event

APR-JUL '22 — Inception and Preparation Activities

JUL '22 — First Stakeholder Engagement Workshop

Technical Meetings with Sectoral Experts in Gaziantep

JULY-NOV '22 — Baseline Assessment and Green City Challenges

NOV '22 — Workshop for Green City Vision and Strategic Objectives

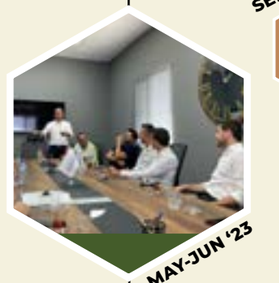
Sectoral Meetings for Validation of Green City Challenges

DEC-FEB '23 — Finalisation of Green City Vision and Strategic Goals, and Development of Longlist of Actions

6 FEB '23

Gaziantep and Kahramanmaraş earthquakes

FEB-MAY '23 — Project paused



MAY-JUN '23 — Virtual Engagement for Shortlisting of Green City Actions

JULY-SEP '23 — Development of Green City Actions and Green City Action Plan

OCT '23 — Council Approval of Green City Action Plan

NOV '23 — Training and Capacity Building Sessions

On 6 February 2023, Turkiye was hit by a series of debilitating earthquakes with the epicentre around 37 km west-northwest of Gaziantep. The disaster claimed over 48,000 lives and caused extensive damage on infrastructure and buildings across 11 Turkish provinces. Shortly after the disaster, the government estimated that the economic impacts of the earthquakes amounted to around USD 103.6 billion, or ~ 9% of the forecasted GDP of Turkiye for 2023[12]. According to the same report, extensive damage to the infrastructure has been recorded for the following sectors:

WATER and UTILITIES

The cumulative damage to potable water infrastructure across Turkiye has been estimated to be USD 88.5 million, with a significant portion earmarked for the replacement of the potable water supply line, repairs of damaged water treatment plant and water tanks. As a water-scarce province that relies on transmission lines from the neighbouring provinces, Gaziantep is likely to require additional measures to integrate resilience into its water sector considering its exposure to seismic hazards and limited domestic water resources.

TRANSPORT

Several segments of the railway network were affected by the earthquake, including Nizip-Gaziantep-Narli segment. A section of the road still under construction (Mersin-Adana-Osmaniye-Gaziantep) was also damaged and will require substantial repairs. While the overall road damage is significant, including in Gaziantep, it appears there has not been a major damage to the airport in Gaziantep.

BUILDINGS

While the number of collapsed buildings across Turkiye as a whole was high as a result of the earthquakes, the damage was comparatively less extensive in Gaziantep. Of the approximately 280,000 housing units in Gaziantep that were damaged, around 29,155 of those have been severely damaged (or have collapsed), 20,251 have suffered moderate damage, and 236,497 have suffered light damage. The disaster exposed the long-standing issues around the poor quality of buildings (both in terms of design and construction), aging building stock, inadequate compliance of construction activities with existing legislation, and poor enforcement of existing regulations around earthquake resilience standards. There is some evidence that asbestos (banned in Turkiye in 2010) had been used in roofing and houses that were built prior to the ban, which is now posing a serious environmental and public health issue[13]. There is an immediate need to strengthen capacities to enforce adequate standards in this sector, as well as use various 'smart' solutions that could detect buildings at risk and allow evidence-based decision-making around buildings and seismic risk.

INDUSTRIES

The damage the earthquakes caused to Organized Industrial Zones (OIZs), and smaller industrial zones varies across the provinces, but Gaziantep seems to have been hit particularly hard, with the estimate of damages ranging from USD 421 million – 1,092 million, depending on the source. Small and medium businesses seem to have been hit hard and it is likely that their survival will require government support.

12 Government of Turkiye. 2023. Turkiye Earthquakes Recovery and Reconstruction Assessment. Ankara. Available at: https://www.sbb.gov.tr/wp-content/uploads/2023/03/Turkiye-Recovery-and-Reconstruction-Assessment.pdf [last accessed 7 August 2023]

13 See, for example. Guardian. 2021. "The Illegality is enormous: Turkiye's quake clean up may kill even more". Available at: https://www.theguardian.com/global-development/2023/aug/06/the-illegality-of-this-is-enormous-will-turkeys-earthquake-cleanup-cause-even-more-death [last accessed 1 September 2023]

ENERGY

Considerable damage was recorded on the electricity transmission lines owned by the TEIAS, with various distribution lines and substations destroyed as a result of the earthquakes, including in Gaziantep. Damage was also recorded on the natural gas distribution lines and facilities, but there seems to have been limited damage to the regional hydropower dams. There will be a need to increase the proportion of energy systems that are independent from the network and integrated with battery energy storage systems that would allow continuity of key activities during disasters, as well as ensure that many of the planned renewable energy projects in Gaziantep incorporate structural resilience measures.

SOLID WASTE

The earthquakes significantly affected this sector, primarily concerning the management of debris resulting from building collapses (millions of cubic meters). Damage was also reported on the solid waste infrastructure across affected provinces. At the time of writing, the available information regarding the extent of damage within this sector in Gaziantep remains limited.

LAND USE / BIODIVERSITY

There is limited information on the impacts of the earthquakes on ecosystems and their services (including carbon storage) other than general reports on damage to forests and trees. Once a more detailed assessment of the damage is available, there will be a need for the recovery efforts to integrate ecosystem and habitat restoration and seek to reverse or compensate for some of the damage to local ecosystems associated with the earthquakes.

In response to the impacts of the earthquake on key GCAP sectors in Gaziantep, some of the GCAP actions have been revised to incorporate both 'soft' and 'hard' actions to support resilience-building measures across the province. This has involved, for example, actions around piloting 'resilience parks' within urban core to serve as evacuation areas during disasters, identifying suitable pilot projects for battery energy storage systems (BESS), developing a digital database with comprehensive information on existing and new buildings to support regulatory enforcement, among others.

Across all actions, efforts have been made to integrate measures to strengthen the robustness and / or redundancy of infrastructure systems, improve resourcefulness of GMM and increase the rapidity of response to disasters. In the wake of such disastrous events, it will be more important than ever to maintain the momentum and made strategic investments in resilient and sustainable infrastructure that will benefit the residents of Gaziantep.

2

City Baseline

Gaziantep's industrial growth has made it one of the fastest growing urban areas in the world since the 1970s, but it has also led to an increase in greenhouse gas emissions.

Its location in a semi-arid region and its high vulnerability to the impacts of climate change are likely to result in long-term water insecurity and challenges for agricultural production in its peri-urban areas. Following unprecedented population growth in the early 2010s driven by the Syrian Civil War, the city's urban infrastructure and services have been under immense pressure.

The GCAP provides an opportunity to address these environmental challenges while augmenting the capacity and quality of urban infrastructure in the city.

FIG 1. EBRD GREEN CITIES IN TURKIYE

Source: AECOM, based on Wikipedia.org, 2023.

Bold text indicates urban districts.

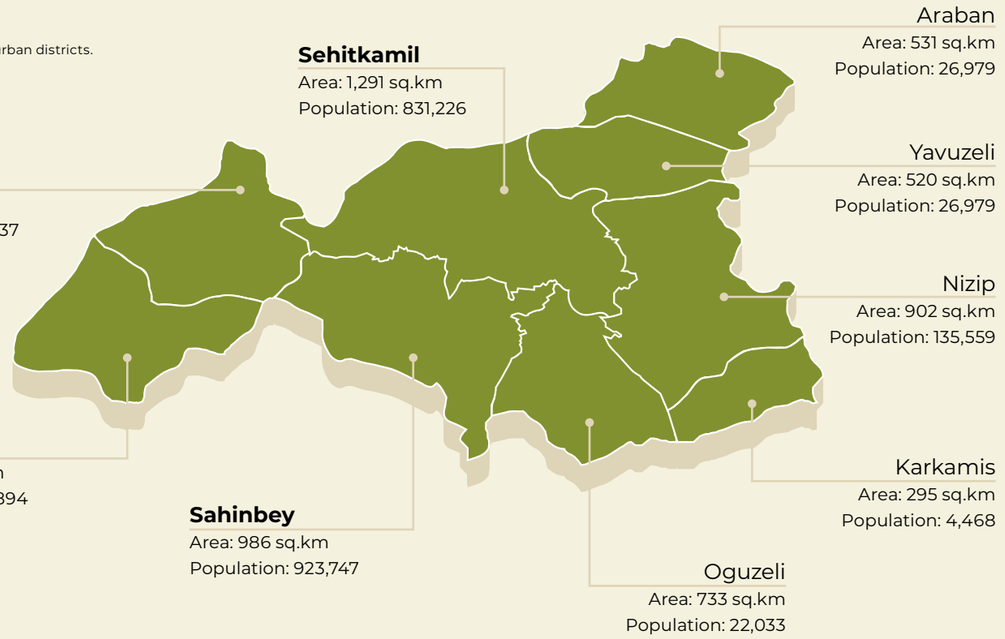


FIG 2. GAZIANTEP DISTRICTS

Source: Population data from TurkStat, 2021; Areas from citypopulation.de.

Geography

Gaziantep is located in south-east Anatolia, approximately forty kilometres from the border with Syria, and covers 6,819 square kilometres in area (Figure 2). Although landlocked, the western boundary of Gaziantep is **only thirty kilometres inland from the Mediterranean Sea.** Within Gaziantep province, **altitude varies between 250 meters and 1,250 meters**, while the **urban core is approximately 850 meters** above sea level. **Around 52% of its land area is mountainous**, mainly to the west and north-west of the province, with the Nur (or Amanos) Mountains marking the western boundary of the province. The Euphrates River marks the eastern boundary of the province.

About **half of Gaziantep's land is classified as being in agricultural use, while a quarter of the land comprises of settlements and roads. Forests and woodlands comprise 16.5% of total surface area, while pastures and meadows account for 7.7%** of the land area in the province. Across the province, there has been a **significant loss in natural habitats, forests, and other green/open areas** to urban expansion and land use change, driven by population growth and industrial development. In general, the Southern Anatolia Region has some of the **highest potential for solar energy in Turkiye, and Gaziantep's topography and features add to this potential.**

As tragically demonstrated by the 6 February 2023 disaster, **earthquakes are the most significant geophysical hazard** within Gaziantep province, mainly due to its location within the **influence area of the seismically active East Anatolian Fault Zone (EAFZ) and Dead Sea Fault Zone (DSFZ).** The urban core of Gaziantep is less exposed to seismic risk than the western districts of Nurdagi and Islahiye due to its location within a seismic gap of the EAFZ – however, **neighbourhoods within the urban core with alluvial soil and buildings that do not meet existing building standards remain highly vulnerable.**

Landslides in Gaziantep are known to occur around the western and north-western parts of the province, around the slopes of the Nur Mountains and in areas with soils composed of gravel, sand and clay. Soil erosion is another key geophysical hazard that is prevalent across the province and has worsened over the last few decades owing to deforestation and land degradation. Climate change is also **expected to increase risk from some geophysical hazards** – for example, the risk of soil erosion is expected to increase on account of changing precipitation patterns, more intense heatwaves, and increased frequency of droughts.

At a Glance

Gaziantep province spans across **6,819 square kilometres**

Population in **2021** amounted to nearly **2.1 million people**[1]

Between 2010 and 2021, the population grew **by more than 25%**

Around **450,000 Syrian refugees** are estimated to be living in Gaziantep

GDP

Gaziantep province accounts for around **2% of the country's GDP**

1 This figure does not include the refugee population, accounting for around 450,000 people. If the refugee population is included in the overall figure, the number increases to over 2.5 million. The larger number reflects the population for which municipal services are required

Key Land Use

- Existing residential areas
- Planned residential areas
- Urban services areas
- Industrial areas
- Existing Forests
- Areas identified for afforestation
- Fallow farmland
- Cultivated farmland
- Pasture land

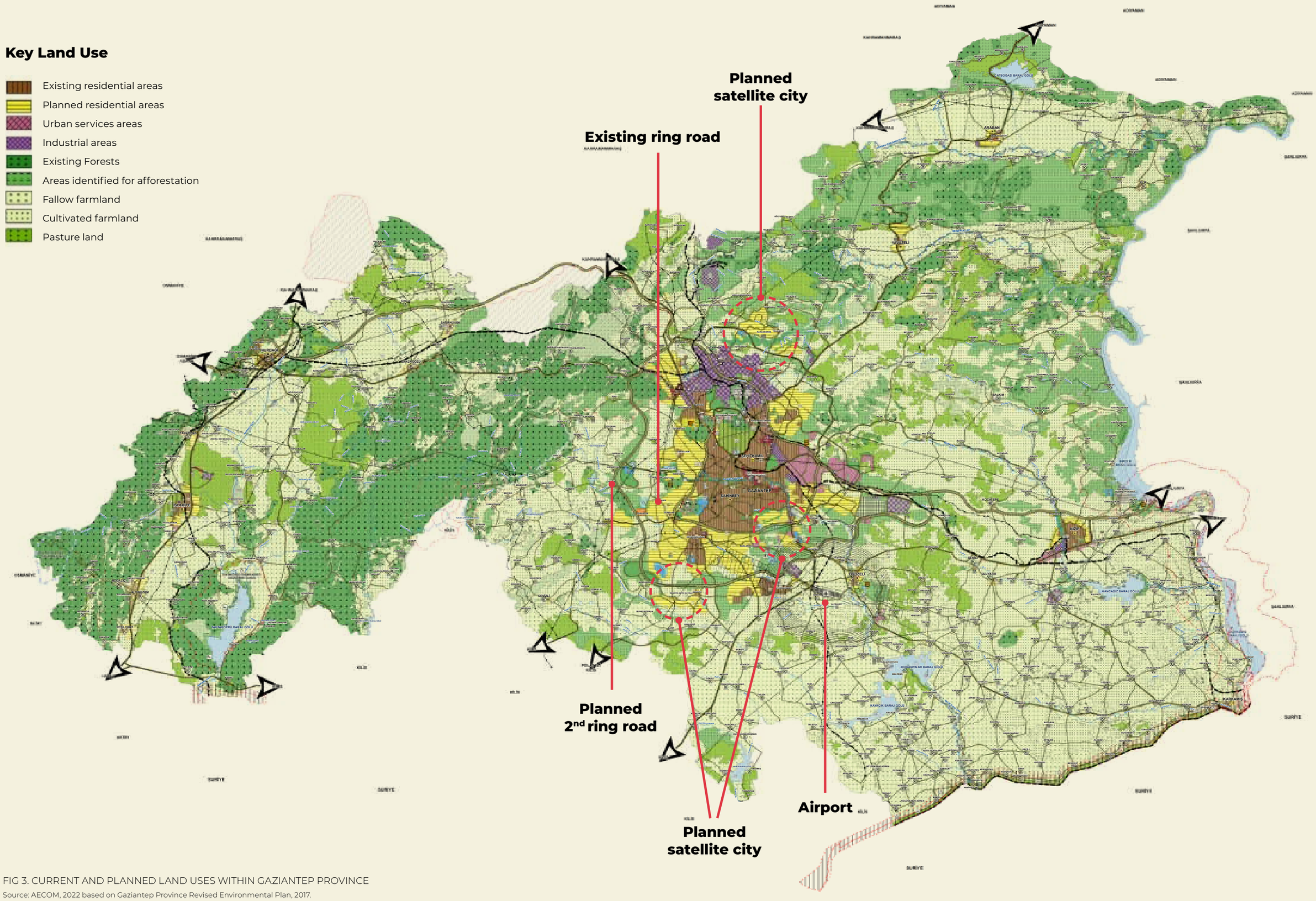


FIG 3. CURRENT AND PLANNED LAND USES WITHIN GAZIANTEP PROVINCE

Source: AECOM, 2022 based on Gaziantep Province Revised Environmental Plan, 2017.

Urban Growth

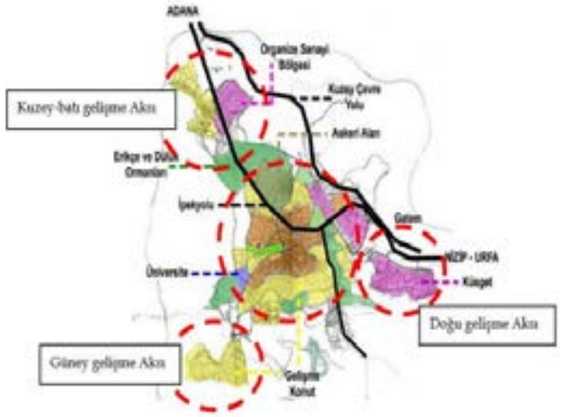
Most urban (i.e., residential, commercial, and industrial) land uses in Gaziantep province are in and around its urban core, spanning the administrative boundaries of Sehitkamil and Sahinbey districts. The district of Nizip in the east of the province contains the third-largest population centre and has substantial industrial land uses. The primary land use towards **the east and south-east of the urban core is farmland and pastureland, with forests dominating the north and northeast.** Older, more established mixed-use neighbourhoods (marked in brown in Figure 3) are mostly contained within an existing ring-road.

Areas planned for new residential developments are primarily located towards the south-west and south-east and contiguous with the urban core, with a few planned residential zones located in the north, near industrial areas. Within the planned residential areas, satellite cities are planned in the **north (Kuzeysehir), southeast (Bayramli), and southwest (Guneysehir) of the urban core. A planned second ring road encircles new residential areas in the south-west**, linking the new satellite cities and providing a high-capacity road connection to the industrial areas to the north. Within the urban core, **the Alleben Creek has green spaces along its northern and southern banks, while the industrial zones to the north are separated from the urban core by forest land and military land.**

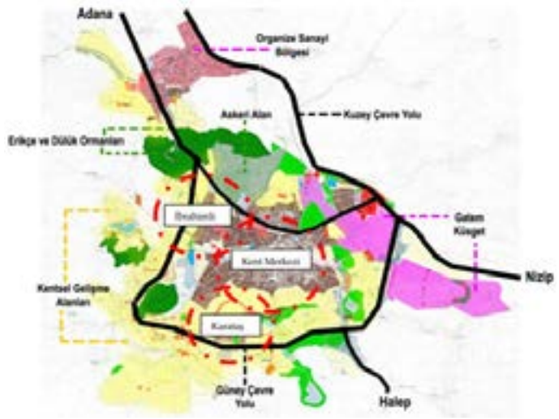
New residential areas follow the direction of urban growth identified in previous masterplans for Gaziantep (Figure 4) e.g., **residential areas to serve planned industrial zones in the north were included in the 1973 Masterplan, while the growth of residential areas to the south-west has been incorporated by the 1990 Masterplan**. Both the 1973 and 1990 Masterplans were developed in the context of rapid population

FIG 4. PREVIOUS MASTER PLANS FOR GAZIANTEP

1973 Masterplan



1990 Masterplan



Source: Yenice, M. S. (2018). A Process Evaluation on Gaziantep City Planning Experiences, Hasan Kalyoncu University. Retrieved from: https://dergipark.org.tr/tr/download/article-file/451529 Note: The red dotted circles in the diagrams are used by the authors to highlight areas with specific urban growth characteristics, and are not relevant to the purpose of this Report.

FIG 5. POPULATION DENSITY PATTERNS IN AND AROUND THE URBAN CORE OF GAZIANTEP
Source: Council on Urban Initiatives, 2022.

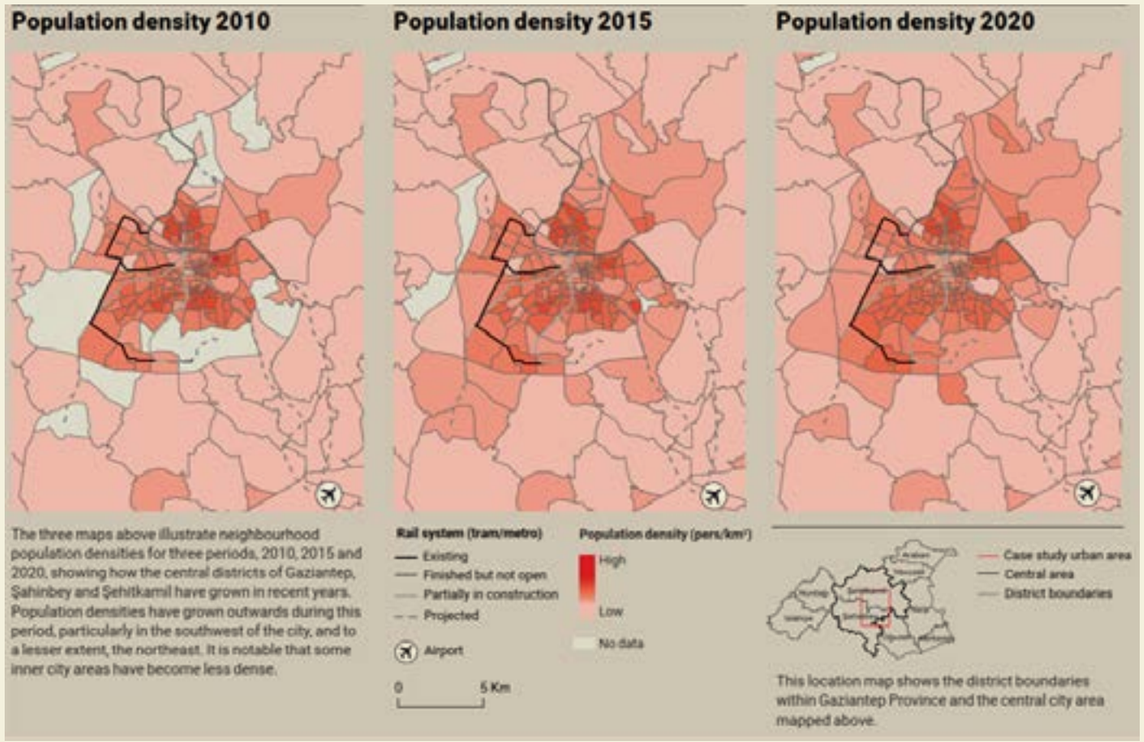
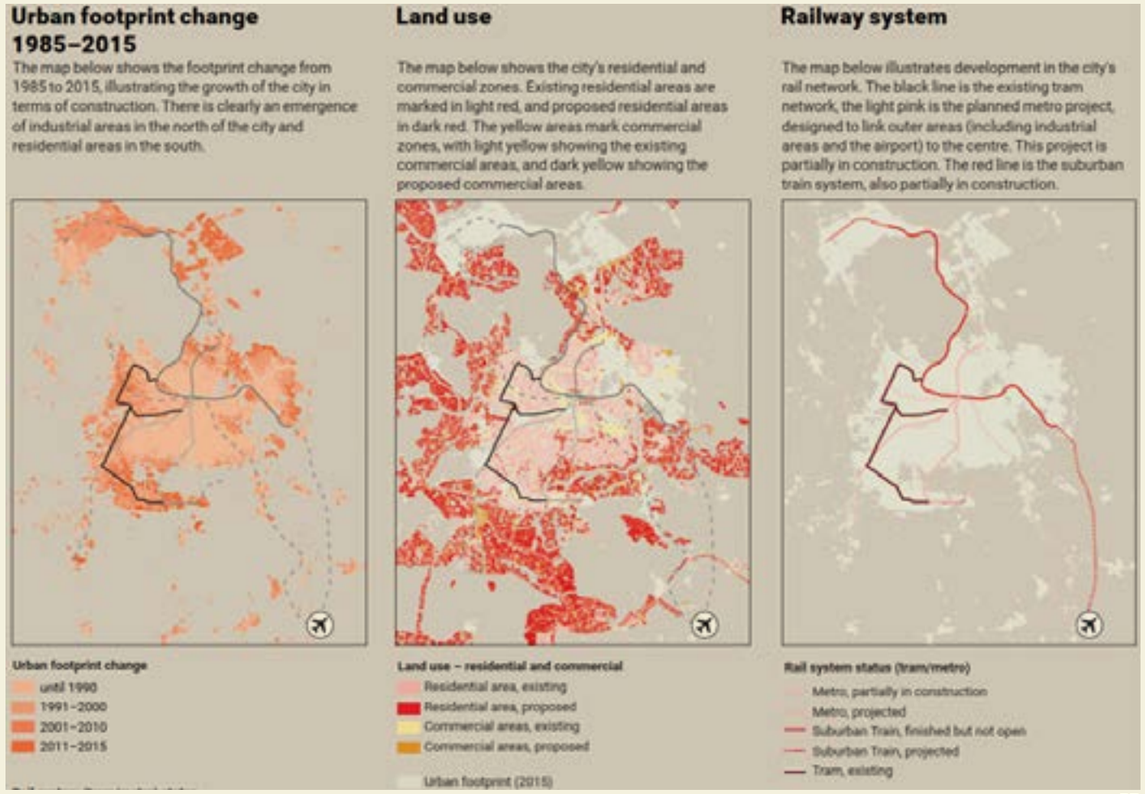


FIG 6. EXISTING AND PLANNED PUBLIC TRANSPORT AND URBAN GROWTH PATTERNS IN GAZIANTEP
Source: Council on Urban Initiatives, 2022.



growth – between the 1970s and 2010, Gaziantep's population grew over ten-fold from around 120,000 to approximately 1.3 million[14] - and urban growth has taken place in line with these land use plans, as demonstrated by the population density in 2010 (Figure 5).

Since 2011, the combination of naturally robust growth alongside the Syrian refugee crisis has **effectively super-charged existing urban growth patterns.** The high population growth rate has meant that the underlying population projections used for the 2017 Environmental Plan (4.15 million people by 2040[15]) were no longer considered valid, requiring a revision of this Plan in 2023[16].

Population densities have seen significant increase in the planned residential areas to the south-west and north-east of the urban core. While there has been a reduction in population in some residential areas within the ring road, **population densities in older neighbourhoods within the urban core have remained relatively high**– this is in line with the settlement patterns for refugees in the city being split along income lines, with middle-income refugees being absorbed by new developments[17] while poorer refugees mainly inhabit older neighbourhoods with aging infrastructure in crowded and slum-like conditions[18].

Public transport infrastructure – particularly light rail and rail-based systems – have looked to keep pace with urban growth patterns. Since 2011, a tram line connected new developments in the south-west and western parts of the urban core with the Central Business District (CBD), a commuter line (Gaziray) launched in 2022 connects industrial zones to the CBD. However, looking at the anticipated locations and coverage provided by these planned public transport facilities (Figure 6), **a substantial portion of the areas proposed for new development will need to rely on private vehicular transport.**

14 Council on Urban Initiatives (2022). Shaping Urban Futures: Case Study Report
15 Gaziantep 1/100,000 Scaled Environmental Plan, Plan Explanation Report
16 Technical Meeting on Land Use and Planning with GMM staff, 21 July 2022.
17 Council on Urban Initiatives (2022). Shaping Urban Futures: Case Study Report
18 Sandal, E. K., Hançerkıran, M. & Tıraş, M. (2016). Syrian Refugees in Turkiye and Their Reflections in Gaziantep Province, Gaziantep University of Journal of Social Sciences. Retrieved from: https://dergipark.org.tr/tr/download/article-file/223095

At a Glance

Open green space in Gaziantep amounts to **8.66 square meters per person**

Share of green space areas within urban limits is **14.2%**

593 parks across the province (including pocket parks)

Average population density within the urban core is **7,535 persons per square meter**

The province is rich in biodiversity, with over **840 species**

Climate

The province is located in the transition zone between continental and Mediterranean climate, with the Nur Mountains acting as a natural border separating the two climatic regions. The southern part of Gaziantep is characterised by Mediterranean climate, with hot and dry summers and mild and rainy winters. The northern and interior parts of the province show continental features, with harsher winters. **Gaziantep's climate brings a high degree of temperature variability across seasons** – as shown in Table 4. The average maximum temperatures in summer months tends to exceed 30 degrees Celsius, while in winter months the average minimum temperatures are below 5 degrees Celsius.

The **mountainous western and north-western parts of the province experience the most precipitation**, with the amount decreasing towards the east and south. **Average annual precipitation is 566.1 mm** with most of the precipitation occurring during winter months as rain and snow (almost 20% of precipitation occurs in December and January) and limited rainfall in summer months. Analysis of standard precipitation indices indicate **an increase in the occurrence of droughts in winter months in recent years.**

Gaziantep's geography and climate marked by long, hot, and dry summers and low rainfall make it **extremely susceptible to extreme heat.** Heat stress is particularly severe in the dense urban core, driven to a large extent by population growth and expansion of built-up areas. Another key factor for the increase in heat stress is the reduction in tree canopy cover since the 1990s, with districts with high levels of deforestation experiencing more frequent and intense heatwaves. **Drought** is a significant hazard in the context of Gaziantep's location in a water-scarce, arid region. Precipitation has shown a decreasing trend in the southern Anatolian region which combined with rapid population growth has already placed significant pressure on the limited water resources in the province. While not as significant a hazard as drought and extreme heat, **fluvial and pluvial flooding** occur in Gaziantep during winter and spring months, with several notable instances of flash flooding caused by heavy rainfall in recent years. Rapid urban development has exacerbated the impact of heavy rainfall, with the **increase in paved and impermeable surfaces, reduction of green spaces, and insufficient maintenance or lack of capacity of drainage infrastructure** as key drivers of flooding in urban areas.

Table 4. Average of daily temperatures in Gaziantep in degrees Celsius and average precipitation in mm, by month (1981-2010)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum	8.3	9.6	14.4	20.1	25.8	31.6	35.7	35.7	31.5	24.5	16	10.2
Minimum	-0.2	0.1	3.4	7.7	12.2	17.3	21.3	21.2	16.6	10.8	4.8	1.3
Precipitation	80	72	59	45	31	7	1	1	5	32	49	81

less than 5 degree C / precipitation > 70 mm
5 - 15 degree C / precipitation between 40-70 mm
15 – 25 degree C / precipitation between 10-40 mm
greater than 25 degree C / precipitation below 10 mm

Source: Gaziantep Metropolitan Municipality (2018). Sustainable Energy and Climate Action Plan.

In general, **climate change is expected to lead to an increase in average temperatures and a decrease in precipitation, further worsening the impacts of hydrometeorological hazards. The drier and warmer northern parts of the province are expected to have a higher increase than the southern parts** of the province. By 2050, the average annual precipitation is projected to decrease up to 98 mm in southwestern parts of Gaziantep (approximately 17% lower than current levels), while the northern parts of Gaziantep are expected to be less affected by changes in precipitation, with an expected decrease of around 20-25 mm (less than 5% of current levels).

At a Glance

Maximum temperature measured in Gaziantep is **44°C**

Average annual temperature change for Turkiye is projected as **1.4°C – 1.7°C by mid century**

Average **annual precipitation** in Gaziantep is **566.1 mm**

Almost **20%** of the **precipitation** occurs in **winter months**, with very limited rainfall in the summer

A decrease in precipitation by **17%** in Gaziantep is possible by mid century

People

With a population of **approximately 1.75 million in the two districts encompassing its urban core, Gaziantep contains the sixth-largest urban area in Turkiye.** This urban core constitutes **nearly 85% of the total population of nearly 2.1 million within the province**[19] (see Table 5), without including the refugee population.

19 TURKSTAT Address-based Population Registration System (ADKNS), 2021.

Table 5. Areas and Population of Districts within Gaziantep Province

District	Araban	Islahiye	Karkamis	Nizip	Nurdagi	Oguzeli	Sahinbey	Sehitkamil	Yavuzeli	Total
Area sq.km.	530.5	859.8	295	901.5	714.3	732.7	986.2	1,291	519.9	6,819
Popul. 2021	26,979	56,894	4,468	135,559	33,137	22,033	923,747	831,226	14,902	2,048,945

Source: Population data from TurkStat, 2021; Areas from citypopulation.de. Districts encompassing urban core highlighted in green.

Population data for the province (TurkStat, 2021) shows **a nearly 50:50 gender ratio**, with only the 65+ age group showing a substantially larger proportion of females in the total population. The province has a **relatively young population**, with **nearly 32% of the population under 15 years of age**, and another 63% between 15-64 years of age i.e., considered working age. The population in rural districts is marginally older, with the proportion of population over 65 years of age at 7.4% compared to almost 5% for urban districts. The 2040 Environmental Plan Explanation Report notes that the **typical household size in 2013 was 5.23** (compared to 4.5 for Turkiye), with larger rural households (containing an average of 6.39 persons) than urban households (4.98 persons).

The most significant set of environmental challenges in the city stem from rapid population growth. In the decades prior to the Syrian war, **Gaziantep was already one of the fastest growing urban areas in the world, expanding from a population of 120,000 in the 1970s to more than 1.3 million by 2010**. This period of growth was largely driven by internal migration from other regions in Turkiye seeking employment and trade opportunities. Since the outbreak of the Syrian civil war in 2011, this growth has accelerated – **the city has accommodated over 450,000 Syrian refugees over the last decade and has seen a large increase in its population** between 2010-2021 (see Table 6). Gaziantep is now home to the second largest Syrian refugee population in Turkiye (after Istanbul).

Over this period, the city has been recognised for its efforts around **social and economic integration of refugees with the existing population.** Municipal services are targeted to a broad cross-section of its population, regardless of ethnicity, often requiring delivery of services in two languages – Turkish and Arabic. Refugee integration efforts have been framed as being to the benefit of local host communities with the arrival of a skilled and educated workforce as a benefit to the city's construction and industrial sectors. GMM offers a wide range of social support and vocational programmes to both Turkish residents and Syrian refugees in the city[20]. The municipal Chamber of Commerce has also played a critical role in **supporting refugee integration- particularly of middle-class Syrians.** A key reason for the city's broadly welcoming approach to Syrian refugees appears to be **historical and strong cultural and trade linkages to the city of Aleppo in Syria.**

20 Ibid.

Table 6. Population Growth, 2010-2021

Year	Province Population	% change from previous year	Urban Districts Population	% change from previous year
2010	1,539,193	3.1%	1,324,520	3.6%
2011	1,593,743	3.5%	1,376,348	3.9%
2012	1,641,403	3.0%	1,421,355	3.3%
2013	1,759,009	7.2%	1,488,018	4.7%
2014	1,802,981	2.5%	1,532,519	3.0%
2015	1,849,129	2.6%	1,574,933	2.8%
2016	1,891,245	2.3%	1,612,970	2.4%
2017	1,921,959	1.6%	1,639,915	1.7%
2018	1,942,515	1.1%	1,658,855	1.2%
2019	1,984,603	2.2%	1,700715	2.5%
2020	2,018,336	1.7%	1,727,894	1.6%
2021	2,048,945	1.5%	1,754,973	1.6%

Source: AECOM, 2022. Based on population data from TURKSTAT, 2010-2021. Highest annual percentage increase in population highlighted in green. These figures do not include Syrian refugee population.

At a Glance

Nearly **85%** of the population **lives** in the **urban districts of Gaziantep**

The population grew by **33%** between 2010 and 2021

Around 450,000 Syrian refugees are estimated to be living in Gaziantep, constituting over 20% of its population

The province has a relatively young population, with **nearly 32% of the population under 15 years of age**

Typical **household size, at 5.23 persons** per household is slightly larger than the national average (4.5)

Economy

Gaziantep is one of Turkiye's most important economic hubs, with a **diverse economy that builds on the two key sectors of manufacturing and agriculture.** Its strategic location near the Syrian border makes it a **key trade centre within the broader eastern Mediterranean region**. The city has strong and historical trade and cultural linkages with Aleppo, on the other side of the border with Syria.

In 2021, **Gaziantep's gross domestic product (GDP) was around TRY 148 billion[21] (approx. USD 16 billion) which translated to a per capita income of TRY 70,228 or about USD 7,819[22].** Robust industrial and agricultural growth over the preceding fifteen years has resulted in steady and resilient economic growth, despite the growing population and high intake of refugees in the same period. The 2022 Districts Socio-Economic Development Ranking Study (SEGE) includes Sehitkamil district within Tier 1, comprising the 67 districts in Turkiye that demonstrate the highest level of socio-economic development, while Sahinbey is one of 173 districts in Tier 2.

Manufacturing accounts for 37% of Gaziantep's GDP and the city is well known for producing textiles and clothing, unique ceramics and tiles, copper products, carpets, confectioneries, soap, and footwear. The **agricultural sector is the second largest contributor** to Gaziantep's economy, with grains, pistachios, legumes, fruits, and vegetables forming the key agricultural products. The city is also a significant hub for livestock and poultry farming. Food processing is a key secondary economic activity, and the city is known for its gastronomic products and local culinary specialities such as baklava. **Tourism is another key sector in Gaziantep's economy**. The city's rich historical and cultural heritage attracts visitors from around the world, including landmarks such as the Gaziantep Castle, the Zeugma Mosaic Museum, and historical places of worship. The city's culinary scene is also a major attraction for tourists.

21 Note that TRY and EUR conversion at the time of writing.
22 https://biruni.tuik.gov.tr/ilgosterge/?locale=tr

Industrial production is the bedrock of Gaziantep's economy; however, it is also the **largest contributor to GHG emissions** accounting for the majority of the city's emissions as of 2020. **Increasing energy consumption in the industrial sector since 2015** has also been the key driver of an overall increase in Gaziantep's GHG emissions in this period. Decarbonising energy consumption for industries without impacting economic growth is a key pathway for sustainable development in Gaziantep.

The **industrial sector is also at the area of high seismic risk, owing to the locations of key industrial zones near fault lines.** On the other hand, the **agricultural sector is particularly vulnerable to the impacts of climate change.** Gaziantep's location in a semi-arid region coupled with increasingly frequent heat waves and variable precipitation patterns over recent years presents significant risk to agricultural production. Another threat to agricultural production is **urban sprawl into farmlands and pastoral areas.**

Despite enormous pressure on the city's utility services, education, healthcare, and housing, the city's **refugee population has been well-integrated into the economy through efforts from the government, civil society, and the private sector.** Since the early stages of the migration flow, the city has focused on the economic contributions of refugees to the local economy as a key element of its integration efforts. The Mayor's advocacy at the national level was a key driver of limited work permits being issued to Syrian refugees in 2016, and a central coordination unit established in the same year by GMM supports social and economic integration efforts. International development organisations and local civil society groups have worked hand-in-hand to support skill development and build language skills. The construction and industrial sectors have absorbed large numbers of skilled and unskilled refugees, while the Chamber of Commerce has supported the establishment of over 1,000 businesses by Syrian entrepreneurs in the city and overseen the expansion of trade links to Arabic-speaking countries in the Middle East and North Africa.

At a Glance

Gaziantep's gross domestic product (GDP) is around **TRY 148 billion (approx. USD 16 billion)**

GDP per capita is **TRY 70,228 (approx. USD 7,819)**

The **industrial sector** has a significant share of the **GDP** of the province, around **37%**

The Chamber of Commerce has supported the establishment of over **1,000 businesses by Syrian entrepreneurs** in Gaziantep

Sehitkamil district ranks within Tier 1, comprising the **67 districts in Turkiye** that demonstrate the highest level of socio-economic development

Greenhouse Gas Emissions

Gaziantep was one of the first metropolitan municipalities in Turkiye to prepare a climate action plan in 2011, and has been undertaking and refining its GHG inventory for over a decade. In 2020, it was estimated that the total GHG emissions originating from activities within provincial borders **amounted to 8.56 million tonnes of CO_2 equivalent (tCO_2e) emissions.** Per capita, this amounts to approximately **4.07 tCO_2e emissions per year,** which is lower than the national average for the same period (6.23 tCO_2e emissions per capita).

In 2015, Turkiye's NDC articulated a commitment to reduce its emissions by 21% from Business as Usual (BAU) scenario to 2030, however, in 2022, **this target has been updated to 41%**. Turkiye has also committed to a net- zero target by 2053. Over the same period, GMM's climate targets either met or exceeded those set at the national level; however, emissions have been increasing since those targets have been set. Between 2015 and 2020, there has been a substantial increase in the emissions from three main sources: **industries (from 1.7 to 3.23 million tCO_2e emissions), transport (from 1.81 to 2.19 million tCO_2e emissions) and residential buildings (from 1.73 to 1.80 million tCO_2e emissions),** as shown in Figure 7 below. This indicates that despite strong efforts to curb emissions in sectors over which GMM has significant control over (like those associated with the municipally-owned buildings and vehicle fleet) significantly more effort will be require to bring down the emissions from all key sectors and meet its climate targets.

At a Glance

GHG emissions from within provincial borders are estimated at **8.56 million tCO_2e emissions**

This amounts to around **4.07 tCO_2e emissions per capita**

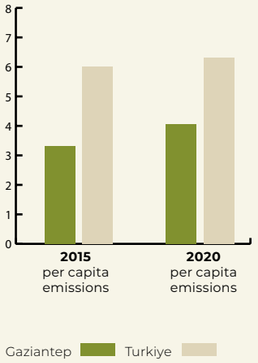
This is considerably lower than the national average of **6.23 tCO_2e emissions per capita**

Between 2015 and 2020, emissions have increased by **34%, mainly from industries and transport**

In 2018, GMM committed to a **40% emissions reduction target** by 2030 compared to its 2015 baseline

FIG 7. SUMMARY OF EMISSIONS TRENDS IN GAZIANTEP

1. Per capita Emissions - Gaziantep vs. Turkiye, 2015 and 2020



In 2015, per capita emissions in Gaziantep amounted to 3.32 tCO_2e, significantly lower than the national average of 6 tCO_2e per capita.

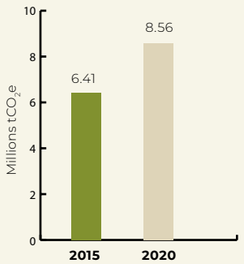
However while in 2020 per capita emissions are still lower in Gaziantep than the national average, the average increase per capita for Gaziantep has been higher (0.75t) than at the national level (0.3t). This means per capita emissions in Gaziantep, while still lower than the national average, have been rising faster than the national average.

2. Evolution of Mitigation Targets - Gaziantep vs Turkiye, 2015 and 2020

In its 2015 Nationally Determined Contribution, Turkiye made a pledge to reduce 21% of its emissions. In the aftermath of recent climate-related and other disasters that struck the country in 2018 and 2019, the governement declared a net zero pledge by 2053, and committed to update its NDC to reflect this more ambitious target.

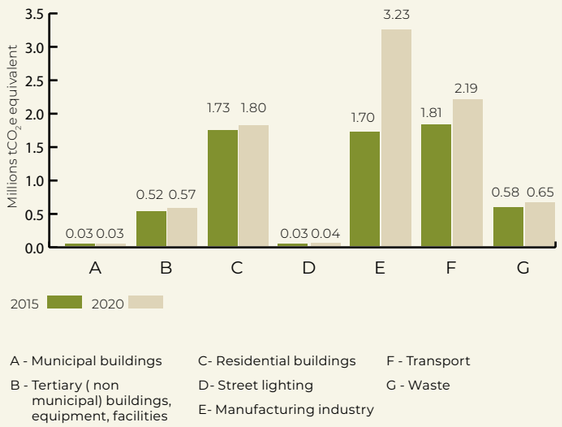
In comparision to national targets, GMM's committed to a 40% emissions reduction target by 2030, compared to 2015 baseline. Considering that Gaziantep's per capita emissions are lower than the national average, this is a target whose ambition exceeds to that of the national level set in Turkiye's 2015 Nationally Determined Contribution. However , as shown in the following graphic the overrall targets were set, and in light of upcoming updates to NDC, GMM's target might require revision.

3. GMM - Total GHG Emissions Trend (2015 - 2020)



In 2015, the overall emissions across the province were estimated to amount to 6.4 $MtCO_2e$ emissions. However, despite ambitious emission reduction targets, emissions between 2015-2020 have been increasing in Gaziantep with an overall 34% increase reported throughout this period. Emissions have been increasing from virtually every sector (with exception for the building and vehicles owned by GMM), with significant increases in industrial consuption of energy , and the transport sector.

4. Key Sources of Emissions and Trends (2015-2020)



A - Municipal buildings
B - Tertiary (non municipal) buildings, equipment, facilities
C- Residential buildings
D- Street lighting
E- Manufacturing industry
F - Transport
G - Waste

Source:
1. per capita figures for Gaziantep are calculated based on GMM reported emissions and population figures for 2015 and 2020. Per capita emission for TUrkiye are from TURKSTAT.
2. Turkiye's National Determined Contribution (2015) and Gaziantep Sustainable Energy and Climate Action Plan (2018).
3. and 4. GMM and GTE 2022. Sustainable Energy and Climate Action Plan: Current Status and Monitoring Report 9 (draft)

Governance

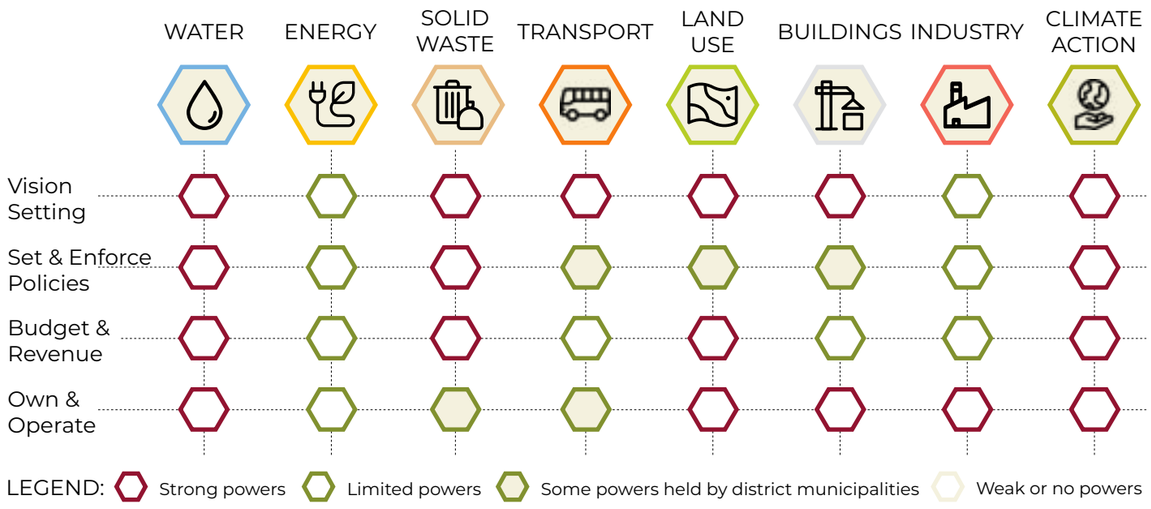
As a Metropolitan Municipality, GMM has, relative to non-metropolitan provinces, **comparatively stronger revenue powers, higher governance capacity, and more clearly articulated responsibilities** split between district and metropolitan (i.e. province-level) administrations. There are 9 district municipalities in Gaziantep: Araban, Islahiye, Karkamis, Nizip, Nurdagi, Oguzeli, Sahinbey, Sehitkamil and Yavuzeli. As with other Metropolitan Municipalities in Turkiye, Gaziantep has a **two-tier governance structure**, with a directly elected Metropolitan Mayor and an indirectly elected Metropolitan Municipal Parliament (translated as Metropolitan Assembly in some sources) composed of representatives from its constituent district assemblies and District Mayors. Metropolitan municipalities operate using a two-tier local government structure. The **Metropolitan Municipality (in this case, GMM) forms the upper tier, overseeing macro-services, whereas District Municipalities operate micro-services** (Table 7).

Since they operate in the same jurisdiction and their services are complementary in nature, **Metropolitan and District Municipalities are often required to coordinate their work through close cooperation.** The Metropolitan Municipality is tasked with **ensuring coordination and resolving disputes among municipalities in the metropolitan area.** This prevents gaps or overlaps in services. Co-ordination is assisted by the fact that **district mayors and some district councillors serve on the Metropolitan Council.** At national level, the Ministry of Environment, Urbanisation and Climate Change is responsible for **issues related to the environment, urban planning, and public works.**

Table 7. Main Functions at GMM and Constituent District Municipality Levels

Main Functions for Metropolitan Municipality	Main Functions for District Municipalities
· Prepare higher scale (1/5,000 to 1/25,000) land development plans	· Street upkeep and hygiene
· Approve implementation plans (1/1,000 scale) prepared by the District Municipalities	· Collection of domestic waste
· Oversee compliance with planning guidelines on land development by district municipalities	· Preparation of implementation plans (1/1,000 scale)
· Produce land plots and housing for orderly urbanisation, building infrastructure as required for industry and trade	· Issue of building licenses
· Draw up metropolitan transport master plan; and plan, implement and manage public transport services	· Social municipal services (reducing poverty, social aid, skills training for the unemployed)
· Build squares, boulevards, avenues, and main roads	· Promotion of amateur sports
· Protect and develop the environment, agricultural land and water basins	· Education, sports and culture services.
· Process and dispose of solid waste	
· Deliver water and sewerage services	
· Supply gas and district heating services	
· Run the provincial Chamber of Commerce	
· Build and manage parking areas	
· Manage environmental health, including regulation and monitoring of food and drink vendors	
· Build regional parks, zoos, museums, sporting, leisure and recreational facilities	
· Develop and manage cemeteries, wholesale food markets and slaughterhouses	
· Provide fire-fighting and emergency services	

Table 8. POWERS OF GMM AND MUNICIPAL ENTITIES BY SECTOR



As a Metropolitan Municipality, Gaziantep has greater ability to enforce policies and implement actions under the sectors relevant to a Green City Action Plan. As summarised in Table 8, **GMM, district municipalities and GMM-owned entities have significant powers across all eight GCAP sectors**. In sectors like **Water, Transport, Land-use, Solid Waste, and Buildings, GMM and district municipalities have substantial powers to influence or control urban development at each stage of the process.**

For the **Energy sector, GMM's ability to shape policies and investments is limited to small-scale energy infrastructure.** While GMM has some powers to direct industrial development into certain areas within the province, its ability to monitor investments within **industrial zones** is limited – however, it can use its powers to enforce industrial policy set at the national level to implement investments in this sector. GMM has been a leader within the **Climate Action** sector, and was one of the first cities in Turkiye to develop a Climate Action Plan in 2011, so it has strong vision-setting powers; although its ability to influence climate-resilient infrastructure investment across other sectors is somewhat partial.

At a Glance

The province is divided into **9 districts** (Araban, Islahiye, Karkamis, Nizip, Nurdagi, Oguzeli, Sahinbey, Sehitkamil, and Yavuzeli)

Metropolitan municipalities operate using a **two-tier local government structure**, with the responsibilities divided between metropolitan (macro services) and district municipalities (micro services)

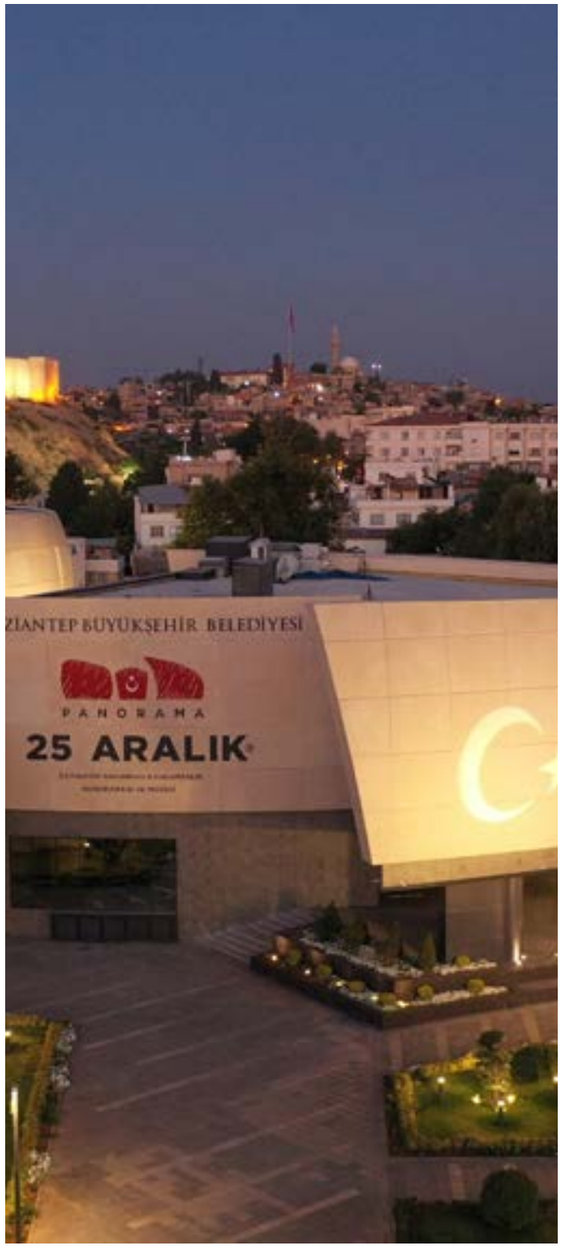
GMM has a strong overall influence over actions and investments in sectors like **water, transport, land use, solid waste, and buildings**

GMM is a leader in urban climate action planning in Turkiye, with the **first Climate Action Plan developed in 2011**

Municipal Finance and Investment Planning

As a Metropolitan Municipality, GMM has access to a wider set of revenue streams as well as more responsibilities for provision of urban services. Non-tax revenue sources (e.g., license fees, land sales, rental incomes from municipally owned facilities) have historically accounted for above 98% of own-source revenue.

The main expenditure items in GMM's budgets are personnel expenses (e.g., salaries), social security payments, purchases of goods and services, debt servicing, interest payments, and transfers to district governments. In the 2017-21 period, expenditures increased by 46% with debt servicing, other operational expenditures, and personnel expenses seeing the relative largest increases. Compared to 2017, capital expenditures in 2021 stayed nearly constant in value but declined from about 48% of total expenditures to about 33%. The relatively smaller increase in expenditures compared to revenues can be partly attributed to efforts managing a negative budget balance, which has declined from -28.3% in 2017 to -8.2% in 2021. **Even after accounting for borrowing, the budget balance has tended to remain negative for four of the five years between 2017-2021.**



A variety of challenges over the last few years have impacted GMM's municipal finances. **Recent years have seen COVID-19 impacting on GMM's finances, with reductions in both central government transfers and GMM's own-source revenues.** During the pandemic, no revenues were collected from individuals/businesses who were using GMM infrastructure such as social facilities or recreational areas, which caused an economic loss for GMM and led to financial difficulties. **Expenditures increased in relation to housing and food supplies.** Additionally, GMM's hosting of refugees from the Syrian Civil War has also had a negative impact on GMM municipal finances, **as the central government revenue allocation formula does not fully account for the approximately 0.5 million refugees in Gaziantep or the need for additional social and utility infrastructure.** The extensive damage to the infrastructure caused by the 2023 earthquakes, in addition to loss of revenue amidst decreased economic activity, will pose an

additional challenge to GMM's municipal finance. GMM may need to prioritize capital expenditures in the short term to rebuild sectors and areas most impacted by the earthquakes.

GMM has experience with large infrastructure projects, with ILBANK, government-owned commercial banks, and international finance institutions (IFIs) as the main sources of borrowing. Notable examples include the Gaziray Metro Project financed by the Islamic Development Bank with ILBANK's coordination. GASKI, which is a GMM-owned entity, secured financing from JICA and ILBANK for two wastewater treatment facilities. EU funding, administered by the UNDP, was also secured for the construction of a new waste management facility. In recent years, GMM has shifted from direct lending agreements with ILBANK to facilitating other investors' access to bank financing. They collaborate with actors like ILBANK for project origination, design, and feasibility to meet IFI's expectations and standards. EBRD has been supporting Gaziantep's Solar Project with a loan and grant in 2021, and Compressed Natural Gas (CNG) Buses Project with a loan in 2016. Recently, GMM has been increasingly exploring other financing models like public-private-partnerships (PPP), build-operate-transfer (BOT) models and energy performance contracts; but for these to succeed the strengthening of legislation is required.

The industrial and business sector in Gaziantep is also involved in funding or financing infrastructure projects. For example, the 'One Hundred Schools' initiative resulted in construction of schools supported through corporate social responsibility funds from over one hundred industrialists, and the Gasmek training facility. Many other social facilities in Gaziantep have also been supported through industrial sector charitable contributions made voluntarily to GMM.

At a Glance

GMM relies heavily on **non-tax revenue sources** for funding.

Recent years have seen COVID-19 impacting GMM's finances, **with reductions in both central government transfers and GMM's own-source revenues**

GMM faces financial challenges but collaborates with **banks, institutions, and the industrial sector** for infrastructure projects

The extensive damage to the infrastructure caused by the 2023 earthquakes, in addition to loss of revenue amidst decreased economic activity, will pose an additional challenge to GMM's municipal finance

Environmental Challenges

Gaziantep faces a multitude of pressing environmental challenges, ranging from air quality, water resources and quality, land and soil quality, biodiversity and open space, and climate change. The region faces intricate issues that demand immediate attention and innovative solutions, and by understanding and addressing these challenges, Gaziantep can pave the way towards a sustainable and resilient future for its people and the environment.

During the technical assessment and consultations with international and local experts, several priority environmental challenges for Gaziantep were identified.

AIR QUALITY

Firstly, the city faces **air quality challenges due to the use of coal and wood for heating in residential buildings, but also associated with industries, and transport.** This leads to high levels of pollution, including particulate matter (PM2.5 and PM10) and sulphur dioxide (SO2) – as shown in Table 9. Addressing this requires retrofitting old buildings for heat pumps, and exploring alternative energy sources. Illegal construction and lack of regulation pose additional hurdles in reducing solid fuel usage. Control over pollutants from small businesses, scattered throughout the city, also presents difficulties in enforcement and monitoring.

Table 9. State Indicators: Air

Station	Indicator and Concentration ($\mu g/m_3$)			
	1. Average annual concentration of PM2.5	1.1 Average annual concentration of PM1	1.2 Average daily concentration of SO2	1.3 Average annual concentration of NOx
Gaziantep		54.9	8.2	
Gaziantep-Beydili	41.7	68.5	33.4	109.6
Gaziantep-GASKI D6		48.4	21.1	54.6
Gaziantep-Nizip	20.8	48.8	12.9	42.7
Gaziantep-Sankopark	25.2	51.9	51.9	144.2
Gaziantep Atapark Yayginlastirma	23.4	48.3	21.3	51.1

Source: Gaziantep Provincial Directorate of Environment, Urbanisation and Climate Change, 2022.

WATER RESOURCES AND QUALITY

Gaziantep encounters **several issues related to water resources and quality**. Gaziantep is a water-scarce city, and high population growth has placed additional pressure on already strained resources. Data gaps hinder routine monitoring and reporting of surface and groundwater quality. Elevated conductivity and nitrates, also pose some concerns. Academic studies reveal significant **metal content in local groundwater used for agriculture**, potentially impacting human health. Further, the lack of clarity on village water supplies fed by local groundwater and untreated water consumption necessitates a comprehensive program to address water quality and treatment. The performance on the indicators in the Table 10 illustrate these challenges quantitatively.

Table 10. State Indicators: Water

Indicator	Unit	Latest Year	Latest Value
Biochemical Oxygen Demand (BOD) in rivers and lakes	Mg/L	2022	3.99
Ammonium (NH4) concentration in rivers and lakes	µg/L	2022	9.99
Bathing waters meeting minimum standards	%	2022	100
Water samples complying with national potable water quality standards	% in a year	2022	95
Water Exploitation Index	%	2018	26.3

Source: Gaziantep Water and Wastewater Department, 2022

LAND AND SOIL QUALITY

There is also a **lack of accessible data on soil pollution**, particularly from the industrial sector, which is a major challenge. Gaziantep's soils and ecosystems are highly vulnerable to climate change impacts, leading to desertification and erosion in some areas. **High energy costs for irrigation exacerbate water insecurity and impact agriculture, while improper practices deplete soil nutrients.** Forest, pasture, and meadow degradation further strains essential ecosystem services in the region. As there is no available data on soil quality, this assessment has been made on the basis of literature review and consultations with local experts in Gaziantep.

As illustrated by the indicators compiled in the Table 11, Gaziantep faces challenges **related to inadequate provision of green/open space per capita**, leading to unequal access between neighbourhoods. Low forest canopy coverage reduces the province's climate regulatory function, especially in the urban core where heat stress is a concern. Whilst forest degradation, both natural and anthropogenic, further impacts woodland ecosystems. **Insufficient data and policies hinder efforts to protect and restore urban biodiversity.** As well as the lack of an integrated approach to green infrastructure planning limits its potential benefits for the province.

Table 11. State Indicators: Open Green Space and Biodiversity

Indicator	Unit	Latest Year	Latest Value
Open green space area ratio per 100,000 inhabitants	m^2 per resident	2020	8.66
Share of green space areas within urban limits	%	2018	14.2%

Source: GCAP Gaziantep. Technical Assessment Report. 2022.

CLIMATE CHANGE MITIGATION

As stakeholders in Gaziantep pointed out during the technical meetings, there is a lack of comprehensive plans and strategies for climate action, hindering progress in mitigation and adaptation efforts. There is a need for better understanding and data on climate hazards across the municipality, especially regarding impacts on certain sectors like water. **Climate projections indicate increased intensity and frequency of heatwaves and droughts, posing cross-sectoral impacts.** Whilst the untapped potential of nature-based solutions (NbS) and green infrastructure to build climate resilience is evident, the strategic implementation is lacking. Rapid population growth has further strained infrastructure and contributes to emissions growth; and while there are plans to reduce the overall emissions, **more ambitious measures are necessary to tackle emissions from key sources like the industrial sector.** Some of the indicators for climate action have been compiled and shown in the Table 12.

Table 12. State Indicators: Climate Action

Indicator	Unit	Latest Year	Latest Value
Annual CO_2e emissions per capita	tCO_2e/y per capita	2020	4.07
Annual CO_2 emissions per unit of GDP	t/USD of GDP	2020	0.0006

Source: GCAP Gaziantep. Technical Assessment Report. 2022.

Gaziantep faces a range of environmental challenges that require urgent and coordinated action. **Addressing them is crucial to ensure a sustainable and resilient future for the province,** as well as implementing innovative and inclusive climate strategies is essential to mitigate the impacts of climate change and build a more sustainable and liveable environment for its residents.

Sectoral Challenges

Gaziantep faces numerous pressing challenges across different sectors, each demanding urgent attention and strategic solutions. As highlighted in the sections above, the key sectors assessed in the GCAP are **Energy, Water, Solid Waste, Transport, Land Use, Buildings, and Industries.**

ENERGY

The energy sector faces numerous obstacles. The failure to approve Solar PV generation connections due to network restrictions and distribution network inadequacies, results in an energy system with insufficient capacity. In 2021, there were over 26 hours of electrical interruptions per year, per customer in Gaziantep, and nearly 9% of network line losses[23]. Inadequate investment planning has been observed, as energy investments are not conducted in an integrated manner- resulting in insufficient investment in priority areas. The lack of electrical energy storage solutions appears to hamper the optimisation of renewable energy sources. Compounding these issues is the escalating energy consumption in the province, further straining the energy infrastructure. The high investment cost of natural gas interventions acts as a barrier to diversifying the energy mix and transitioning to cleaner energy sources. In 2021, the share of renewables in total energy consumption in Gaziantep stood at 17%, which is relatively low for a province like Gaziantep which has a high potential for renewables[24].

WATER

Another crucial area of concern is the city's water sector. As mentioned in the section above, Gaziantep faces the long-term threat of water insecurity due to climate change, which may lead to increased energy consumption for future water supply. In 2022, 0.948 KWh/m_3 of energy was used for urban water supply in Gaziantep – a very high figure[25]. Although official data suggest that over 95% of residential and commercial wastewater in Gaziantep is treated, the lack of standards and enforcement for treated wastewater used in irrigation raises concerns about water quality and potential health risks. As some of the stakeholders in Gaziantep also pointed out, the ambiguity in roles and responsibilities related to water management strategies contributes to potential inefficiencies. The presence of sludge in treated water (only around 28% of sludge produced in Gaziantep is treated, disposed of, or safely used)[26] and concerns over water quality from Hancagiz Dam further impact the city's water resources. The high non-revenue water (equivalent to nearly 50% in 2021[27]) exacerbates water management challenges, necessitating careful monitoring and protection of both surface and groundwater.

SOLID WASTE

Waste management is another area requiring immediate attention. Gaziantep residents generate 324 kg of municipal solid waste per capita, and while the waste collection services coverage rate is stated to be 100%[28], the city faces challenges such as the lack of source separation, inadequate facilities for hazardous waste, and weak enforcement of animal waste disposal regulations, all of which were mentioned by stakeholders during technical meetings. For the sustainable development of waste management, the Mechanical Biological Treatment (MBT) facility project has been implemented. Oguzeli Central Biogas Facility is being used for animal waste. Although cumulative solid waste figures are available, there are partial inadequacies in data collection. The waste system is generally costly, but GMM continues to work on reducing costs (e.g., taking a share of energy recovery). For the prosperity of the city, sustainable waste management practices must be prioritized.

23 GCAP Gaziantep. Technical Assessment Report. 2022.
24 GCAP Gaziantep. Technical Assessment Report. 2022.
25 Ibid.
26 Ibid.
27 Ibid.
28 Ibid.

TRANSPORT

The transport sector faces significant hurdles, including an increasing reliance on private vehicles leading to traffic congestion and pollution. In 2015, the share of private transport (private cars, taxis, motorcycles) in total transport modal share was high at 32.5%[29]. On average, there are 0.72 vehicles (cars and motorbikes) per household in Gaziantep, which is comparatively high[30]. Lack of integration among different public transport modes hinders efficiency and accessibility. Moreover, the absence of dedicated lanes for public and non-motorised transit discourages sustainable transportation options, while the scarcity of parking facilities exacerbates traffic issues. Gaziantep has only 0.15 km of road dedicated exclusively to public transport per 100,000 residents, and less than half of the population have access to public transport within 15 minutes by foot[31]. To mitigate these challenges, promoting sustainable transportation alternatives, improving public transport integration, and prioritising the development of dedicated lanes and parking facilities are essential steps.

LAND USE

In the realm of land use, Gaziantep faces challenges stemming from the lack of long-term, integrated planning, resulting in inefficient land use and development. Since 2011, the unprecedented increase in population due to the Syrian refugee crisis has effectively super-charged existing urban growth patterns. The high population growth rate has meant that the underlying population projections used for the 2017 Environmental Plan (4.15 million people by 2040) are no longer considered valid, requiring a cancellation and revision of this Plan[32]. Insufficient green and open spaces further compound issues, impacting residents' well-being and environmental sustainability. In 2020, estimates of available open/green space in Gaziantep amounted to 17,575,076 m^2 (equivalent to 8.66 m^2 per capita), which falls below global recommendations[33]. The World Health Organization (WHO) recommends a minimum of 9 m^2 per capita and Turkiye's national standard requires 10 m^2 per capita. The existence of empty and underutilised sites within existing settlements, as well as the issue of unavailable or unaffordable housing, pose additional hurdles. To create a balanced and resilient urban landscape, comprehensive and strategic urban planning is needed, including investments in public transport and satellite city integration to manage population growth effectively.

BUILDING

The building sector in Gaziantep faces diverse challenges, including the lack of up-to-date building data hindering effective urban planning and energy efficiency initiatives. The absence of standards and enforcement for Energy Performance Certificates contributes to inefficient energy use. The prevalence of greenhouse gas-emitting energy sources in buildings further impacts the city's environmental footprint: 51% of residential buildings in Gaziantep uses natural gas, 4.2% LPG, 17.21% lignite and coal, and 27.52% electricity[34]. In contrast, commercial buildings rely more on electricity (64%) than natural gas (36%), while public buildings overwhelmingly rely on natural gas (87% of total energy consumption, with the remainder relying on electricity)[35]. Unofficial estimates suggest that over 70% of buildings in Gaziantep do not meet building codes or standards[36], posing risks to occupants, as tragically demonstrated by the February 2023 earthquakes. Additionally, the lack of incentives for retrofitting existing residential buildings and installing rooftop solar discourages sustainable practices. To address these issues, it is crucial to avoid carbon lock-in and implement sustainable building practices, aligning new construction with long-term sustainability goals.

29 Ibid.
30 Ibid.
31 Ibid
32 Ibid

33 Ibid
34 Ibid.
35 Ibid
36 ibid.

INDUSTRIES

Lastly, the industrial sector in the city faces challenges concerning environmental hazards (including air, water and soil pollution) generated by production patterns and weak institutional regulation. A considerable reason for concern is the lack of availability on data on environmental impacts of the industrial zones, especially considering that the stakeholders identified environmental hazards posed by the growing industrial sector as a major challenge[37]. Although the industrial sector is the single largest source of GHG emissions, only around 7% of industrial energy consumption in Gaziantep currently comes from renewable energy[38]. Although it has been noted that nearly 100% of industrial wastewater in Gaziantep is being treated[39], exploring industrial wastewater reuse and recycling is also crucial to enhance sustainability within the industry. Efficient industrial waste management and recycling need improvement, and incentives to promote the digitalisation of the sector are essential.

37 Ibid.
38 Ibid.
39 Ibid.

Interlinkages between Challenges

As referenced in previous sections and illustrated in Figure 8, **three main pressure drivers** impact each GCAP sector and indirectly lead to environmental impacts – these include **Gaziantep's climate and physical geography, high population growth, and rapid growth of its industrial sector.**

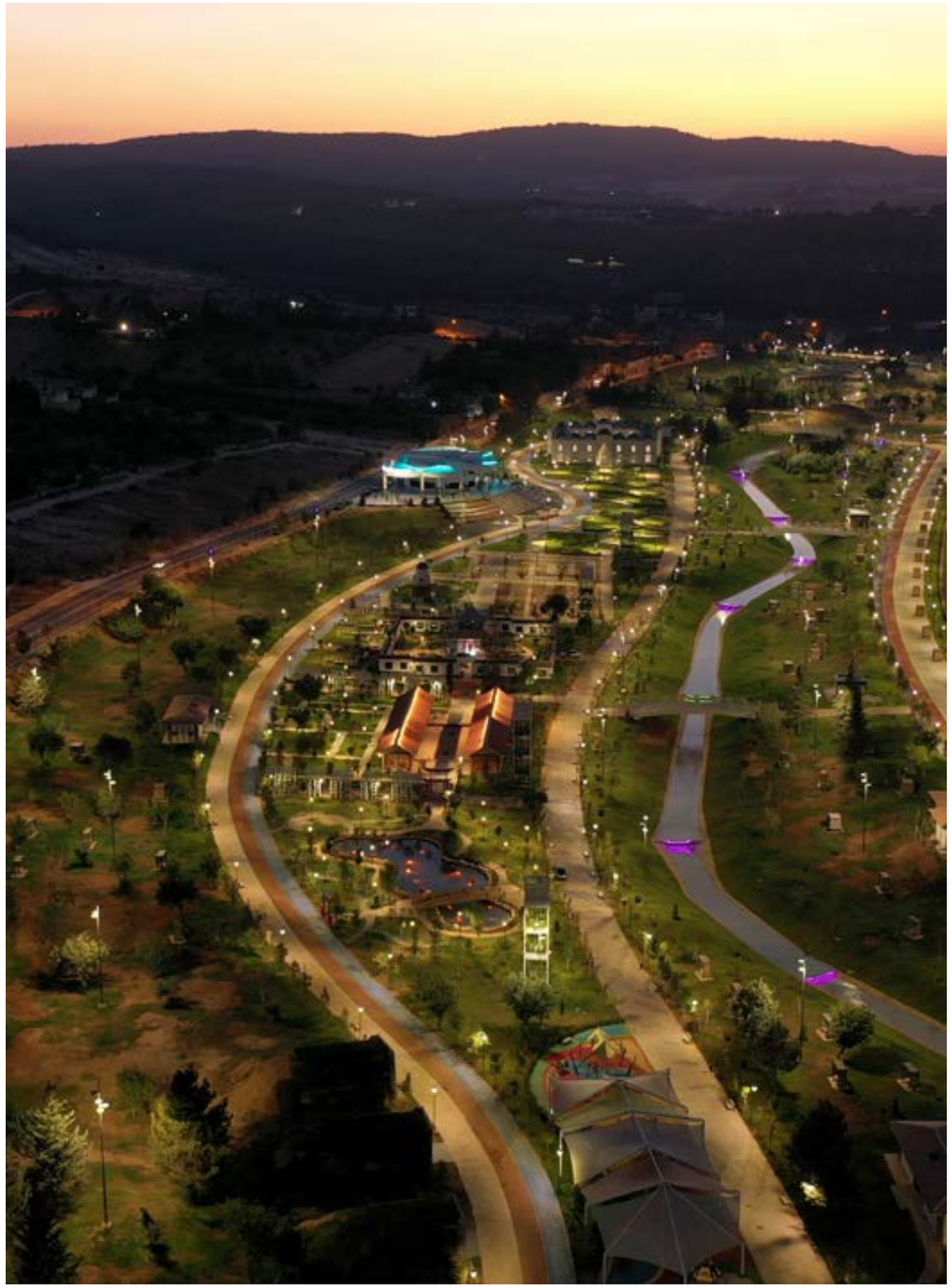
Each of these three pressure drivers affects, directly and indirectly, **the performance of each sector.** Further exacerbating the **impacts of these pressure drivers are direct and indirect interdependencies between the sectors,** as illustrated through the following examples:

- Gaziantep's **climate and physical geography** is such that the province is **dry and water scarce.** As there are limited water sources within provincial borders, a **costly and energy-intensive process** of water transfer from neighbouring provinces is required. The effects of climate change – including changing rainfall patterns and more frequent droughts – is likely to result in **long-term water insecurity.**
- The **high population growth** experienced by the city over the last ten years has led to an increased demand for housing, causing **urban sprawl** into pastoral land, farmlands, scrubland and unprotected forests and **additional pressure on transport systems** in the city. Development of public transit cannot match the rate of increase in demand, leading to **increased use of private vehicles and a negative impact on air quality.**
- **Industrial development** within the province has been a key driver of economic growth but has also exacerbated the **high demand for energy and put pressure on solid waste disposal systems** in the province, leading to increased GHG emissions due to the use of high carbon-emitting energy sources and **increased soil and air pollution due to improper waste disposal**.

At the same time, these **cross-sectoral linkages can enable positive cascading impacts from a few, strategically targeted actions,** particularly in sectors or areas where GMM is able to exert control, as illustrated by the following examples:

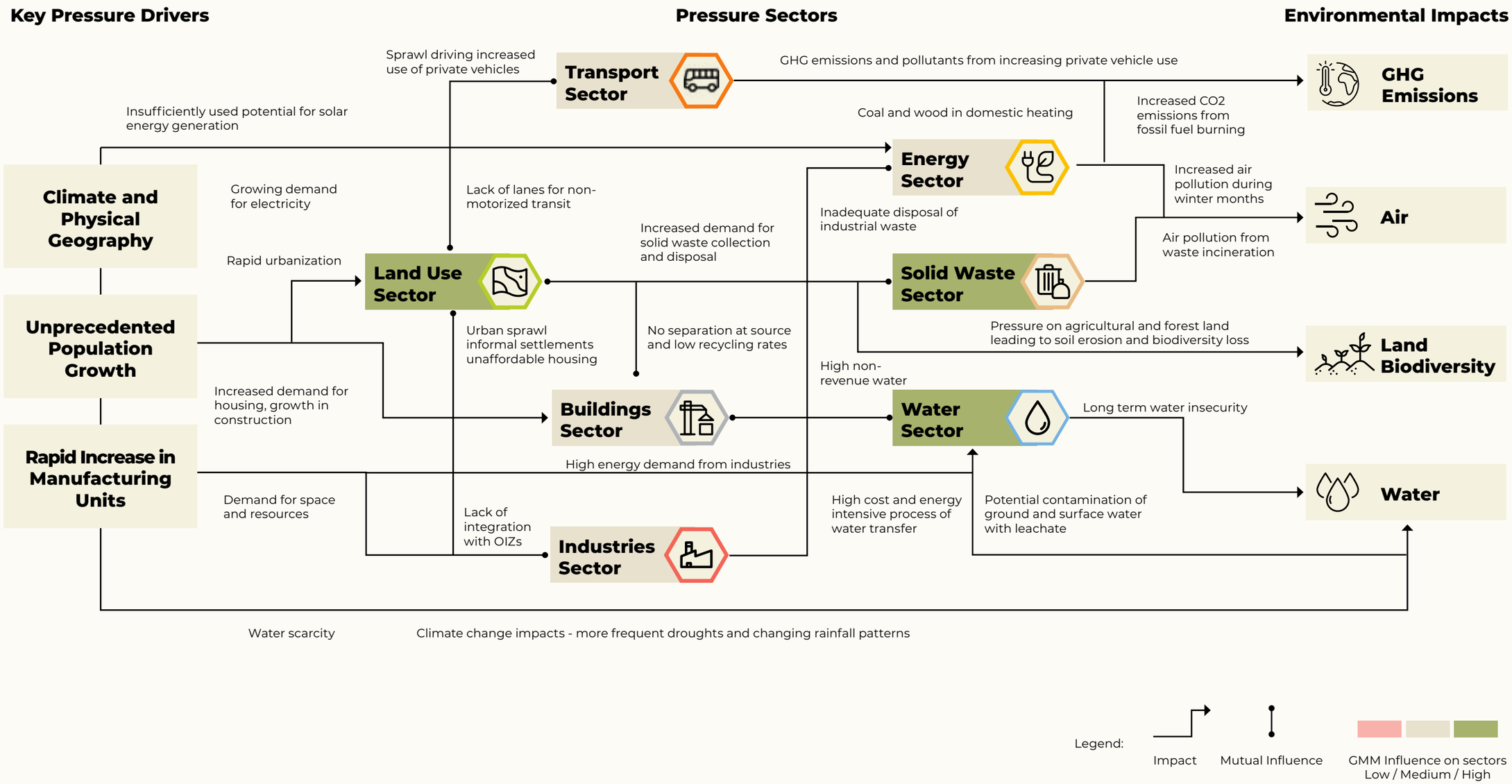
- Fostering and promoting **mixed-use, transit-oriented developments** across the urban core and its immediate periphery can result in r**educed use of private vehicles**, with a consequent **positive impact on air quality and GHG emissions from the transport sector.**
- **Incentivising improved energy efficiency of residential buildings** will reduce the demand for natural gas, reducing pressure on the energy system as well as support eliminating the use of coal and wood for heating, thus **contributing to a reduction in GHG emissions.**
- **Encouraging the use of treated wastewater** for construction, landscaping, or industrial use can reduce **the demand on water supply infrastructure,** while also **addressing the risk of soil pollution** from untreated wastewater.

Actions in this GCAP look to leverage similar positive feedback loops where possible to mitigate environmental challenges and support Gaziantep in achieving its Green City Vision and Strategic Objectives, described in the next section.



2023 Green City Action Plan (GCAP) Gaziantep

FIG 8. KEY PRESSURE DRIVERS OF ENVIRONMENTAL IMPACTS IN GAZIANTEP



3

Green City Challenges, Vision and Strategic Goals

The development of actions in Gaziantep's GCAP is informed by a Green City Vision that succinctly outlines the city's environmental ambitions for the year 2050. Nested under this Vision are Strategic Goals that identify medium-term areas of focus for each sector that help address the Green City Challenges, which are priority challenges for each sector that see the greatest need and provide the greatest opportunity for impact.

FIG 9. RELATIONSHIP BETWEEN GREEN CITY VISION, STRATEGIC GOALS, AND GREEN CITY ACTIONS

Source: AECOM, 2023.

Green City Challenges

Green City Challenges (Table 13) represent the focus areas for actions within each of the eight sectors relevant to the urban built environment: Water, Energy, Land use, Buildings, Industry, Solid Waste, Transport, and Climate Action.

For each sector, Green City Challenges were developed as outcomes from the baseline technical assessment carried out by international and local technical experts. These Challenges were then reviewed at meetings with GMM sectoral specialists, and 3-5 Green City Challenges were prioritised. Green City Challenges have been developed keeping in mind the urban policy and implementation context in Turkiye, as well as national and city-level priorities.

Legend

- ● Challenges selected as key Green City Challenges during Sectoral Meetings
- ○ Other challenges identified in baseline Technical Assessment

Table 13. Green City Challenges in Gaziantep

WATER

- ● **Long-term water insecurity**
- ● **Potentially high energy use from future water supply**
- ● **Lack of / enforcement of standards for treated wastewater for use in irrigation**
- ○ Lack of clearly identified of roles and responsibilities across plans and strategies
- ○ Quality of water from Hancagiz Dam
- ○ High non-revenue water
- ○ Surface and groundwater quality
- ○ Ageing and vulnerable assets

ENERGY

- ● **Lack of capacity in energy system**
- ● **Inadequate / unintegrated investment planning**
- ● **Inadequate electrical energy storage**
- ● **Increasing energy consumption**
- ● **High investment cost of natural gas interventions**
- ○ Solid fuels still used for domestic heating

SOLID WASTE

- ● **Lack of source separation for households or commercial buildings**
- ● **Lack of adequate facilities for hazardous waste disposal and incineration**
- ● **Implementation/enforcement of regulations on disposal of animal waste**
- ○ High costs of entire waste system
- ○ Inadequate management and processing of effluents
- ○ Insufficient monitoring, collection and availability of data

TRANSPORT

- ● **Increased use of private vehicles**
- ● **Lack of integration across different public transport modes**
- ● **Lack of lanes dedicated exclusively to public transport and micro-mobility vehicles (bicycles and scooters)**
- ● **Lack of car parks and parking lots**
- ○ Large contribution to GHG emissions
- ○ Lack of training on traffic rules/sharing the road with all types of road users
- ○ Lack of public transport connections with OIZs and satellite settlements

LAND USE

- ● **Lack of long-term planning**
- ● **Insufficient green and open spaces**
- ● **Empty sites / brownfield sites in existing settlements**
- ● **Unavailable or unaffordable housing**
- ● **Public transport systems do not serve medium term needs**
- ○ Pressure on older neighbourhoods
- ○ Urban sprawl and lack of integration of satellite cities
- ○ Alignment of locations of industrial areas with urban growth patterns

BUILDINGS

- ● **Lack of up-to-date/accurate buildings data**
- ● **Lack of standards / enforcement of Energy Performance Certificates**
- ● **Use of GHG emitting and polluting energy sources**
- ● **Unsuitable, unsafe buildings**
- ○ Insufficient incentives for retrofitting existing residential buildings
- ○ Insufficient incentives for rooftop solar
- ○ Lack of actions to avoid carbon lock-in in the sector
- ○ Unprecedented scale of construction activity

CLIMATE ACTION

- ● **Inadequate innovative measures, non-inclusive plans and strategies**
- ● **Lack of integrated approach to adaptation planning**
- ● **Lack of data for understanding impacts of climate change**
- ● **Pressure of rapid population growth on infrastructure**
- ○ Significant increase in emissions related to industrial energy consumption
- ○ Increasing frequency of heat waves and drought
- ○ Untapped potential for building resilience through nature-based solutions

INDUSTRIES

- ● **Environmental hazards generated by industries**
- ● **Weak and overly bureaucratic institutional structure**
- ● **Lack of incentives for proper wastewater/ solid waste management in OIZs**
- ○ Shortfalls in efficient waste management
- ○ Lack of incentives for digitalization of the sector
- ○ Financial difficulties in implementing green/low-carbon actions

Green City Vision

The **Green City Vision captures Gaziantep's ambition of its future state in the year 2050.** Co-created with the GCAP Steering and Technical Committees with input from stakeholders across the city, the Green City Vision aligns with other urban development visions defined by the Gaziantep Metropolitan Municipality, including in its Strategic Plan and Smart City Road Map. The Green City Vision sets a consistent and integrated direction for sustainable and resilient urban development in the city over the coming twenty-years and serves as the basis for sector-specific Sectoral Goals.

FIG 10. COMMON THEMES AMONG CURRENT VISION STATEMENTS BY GMM

To ensure consistency with other drivers of urban development in Gaziantep, the Green City Vision builds on common themes from vision statements included in GMM Strategies and Plans, such as:

To be a **global centre** that **carries tradition to the future**, produces values that glorify humanity, **seeks excellence** with a common mind, and **lives with taste.**

Gaziantep Strategic Plan 2020-2024

Gaziantep, Turkiye's leading smart city, offering **sustainable high quality** of life with **citizen-oriented** technological solutions integrated with all its stakeholders and the **culture of the city.**

Gaziantep Smart City Road Map 2022

To make Gaziantep a city with a **high quality of life at a sustainable development** level, which is shown as **an example** in the world with its **historical and cultural heritage** and **contemporary works**.

Gaziantep Metropolitan Municipality Webpage

Based on these common themes, the Consultant Team developed a draft Vision, which was reviewed with the GCAP Technical Committee. Two additional draft Visions were co-created with the Technical Committee and other stakeholders that formed the basis of the final Green City Vision for Gaziantep.

Using key themes in GMM strategic documents:

An **innovative and thriving regional centre** that provides a **high quality of life to all its residents**, **fosters its natural heritage**, and is **an exemplar of low-carbon and resilient urban development** in Turkiye.

Draft 1 co-created with GCAP Technical Committee:

The **pioneer of climate action**, the **smart, strong, green** city that acts with **a net zero vision**, and **protects its natural resources.**

Draft 2 co-created with GCAP Technical Committee:

A **smart, sustainable, green** city that **conserves its natural resources and manages its water, pioneering climate action**.

In 2050, Gaziantep will be...

A resilient and green city serving as an example of local climate action that works in a **collaborative and innovative manner** to **sustainably and resiliently manage its natural resources,** foster a **high quality of life for all residents,** and has **achieved net zero emissions.**

Strategic Goals

GCAP Strategic Goals (listed in Table 14) articulate medium-term areas of focus for each of the eight sectors to help achieve the Green City Vision in 2050. Strategic Goals provide a tangible target around which 'hard' and 'soft' actions within each sector have been identified and developed. In many cases, individual actions will help achieve more than one Strategic Goal across different sectors, providing a foundation for an integrated approach to sustainable and resilient urban development.

Table 14. Sectoral Strategic Goals

WATER

I. Sustainably manage water resources to build long-term water security
II. Reduce the rate of non-revenue water and per capita consumption
III. Climate-proof the water sector, including through nature-based solutions
IV. Enhance resilience to flood risk
V. Promote water re-use

ENERGY

I. Eliminate the use of coal for heating
II. Increase efficiency across the energy system
III. Improve resilience of energy infrastructure
IV. Maximise the share of renewable energy and fuels within the energy system

INDUSTRIES

I. Minimize environmental impact of industrial growth
II. Improve data collection and monitoring of industrial emissions
III. Incentivise transition towards low-carbon industrial development
IV. Increase the share of industrial energy consumption from renewables
V. Improve efficiency of resource use in industrial production
VI. Improve disposal and management of industrial waste

CLIMATE ACTION

I. Leverage natural assets to improve resilience to climate hazards
II. Improve collaboration, coordination, and integration for climate action
III. Explore new technologies for carbon emission management
IV. Reduce vulnerability of disadvantaged groups against climate change
V. Improve resilience of agriculture and food systems to climate change

LAND USE

I. Promote urban development along a climate-resilient and low-carbon pathway
II. Increase access and quality of green spaces for residents and visitors in the city
III. Foster neighbourhood identity and raise public awareness through land use planning
IV. Improve access for all residents to urban amenities
V. Foster natural and cultural heritage and biodiversity

BUILDINGS

I. Ensure availability of up-to-date data on building stock
II. Minimise GHG emissions from residential and commercial buildings
III. Incentivise take-up of green building measures in construction
IV. Achieve net zero emissions from all municipal and public buildings
V. Promote safe, affordable, and near-zero emission housing

SOLID WASTE

I. Promote zero-waste initiatives
II. Increase uptake of waste segregation in residential areas
III. Minimize the amount of waste ending up in a landfill
IV. Incentivise sustainable management of hazardous waste

TRANSPORT

I. Decarbonize the transport sector
II. Connect all residents across the city with public transport
III. Make the city a micro-mobility champion
IV. Minimize the use of private vehicles
V. Enhance the use of smart solutions for transport

4

Green City Actions

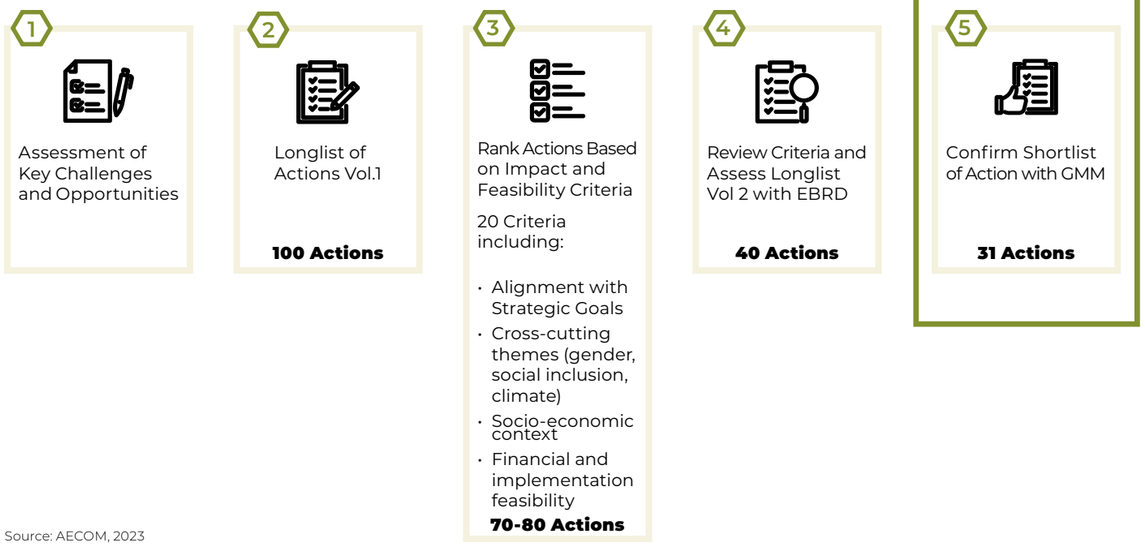
The actions developed for this GCAP have been developed in a collaborative manner and taking into account the city's unique environmental and sectoral challenges, as well as the Green City Vision and Strategic Goals. The actions also build on key opportunity areas identified with GMM and other key stakeholders, in line with the city's ambitions and existing potential.

Actions Overview

Following on from the technical assessment, and completion of the Green City Vision and Strategic Goals, the **Consultant Team compiled a longlist of approximately 100 actions.** The development of those actions was tailored to specific environmental and sectoral challenges in Gaziantep, as well as with the **Strategic Goals** identified for each sector and the overall vision (Figure 12). Each of the actions was then thoroughly evaluated using **~20 criteria grouped under 'Action Impact'** (each action was scored based on its alignment with the Strategic Goals for the sector, support for cross-cutting themes, and the potential to improve socio-economic outcomes) and **'Action Feasibility'** (each action was given a score based on its implementation and financial feasibility). The **~40 actions** with the highest scores were recommended for prioritisation, and those actions were then discussed and agreed with GMM and other stakeholders. This process resulted in a list of **31 priority actions** that form part of this GCAP (Figure 11).

As the subsequent sections show, each action has been described in detail, covering general information about **action owner and supporting institutions, location and type of action, as well as expected impact** (ranging from quantitative impact on key GCAP indicators, estimated carbon emissions reduction, to jobs created). Further sections outline **implementation details, including operational modality, timeframes, indicative costs, key technical aspects of the action and implementation steps, expected co-benefits, suggested financing approach, stakeholders** that could be brought in to support the implementation, and some of the **potential risks and barriers** that may apply to each action.

FIG 11. GCAP ACTION DEVELOPMENT PROCESS



Source: AECOM, 2023

Estimates of Investment Needs and Finance Sources

It is estimated that **EUR 70 million[40] are required for development and advisory support** for Gaziantep's GCAP actions[41]. Capital expenditures are estimated at EUR 2.82 billion[42] and operational expenditures over the first 5 years are estimated at EUR 260 million.

Estimates of Emission Reductions

Although based on only limited local data and assumptions informed by international good practice, **the carbon emissions reductions for the GCAP actions are estimated to be 1,099,810 tCO_2e per annum**[43] – making a direct contribution to Turkiye's Nationally Determined Contribution (NDC). Additionally, several of the proposed actions contribute to indirect positive effects and/or have the potential for significant upscaling beyond initial pilot activities, which allows for further carbon emission reductions, particularly in the medium-to-long term beyond the timeframe of this GCAP.

Estimates of Job Creation

In addition to those environmental benefits, it is estimated that several of the GCAP actions have the **potential for job creation, with an estimated 13,855[44] new jobs** being created through the construction, operation and maintenance works, as well as green economy services linked to several of the GCAP actions.

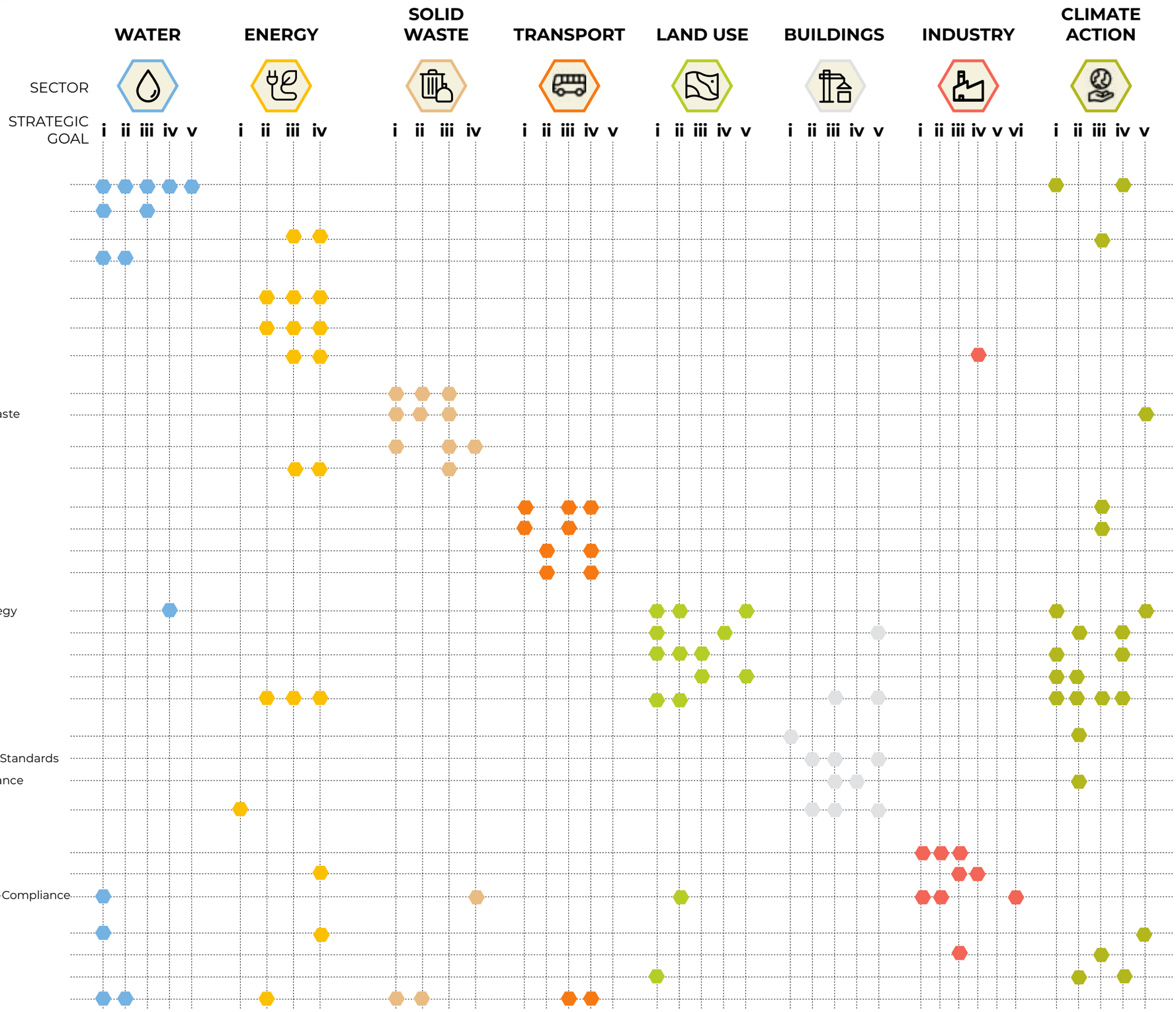
40 Note – at the time of writing the exchange rate was EUR 1 – TRY 28.8 (September 5, 2023)
41 Note – this figure does not include the estimated development and advisory support for Action LU5. The estimate development and advisory support required for Action LU5 is EUR 90,000.
42 Note – this figure does not include the estimated capital expenditures support for Action LU5. The estimate capital expenditures support required for Action LU5 is EUR 4,939,680.
43 Note – this figure does not include the estimated emissions reductions from Action LU5. The estimated emission reduction for Action LU5 is 1,408 tCO_2e per annum.
44 Note – this figure does not include the number of jobs created through the implementation of Action. The estimated number of jobs created from Action LU5 is 30. The figure is high level.

FIG 12. MAPPING GREEN CITY ACTIONS AGAINST SECTORAL STRATEGIC GOALS

As illustrated in this diagram, the thirty-one Green City Actions are grouped under eight sectors for ease of implementation, and contribute to multiple Strategic Goals across all eight sectors.

ACTIONS

- 01 Develop an Integrated Plan for Water Resources Management
- 02 Introduce Standard Processes for Data Collection and Monitoring of Ground and Surface Water
- 03 Transition to Net Zero Wastewater Treatment
- 04 Conduct Study to Reduce Non-Revenue Water
- 05 Identify Feasible Battery Energy Storage System (BESS) Opportunities
- 06 Strengthening Existing Electricity System Against Natural Disasters and Developing an Alternative Energy Storage System
- 07 Wind Farm Feasibility Study and Development
- 08 Feasibility Study for a 2-bin Waste Separate System for Households
- 09 Carry out Feasibility Studies for Collection and Valorisation Organic Waste
- 10 Inventorise Sources of Hazardous Waste Production in Gaziantep Hazardous Waster Management Plan
- 11 Build a New energy Plan Which Can Utilise RDF
- 12 Continue Expansion of the Active Travel & Micro Mobility Network
- 13 Bus Fleet Upgrade and Charging Infrastructure
- 14 Congestion Reduction Programme
- 15.Continue Expansion of the Light Rail Transport System
- 16 Develop an Integrated Landscape and Biodiversity Management Strategy
- 17 Pilot a Sustainable, Mixed-use, Mixed-income Housing Development
- 18 Plan and Pilot Resilience Parks
- 19 Implement a Meanwhile Use Programme
- 20 Ecological Village Project
- 21 Develop a Digital Buildings Database
- 21 Develop Feasible Approaches for Improving Compliance with Building Standards
- 23 Retrofit or Reconstruct Public buildings for Improved Energy Performance
- 24 Incentivise Low-Carbon Heating and Cooling, and Energy Efficiency in Residential Buildings
- 25 Digital Data Management Centre for Environmental Monitoring
- 26 Renewable Energy Generation Industrial Zone
- 27 Enforcing Businesses Accountability for Environmental Monitoring Non-Compliance
- 28 Climate-Smart Irrigation and Renewable Energy Systems
- 29 Develop A Study on Carbon Capture, Utilization, and Storage
- 30 Integrated and Evidence-based Climate Action Planning in Gaziantep
- 31 Raise Awareness on Sustainable Consumption in Gaziantep



WATER

WA1 Develop an Integrated Plan for Water Resources Management

WA2 Introduce Standard Processes for Data Collection and Monitoring of Ground and Surface Water

WA3 Transition to Net Zero Wastewater Treatment

WA4 Conduct a Study on Authorised Unbilled and Unauthorised Consumption and Develop a Phased Reduction Plan

WA1 Develop an Integrated Plan for Water Resources Management

Develop an integrated plan for water resources in Gaziantep including a climate risk assessment to identify integrated water demand/supply/quality projects for resilience.

INFORMATION

Status:
New

Location:
N/A

Type:
Strategies, plans, and programmes

Action Owner(s):
- GASKI
- DSI

Supporting Institutions:
- Department (Daire) of Water Management
- GMM Energy Management and Climate Change Branch Office
- Gaziantep OIZ
- Provincial Directorate of Environment, Urbanisation and Climate Change

Relevant Sector(s):

Related Actions:

WA4 - Conduct a study on authorised unbilled and unauthorised consumption and develop a phased reduction plan

Gaziantep is a water-scarce city, with limited water resources, high drought risk and generally poor water quality. The city has a growing population, with high water consumption levels per-capita, high industrial water use, and experiences high levels of non-revenue water, from physical losses as well as administrative. The multifaceted pressures on limited resources call for an integrated approach to management and identification of specific, impactful projects which can address these challenges. It is essential to consider an integrated approach to wastewater treatment, water reuse as well as resource recovery to capitalise on the benefits.

To date, there is no climate change risk assessment for the water sector although it is known that the city is likely to experience more regular and severe droughts, pressurising already limited resources. To adequately prepare for these events, GASKI will conduct a climate change risk assessment for the water sector to understand the extent of climate-related challenges on their ability to supply water and wastewater services to the community as well as stormwater drainage services in the future.

An integrated plan will be developed which includes a roadmap of investment projects and supporting actions to improve resilience through integrated water resources management. These may include specific projects and actions around:

- **Water supply and transmission:** This will include assessment of current water resources (including a climate risk assessment), alternatives for mid and long-term, transmission networks (including how to reduce leaks and network losses) and options for reducing the energy intensity of water transmission.
- **Stormwater management:** Projects to build resilience to stormwater, surface water runoff and flooding are likely to include green infrastructure techniques such as installation of raingardens, permeable pavements, and bioswales. Such techniques will simultaneously reduce localised flood risk, while improving water quality, supporting infiltration, reducing the urban heat island effect and supporting biodiversity. Other projects may include developing drought planning and early warning systems.
- **Water recovery and reuse:** With limited water availability in the municipality, Gaziantep will prioritise opportunities for recovering and reuse of water. This may include upscaling greywater reuse for irrigation and industrial processes, initiating water recovery projects for municipal uses (i.e. street cleaning, construction sites etc), indoor greywater uses (i.e. toilet flushing) or recreational uses (i.e. golf courses or other recreation). Pilot studies could be undertaken in industrial areas on water reuse and recovering.
- **Community engagement**: The IWRM plan should emphasise the importance of community engagement in the identification and selection of projects and encourage community ownership of any nature-based solutions projects. The plan could also include training for the community on water reuse and recycling, water conservation etc.
- **Training and capacity building:** Increasing capacity of GASKI and supporting institutions will vastly improve the resilience of the water sector to future pressures.

This action is aligned with the existing GASKI 2020-2024 Strategic Plan, which includes information on Gaziantep's water infrastructure, Sustainable Energy and Climate Action Plan (2018), as well as various sectoral plans (Drought Action Plan, Basin Management Plan, Sectoral Water Allocation Action Plan, and River Basin Action Plan).

INFORMATION

CA4 - Raising awareness on sustainable consumption in Gaziantep

Challenges Addressed:
Priority Environmental Challenges:

- Lack of published routine monitoring and reporting of surface and groundwater quality, and general lack of data relating to surface water bodies
- Elevated conductivity and nitrates
- Lack of integrated approach to adaptation planning
- Good understanding of natural hazards, but a need for better understanding of climate hazards Increased intensity and frequency of heatwaves and droughts
- Untapped potential for building resilience through nature-based solutions (NbS)

Green City Challenges:

- Long-term water insecurity

WA1

IMPACT

Strategic Goals Supported:

Wi | Sustainably manage water resources to build long-term water security

Wii | Reduce the rate of non-revenue water and per capita consumption

Wiii | Climate-proof the water sector, including through nature-based solutions

Wiv | Enhance resilience to flood risk

Wv | Promote water re-use

CA i | Leverage natural assets to improve resilience to climate hazards

CA iv | Reduce vulnerability of disadvantaged groups against climate change

IN iii | Lack of incentives for proper wastewater/ solid waste management in OIZs

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Cross-cutting Themes

Climate Action [Directly targeted]: Integrated water resources management is likely to lead to projects to reduce water demand and consumption, effectively also reducing energy and water usage. Opportunities for water reuse and recycling will also limit energy demand from pumping, transmission, and treatment, with a direct influence on reducing GHG emissions.

Gender and Social Inclusion [Some elements]: Development of the plan and selection of integrated water management will focus on community engagement and support community ownership of projects when established.

Smart Maturity [Some elements]: Integrated water resources management will likely identify opportunities for smart maturity development, including leakage detection (to reduce losses in the system), smart metering, water efficiency and optimisation technologies.

Co-Benefits

Resilience: (i) Water recycling and reuse will reduce pressure on scarce water resources through reuse of wastewater and create a closed cycle. (ii) Green infrastructure projects will reduce flood risk while lowering urban temperatures and providing shading, other resilience benefits include improved water quality.

Economic: (i) Recycling of wastewater will reduce the demand for abstraction, water treatment and pumping, therefore reducing energy requirements and financial costs. (ii) Projects related to stormwater, such as green infrastructure will minimise flood risk and extreme heat, resulting in reduced damages. (iii) Improving the transmission network will reduce the leaks, with positive economic impact.

Social: (i) New projects and technologies will create new employment opportunities for residents, and opportunities for upskilling and retraining. (ii) Green infrastructure projects have the dual benefit of creating spaces for recreation, and cool refuges for city residents as well as improved air and water quality. (iii) Stormwater infrastructure and green infrastructure reduces flood risk and surface water, improving safety and reducing the risk of injuries and fatalities from hazards.

IMPACT

Quantitative Impact measures:

2 - Biochemical Oxygen Demand (BOD) in rivers and lakes

2.1 - Ammonium (NH_4) concentration in rivers and lakes

3 - Water samples complying with national potable water quality standards

5 - Water Exploitation Index

25 – Domestic water consumption per capita

25.1 – Non-revenue water

25.2 – Daily number of hours of continuous water supply per household

25.4 – Potable water storage

25.5 – Water consumption per unit of city GDP

25.6 – Share of industrial water consumption

WA1

IMPLEMENTATION

Operational Modality:
The integrated plan will be developed and owned by GASKI and DSI.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost: €375,000

Capital Cost:
N/A

Development / Advisory Costs:
€375,000

Total cost 5-year Operational Cost:
N/A

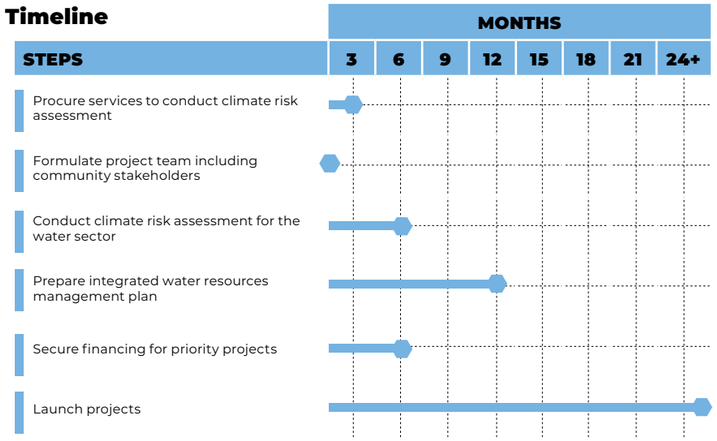
Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Revenue Opportunities:
Yes, to be determined from feasibility study.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 375,000**	Industry standard for consultancy fees for conducting CRA and developing a water resource integrated plan and investment roadmap
Component 1 – Climate risk assessment for the water sector	EUR 75,000	6-month consultancy
Component 2 – Development of water resources masterplan and investment roadmap	EUR 300,000	12-month consultancy
Capital Costs	EUR 0	
Operational Costs (over 5 years)	EUR 0	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Illbank	Involve
University of Gaziantep, other academic institutions	Consult
GMM Department of Urban Aesthetics and Green Spaces	Involve
Ipekyolu Development Agency	Involve

RISK

RISK TYPE	RISK	POTENTIAL MITIGATION
Social	Projects do not benefit most vulnerable or poor communities or negatively impact communities (through exacerbated flood risk displacement).	Community ownership will be encouraged for new projects. Project team will include community representatives to ensure projects have the most impact for vulnerable communities and to avoid negative consequences.
Technical	Lack of capacity to implement, maintain and operate projects.	Project will include upskilling of workforce and retraining to maintain and operate systems.

WA2

Introduce Standard Processes for Data Collection and Monitoring of Ground and Surface Water

Introduce standard processes for data collection and monitoring of ground and surface water quality and flow (level) data and implement annual reporting and publication of data.

INFORMATION

Status:
New

Location:
N/A

Type:
Monitoring, data collection, analysis, and studies

Action Owner(s):
DSI

Supporting Institutions:

- GASKI
- Department (Daire) of Water Management

Relevant Sector(s):

Related Actions:

WA1 - Develop an integrated plan for water resources management

Challenges Addressed:

Priority Environmental Challenges:

- Lack of published routine monitoring and reporting of surface and groundwater quality, and general lack of data relating to surface water bodies
- Elevated conductivity and nitrates
- Significant metal content in local groundwater

Green City Challenges:

- Long-term water insecurity

Limited data on the quality and quantity of ground and surface water in Gaziantep is currently available. For example, there are limited findings on surface water quality for the urban areas in Gaziantep; the provincial environmental report provides no surface water quality data. A number of hydrogeological studies have been undertaken, which suggest that groundwater locally has naturally elevated conductivity, nitrates and dissolved metals. Local groundwater is not a primary drinking water source for Gaziantep but is used for irrigation. Without consistent collection, monitoring and reporting of water resources data, effective decision making is a challenge for GASKI. There is therefore a need to introduce standard processes for data collection and monitoring of ground and surface water. A geographic spread of samples and information on both location and time are necessary to determine a baseline of the water 'state' situation, but this is not available at the current time. Potential problematic locations such as industrial discharges, should be included to the monitoring programme. Introducing standard processes for surface water and groundwater monitoring would create consistent data for understanding the water quality and availability in the region. It would also increase knowledge on the state of effectiveness of water treatment of industrial effluent.

Both surface water and groundwater should be monitored within the area year-round. Monitoring locations should have a good geographical spread – this should include locations upstream of the city and industrial activity and downstream as well as monitoring water resource sources such as the springs in the south-east.

Some requirements for the monitoring to standardise the approach:

- The monitoring should be undertaken at the least quarterly in all seasons across both wet and dry and shoulder seasons. Groundwater samples shall be taken after purging the borehole to minimum three borehole volumes. Surface water samples can be taken as grab samples.
- Water level (continuous monitoring).
- Selected locations shall be installed with a telemetry unit to monitor the level and quality. Alarm levels should be set to get an early warning on quality, drought, flood etc.
- Water level spot measurements.
- Standard set of water quality parameters for groundwater and surface water.
    - Groundwater samples shall be analysed in line with *The Regulation on Protection of Groundwater Against Pollution and Deterioration* and
    - Surface water samples, in line with *The Regulation on Monitoring of Surface Water and Groundwater.*
- Time and date of monitoring.
- Location of monitoring.
- Yearly analysis and reporting of data.
- Where surface water locations are ephemeral, they should still be visited to make record of the dry periods.

All data collected should be stored in a central database to allow data sharing.

Implementation:

- Locations for monitoring selected.
- Standard form for data collection possible use of digital technology to collect data and database to receive the data.
- Pilot project for small selection of locations.
- Feedback from pilot project feedback and improvements made to monitoring template.
- Training session for anyone who will be involved in data collection. This is to ensure consistency between monitoring techniques.
- Roll out monitoring scheme.

Where monitoring is required near industrial sites, it may be possible to get buy into to scheme from the industries to do the monitoring in their area. Data sharing between industrial zones in Gaziantep and GASKI would be essential. All data should be stored in central database.

It is known that State Hydraulic Works (DSI) and Department (Daire) of Water Management (SYGM) has extensive experience on river basin planning and development and implementation of monitoring programmes in Turkiye. Both governmental bodies can be consulted to implement an effective monitoring programme.

This action supports the existing Sustainable Energy and Climate Action Plan (2018) as well as DSI Action Plan.

WA2

IMPACT

Strategic Goals Supported:
Wi | Sustainably manage water resources to build long-term water security

Wiii | Climate-proof the water sector, including through nature-based solutions

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: 13

Quantitative Impact measures:
2 - Biochemical Oxygen Demand (BOD) in rivers and lakes

2.1 - Ammonium (NH4) concentration in rivers and lakes

3 - Water samples complying with national potable water quality standards

Cross-cutting Themes

Climate Action [Directly targeted]: Having standard processes for surface water and groundwater monitoring could provide consistent data that would enable better planning and evidence-based decision making for the water resources, which will be essential to reduce the impact of climate-related hazards (like droughts).

Gender and Social Inclusion [No elements]: There are no elements of this action that directly relate to gender and social inclusion.

Smart Maturity [Some elements]: There is potential to integrate various digital technologies for this action, and the action is also expected to strengthen GASKI's and GMM's capacities on data management.

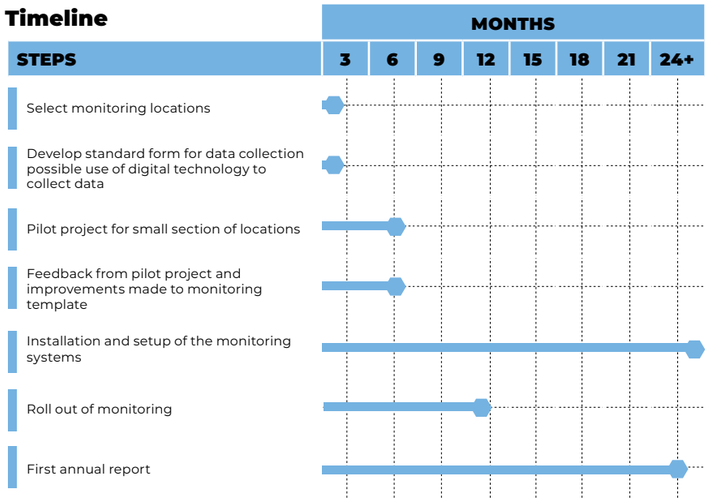
Co-Benefits

Resilience: (i) Improved data monitoring and awareness will ultimately improve ground and surface water quality, increasing the availability of water resources and contributing to community resilience. (ii) Integration of this action with existing early-warning systems can help inform prevention against flood events.

Economic: (i) The economic benefit of this action will be through improved decision making and coordination, that will help to reduce costs through informed water resource planning. (ii) With closer monitoring of water quality, there will be reduced damages from poor water quality as any contamination can be identified and addressed rapidly, and the action also has the potential to reduce raw water treatment needs.

Social: (i) The action will benefit local communities who rely on locally sourced water for irrigation and personal use.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 335,000**	
Component 1 – Develop standards for data collection and development of digital monitoring system	EUR 25,000	2-month consultancy
Component 2 – Piloting monitoring system	EUR 50,000	6-month consultancy
Component 3 – Refinement of monitoring system	EUR 50,000	6-month consultancy
Component 4 – Rollout and installation of monitoring systems	EUR 200,000	12-24 -month consultancy
Component 5 – Annual report	EUR 10,000	Broad estimate
Capital Costs	**EUR 350,000**	
Component 1 – Procurement of measurement equipment and data management system	EUR 350,000	Based on EBRD estimates
Operational Costs (over 5 years)	**EUR 52,500**	Estimated 3% of investment costs

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Provincial Directorate of Environment, Urbanisation and Climate Change	Consult
Department (Daire) of Water Management, Ministry of Agriculture and Forestry	Involve
University of Gaziantep, other academic institutions	Consult
GMM Energy Management and Climate Change Branch Office	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Lack of financing options for monitoring.	A pilot project might make it more attractive to potential donors.
Technical	Incorrect storage of data in the central database.	Digital collection of data sent directly to database would make certain of data security.
	Lack of technical expertise to undertake the monitoring.	Training for the staff will be undertaken to ensure sufficient experience and consistency between results. DSI and SYGM can also provide support for capacity-building.

IMPLEMENTATION

Operational Modality:
Data collection process and monitoring will be led and conducted by DSI.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost: €685,000

Capital Cost:
€350,000

Development / Advisory Costs:
€335,000

5-year Operational Cost:
€52,500

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Loan - State-owned banks, commercial banks, IFIs

Revenue Opportunities:
No

WA3 Transition to Net Zero Wastewater Treatment

Transition to net zero wastewater treatment through investment in renewable energy technologies and energy efficiency measures in the operation of all WWTPs.

INFORMATION

Status:
Ongoing

Location:
All wastewater treatment facilities in Gaziantep

Type:
Capital Investment

Action Owner(s):
GASKI

Supporting Institutions:

- GMM Department (Daire) of Environmental Protection, Zero Waste and Climate Change
- GMM Energy Management and Climate Change Branch Office
- OIZ

Relevant Sector(s):

Related Actions:
None that are directly relevant for this action.

Challenges Addressed:

Green City Challenges:

- Potentially high energy use from future water supply
- Increasing energy consumption

Wastewater treatment is known to be a carbon-intensive process, typically the energy needed for a wastewater treatment plant (WWTP) using aerobic activated sludge processes and anaerobic digestion is 0.6 kWh per m^3 of wastewater treated.[45] Climate change increases water demand, while regional water insecurity challenges require an integrated approach to the water-energy nexus, focus on recouping benefits from wastewater treatment, water reuse and recovering resources.

To reach net zero in wastewater treatment, GASKI will need to minimise the wastewater first (through policies and practices aimed at maximising reuse and recycling of wastewater), and then scale up existing interventions and explore new technological opportunities. Possible strategies could include:

- Improving energy efficiency of processes
- Installing or upscaling on-site renewable energy systems and upgrading biogas production
- Exploring opportunities for energy generation from treated effluent (e.g. heat pumps)
- Decentralisation of water-energy supply facilities (standalone or hybridised facilities or facilities integrated into centralised WWTPs)[46]

This could involve some or all of the following:

- Investment in renewable energy systems (i.e. solar panels or wind turbines)
- Upscaling biogas collection (i.e. through anaerobic bioreactors to produce heat and bioelectricity)
- Fitting of Archimedes screw turbines at all WWTPs
- Investing in energy efficiency infrastructure (i.e. high-efficiency pumps, blowers and motors)
- Process optimisation and automation (i.e., installation of advanced process control systems, sensors and data analysis to automate and optimise treatment processes)

This action relates to the following plans and strategies already developed by GMM:

- Gaziantep Sustainable Energy and Climate Action Plan 2018: GMM set a target to reduce greenhouse gas emissions by at least 40% by 2030.
- Gaziantep Climate Change Action Plan 2016: The plan sets to improve the energy efficiency of WWTPs and sludge treatment, increasing the calorific value of sewage sludge and reducing CO_2 emissions.

45 Rani, A., et al. 2022. Pathways to a net-zero-carbon water sector through energy-extracting wastewater technologies. Nature. Available: https://www.nature.com/articles/s41545-022-00197-8
46 Rani, A., et al. 2022. Pathways to a net-zero-carbon water sector through energy-extracting wastewater technologies. Nature. Available: https://www.nature.com/articles/s41545-022-00197-8

Cross-cutting Themes

Climate Action [Directly targeted]: Reaching net zero through investment in energy efficiency, installing renewable energy sources (RES) and other aspects of this action will directly reduce carbon emissions from wastewater treatment.

Gender and Social Inclusion [No elements]: None that are directly applicable for this action.

Smart Maturity [Directly targeted]: Likely strategies for reaching net zero wastewater treatment will include smart data analytics including process optimisation techniques, smart sensors and other automation technologies.

Co-Benefits

Resilience: (i) Implementing energy efficiency measures and installing local RES, will reduce dependence on external energy sources and improve energy independence. This will ensure wastewater treatment can proceed with throughout disruptions, such as natural hazards. (ii) Water reuse and recycling systems which may be considered as part of this action will improve water resource management and reduce water demand and reliance on freshwater sources for uses such as irrigation or industry.

Economic: (i) Optimising process and improving efficiency will reduce the financial costs of each m3 of wastewater treated. (ii) New technologies are likely to produce saleable outputs, such as biogas, heat and electricity which could be sold to the grid, providing a revenue stream for GASKI. (iii) Minimising the amount of wastewater means there is less to treat, which will result in cost-savings.

Social: (i) Design and construction of new infrastructure and RES will result in new employment opportunities for the local community as well as opportunities for upskilling and retraining.

IMPACT

Strategic Goals Supported:
ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

CA iii | Explore new technologies for carbon emission management

Estimated benefit(s):

CO_2 savings:
40 tCO_2e per annum

Job Created:
22

Quantitative Impact measures:
8: Annual CO_2e emissions per capita

8.1: Annual CO_2 emissions per unit of GDP

16: Share of renewable in total energy consumption

27.1: Energy used for wastewater collection and treatment

WA3

IMPLEMENTATION

Operational Modality:
Renewable energy technologies and energy efficiency measures in all operation of wastewater treatment plants will be developed by GMM Energy Management and Climate Change Branch Office. Investment opportunities to be led by the branch office. Overall the transition to net zero wastewater treatment will be carried out by GASKI in consultation with the branch office.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost:
€21,600,000

Capital Cost:
€20,000,000

Development / Advisory Costs:
€1,600,000

5-year Operational Cost:
€2,000,000

Potential Financing Instruments:

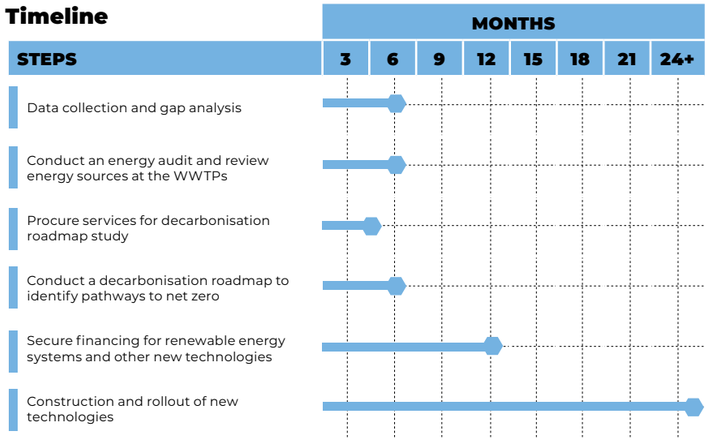
Instrument:
Own source -GMM, GASKI

National government, IFI, International Organisations

Loan - Government-owned bank, IFI

Revenue Opportunities:
No

Timeline



Financing Approach

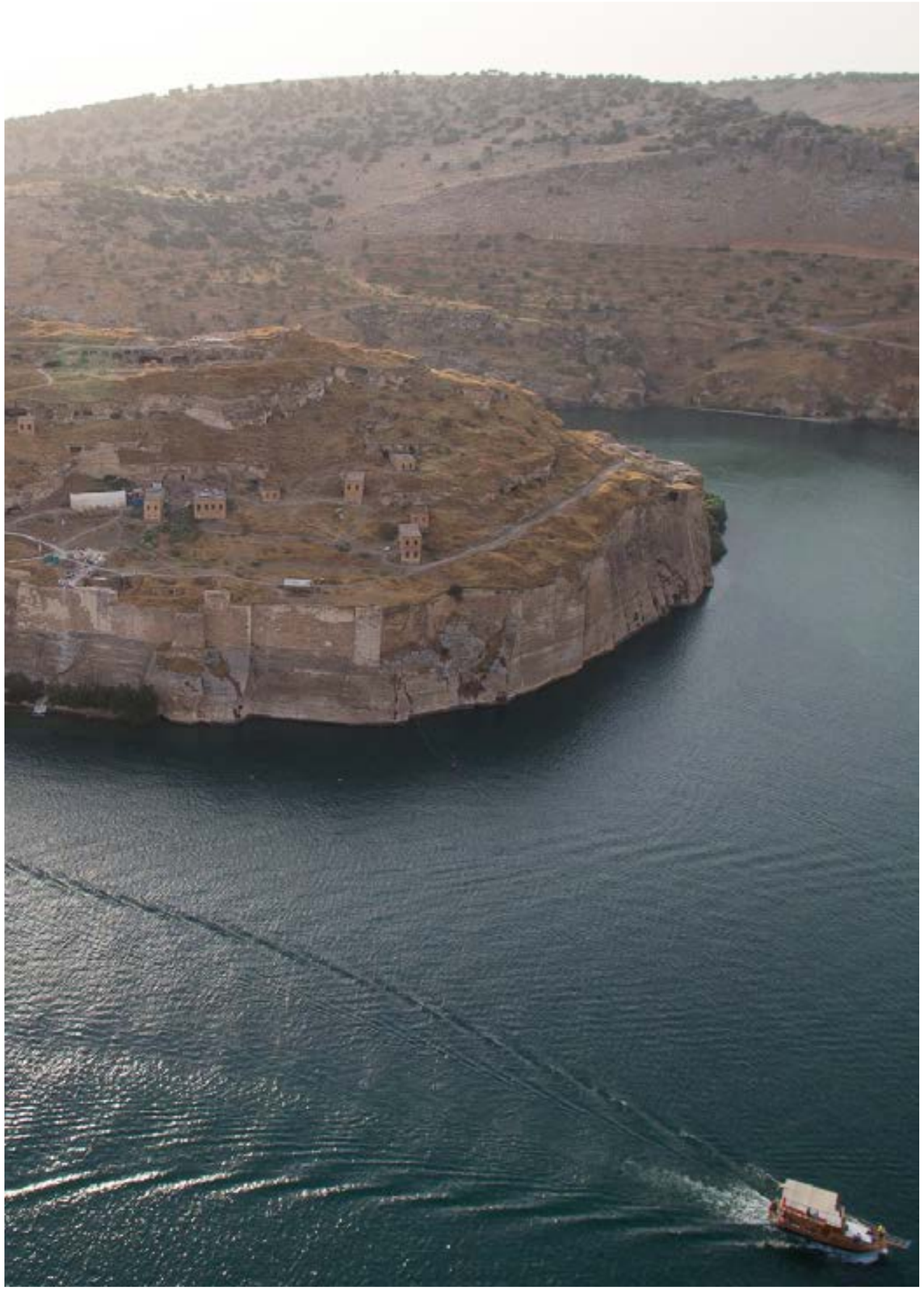
COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 1,600,000**	Industry standard for consultancy fees for conducting decarbonisation roadmap for integrating renewable energy and energy efficiency measures. The findings from the feasibility study will inform the scale required, the type of technologies and financing required to achieve targets
Component 1 – Energy audit and review energy sources for WWTP	EUR 100,000	6-month consultancy
Component 2 – Decarbonisation roadmap	EUR 100,000	6-month consultancy
Component 3 – Supervision of works applying 7% of construction costs	EUR 1,400,000	Construction duration
Capital Costs	**EUR 20,000,000**	Based on EBRD suggestions
Component 1 – Construction of 1 anaerobic digestion facility for sludge treatment	EUR 20,000,000	Assumed EUR 20 million to construct 1 anaerobic digestor within a WWTP to treat sludge waste
Operational Costs (over 5 years)	**EUR 2,000,000**	Estimated 2% of investment costs

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Provincial Directorate of Environment, Urbanisation and Climate Change	Involve / Consult
DSI	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	New technologies financially inaccessible.	Through a feasibility study, new projects will be financially attractive to donors and therefore, GMM could secure loans to rollout RES related energy efficiency investments and alternative technologies.
Technical	Lack of available energy data.	A short data collection phase and gap analysis will help to identify the types of data which are available ahead of the energy audit.



WA4 Conduct a Study on Authorised Unbilled and Unauthorised Consumption and Develop a Phased Reduction Plan

Conduct a study on authorised unbilled and unauthorised consumption and develop a phased reduction plan.

INFORMATION

Status:
New

Location:
N/A

Type:
Monitoring, data collection, analysis, and studies

Action Owner(s):
- GASKI
- DSI

Supporting Institutions:
GMM Energy Management and Climate Change Branch Office

Relevant Sector(s):

Related Actions:
WA1 - Develop an integrated plan for water resources management

CA4 - Raising awareness on sustainable consumption in Gaziantep

Challenges Addressed:
Green City Challenges:

- Long-term water insecurity
- Pressure of rapid population growth on infrastructure

Total non-revenue water (NRW) in Gaziantep is high, with 49.83% of potable water being lost (2021). This is a major challenge in Gaziantep, as a water scarce city battling migration and population growth and water availability shortages with climate change. Recently, GASKI have implemented measures to drastically reduce physical losses through innovative programmes, but high NRW persists. There appear to be multiple sources for this, including leakage, unknown losses, and known unmetered and unbilled use (possibly from informal settlements or industry). However, much of this is speculative. As such, a study should be conducted to unequivocally identify the sources and locations of these losses to produce a reduction plan. To minimise any negative impacts to poor or vulnerable households, the reduction plan should be phased to allow households to find alternative means of affording tariffs or subsidies could be provided, so that these groups are not disproportionately affected.

Part 1: Study

The study should cover the following:

- Developing a log of complaints, infrastructure failures, leakages and other water supply issues as well as earthquake damage.
- Mapping of areas with the highest difference in pumped water versus billed water (to identify the areas with the highest losses).
- Analyse the data from the two exercises to identify questionable water usage patterns which may identify illegal or unauthorised connections.
- Support the analysis with site visits and consultations with civil society and stakeholders to corroborate findings and to understand vulnerabilities among the population using unauthorised connections.
- Support these activities with ultrasonic water leak tests and flow balance analysis on pump stations, to rule out inaccurate metering and leaking pipes are alternative sources of water losses.

Part 2: Phased Reduction Plan

Based on the findings of the study, GASKI will prepare a phased reduction plan with the support of the Department of Environmental Protection, Climate Change and Zero Waste, to monitor and advise on the equitability of the plan. Using an incremental approach, GASKI will prepare a comprehensive NRW multi-year plan, including annual targets, yearly interventions and incorporating budgetary and organisational support.

The reduction plan should include:

- Development of an illegal use reduction policy which describes the types of water use which are illegal (i.e. by-passing a meter, reconnections after non-payment, independently connecting to the network, reversing a water meter etc).
- A supporting publicity campaign which specifies GASKI's position on illegal water use and updated approach to tackling it .
- A monitoring and evaluation processes to update the plan responding to real-time developments in NRW.
- The reduction plan may include some of the following which are most suitable after the findings of the study:
- Roll out of smart meters for connected households to accurately monitor water use.
- Adopting a gradual penalty scheme for illegal connections, which are means adjusted and relative to the offence and the industry (where relevant).
- Providing a reward mechanism for informers.
- Payment agreements with individuals that are unable to pay off fines.

WA4

IMPACT

Strategic Goals Supported:
W i | Sustainably manage water resources to build long-term water security

W ii | Reduce the rate of nonrevenue water and per capita consumption

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
5: Water Exploitation Index

8: Annual CO_2e emissions per capita

8.1: Annual CO_2 emissions per unit of GDP

25.1: Non-revenue water

25.2: Daily number of hours of continuous water supply per household

25.3: Energy used for urban water production and supply

Cross-cutting Themes

Climate Action [Directly targeted]: Reducing non-revenue consumption will reduce the volume of drinking water which is pumped to the city, due to the topographic situation of the city, pumping water is energy and carbon intensive. The study will provide GASKI with a detailed depiction of the water demand situation in the city, allowing them to prepare for climate-induced water fluctuations more accurately.

Gender and Social Inclusion [Some elements]: The phased reduction plan will include options to support low-income households to access water supply, this may include subsidies, grants and support programmes.

Smart Maturity [Directly targeted]: GASKI already utilise the Supervisory Control and Data Acquisition (SCADA) programme to detect leaks, as part of the phased reduction plan this programme may be expanded and additional smart technologies adopted. The phased reduction plan could include further roll-out of smart meters to households to accurately monitor water usage.

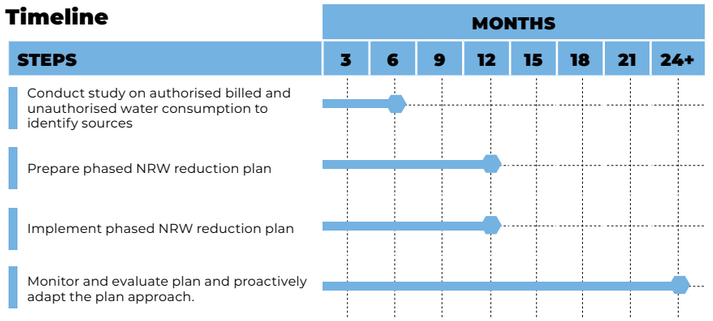
Co-Benefits

Resilience: (i) A phased reduction plan will reduce NRW, improving drinking water availability for the city. (ii) Lower NRW reduces the demand on abstraction, improving the water network's resilience.

Economic: (i) Understanding the unmetered and unbilled losses will enable GASKI to charge to collect a higher proportion of tariffs from water users, and to develop a means-adjusted tariff system, allowing them to charge more, for example for certain industries. (ii) reducing NRW will reduce the amount of water losses, which directly correlate to financial losses for GASKI.

Social: (i) Better management of NRW will increase revenue for GASKI, enabling more water availability for the city, including more capacity to develop new service extensions.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 250,000**	Industry standard for consultancy fees for conducting studies on water consumption and reduction measures
Component 1 – Study on unbilled water and unauthorised consumption and development of a phased reduction plan	EUR 250,000	18-month consultancy
Capital Costs	**EUR 7,000,000**	Assumption of indicative budget to be earmarked
Component 1 – Budget allocated for the implementation of NRW reduction plan	EUR 7,000,000	Based on EBRD estimates
Operational Costs (over 5 years)	**EUR 700,000**	Estimated 2% of investment costs

Stakeholders

STAKEHOLDERS	ENGAGEMENT
GMM Department of Environmental Protection, Climate Change and Zero Waste	Consult
University of Gaziantep, other academic institutions	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Social	Disproportionate negative impacts for poor households.	As part of the phased reduction plan, a social impact assessment should be conducted to fully understand the impacts for these groups and propose mitigation measures to protect vulnerable households. GASKI should consider providing a medium-term subsidy scheme or means-adjusted tariffs to minimise the impact for poor households transitioning to paid water supply.
Economic	Effective prioritisation of works for task 2.	Task 1 data collection will be important to do this effectively.
Technical	GASKI capacity constraints to roll out phased reduction plan.	Ahead of the phased reduction plan development, a project team will be developed across multiple organisations to share the tasks of the plan and reduce pressure on GASKI as the sole responsible party
	Poor data availability or management making phase 1 challenging.	Site visits will support any desk-based study, to both corroborate findings but also to fill any remaining gaps.

IMPLEMENTATION

Operational Modality: Study of unbilled and unauthorised water consumption will be carried out by GASKI and DSI. The phased reduction plan will be developed and delivered by GASKI and DSI in consultation with GMM Energy Management and Climate Change Branch Office.

Implementation Timeframe and Timeline: 2023-2025

Indicative Total Cost: €7,250,000

Capital Cost: €7,000,000

Development / Advisory Costs: €250,000

5-year Operational Cost: €700,000

Potential Financing Instruments:

Instrument: Own source - GMM

Grant - National government, IFI, International Organisations

Loan - Commercial banks, IFI

Revenue Opportunities: Yes, to be determined by the feasibility study.

ENERGY

ENG1 Identify Feasible Battery Energy Storage System (BESS) Opportunities

ENG2 Strengthening Existing Electricity Systems Against Natural Disasters and Developing an Alternative Energy Storage System

ENG3 Wind Power Plant Feasibility Study and Development

ENG1 Identify Feasible Battery Energy Storage System (BESS) Opportunities

Carry out a feasibility study identifying the best BESS opportunities to store excess electricity and/or heat. This may be in the form of utility scale storage or smaller scale serving local generation to feed a localised load (e.g., Solar PV on municipal buildings).

INFORMATION

Status:
New

Location:
N/A

Type:
Investment-related feasibility study

Action Owner(s):
GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:

- GMM Department of Transportation
- GASKI
- Ipekyolu Development Agency

Relevant Sector(s):

Related Actions:

ENG2 - Strengthening existing electricity systems against natural disasters and developing an alternative energy storage system in case of disasters

Developing energy storage solutions is essential for storing electricity / heat generated by renewable technologies (e.g., solar PV, wind etc.) that are reliant on external factors and therefore generate energy on an intermittent basis. Battery Energy Storage Systems (BESS) offer the opportunity to store excess heat or electricity during times of peak generation, and to reduce heat waste. They can improve the resilience of the electrical infrastructure by providing energy to critical loads when there is an electrical interruption (e.g., power outage due to climate extreme). They can also increase the share of renewables in the total energy consumption and can utilise land that may be unsuitable for other uses (e.g., brownfield sites). A variety of BESS technologies exist, each with their own advantages and disadvantages dependent on the reason for development. A feasibility study provides the opportunity to explore both existing, market-ready BESS technologies as well as innovative technologies such as compressed air, liquid air, or hydrogen to understand feasibility, scale, and potential locations of such systems to serve Gaziantep.

This action involves carrying out a feasibility study to identify the best BESS opportunities for Gaziantep to store excess electricity produced by renewable sources across the electricity grid or within Gaziantep province and develop suitable pilot projects to capitalise on these opportunities.

The benefits of a feasibility study may be diminished if the outcomes are not clearly defined. The feasibility study should therefore identify a clear focus at inception, to ensure that feasible and implementable opportunities are identified and tested by the end of the study. The feasibility study should, at a minimum, look to address the following aspects:

- **Type of energy stored:** Energy storage solutions exist to store both electrical energy and energy in the form of heat. A decision on whether the feasibility study should consider opportunities for storage of both electricity and heat, or just electricity should be made at the beginning of the study. If heat storage is included, it is recommended that the feasibility studies are undertaken simultaneously. This will allow for their outcomes to be reviewed at the same time to allow for a storage master plan to be created. The feasibility study for electricity should also assess suitable types of battery storage that should be considered for the context.
- **Scale of intervention:** BESS opportunities may be in the form of utility scale storage (i.e., at the grid level) or storage serving local generation or localised loads (e.g., solar PV on municipal buildings). Depending on the potential action owners, financial resources available, and interest from key stakeholders, one of these scales may be more suitable for the feasibility study to focus on.

- **Identification of potential sites:** The BESS feasibility study should utilise available information to create a map that provides a clear picture of the potential constraints and opportunities for installation and identifies potential land parcels for installation. Constraints may include ecologically or culturally sensitive areas (e.g., habitats for protected species, protected ecological sites, World Heritage sites, scheduled monuments, listed buildings, areas of archaeological significance), natural resources such as watercourses or agriculturally important land, and land with unsuitable topography. Depending on the context, land parcels may present optimal opportunities for BESS if located near electricity grid connection points, utility scale renewable energy technologies (e.g., Solar PV, Solar thermal), or significant heat sources (e.g., data centres).
- **Feasibility assessment:** Once potential sites are identified, a high-level assessment of BESS suitability and feasibility should be undertaken. This should review both the mapped constraints as well as the requirements for energy storage at the site. This assessment should include both a technoeconomic assessment as well as a review of the potential energy source at the site (e.g., Solar PV) and the load which it could feed (i.e., to the grid or a local demand such as EV charging points).

This action relates to the following plans and strategies at the national or metropolitan level:

- **Turkiye's Eleventh Development Plan (2019 – 2023):** This action supports a measure in the Eleventh Development Plan that focuses on increasing installation of energy storage systems to eliminate the constraints of increasing renewable energy on the grid.
- **Control of Waste Batteries and Accumulators Regulation No. 25569:** This regulation explains the responsibilities of public institutions in waste battery storage processes, selection of storage areas and operation of storage areas. This should be consulted in the feasibility study process.
- **National Energy Efficiency Action Plan 2017-2023:** This plan states a total of 7.5 GW installed capacity of battery storage planned for the year 2035. This feasibility study supports this target.
- **Climate Change Adaptation Plan (under preparation).**

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Lack of innovative measures, inclusive plans, and strategies for climate action
- Need for more innovative / ambitious measures for emission reduction

Green City Challenges:

- Lack of capacity in energy system
- Inadequate electrical energy storage
- Increasing energy consumption
- Use of GHG emitting and polluting energy sources
- Pressure of rapid population growth on infrastructure

ENG1

IMPACT

Strategic Goals Supported:
ENG ii | Increase efficiency across the energy system

ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

Estimated benefit(s):

CO_2 savings: N/A*

Job Created: N/A

Quantitative Impact measures:
14.1: Electrical interruptions

16.0: Share of renewable in total energy consumption

17.0: Power outages by climate extremes

Not possible to calculate on the basis of existing data.

Cross-cutting Themes

Climate Action [Directly targeted]: BESS are critical to the decarbonisation of the electricity grid and the energy sector, so if the feasibility study confirms their potential application in Gaziantep, this would bring significant carbon reduction benefits for the city, directly supporting climate action.

Gender and Social Inclusion [Some elements]: As this is a feasibility study, there are no immediate benefits that are expected to stem from the direction regarding gender and social inclusion. In themselves, BESS can improve the resilience of the electrical infrastructure by providing redundancy during power outages, which can in itself support community resilience to these types of shocks.

Smart Maturity [No direct links]: Although there are no direct implications of this study for smart maturity, as this action will support the GMM in identifying and deploying new technologies and mechanisms for decarbonisation, this could further feed into the city's data-driven decision-making.

Co-Benefits

Resilience: (i) BESS can offer a short-term 'off-grid' solution, meaning critical loads (e.g., hospitals) can continue to receive power if their transmission lines are impacted by natural disasters, such as earthquakes and wildfires. (ii) By storing excess energy for use during high demand periods, BESS can smoothen the timing imbalance between peak energy demand and peak energy generation that typically affects renewable energy technologies such as solar PV.

Economic: (i) BESS's can provide operational life cost savings. When lifetime costs and savings are sufficiently analysed, BESS's can, in some cases, provide financial savings when compared to purchasing the equivalent volume of electricity from the grid, (ii) As the contribution of PV and renewables into the grid increases, BESS can provide a lower-cost alternative to reinforcement of transmission and distribution infrastructure.

Social: (i) Grid-level BESS solutions can enhance reliability of electricity supply for those utilising the electricity and minimise interruptions and may particularly benefit residents in isolated areas or satellite towns.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Tender for the feasibility study	●							
Engage key stakeholders to discuss key outcomes, requirements of BESS solutions across Gaziantep, and availability of data	●							
Desktop review to identify potential locations for BESS solutions, including mapping of key constraints including planning conditions, restrictions (e.g., protected land), location of existing and planned renewable technologies, grid constraints, demand, and engagement with key stakeholders who can provide required data	———	●						
Desktop review of BESS solutions and their suitability in Gaziantep, including identification of type of storage solution and where specific storage solutions can be implemented to meet the strategic goals of the city (e.g., to improve resilience of infrastructure and to improve the share of renewable energy in total energy consumption)	———	●						
Workshop to discuss feasibility study outcomes, next steps, and identify potential pilot projects	●							

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 150,000**	Industry standard for consultancy fees for conducting a feasibility study and a techno-economic assessment. The cost assumes that grid-connection point data is available for BSP (bulk supply points, i.e. city-level grid connections)
Component 1 –Feasibility study to identify BESS opportunities and techno-economic assessment	EUR 150,000	12-month consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ministry of Energy and Natural Resources	Inform
Republic of Turkiye Energy Market Regulatory Authority (EPDK)	Consult
Turkish Electricity Generation Corporation (EUAS)	Consult
Turkish Electricity Transmission Corporation (TEIAS)	Consult
Toroslar EnerjiSA	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Political	After the feasibility study, the project may be seen as a low priority for the management.	In the feasibility study, the financial benefits must be properly demonstrated
Economic	Funding not available to progress site specific study after completion of feasibility study.	Identify potential funding streams early in the feasibility study process
Technical	No immediate opportunities identified in feasibility study.	BESS pilot for proposed Solar PV farms can provide 'proof of concept' for other similar projects Any future renewable energy projects can include incorporation of BESS as part of typical scope of work
	Failure to find applicable solutions (due to infrastructure limitations).	The scope of the feasibility study should be comprehensive enough to avoid this risk.

IMPLEMENTATION

Operational Modality:
Once complete, the outputs of the feasibility study should be further developed with the best BESS opportunities taken forward. Site specific analysis (e.g., technoeconomic modelling, site surveys etc) should be undertaken.

Implementation Timeframe and Timeline:
2023-2024

Indicative Total Cost: €150,000

Capital Cost:
N/A

Development / Advisory Costs:
€150,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Revenue Opportunities:
No

ENG2 Strengthening Existing Electricity Systems Against Natural Disasters and Developing an Alternative Energy Storage System

Carrying out a feasibility study for smart grids in certain parts of the city, distributed energy sources, especially solar and wind, and micro grids integrated with batteries, mobile energy storage systems in order to create a more resistant network system against disasters

INFORMATION

Status:
New

Location:
Gaziantep city-wide

Type:
- Investment-related feasibility study
- Capital investment

Action Owner(s):
GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:
- EDAS
- TEIAS
- AFAD Provincial Directorate

Relevant Sector(s):

Related Actions:
ENG1 - Identify feasibility battery energy storage (BESS) opportunities

With the earthquakes of 7.7 and 7.6 magnitude that occurred consecutively on 06.02.2023 in Kahramanmaraş, extensive destruction was experienced across 10 provinces and long-term energy cuts occurred in the region. Serious problems relating to health, nutrition and shelter have occurred due to energy cuts in the region, including loss of life. This disaster has shown that it is essential to create and implement a strategy and roadmap, especially with regards to increasing resilience of electrical infrastructure against natural disasters.

Micro-grids can play an important role in the survival of the electricity system and ensuring the availability of electricity during and after natural disasters. Although Turkiye's electricity grid has a strong infrastructure, it is essential that strategies are developed in a way that will be least affected by disasters such as the earthquake recently experienced. This action is related to the first steps in this resilience-building process and includes:

- A review of the topology grid serving the community, potential failure points, and resilience or redundancy needs.
- Undertaking a study to identify the feasibility for:
  - Smart grids in certain parts of the city
  - Distributed energy sources (e.g., solar PV and wind turbines)
  - Micro grids integrated with batteries
  - Mobile energy storage systems
  - Infrastructure for transmission and distribution across the city
- Preparation of a resilient generation, transmission and distribution infrastructure roadmap utilising the outcomes of the grid review and the feasibility study. The roadmap should take account of smart technologies such as data measuring infrastructure and remote sensing systems to ensure maximum benefit from the innovations brought by digitization.
  - Potential pilot sites and upcoming energy generation and storage systems should be identified and included in this roadmap, such as the potential for energy storage to be co-located with the proposed 27 MW solar power plants.
- Instruction booklets for the assignment of emergency energy teams during disasters should also be created.

The dissemination of these systems can be prioritized in Turkiye, especially in Gaziantep, and regions where fault lines are intense. In the upcoming period, comprehensive legislation, correct financing mechanisms, awareness and technical capacity should be developed in order for the electricity system to be prepared for disasters and indirectly reduce the effects of climate change.

This action relates to the following plans and strategies at the national or metropolitan level:

- **Sustainable Energy and Climate Action Plan (2018)**
- **Climate Change Adaptation Plan (upcoming)**
- **Gaziantep Smart City Master Plan (upcoming)**

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Lack of innovative measures, inclusive plans, and strategies for climate action
- Good understanding of natural hazards, but a need for better understanding of climate hazards

Green City Challenges:

- Lack of capacity in energy system
- Inadequate electrical energy storage
- Use of GHG emitting and polluting energy sources

ENG2

IMPACT

Strategic Goals Supported:
ENG ii | Increase efficiency across the energy system

ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

Estimated benefit(s):

CO_2 savings: N/A

Job Created: N/A

Quantitative Impact measures:
14.1: Electrical interruptions

16.0: Share of renewable in total energy consumption

17.0: Power outages by climate extremes

Cross-cutting Themes

Climate Action [Some elements]: Depending on the findings of the feasibility study, the action could contribute to climate action in Gaziantep through the creation of more resilient energy infrastructure.

Gender and Social Inclusion [Some elements]: Depending on the findings of the feasibility study, the action could bring substantial benefits for gender and social inclusion in Gaziantep by making the energy infrastructure more resilient to the effects of disasters.

Smart Maturity [Some elements]: The roadmap that will be prepared will aim to integrate data measuring infrastructure and remote sensing systems.

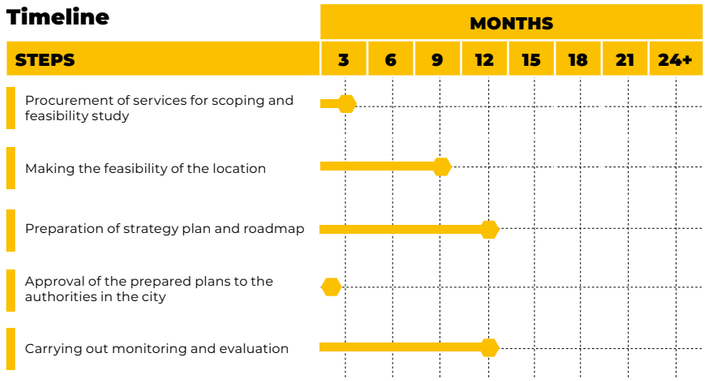
Co-Benefits

Resilience: This action aims to make the energy infrastructure in Gaziantep more resilient to the impacts of disasters, and therefore resilience is one of the key co-benefits.

Economic: N/A

Social: N/A

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 614,000**	Industry standard for consultancy fees for techno-economic assessment, site visits, detail designs, and permits for battery storage facility. CAPEX costs are based on average construction costs for other battery storage facilities applying EUR 530 per KW for a 5 MW battery storage facility
Component 1 –Feasibility study	EUR 50,000	3-month consultancy
Component 2 – Site visits, surveys and planning design	EUR 50,000	12-month consultancy
Component 3 – Technical designs, surveys and permitting	EUR 150,000	12-month consultancy
Supervision of works applying 7% of construction costs	EUR 364,000	Construction duration
Capital Costs	**EUR 5,200,000**	Assumption made on the basis on IRENA 2017 Publication "Energy Storage and Renewables: Costs and Markets 2030"
Component 1 – Construction of 5 MW battery storage pilot applying EUR 520 per KW for a battery storage requirement of 10,000 kW	EUR 5,200,000	
Operational Costs (over 5 years)	**EUR 780,000**	Estimated 3% of investment cost

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Gaziantep Governorship	Involve
District municipalities	Involve
GAZDAS	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Funding not available to progress pilot or site specific studies after feasibility stage.	Identify potential funding streams early in the feasibility study process.
Technical	Lack of data availability.	Identify data availability at beginning of feasibility stage and suitable methods of estimation where required data is not available.

IMPLEMENTATION

Operational Modality:
The roadmap that will emerge after feasibility will be used and regular training will be provided for the emergency energy teams.

Implementation Timeframe and Timeline:
2023-2050

Indicative Total Cost: €5,814,000

Capital Cost:
€5,200,000

Development / Advisory Costs:
€614,000

5-year Operational Cost:
€780,000

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Loan – Government owned bank, IFI

Revenue Opportunities:
No

ENG3 Wind Power Plant Feasibility Study and Development

Revise the existing feasibility study for the 30 MW Wind Power Plant to meet the requirements of current legislation and utilising the most up to date technologies. Additionally, progress this beyond the feasibility stage through development and construction to operation.

INFORMATION

Status:
New

Location:
- Nurdagi districts
- Islahiye districts
- or another location that may emerge as a result of feasibility study

Type:
- Investment-related feasibility study
- Capital investment

Action Owner(s):
GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:
- GASKI
- GMM Department of Transportation
- GAZIULAS

Relevant Sector(s):

Related Actions:
ENG1 - Identify feasibility battery energy storage (BESS) opportunities

Challenges Addressed:
Priority Environmental Challenges:
- Lack of innovative measures, inclusive plans, and strategies for climate action

Green City Challenges:
- Increasing energy consumption
- Use of GHG emitting and polluting energy sources

A wind farm provides the opportunity to increase the share of renewable energy within the energy system, and in particular industrial loads that could potentially be served by the wind farm if a direct connection is possible. In 2016 a study was undertaken to understand the feasibility of developing a 30 MW Wind Power Project within the Nurdagi and Islahiye districts of Gaziantep. In the 2017 application, the associated degree applications were postponed by the EPKD board (Energy Market Regulatory Authority). In 2020 this decision was updated and the associated application was cancelled. Due to this and advancements in technology and market changes, the feasibility study must be revised. This action proposes an update of the feasibility study as well as progression of the wind farm through scoping, planning, construction, and operation.

As per the 2016 feasibility study, it is proposed that the wind power plan is developed meeting the requirements of the Electricity Market License Regulation published in the Official Gazette dated 02/10/2013 or aligned to the latest Regulation at the time of development.

This action involves revisiting and updating the 2016 feasibility study to meet the requirements of current legislation and utilising the most up to date technologies. It is proposed to then develop this further through scoping, the Environmental Impact Assessment (EIA), construction and operation. It should be noted that each step is reliant on the success of the previous. An overview of the actions involved with each step are as follows:

- **Feasibility Study:** A study should be undertaken to review current legislation, best practice, economic considerations and current technologies to understand the feasibility of developing a wind farm in selected sites. This should take note of any changes since the 2016 study was complete and should cover the same scope including both a technological and economic review of the potential development.
- **Scoping:** If deemed feasible as a concept, scoping should be undertaken to further understand the feasibility of the development. This should include wind modelling, site visits and initial surveys (e.g., ecology), relevant permitting should be explored and requested, land agreements should be agreed and an in principal grid connection application should be submitted. A scoping design should be developed and shared with relevant stakeholders to determine any concerns that will require mitigation in the next stage (e.g., specific survey requirements).
- **Environmental Impact Assessment:** Further stakeholder consultations should drive the EIA along with all required surveys being undertaken. A planning design should be developed and submitted as part of the EIA process to relevant regulatory bodies.

- **Detailed design and procurement:** The project design should be further developed and procurement of contractors, turbines and other balance of plant should be undertaken.
- **Construction:** The wind farm should be constructed as per the detailed design, meeting the requirements of any conditions placed during the scoping and EIA stages by stakeholders.
- **Testing and Commissioning:** All required testing and commissioning activities should be undertaken prior to operation.
- **Operation and Maintenance:** A suitable operation and maintenance plan should be developed throughout the planning and construction phase and should be adhered to throughout operation. This should be updated to meet national and local standards and requirements when necessary, throughout the wind farms operational life. An appropriate decommissioning plan should also be created and updated to meet current national and local standards and requirements.

This action relates to the following plans and strategies at the national or metropolitan level:

- **Gaziantep Ministry of Economy Incentive Practices III**
- **Gaziantep Sustainable Energy and Climate Action Plan (2018)**
- **Strategic Plan 2018-2023 (GMM Department of Environmental Protection, Climate Change and Zero Waste)**

ENG3

IMPACT

Strategic Goals Supported:
ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

IND iv | Increase the share of industrial energy consumption from renewables

Estimated benefit(s):

CO_2 savings: 20 tCO_2e per annum

Job Created: 342

Quantitative Impact measures:
14.1: Electrical interruptions

16.0: Share of renewable in total energy consumption

17.0: Power outages by climate extremes

22.2: Share of industrial energy consumption from renewable energy

Cross-cutting Themes

Climate Action [Directly targeted]: This action directly contributes climate action in Gaziantep through creation of low-carbon, renewable energy infrastructure.

Gender and Social Inclusion [Some elements]: Although the action does not directly target gender and social inclusion, by providing additional affordable, renewable source of energy, wind farms can contribute to energy security of low-income populations in Gaziantep.

Smart Maturity [No direct link]: None that are directly applicable for this action.

Co-Benefits

Resilience: By increasing the stability of the local electricity network and increasing security of energy supply through construction of a wind farm, this action is expected to contribute to community resilience.

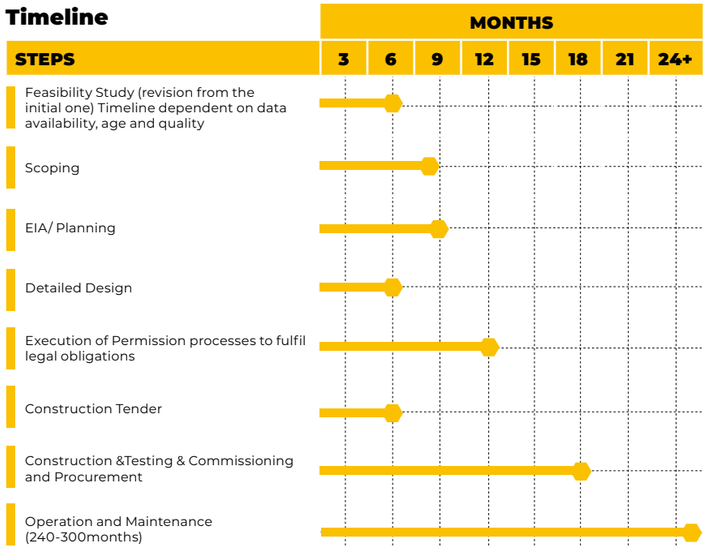
Economic: Wind farm construction can bring significant local economic benefits (through land acquisition, job creation during the construction, operation and maintenance phase) as well as result in cost-savings on electricity bills.

Social: There are a variety of social benefits associated with (well planned and executed) wind farm development, ranging from enhancement of the local road network (as developers will often upgrade these to enable large components to be transported to the site), enhancement of amenity values and sense of place, etc.

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Funding not available to progress site specific study after completion of feasibility study.	Identify potential funding streams early in the feasibility study process
Technical	Licenses not attained.	Undertake all necessary surveys and other stakeholder requirements to, as far as possible, mitigate any objection to license approval
	Permission to construct not approved.	Undertake all necessary surveys and other stakeholder requirements to, as far as possible, mitigate any objection to construction.
	Grid constraints prevent construction.	Undertake a grid connection analysis during scoping to understand constraints. Submit a grid connection application to confirm connection viability.
	Technical errors in design.	Implement an effective technical quality review process throughout design to mitigate technical errors.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 2,525,000**	Industry standard for consultancy fees, this includes detailed designs, EIAs, and permits.
Component 1 –Feasibility study	EUR 125,000	6-month consultancy
Component 2 – Detailed design, EIA and permitting	EUR 300,000	18–24-month consultancy
Component 3 – Supervision of works applying 7% of construction costs	EUR 2,100,000	18-month construction duration assumed
Capital Costs	**EUR 30,000,000**	Assumes the construction and installation of wind turbines using comparable of EUR 1,000,000 per MW for wind turbines. The PPA for energy generated is not known, but this can offset the initial CAPEX.
Operational Costs (over 5 years)	**EUR 4,500,000**	Estimated 3% of investment cost (for maintenance, cleaning, etc).

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ministry of Environment, Urbanization and Climate Change	Involve
Ministry of Energy and Natural Resources	Involve
Republic of Turkiye Energy Market Regulatory Authority (EPDK)	Involve
Turkish Electricity Generation Corporation (EUAS)	Collaborate
Electricity Distribution Inc (EDAS)	Collaborate
Energy Markets Management Inc (EPIAS)	Collaborate
Turkish Electricity Transmission Corporation (TEIAS)	Collaborate

IMPLEMENTATION

Operational Modality:
This will be established in the updated feasibility study.

Implementation Timeframe and Timeline:
Long: 2023-2050

Indicative Total Cost: €32,525,000

Capital Cost:
€30,000,000

Development / Advisory Costs:
€2,525,000

5-year Operational Cost:
€4,500,000

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant – National government, IFI, International Organisations

Loan – Government-owned bank, IFI

Revenue Opportunities:
Yes, to be confirmed by the feasibility study.

SOLID WASTE

SW1 Feasibility study for a 2-bin Waste Separation System for Households

SW2 Build a new Energy Plant Which Can Utilise RDF

SW3 Carry Out Feasibility Studies for Collection and Valorisation of Organic Waste

SW4 Inventorise Sources of Hazardous Waste Production Within Gaziantep and Develop a Hazardous Waste Management Plan

SW1

Feasibility study for a 2-bin Waste Separation System for Households

Develop a feasibility study for scaling up waste separation across the metropolitan municipality.

INFORMATION

Status:
New

Location:
Gaziantep (city-wide)

Type:
Investment-related feasibility study

Action Owner(s):
GMM Directorate of Environmental Protection, Zero Waste and Climate Change

Supporting Institutions:

- District municipalities
- Provincial Directorate of Environment, Urbanization and Climate Change

Relevant Sector(s):

Related Actions:

SW2 - Build a new energy plant which can utilise RDF

SW3 - Carry out feasibility studies for collection and valorisation of organic waste

CA4 - Raising awareness on sustainable consumption in Gaziantep

Challenges Addressed:
Green City Challenges:

- Lack of source separation for households or commercial buildings

Household source separation of waste is extremely limited in Gaziantep, with only 14% of waste recycled. The remaining waste is sent to landfill, including a high proportion of organic waste (52%), which leads to very high GHG emissions throughout the decomposition process. Currently, opportunities for high value capture of waste are lost. Initiating a source separation system for biowaste will reduce pressure on the two landfills, increase the performance of the new Mechanical Biological Treatment (MBT) and landfill gas facilities [such as those in Nizip and City Centre (Sahinbey) with facilities for waste disposal and energy generation], reduce emissions from waste disposal and may enable GMM to generate income from the solid waste system in Gaziantep.

The Zero-Waste Regulation (2019) No. 30829 provides the legal basis for the source separation system to be developed in metropolitan municipalities and metropolitan district municipalities, in line with the sustainable management of raw materials and natural resources, and the establishment and monitoring of a zero-waste management system. A 2-bin waste separation system is an obligation in this regulation, outlining that bins of different colours should be provided for different waste types (blue for recyclable wastes and grey for non-recyclable waste). Waste collection is under the jurisdiction of the District Municipalities; however, the lack of sufficient financing to provide the necessary tools and equipment for the 2-bin waste sorting system is an obstacle to its dissemination.

To support create the business case for a wider roll out, as well as adhering to the national Zero-Waste Regulation, GMM launched the pilot of a 2-stream waste separation system in Sehitkamil. The other districts (who are unable to financially support a 2-bin system currently) are providing alterative waste collection methods, such as: providing orange bins or underground waste bins (without separation); or they are providing bins near public places (such as shopping malls) to collect recyclable waste.

After the pilot phase, the intention of this Action will be to evaluate the implementation phase and understand the successes and limitations of the approach after which the system will be rolled out to cover the entire city.

The project will broadly follow these steps:

- **Waste Analysis:** Following the pilot study, and analysis of the waste types, quantities, and seasonal variations will be undertaken to identify the waste generation patterns to estimate system needs.
- **Infrastructure Assessment:** an assessment of the vehicle types and numbers based on collection frequency will be undertaken, which would include and evaluation of the existing waste processing facilities to determine their suitability, as well as the need for upgrades in processing infrastructure.

- **Bin Design and Distribution:** Following the learning from the pilot study, the bin specification would need to be determined, which would also include labelling and user-friendliness.
- **Implementation Plan:** A phase rollout would then need to be developed to support the 2-bin roll out across all district municipalities; consideration should be given to a gradual introduction, starting in specific areas. A timeline would also be developed to outline the activities for each phase, from distribution to collection. Evaluation of the regulatory implications for the entity rolling out the bin system.
- **Financial Feasibility:** An exercise to estimate the costs would then be undertaken to calculate expenses for the bins, vehicles, training, and campaigns. An activity to explore funding sources, such as budgets, grants, and partnerships would then be undertaken.
- **Impact Assessment:** a review of the environmental benefits would be undertaken, such as the assessment of waste reduction, recycling increase, and emissions reduction. A review of the social acceptance for such a scheme should also be undertaken, such as a review of the community's readiness. Concerns should be included in the revised plans.
- **Monitoring and Evaluation:** To assess the performance of the 2-bin waste segregation roll out, metrics/KPIs will be defines, such as recycling rates and operational efficiency. Regular data collection will also for a key element for progress tracking.
- **Public Engagement:** The separation system will be supported by a targeted awareness raising campaign, delivered to households, communities and schools to encourage the correct separation of waste, which will minimise sorting and cleaning later. It is recommended that the campaign includes opportunities for two-way communication, allowing the public to interact and ask questions.
- **Decision and Reporting:** A final feasibility report would then be prepared to present the findings and recommendations following the pilot phase and the assessment.

This action relates to the following plans and strategies at the national or municipal level:

- **Collecting organic wastes from households as a pilot study:** GMM chose a couple of buildings under a pilot study to collect organic wastes from households and creating fertilizer by composting. The study is still ongoing. It is anticipated that there will be reductions in garbage leachate as well as costs by separating organic waste at the source.
- **Zero Waste Regulation:** The regulation indicates an obligation to have a 2-bins waste separation system inside of the city. GMM is currently working on transition to 2-bin system in the whole city.
- **Sustainable Energy and Climate Action Plan:** It includes statistical information and mitigation measures for solid waste.
- **Climate Change Action Plan of Gaziantep:** It provides actions to be followed for sustainable solid waste management.
- **Gaziantep 2040 Environmental Plan / Plan Notes:** It gives information about the operation of the solid waste management system and explains the legal background by defining the role of GMM in the selection of solid waste transfer, disposal and recovery facilities.
- **Climate Change Adaptation Plan** (under preparation)

SW1

IMPACT

Strategic Goals Supported:
SW i | Promote zero-waste initiatives

SW ii | Increase uptake of waste segregation in residential areas

SW iii | Minimize the amount of waste ending up in a landfill

Estimated benefit(s):

CO_2 savings: N/A

Job Created: 1

Quantitative Impact measures:
4: Contaminated sites

8: Annual CO_2e emissions per capita

30.2 Proportion of organic waste

31: Municipal solid waste disposed of in sorting, processing and disposal plants

32: Remaining life of current landfill(s)

Cross-cutting Themes

Climate Action [Directly targeted]: Organic waste generates large amounts of GHG emissions when landfilled, by intercepting this at household level and reusing the product will vastly reduce emissions from solid waste. The collection of recyclable waste for re-use/ re-processing will also reduce GHG emissions by reducing the need for raw material extraction, manufacturing processes, and energy consumption associated with producing new products from virgin materials.

Gender and Social Inclusion [Some elements]: Incentive mechanisms that can be arranged with the implementation of the new system will be revealed in the feasibility study. Thus, the new system will be rolled out across the municipality, with benefits for all households. Separation of waste in the household is likely to be disproportionately operated by women, which will be considered in the system design.

Smart Maturity [Some elements]: Use of in-bin sensors and collecting routing systems can be considered to increase efficiency of collection system.

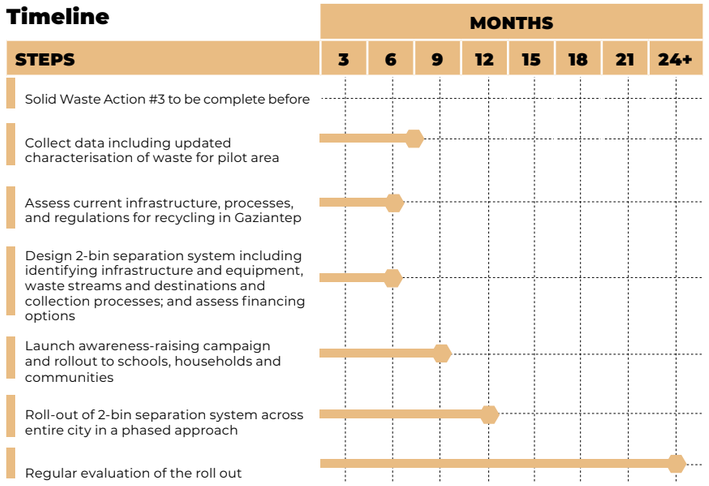
Co-Benefits

Resilience: (i) Separation of waste streams will reduce the volume of waste in the landfills and reducing leachate, as such there will be less pollution of surface and groundwater, improving water quality and availability. (ii) The products of organic waste treatment (i.e. compost), will be used to improve soil quality, creating a cycle for nutrients.

Economic: (i) The reduction in the amount of waste disposed of in the landfills will extend the investment period of GMM for new sites. (ii) The separation of organic waste will allow organic waste to be utilised in composting/ or other facilities and reused for GMM purposes (as compost of green spaces, public needs) or sold for agriculture, thereby creating an additional income stream for GMM.

Social: (i) Jobs will be created in order to manage and operate a new waste separation system, and for the creation and roll out of the awareness raising campaign. (ii) Separation of waste will improve health and safety for both formal and informal solid waste workers, removing some unsanitary components of waste at the source.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 220,000**	Industry standard for consultancy fees for undertaking assessments for waste separation and feasibility for upscaling. The action includes the communication campaign and awareness raising.
Component 1 –Feasibility study	EUR 200,000	12–14-month consultancy
Component 2 – Communication campaign	EUR 20,000	9-month communication campaign
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District Municipalities	Empower
Residential building owners and tenants	Empower
Ilbank	Consult
Chambers of Environmental Engineers Gaziantep Branch	Consult
Ministry and Provincial Department of Environment, Urbanisation and Climate Change	Inform
EBRD	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	There is a risk of waste separation to be insufficient, and therefore the resulting soil improvement products (compost or digestate) being unsuitable for use.	An awareness raising campaign including 2-way communication channels will support the project role out to maximise opportunities for the community to share any concerns or questions.
Technical	Lack of equipment, infrastructure, personnel or capacity of treatment facilities to manage separated waste.	As part of the data collection and system design, available equipment and infrastructure will be mapped to identify any capacity constraints. The system will be designed to the availability of resources.
Social	There is a risk of waste disposal behaviours for the households.	Appropriate location selection of waste bins can improve waste collection and waste separation. Educational campaigns can be organized for households.

IMPLEMENTATION

Operational Modality:
According to the current legislation (Zero Waste Regulation, 2019), waste collection is under the responsibility of District Municipalities. However, since the resources of the district municipalities are not sufficient, support will be given by the Gaziantep Metropolitan Municipality.

Implementation Timeframe and Timeline:
2023-2030

Indicative Total Cost: €220,000

Capital Cost:
N/A

Development / Advisory Costs:
€220,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant – National government, IFI, International Organisations

Revenue Opportunities:
Yes, to be confirmed by the feasibility study.

SW2 Build a new Energy Plant Which Can Utilise RDF

Build a new energy plant which can utilise RDF

INFORMATION

Status:
Planned

Location:
Sahinbey

Type:
Capital Investment

Action Owner(s):
GMM Directorate of Environmental Protection, Zero Waste

Supporting Institutions:

- Ministry of Energy and Natural Resources
- Ministry of Environment, Urbanization and Climate Change

Relevant Sector(s):

Related Actions:

SW1 - Feasibility study for a 2-bin waste separation system for households

Challenges Addressed:
Green City Challenges:

- Increasing energy consumption

Waste sent to landfill is an underutilised resource in Gaziantep. Thermal processes offer a sustainable energy source for the city to benefit from through waste-to energy (WtE).

In 2021 a new Mechanical Biological Treatment (MBT) plant was opened in Gaziantep to help the municipality solve one of the biggest challenges arising from the dramatic increase in the city's population as a result of the Syrian refugee crisis. It has the capacity to process approximately 100,000 tonnes of solid waste per year. In this treatment plant, the municipal waste is sorted, and all non-combustible materials (such as glass, electronics and metals) are removed, and the remaining waste is processed into refuse-derived fuel (RDF). The energy content of RDF means it can be used as an alternative to fossil fuels (such as coal or oil). Currently the RDF being produced from this facility is used in cement factories in neighbouring provinces, as an alternative energy source for the cement kiln, which means the waste is diverted from landfill waste disposal which avoids the potential impacts from landfill which may include soil/groundwater contamination, microplastic contamination of water bodies, GHG emissions and air pollution.

The aim of this action is to construct a new WtE facility, which is currently being planned in Gaziantep. The facility should be designed to accept the RDF that is already produced by the city's MBT facility, which is estimated at 48,300 tonnes/year to provide an additional energy source for the municipality. The current MBT was designed to satisfy the existing city population, and GMM intend to conduct a feasibility study to anticipate the future population growth, and thus increase the RDF production with the anticipated increase in waste volumes.

To support this action, a feasibility study would need to be carried out which would include evaluation of waste arising and RDF production (current and future); existing RDF outlets; WtE technology options; development costs and financial viability; contractual arrangements; and environmental impacts. The scope of the feasibility study should be reviewed and refined by GMM prior to commencement.

Cross-cutting Themes

Climate Action [Directly targeted]: Using alternative fuels such as RDF will reduce Gaziantep's reliance on fossil fuels, with direct impacts to reducing greenhouse gas emissions and mitigating climate change (this is dependent on the proportion of fossil carbon-derived waste in the RDF).

Gender and Social Inclusion [No direct links]: No direct links to gender and social inclusion have been identified for this action.

Smart Maturity [No direct links]: No direct links to smart maturity have been identified for this action.

Co-Benefits

Resilience: This action will improve the resilience of the energy network by providing an alternative source of sustainable energy.

Economic: Energy produced from the new plant will be sold to the grid to generate income.

Social: The new waste-to-energy plant will create employment opportunities as well as opportunities for upskilling and retraining.

IMPACT

Strategic Goals Supported:
ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

SW iii | Minimise the amount of waste ending up in a landfill

Estimated benefit(s):

CO_2 savings:
N/A*

Job Created:
440

Quantitative Impact measures:
16: Share of renewables in total energy consumption

* Not possible to calculate on the basis of existing data.

SW2

IMPLEMENTATION

Operational Modality:
It will be operated by GMM Directorate of Environmental Protection and Zero Waste.

Implementation Timeframe and Timeline:
2023-2025

Indicative Total Cost:
€44,378,850

Capital Cost:
€41,055,000

Development / Advisory Costs:
€3,323,850

5-year Operational Cost:
€6,158,250

Potential Financing Instruments:

Instrument:
Own source -GMM, Waste Operator

Grant -National government, IFI, International Organisations

Loan: Government-owned bank, IFI

Investment -IFI, private sector

Revenue Opportunities:
Yes, to be confirmed by the feasibility study.

Timeline

STEPS	MONTHS: 3	6	9	12	15	18	21	24+
Conduct a feasibility study for RDF and other wastes (including defining the scope and objectives of the new site), including a technical due diligence assessment.								
Select a site and procure services for the design of the new waste-to-energy facility								
Design the new waste-to-energy facility (such as the refuse collection and transportation system; the RDF processing plant, the combustion chamber, the steam turbine generator, and an air pollution control system)								
Obtain permits and approvals								
Construct new waste-to-energy facility								
Commission and start-up the facility. This phase will involve testing and adjusting the equipment to ensure that the facility is operating properly.								

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 3,323,850**	Industry standard for undertaking feasibility studies, detailed designs, EIA and permitting for the advisory costs.
Component 1 – Feasibility study for RDF and other waste use	EUR 200,000	12–14-month consultancy
Component 2 – Detailed design of Waste-to-Energy facility including EIAs and permitting	EUR 250,000	8 months consultancy
Component 3 – Supervision of works for new facility applying 7% of construction costs	EUR 2,873,850	Construction duration
Capital Costs	**EUR 41,055,000**	Capacity of 48,300 tons per annum applying EUR 850 per ton
Component 1 – Construction of a 48,300 ton per annum waste-to-energy facility applying EUR 850 per ton for construction costs	EUR 41,055,000	
Operational Costs (over 5 years)	**EUR 6,158,250**	Estimated at 3% of investment cost

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ilbank	Consult
Ministry of Environment, Urbanisation and Climate Change	Inform
International Financial Institutions	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Environmental	Air pollution and emissions from selected process.	Ensure that the new WtE facility includes air pollution control equipment which meets good international industry practice and that suitable facilities are available for proper management of air pollution control residues and bottom ash.
Technical	The availability of qualified personnel.	Early planning is needed to ensure the availability of qualified personnel. Further, Contractors and vendors can be a valuable source of qualified personnel. By building strong relationships with these organizations, it will enable access to the personnel needed for the delivery of the project.
	Avoidance of locking in recyclables in the new facility due to overcapacities.	Considerations of capacity planning of the MBT and WtE such as a recycling targets would be addressed in the Feasibility Study.
Social	Selected site could cause air or other pollution in surrounding communities.	A national EIA and an ESIA will be conducted to ensure there are no adverse impacts for vulnerable or poor groups from the selected site.

SW3

Carry Out Feasibility Studies for Collection and Valorisation of Organic Waste

Carry out feasibility studies for collection and valorisation of organic waste from restaurants and weekly district bazaars and wholesale market hall and implement a pilot in a suitable neighbourhood

INFORMATION

Status:
New

Location:
Areas where restaurants are concentrated (e.g. near Gaziantep Castle)

Type:
- Investment-related feasibility study
- Other investment

Action Owner(s):
GMM Directorate of Environmental Protection, Zero Waste and Climate Change

Supporting Institutions:
District municipalities

Relevant Sector(s):

Related Actions:
SW1 - Feasibility study for a 2-bin waste separation system for households

CA4 - Raising awareness on sustainable consumption in Gaziantep

Gaziantep has a very high proportion of organic waste; across SE Anatolia this is as high as 60% of all waste produced. There is exclusive organic waste collection already in operation from designated venues, such as cafes/restaurants owned by the GMM which is treated at a small (100 L/day) compost facility. Otherwise, the remaining organic waste is sent to landfill. Intercepting and utilising this waste will reduce emissions, improve air, water and soil quality while providing a product (compost) which may be a source of revenue for GMM and to create new employment opportunities in the city. This action is linked to solid waste action 1, extending a 2-bin waste separation system for households citywide.

This action will involve conducting a feasibility study across the whole city, specifically to identify the most practical and viable options for treating and managing organic waste in Gaziantep. The initial focus will be on organic waste produced from restaurants and bazaars. This should include:

- An inventory study to identify sources, types and composition of organic waste, e.g. household food waste, commercial food waste, garden waste, agricultural waste and animal waste.
- Identify appropriate technologies based on the results of the inventory study: this could include composting, anaerobic digestion or vermicomposting. Assess the different technological options based on the advantages and disadvantages, scalability and cost.
- Establish capacity, equipment and infrastructure (which would review the needs for additional material-recovery facilities, such as post-sorting/processing of dry recyclables in combination with the existing Mechanical Biological Treatment plant) needs based on the location and types of organic waste. This would also include a review of the additional CAPEX needs for composting / anaerobic digestion.
- Establish a market for recycled outputs, this may include (i) for compost: use in municipality operated green spaces, parks, cemeteries, gardens or sale to private users or agriculture, (ii) for biogas: supply to the gas grid, use in gas generators, or use in running municipal vehicles (i.e. solid waste collection trucks), (iii) digestate: use in agriculture as a nutrient fertiliser).

The aim of the feasibility study should be to undertake a waste generation assessment, a technology options assessment, as well as an assessment of markets for outputs. Based on the results of the feasibility study, GMM can evaluate the costs and benefits of organic waste collection (including consideration on commercial bin sizes) and treatment and develop a business case. Prior to full scale implementation, the next step (following on from this Feasibility Study) would be to develop a Pilot Study. The scope of the Pilot Study would be determined as part of the Feasibility Study and would be based on the inventory study of organic waste generators, and identification of the most appropriate technology solution. A pilot composting site could also be rolled out as a next step following the feasibility assessment

It is expected that the Pilot Study would focus on restaurants/ bazaars where large quantities of organic waste are generated by a relatively concentrated number of businesses. The Pilot Study would be used to test the mechanisms for collection and treatment of organic waste, and the market for outputs. Depending on the results of the Pilot Study, organic waste collection and treatment would then be expanded across the municipality. When organic waste collection is expanded across the municipality, there would then be linkages and potential synergies with the proposed 2-bin collection system (subject of a separate Solid Waste Action 1 in this GCAP).

This action relates to the following plans and strategies at the national or municipal level:

- **Sustainable Energy and Climate Action Plan**
- **Waste Management Plan**

IMPACT

Challenges Addressed:
Priority Environmental Challenges:

- Impacts of climate change on soil productivity
- Loss of soil nutrients and organic matter due to improper agricultural practices; including excessive and incorrect application of fertilisers
- Rapid population growth

Green City Challenges

- Lack of source separation for households or commercial buildings

SW3

IMPACT

Strategic Goals Supported:

SW i | Promote zero-waste initiatives

SW ii | Increase uptake of waste segregation in residential areas

SW iii | Minimize the amount of waste ending up in a landfill

CA v | Improve resilience of agriculture and food systems to climate change.

Estimated benefit(s):

CO_2 savings: 406,650 tCO_2e (from the pilot)

Job Created: 6

Quantitative Impact measures:

8: Annual CO_2e emissions per capita

30.2 Proportion of organic waste

31: Municipal solid waste treated in sorting, processing and treatment plants

32: Remaining life of current landfill(s)

Cross-cutting Themes

Climate Action [Directly targeted]: Without treatment, organic waste produces significant volumes of GHG emissions. New technologies for processing organic waste will reduce emissions from landfill and extend the useful life of organic produce, mitigating emissions elsewhere. Depending on the selected technology, production of biogas or biofuel could serve as an alternative to carbon intensive fuels in the transport or other sectors.

Gender and Social Inclusion [Some elements]: The pilot will be rolled-out to bazaars and restaurants, many of which are SME's, separate collection of organic waste may reduce the financial cost of their general waste disposal.

Smart Maturity [No Elements]: No directly relevant links to smart maturity have been identified for this action.

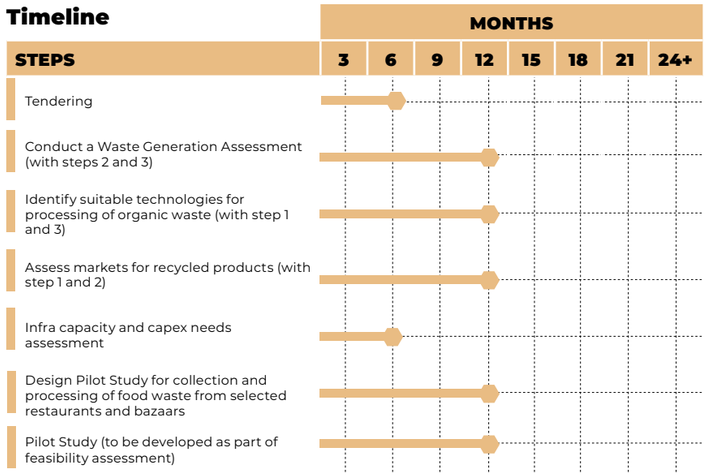
Co-Benefits

Resilience: (i) Separation of organic waste will reduce the volume present in the landfills and reducing leachate, as such there will be less pollution of surface and groundwater, improving water quality and availability. (ii) The products of organic waste treatment (i.e. compost), will be used to improve soil quality, creating a cycle for nutrients.

Economic: Organic waste technologies may produce saleable products like compost which could be used to reduce costs for GMM or sold to generate revenue. (ii) The separation of organic waste will allow organic waste to be utilised in the compost facilities and reused for GMM purposes (as compost of green spaces, public needs) or sold for agriculture, thereby creating an additional income stream for GMM.

Social: (i) Reducing the organic waste component at the landfill will reduce emissions as well as odours from waste disposal, improving air quality for nearby residents. (ii) The supply or sale of compost to farmers and other beneficiaries will reduce the dependency on chemical fertilisers to improve soil health and reduce costs to these stakeholders.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 210,000**	Industry standard for consultant fees for feasibility study and oversight of the pilot project. The feasibility study will inform the components of waste that will inform valorisation technology to be procured, including the overall capacity requirement for the facility.
Component 1 – Waste generation study and feasibility assessment	EUR 100,000	6 months consultancy
Component 2 – Infrastructure capacity needs assessment	EUR 35,000	3 months consultancy
Component 3 – Design a pilot for collection and processing of food waste from restaurants and bazaars	EUR 75,000	6 months consultancy
Capital Costs	**EUR 6,255,000**	This has included the procurement of a limited number of bins for restaurants and market traders, a new vehicle for collection and a composting capacity. Includes an indicative budget of EUR 5 million for scaling up the programme.
Component 1 – Procurement of 500 x 1100 L bins applying EUR 210 each	EUR 105,000	
Component 2 – Procurement of waste collection vehicle	EUR 150,000	
Component 3 – Establish a composting treatment plant, assuming a 5,000 tonnes per annum capacity	EUR 1,000,000	
Component 4 – Budget to be allocated for implementation of a pilot in 1 neighbourhood	EUR 5,000,000	
Operational Costs (over 5 years)	**EUR 900,000**	Estimated 3% of investment costs.

IMPLEMENTATION

Operational Modality: The operation modality will be determined after the technical due diligence study is undertaken.

Implementation Timeframe and Timeline: 2023-2027

Indicative Total Cost: €6,465,000

Capital Cost: €6,255,000

Development / Advisory Costs: €210,000

5-year Operational Cost: €900,000

Potential Financing Instruments:

Instrument: Own source -GMM, Waste Operator

Grant - National government, IFI, International Organisations

Loan - Government-owned bank, IFI

Revenue Opportunities: Yes, to be determined by the pilot.

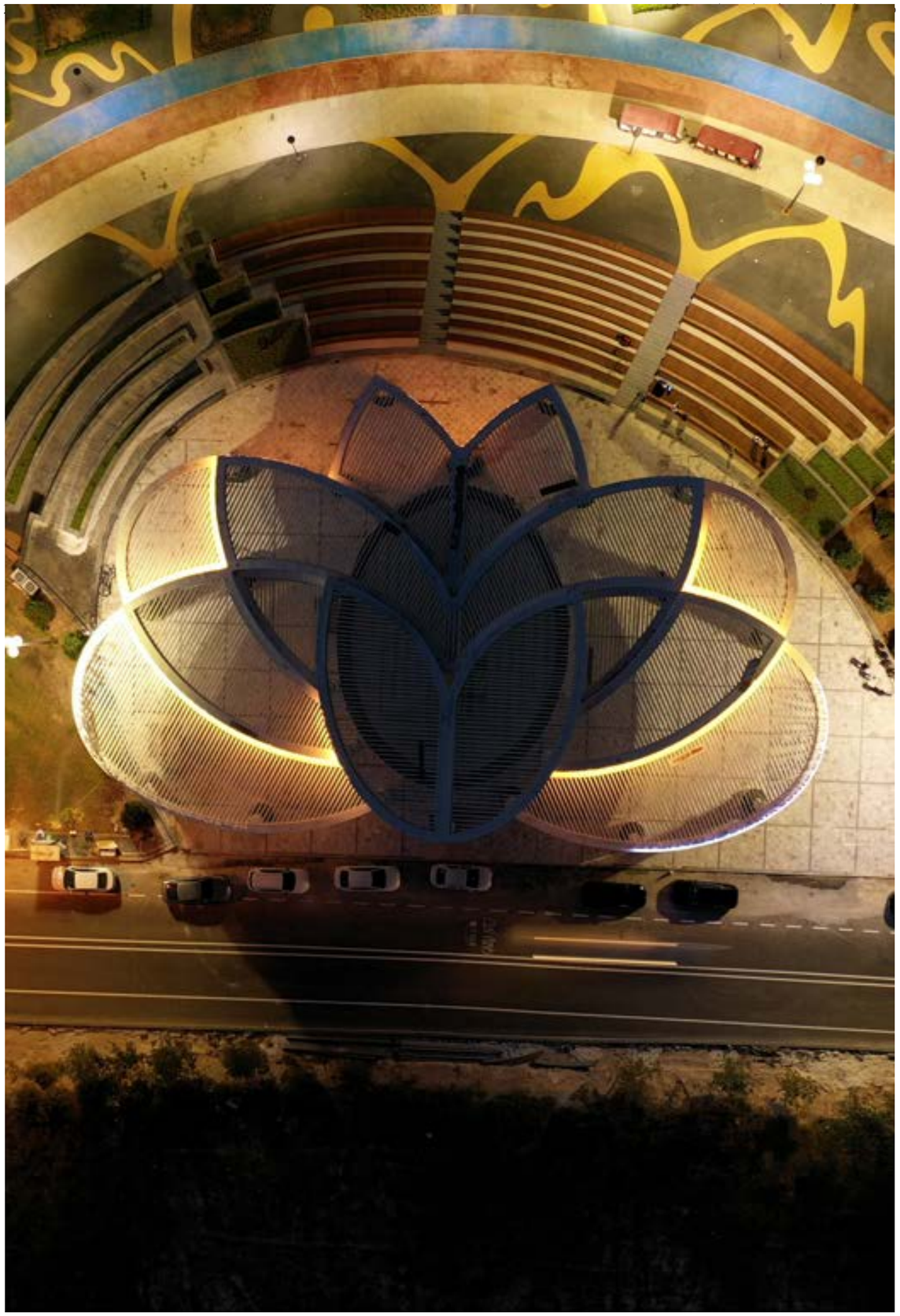
SW3

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Restaurant owners	Empower
Tradesmen of bazaars and wholesale market halls	Empower
District Municipalities	Empower

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Income generated insufficient to recover costs of new system.	· After feasibility, markets for compost/digestate will be identified ahead of the pilot and full project to ensure there is sufficient demand for the products. · Supported by awareness raising campaign to encourage the proper separation of wastes to maximise quality of outputs
Technical	Lack of clean waste streams.	· The feasibility study and system design will include rigorous stakeholder engagement, to design a system which is best fitting to the needs of the municipality and which businesses and residents can use. · As part of the system, strict enforcement on acceptance criteria will be included as well as inspections of inbound waste to identify and reject non-conforming loads.
Social	Lack of engagement and/ or compliance with waste separation.	· In the design of the system, stakeholder engagement will be utilised to prepare a separation process that is easy to understand and useable for commercial users. · An awareness raising campaign will support the action to encourage users to separatee organic waste.



SW4

Inventorise Sources of Hazardous Waste Production Within Gaziantep and Develop a Hazardous Waste Management Plan

Inventorise sources of hazardous waste production within Gaziantep and develop a waste management plan compatible with current legislation for sustainable management of hazardous waste

INFORMATION

Status:
New

Location:
N/A

Type:
Investment-related feasibility study

Action Owner(s):
GMM Directorate of Environmental Protection, Zero Waste and Climate Change

Supporting Institutions:

- Provincial Directorate of Environment, Urbanization and Climate Change
- Gaziantep Chamber of Industry
- The Ministry of Industry and Energy
- Gaziantep Chamber of Commerce
- Sehitkamil municipality
- Sahinbay municipality
- Gaziantep OIZ

Relevant Sector(s):

Related Actions:
IN3 - Enforcing business accountability for environmental non-compliance

Challenges Addressed:
Green City Challenges

- Lack of adequate facilities for hazardous waste disposal and incineration

Hazardous waste (in this context being industrial waste) must be properly managed and processed in Gaziantep, to not have a negative impact on air, soil and water pollution, and ultimately the health of the residents of the Municipality. Without adequate control, hazardous waste is a public health concern, posing a particular risk to not only informal waste collectors and vulnerable people, but the wider population as well.

Efforts to ensure the collection, transportation, final disposal and recycling of hazardous wastes from industrial facilities in Gaziantep continue. Waste is transported to Izmit IZAYDAS facility (approx. 1000 km from Gaziantep) and Ankara ITC facility at high expense, as the facilities licensed to dispose of hazardous waste in Türkiye.

Gaziantep Metropolitan Municipality (GMM) has plans to develop its own hazardous waste processing plant; but as a preliminary step it needs to develop a hazardous waste management strategy and action plan to understand the sources, types and quantities of hazardous waste, as well as assessing the type and suitability of the waste processing plant. The aim of this action is to undertake an inventory of all hazardous waste production within Gaziantep and develop a waste management plan compatible with current legislation for sustainable management of hazardous waste The aim of integrated hazardous waste management planning is to ensure the protection and safety of the environment through efficient and effective hazardous waste management. These aims must be achieved within the framework of cost effective, efficient and sustainable environmental management systems and practices. This can only be achieved by involving all stakeholders, business, industry and interested and affected parties in the development of a hazardous waste management plan for Gaziantep. For this purpose, GMM will conduct a study to identify the main sources of hazardous waste in the city, which will include major industries in the Organised Industrial Zones and small industries. The study will create an inventory of:

- Hazardous waste producers
- Types of hazardous waste
- Volumes of waste
- Locations within the city

Based on the study, GMM will prepare a hazardous waste management strategy and action plan, which will include at least the following information:

- The types of hazardous waste that is generated.
- Hazardous waste statistics.
- The proposed projects / activities to ensure that the objectives and targets that have been set are achieved within the set time frames, including an overview of the actions needed to deliver them.
- The responsibilities of the various role players in the implementation of this plan.

The hazardous waste management strategy and action plan will determine the types of regulatory and policy measures which will be adopted as well as infrastructure and facility requirements for disposal. There is a feasibility study currently out to tender for a hazardous waste disposal facility in the province, other infrastructure investments will likely be identified, requiring financing. It is worth noting that this action may turn into a hard action depending on the findings from the feasibility study.

SW4

IMPACT

Strategic Goals Supported:
SW i | Promote zero-waste initiatives

SW iii | Minimize the amount of waste ending up in a landfill

SW iv | Incentivise sustainable management of hazardous waste

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
4: Contaminated sites

4.1: Concentration of mercury in the soil

4.2: Concentration of cadmium in soil

4.3: Concentration of zinc in soil

4.4: Concentration of mineral oil in soil (using infrared spectroscopy)

23: Share of industrial waste recycled

32: Remaining life of current landfills

Cross-cutting Themes

Climate Action [Directly targeted]: Some hazardous wastes are highly emitting, particularly is gases are not captured after disposal. Through proper management these emissions will be reduced.

Gender and Social Inclusion [Directly targeted]: Hazardous waste is often disposed of in community areas, intercepting this waste will have immediate health benefits for communities through cleaner air, soil and water.

Smart Maturity [Directly targeted]: Through the enhanced data collection processes, data storage platforms could be developed which accesses made available to relevant department. The data storage platform could be developed with other waste collection bodies to prevent a siloed approach.

Co-Benefits

Resilience: (i) Proper management and disposal of hazardous waste will reduce pollution of soil water and air and improve quality. (ii) Separation and disposal of hazardous waste will minimise the damage and impacts from disasters in Gaziantep with lower risk to public health.

Economic: There will be reduced damages and reduced environmental pollution by adequately treating and disposing hazardous waste and preventing pollution which may be causing damage to natural assets, agriculture and drinking water supplies.

Social: (i) Reducing the pollution will have health benefits on the local communities and residents. (ii) Jobs will be created to construct and operate any new facilities for disposal of hazardous waste.(iii) The new system will limit the volume of hazardous waste dumped in communities, with immediate benefits from improved air, water and soil quality.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Consultancy Tender	●							
Conduct a study to inventorise hazardous waste sources		●						
Prepare a hazardous waste management plan			●					
Conduct feasibility study for a hazardous waste disposal facility			●					

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 500,000**	Industry standard for consultancy fees for developing a waste management plan, this action also includes undertaking a waste characterisation of hazardous waste and a feasibility study for hazardous waste facility.
Component 1 – Inventory development of hazardous waste	EUR 100,000	6 months consultancy
Component 2 – Development of waste management plan	EUR 200,000	8 months consultancy
Component 3 – Feasibility study for hazardous waste disposal facility identification	EUR 200,000	12 months consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Gaziantep organised industrial zones	Collaborate
Gaziantep small industrial zones	Collaborate

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Financial	There can be a risk of provision of sufficient financial resources.	Ensure that sufficient funds are available to implement the activities and / projects identified in the plan.
Technical	There can be a risk of accurate and reliable information management.	Strengthen and build the infrastructure and capacity at municipal level to collect, analyse and use relevant information and knowledge to ensure informed decision-making, which would support hazardous waste management.
Social	There can be a lack of effective compliance, monitoring and enforcement of the plan.	Raise awareness of the significance and value of the environment

IMPLEMENTATION

Operational Modality: Operation modality will be determined after the feasibility study.

Implementation Timeframe and Timeline: 2023-2026

Indicative Total Cost: €500,000

Capital Cost: N/A

Development / Advisory Costs: €500,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source - GMM

Grant - National government, IFI, International Organisations

Revenue Opportunities: Yes, to be confirmed by the feasibility study.

TRANSPORT

T1 Continue Expansion of the Active Travel & Micro Mobility Network

T2 Congestion Reduction Programme

T3 Bus Fleet Upgrade and Charging Infrastructure

T4 Continue Expansion of the Railway Network

T1 Continue Expansion of the Active Travel & Micro Mobility Network

Continue expanding the active travel and micro-mobility network and infrastructure, supported by the preparation of an 'Active Travel and Micro-Mobility Strategy' for Gaziantep.

INFORMATION

Status:
Ongoing

Location:
- All Gaziray stations
- All LRT and Tramline stationS
- Gaziantep city-wide

Type:
Strategies, plans, and programmes

Action Owner(s):
- GMM Department of Transport
- GAZIULAS

Supporting Institutions:
- Ministry of Transport and Infrastructure
- GMM Department of Zoning and Urbanisation
- Ministry of Environment, Urbanisation and Climate Change
- Gaziantep Police DepartmenT
- Provincial Directorate of National Education
- GMM Traffic Signalling Control Branch Office

Relevant Sector(s):

Related Actions:
T2 - Congestion reduction programme
CA4 - Raising awareness on sustainable consumption in Gaziantep

Across all trips in Gaziantep, the share of bicycle use is very small at only 0.1%.50 This can at least in part be attributed to insufficient provision of cycling infrastructure in the city. Increasing cycling and walking mode share, particularly during peak hours, will contribute to reducing congestion and improving air quality. Increasing active travel mode share has many other benefits, improving the liveability and safety of a city, alongside physical and mental health benefits for users. To address the need for cycling infrastructure, the TMP 2030 sets out to increase the network to 150 km by 2030.

The components of this action are as follows:

- **Development of city-wide active travel and micro-mobility strategy** covering all active modes (e.g. walking, wheeling, cycling and scooting) and setting out how the vision for active travel in Gaziantep, alongside tangible steps and schemes that will be progressed in line with best practice, e.g. adhering to a set of principles designed to deliver healthy and safe streets, and high standards of accessibility and inclusivity. These principles will guide delivery of active travel schemes and infrastructure.
- **Increase network of segregated cycle infrastructure** and associated infrastructure incl. cycle parking, resident secure cycle storage (e.g. cycle hangars). The cycling network should be planned with consideration to existing pedestrian routes and green infrastructure, prioritising kerbside space for active modes.
- **Increase network of walkable / pedestrian-friendly measures** incl. wayfinding, crossing and junction improvements, a 'key routes' network, incorporation of 'healthy streets' principles into transport and urban realm scheme design.
- **Develop feasibility/delivery plan for delivery of shared micro-mobility,** considering which services are most appropriate for Gaziantep and providing recommendations for service roll-out and operation (services considered should include docked bikes and cargo bikes, dockless bikes, e-bikes, e-scooters and scooters). The Plan should also make recommendations for associated infrastructure and any governance structures or partnerships required for successful delivery.
- **Develop feasibility/delivery plan for delivery of a network of Active Transfer Hubs** across the city, linked to existing mass transit hubs and stops, to organise shared transport/ micro-mobility services in recognisable hub locations across the city. This could also be linked to other elements, including parcel lockers and shared car use with electric vehicle charging points.

- **Deliver an awareness raising / behaviour change campaign** on the benefits of active travel and consider opportunity (e.g. cycle training, public information, maintenance, changes to ''highway standards') to improve understanding on traffic rules / sharing road space with vulnerable road users.

This action supports implementation of several actions included in the following plans and strategies already developed by GMM:

- **Transportation Master Plan 2030 (TMP 2030) (2016)**
- **Climate Sustainable Energy and Change Action Plan for Gaziantep (2018)**
- **Climate Change Adaptation Plan (under preparation)**

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:
- Lack of innovative measures, inclusive plans and strategies for climate action
- Rapid population growth putting a significant pressure on infrastructure and service provision in Gaziantep and contribution to a growth in emissions

Green City Challenges:
- Increased use of private vehicles
- Lack of integration across different public transport modes
- Lack of lanes dedicated exclusively to public transport and micro-mobility vehicles (bicycles and scooters)
- Insufficient green and open spaces
- Public transport systems do not serve medium term needs

T1

IMPACT

Strategic Goals Supported:
T i | Decarbonize the transport sector

T iii | Make the city a micro-mobility champion

T iv | Minimize the use of private vehicles

CA iii | Explore new technologies for carbon emission management

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
1.0: Average annual concentration of PM2.5

1.1: Average annual concentration of PM10

1.3: Average annual concentration of NOx

8.0: Annual CO2e emissions per capita

11.0: Transport modal share in commuting

11.1: Transport modal share in total trips

11.5: Kilometres of bicycle path per 100 000 population

11.6: Share of population having access to public transport within 15 min by foot

Cross-cutting Themes

Climate Action [Directly targeted]: This action directly targets climate action by looking to reduce the reliance on private vehicles and associated GHG emissions.

Gender and Social Inclusion [Some elements]: Presently, the lack of cycling infrastructure and pedestrian-friendly measures means that there are safety concerns that may be constraining the uptake of micro modes of transport. This can impact different groups of population, e.g., safety concerns may impede younger populations to take up cycling, people with visual disabilities may prefer to hail and taxi than walk a short distance, etc. Expanding the active travel and micro-mobility network and infrastructure will help build confidence and trust in this mobility mode, providing more transportation options for different population groups in Gaziantep.

Smart Maturity [Some elements]: Marginally, this action is expected to further drive the integration of smart solutions for the transport sector in Gaziantep through more systematic integration of micro-mobility transport modes into the existing electronic payment systems.

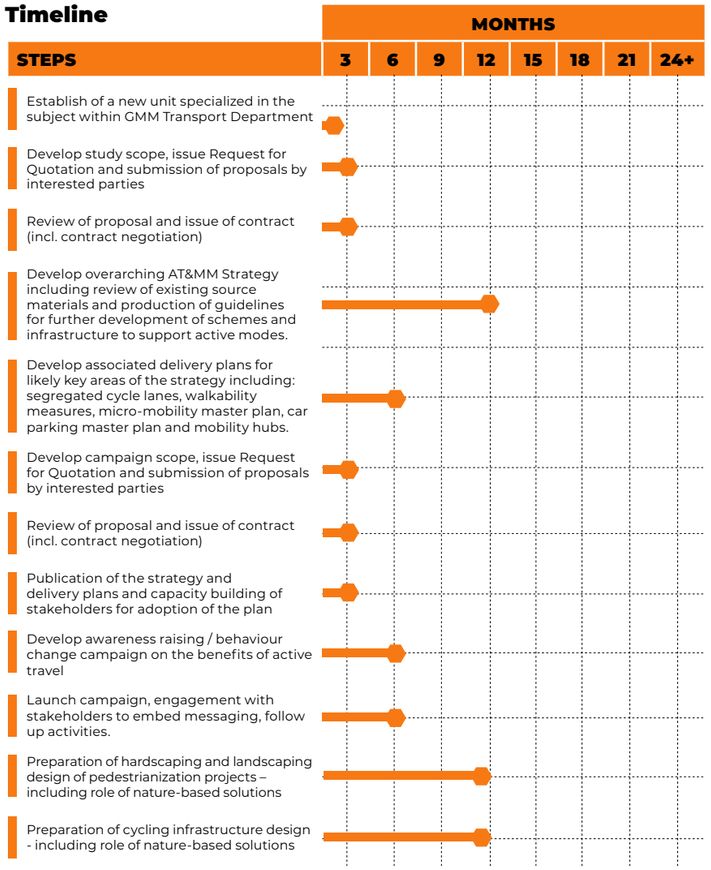
Co-Benefits

Resilience: (i) Increased use of active modes (walking, wheeling, cycling, e-bikes, e-scooter and scooting) can reduce traffic congestion, and create spare capacity within the transport network for emergencies or disaster events.

Economic: (i) Congestion reduction benefits of moving short, urban trips to modes requiring less road space. Accordingly, external economic gains are expected from reducing travel delays and the time people spend commuting.

Social: (i) Improved safety and increased use of active modes (walking, wheeling, cycling, e-scooter and scooting) with associated health and wellbeing benefits alongside traffic collision reductions.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 500,000**	Assumed based on the industry standard for consultancy fees for undertaking an assessment for active travel. This includes preparing of a feasibility study and feeds for communication materials to raise awareness.
Component 1 - Feasibility study	EUR 150,000	12-month consultancy
Component 2 - Development of delivery plan for micro-mobility projects	EUR 50,000	6-month consultancy
Component 3 - Development of awareness campaign on smart travel	EUR 50,000	6-month consultancy
Component 4 - Designs for pedestrianization projects	EUR 125,000	12-month consultancy
Component 5 - Design for cycling infrastructure	EUR 125,000	12-month consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

IMPLEMENTATION

Operational Modality: Strategy to be developed by the GMM Transport Department and consultants/contractors. Behaviour campaign also to be delivered by GMM or appropriate contractor.

Implementation Timeframe and Timeline:
Long: 2024-2030

Indicative Total Cost: €500,000

Capital Cost: N/A

Development / Advisory Costs: €500,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source – GMM

Grant – National government, or IFI, or International Organisations

Revenue Opportunities: No

T1

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District municipalities	Collaborate
UKOME	Collaborate
Vulnerable population representatives (e.g., NGOs, civil society groups)	Consult
Universities and research institutes – e.g. departments of planning and transport engineering	Consult
GMM Department of Environmental Protection, Zero Waste and Climate Change	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Social	Gaziantep's hot weather in the summer may limit the use of active transport modes (walking, cycling, e-bikes, e-scooter, etc).	The project will include climate adaptation measures.
	There is a potential risk associated with the fact that the micro-mobility vehicle user type has not yet been established in Gaziantep.	This risk will be minimized with appropriate traffic controls (increasing fines) and training activities.
Technical	Increasing the use of e-scooters and scooters may cause an increase in traffic accidents rates.	The project will include traffic safety trainings for drivers, users and students of e-scooters and scooters. It will also include adopting new policies and traffic rules to mitigate this risk.

T2 Congestion Reduction Programme

Develop a congestion reduction programme to include city-wide Park and Ride feasibility study, bus priority measures and traffic control / intersection improvements, and investigation of public transport measures to support rapid access into the city from the P&R sites.

INFORMATION

Status:
Ongoing

Location:
- Akkent Park,
- Emine Nakıboglu, Kucukkizilhisar,
- Erdem Koleji,
- Yesilvadi,
- Burc Intersection,
- Budak,
- Belkiz and OIZ – 1. Section
- Gaziantep city centre

Type:
Strategies, plans, and programmes

Action Owner(s):
- GMM Department of Transport
- UKOME

Supporting Institutions:
- GMM Department of Zoning and Urbanisation
- Traffic Branch Office of Gaziantep Security Directorate
- Highways 54th Branch Office
- Gaziantep Governorship

Relevant Sector(s):

Related Actions:
LU2 - Pilot a sustainable, mixed-use, mixed-income housing development
T1 - Continue expansion of the active travel and micro-mobility network
T3 - Bus fleet upgrade and charging infrastructure
T4 - Continue expansion of the railway network
CA4 - Raising awareness on sustainable consumption in Gaziantep

A high number of private vehicles cause traffic congestion and poor air quality, especially in the densest parts of the city. According to Gaziantep's Clean Air Action Plan 2020 – 2024, traffic is the second largest source of air pollution in the city after domestic heating. There are around 626,000 road vehicles in the city as of 2022.[47] This can be tackled through a combination of restrictions for different vehicles at different times of day.

The congestion reduction programme will review and report on options to reduce the number of motor vehicles entering the city. The programme should review methods to assess both through trips and destination trips. This should include:

- **Development of a strategic plan and investment plan for a network of Park & Ride facilities** at strategic locations around the city. These facilities will, to be successful, need to be connected to fast, reliable and cheap public transport – either existing or planned light rail connection or improved bus network connections.
- The city has a problem with buses getting stuck in general congestion. **A delivery plan for bus priority measures on key P&R routes into the city** should be considered in conjunction with P&R facilities to provide users with a reliable alternative to private vehicles. Opportunities to integrate with Car Park Master Plan and Micro Mobility Master Plan, which are planned to be procured, will be developed. Specifically, the Mobility Hubs described in that action will be most successful if they act as key interface locations where the active travel and public transport networks meet, providing opportunities for multi-modal journeys across the city.
- **Opportunities to connect P&R sites to the expanding light rail network** should also be explored as the LR project progresses. This could be included in process above or developed separately.
- Other congestion mitigation actions that could be considered / reviewed in a **further Option Assessment process** include: 'congestion zone' style restrictions with charges and penalties applied to vehicles entering the restricted zone; restrictions on deliveries and loading (e.g. timed to off-peak hours); providing support to businesses to achieve freight/delivery consolidation and other freight reduction measures; Workplace Parking Levy; and methods for reducing/consolidating road maintenance works and infrastructure renewal (this may be especially important given reconstruction works to the city). Methods should be focused on constraining general traffic and prioritising public transport and active modes rather than providing general capacity improvements.

47 Provided by GMM

This action supports implementation of several actions included in the following plans and strategies already developed by GMM:

- **Transportation Master Plan 2030 (TMP 2030) (2016)**
- **Sustainable Energy and Climate Change Action Plan for Gaziantep (2018)**

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:
- Rapid population growth putting a significant pressure on infrastructure and service provision in Gaziantep and contribution to a growth in emissions
- Significant increase in emissions

Green City Challenges:
- Increased use of private vehicles
- Lack of integration across different public transport modes
- Lack of lanes dedicated exclusively to public transport and micro-mobility vehicles (bicycles and scooters)
- Lack of car parks and parking lots

T2

IMPACT

Strategic Goals Supported:
T ii | Connect all residents across the city with public transport

T iv | Minimize the use of private vehicles

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
1.0: Average annual concentration of PM2.5

1.1: Average annual concentration of PM10

1.3: Average annual concentration of NOx

8.0: Annual CO_2e emissions per capita

11.0: Transport modal share in commuting

11.1: Transport modal share in total trips

11.5: Kilometres of bicycle path per 100,000 population

11.6: Share of population having access to public transport within 15 min by foot

Cross-cutting Themes

Climate Action [Directly targeted]: By targeting reduction in the number of motor vehicles entering the city, this action directly targets emissions reduction associated with the transport sector in Gaziantep.

Gender and Social Inclusion [Directly targeted]: Traffic congestion aggravates environmental pollution (e.g. air and noise), which has direct health implications for those residents that are particularly vulnerable to them (elderly, youth, people with respiratory diseases). Traffic congestion can also affect timely access and availability of healthcare services, as well as emergency response. By addressing traffic congestion, this action will help reduce the impact of environmental pollution on vulnerable residents and support timely provision of essential services in Gaziantep.

Smart Maturity [Some elements]: GMM is currently planning a project for the management of intersections with artificial intelligence (AI) and it is being negotiated with international companies. This AI project will facilitate supporting rapid access into the city from the P&R sites by giving priority to buses. The P&R programme could benefit from, or be integrated with, route planner and payment system.

Co-Benefits

Resilience: Making the city's transport infrastructure more resilient by reducing reliance on private vehicles..

Economic: Regions outside the city centre will be better connected to the city centre and benefit from the associated economic opportunities in the city.

Social: (i)Areas at highest risk of air pollution are those in urban core (Sehitkamil and Sahinbey) where most of the population, which includes the highest proportion demographically vulnerable population (children and elderly), is concentrated. These areas will benefit the most from measures to reduce vehicular traffic into the city, (ii) High quality public transport is more inclusive than private vehicle ownership since not everyone can afford, or is physically able, to drive a vehicle. There are therefore equality and inclusion benefits to investing in public transport and reducing the need for private vehicles, (iii) Increased access to social and leisure opportunities.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Establish the project team and governance structure within GMM Transport Department	●							
Develop study scope, issue Request for Quotation and submission of proposals by interested parties	●							
Review of proposal and issue of contract (incl. contract negotiation)	●							
Development of a strategic plan and investment plan for a network of Park & Ride facilities at strategic locations around the city, with accompanying parking strategy for city centre, including data review.	●		●					
Development of feasibility study / delivery plan for bus priority measures, initially linked to P&R key locations but successful techniques to be expanded city wide to improve bus services reliability and passenger experience.	●	●						
Data collection commissioned to plug gaps identified in Task 4. This could include passenger counts, trip diaries, parking surveys, loading surveys, passenger satisfaction surveys, growth forecasting, in-depth interviews with key stakeholders.	●	●						
Engagement with stakeholders and communities on identified sites for P&R	●							
Analysis of engagement responses. Development of proposals based on feedback. Sifting exercise to determine extensions and new routes to be taken forward for more detailed analysis and development	●							
Development of high-level proposals for major schemes, including any requirements for funding and prioritisation exercise. Plans and proposals to be incorporated in the next Gaziantep Transport Master Plan	●	●						
Increasing traffic enforcement measures with charges and penalties applied to drivers not obeying the traffic rules.	●							
Further development of additional congestion mitigation measures if required (see description) TBC								

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 250,000**	Industry standard for consultancy feeds for a feasibility study for P&R networks, congestion reduction programs, etc.
Component 1 - Feasibility study, stakeholder engagement, development of potential projects for congestion reduction	EUR 250,000	24-month consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

IMPLEMENTATION

Operational Modality: Strategy and delivery programme to be developed by the GMM Transport Department and consultants/contractors.

Implementation Timeframe and Timeline: 2024-2027

Indicative Total Cost: €250,000

Capital Cost: N/A

Development / Advisory Costs: €250,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source – GMM

Grant – National government, IFI, International Organisations

Revenue Opportunities: No

T2

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ministry of Transport and Infrastructure	Consult
District municipalities	Empower
Vulnerable population representatives (e.g., NGOs, civil society groups)	Consult
Universities and research institutes – e.g. departments of planning and transport engineering	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Social	Social attitudes towards traffic rules (disregard for the traffic rules and parking in places where parking is prohibited) in Gaziantep.	The project will include traffic safety trainings for drivers. Traffic Signalling and Control Branch Office of Gaziantep Police Department will continue to play an active role in the enforcement of traffic safety rules.
Technical	The high number of different institutions and stakeholders involved might make the implementation particularly challenging.	UKOME and GMM Department of Transport will be the action owner and will effectively engage the stakeholders throughout the project.

T3 Bus Fleet Upgrade and Charging Infrastructure

Continue modernisation of Gaziantep's bus fleet with a Zero Emissions Action Plan designed to deliver a transition to zero-emission vehicles across public and private fleets.

INFORMATION

Status:
Ongoing

Location:
- City-wide

Type:
Strategies, plans, and programmes
Capital Investment

Action Owner(s):
- GMM Department of Transport
- GAZIULAS
- Blue and Yellow Private Bus Companies

Supporting Institutions:
- UKOME
- EDAS

Relevant Sector(s):

Related Actions:
T2 - Congestion reduction programme
CA4 - Raising awareness on sustainable consumption in Gaziantep
ENG1 - Identify feasible battery energy storage system (BESS) opportunities

The existing bus network and services are an integral part of Gaziantep's public transport offer. The network must be future proofed by investing in and implementing appropriate zero-emissions technologies. Buses, like other modes, are likely to require at least some conversion to electric, though this can potentially sit alongside other fuels and technologies. The action also includes work to prepare the city for electric charging infrastructure to support all modes, including buses, taxis, car clubs and private vehicles.

Electric vehicle charging infrastructure (EVCI) should be considered a priority for buses and other shared fleets (taxis, car clubs) alongside delivery of shared infrastructure for private vehicles. Studies on the suitability of other alternative fuels should also be conducted as opportunities arise, such as those associated with renewable energy generation. Electrifying the bus fleet in parallel to wider improvements to the public transport offer in Gaziantep will help achieve modal shift onto public transport and away from private motor vehicles (with associated congestion and air quality/carbon benefits). EBRD has experience with bus fleet electrification in particular, and is well-placed to support delivery of this action. The bus fleet upgrade programme should include:

- **Feasibility studies for alternative fuels for buses,** including electricity and hydrogen (employing modelling of individual routes, depot and maintenance workshops requirements to determine the right strategy for deployment of a zero-emission fleet mix for Gaziantep's needs);
- **The investment in and roll-out of zero-emission buses[48] and associated infrastructure** including an investment plan for the transition of bus depots to support electric vehicles and other future technologies (considering charging infrastructure, fire risk management and space-saving initiatives). This could also include opportunities for commercial (and potentially residential) developments alongside depots;
- **A wider investment plan for the construction of fast charging stations for other electric vehicles (EVs)**, including municipal utility vehicles, taxis, car clubs, private vehicles. This should be integrated with Mobility Hubs at key interchange locations, such as: Gar Station Transit Hub, City Hospital Transit Hub, Gaziantep University Transfer Centre, GAUN 15 July Campus Transfer Centre, Baspinar – OIZ Transfer Centre, Duztepe Transfer Centre, Oduncular Station Transfer Centre, Binevler Station Transfer Centre, Otogar Transfer Centre and Barak Transfer Centre and potential Park & Ride sites, such as: Akkent Park, Emine Nakıboglu, Kucukkizilhisar, Erdem Koleji, Yesilvadi, Burc Intersection, Budak, Belkiz and OIZ – 1. Section; and

48 Bus lengths of 11.95 – 12 meters

- **Production of a future energy demand requirements and grid capacity study** to determine priority phasing of depot electrification and options for investment in the grid (if required) to support transition to EV across the city in both central and residential locations.

This action supports implementation of several actions included in the following plans and strategies already developed by GMM:

- **Transportation Master Plan 2030 (TMP 2030) (2016)**
- **Sustainable Energy and Climate Change Action Plan for Gaziantep (2018)**
- **GMM Smart City Roadmap (under preparation)**

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Lack of innovative measures, inclusive plans and strategies
- Rapid population growth putting a significant pressure on infrastructure and service provision in Gaziantep and contribution to a growth in emissions

Green City Challenges:

- Large contribution to GHG emissions
- Inadequate innovative measures, non-inclusive plans and strategies

T3

IMPACT

Strategic Goals Supported:
T i | Decarbonize the transport sector

T iv | Minimize the use of private vehicles

CA iii | Explore new technologies for carbon emission management

Estimated benefit(s):

CO_2 savings: 8,570 tCO_2e per annum

Job Created: 75

Quantitative Impact measures:

1.0: Average annual concentration of PM2.5

1.1: Average annual concentration of PM10

1.3: Average annual concentration of NOx

8.0: Annual CO2e emissions per capita

Cross-cutting Themes

Climate Action [Directly targeted]: This action will directly contribute to the reduction of transport-related GHG emissions in the city (approximately 25% of all emissions in Gaziantep).

Gender and Social Inclusion [Directly targeted]: The existing reliance on private motor vehicles and an old vehicle fleet is a significant contributor to poor air quality in Gaziantep, which disproportionally affects the elderly, young, and people with respiratory diseases. Modernising and electrifying public transport in Gaziantep has the potential to improve air quality in the city, with direct benefits for some of the most vulnerable segments of the population.

Smart Maturity [Some elements]: The action will support GMM's objective of deploying new technologies to decarbonise its transport, which should also contribute to the GMM Smart City Roadmap for Gaziantep (under preparation).

Co-Benefits

Resilience: Future proofing the bus network with up-to-date-technology that will contribute significantly to decarbonising the transport sector and increasing the sectoral resilience.

Economic: Operational cost-savings that can be achieved through improved efficiency of the fleet.

Social: Improved passenger experience of bus network and services will be one of social co-benefits.

Timeline

STEPS	MONTHS: 3	6	9	12	15	18	21	24+
Establish the project team and governance structure within GMM Transport Dept	●							
Develop study scope, issue Request for Quotation and submission of proposals by interested parties	●							
Review of proposal and issue of contract (incl. contract negotiation)	●							
Develop energy demand forecasts and feasibility studies for alternative fuels for buses, including electricity and hydrogen		●						
Identify bus operator partners for zero-emission vehicle support and renewal timescales for existing fleets: · Gaziulas, the public transport bus company in Gaziantep and affiliated with GMM, runs 343 municipal buses. 145 of the buses use CNG and the remaining vehicles are diesel buses · The Blue Buses Private Public company operates 184 diesel buses · The Yellow Buses Private Public company operates 487 diesel buses	●							
Identify funding sources and delivery plan for upgrading the fleet to zero-emission buses	●							
Identify depot requirements and delivery plan for depot upgrades in line with vehicle purchasing, grid connections and future energy requirements		●						
Continue wider roll-out of electric charging infrastructure in line with the Charging Service Regulation for electric vehicles in Turkiye, published on 2 April 2022. Aim to link upgrades, where possible, to planned investment in other Action deliverables e.g. Mobility Hubs linked to central bus depots / major stops.								●
Identify opportunities for linking EVCI to other transport needs with existing and future energy needs, including rail network, Park and Ride sites, and freight/ goods vehicle charging		●						

IMPLEMENTATION

Operational Modality:
Once procured, the buses will be operated by GAZIULAS.

Implementation Timeframe and Timeline:
Long: 2024-2028

Indicative Total Cost:
€84,075,000

Capital Cost:
€83,875,000

Development / Advisory Costs:
€200,000

5-year Operational Cost:
€12,581,250

Potential Financing Instruments:

Instrument:
Own source – GMM,
Bus Operator Grant – National government, IFI, International Organisations

Loan – Government-owned bank, IFI, Commercial bank

Revenue Opportunities:
Yes, to be determined by the feasibility study.

T3

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 200,000**	Industry standard for consultancy fees for a feasibility study on enhancing electric buses and providing EV charging points for commercial and private vehicles.
Component 1 - Feasibility study for the expansion of the electric vehicle network	EUR 200,000	6-9-month consultancy
Capital Costs	**EUR 83,875,000**	This action assumes the procurement of 150 electric buses at EUR 500,000 each, and the procurement of 75 EV charging points for commercial vehicles at EUR 25,000 each, and 200 EV charging points for private vehicles at EUR 35,000 each
Component 1 – Procurement of 150 electric buses at EUR 500,000 each	EUR 75,000,000	
Component 2 – Procurement and Installation of 75 charging points for buses applying EUR 25,000 per charging point	EUR 1,875,000	
Component 3 - Procurement and installation of 200 fast charging points for private vehicles applying EUR 35,000 per charging point	EUR 7,000,000	
Operational Costs (over 5 years)	**EUR 12,581,250**	OPEX costs for the operation and maintenance of EV buses and EV charging points are estimated at 3% of total CAPEX costs per annum.

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ministry of Transport and Infrastructure	Collaborate
District municipalities	Collaborate
Bus user groups / representatives	Consult
Vulnerable population representatives (e.g., NGOs, civil society groups)	Consult
Universities and research institutes – e.g. departments of planning and transport engineering	Consult
Gaziantep Chamber of Electrical Engineers	Consult
GMM Energy	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Funding not available for upgrading the fleet to zero-emission buses.	Identify potential funding streams early in the process of preparation of the feasibility study.
Technical	Lack of capacity to implement, maintain and operate projects.	The project will include upskilling of workforce and training on how to maintain and operate systems.

T4 Continue Expansion of the Railway Network

Continue the expansion of the railway network of Gaziantep with 54 km of new LRT lines and 4 km extension of tramlines by 2030.

INFORMATION

Status:
Ongoing

Location:
- New LRT line between Gar Station and City Hospital (10,5 km)
- New LRT line between Gar Station and Gaziantep University July 15 Campus (11 km)
- New LRT line between Gar Station and Stadium (7 km)
- New LRT line between Sehirgosteren and Airport (26 km)
- Tramline extension from City Hospital to Guzelvadi (2.5 km)
- Tramline extension from Olympic Pool to Kadi Degirmeni (1 km)
- Tramline extension from Courthouse to Budak (0.5 km)

Type:
- Capital Investment
- Investment-related feasibility study
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM Department of Transport
- Ministry of Transportation and Infrastructure
- Turkish State Railways (TCDD)

Supporting Institutions:
- Gaziulas
- EDAS
- TEIAS
- GAZDAS

Gaziantep has already begun investing in the construction of a light-rail transport system (tramline and metro) which aims to become the backbone of the city's public transport system. Investments in it can be considered a priority to meet strategic goals around reducing private vehicle use and connecting all residents to high-quality public transport provision.

Gaziantep is planning to extend the railway network from 47 km (including 22 km tramline and 25 km Gaziray[49]) as of 2022 to 101 km in length by 2030 according to the TMP 2030, including light rail (metro) line, tramline and Gaziray. Since the publication of the TMP 2030 in 2016, the city has started developing two light rail (metro) projects. The required approvals were obtained for the light rail between Gar Station (the main train station in the city centre) and City Hospital which has a total length of 10.5 km. The pre-feasibility study for another 11 km line between Gar Station and Gaziantep University July 15 Campus has been completed.

To further develop expansion plans towards targets, this action will undertake a strategic review of the existing and planned LRT and tramline provision. Data gathering and commissioning to 'plug' data gaps will be undertaken. Evidence is compiled into a strategic review of the existing network and opportunities for transit-oriented development, including commercial and residential. A long list of schemes will be developed and assessed against key indicators before shortlisting. Consideration could also be given to connections to the proposed metro system in the city.

Stakeholders, including the public, will be engaged with on the options as they are developed and refined. Once a final shortlist is agreed, these options will be taken forward to be worked up in depth and prioritised. Throughout scheme shortlisting, potential funding sources could be identified, and any requirements for funding (business cases etc) and potential financing could be complied. This action relates to the following plans and strategies already developed by GMM:

- **Existing Plan / Strategy 1: Transportation Master Plan 2030 (TMP 2030) (2016)**
- **Sustainable Energy and Climate Change Action Plan for Gaziantep (2018)**
- **Explanation Report of Gar-Duztepe-Hospital Light Rail System (Metro) Line for 1/5,000 Scaled Master Plan Change**
- **Explanation Report of Gar-GAUN 15 July Campus Light Rail System (Metro) Line for 1/1,000 Scaled Implementation Plan Change**

49 Gaziray, a commuter rail line with a total length of 25 km, was commissioned at the end of 2022. Gaziray is a joint venture between Turkish State Railways (TCDD) and GMM to expand the existing network from single-track to quart-track, with segregated trainlines, as well as constructing new stations and renovating existing ones. Gaziray is shown with yellow line on the Gaziantep railway map above.

INFORMATION

Relevant Sector(s):

Related Actions:
LU2 - Pilot a sustainable, mixed-use, mixed-income housing development
T3 - Bus fleet upgrade and charging infrastructure

Challenges Addressed:
Priority Environmental Challenges:
- Rapid population growth putting a significant pressure on infrastructure and service provision in Gaziantep and contribution to a growth in emissions
- Significant increase in emissions

Green City Challenges:
- Increased use of private vehicles
- Lack of integration across different public transport modes
- Public transport systems do not serve medium term needs

T4

IMPACT

Strategic Goals Supported:
T ii | Decarbonize the transport sector

T iV | Minimize the use of private vehicles

Estimated benefit(s):

CO_2 savings: 668,050 tCO2e per annum

Job Created: 9,706 (construction and operation estimates)

Quantitative Impact measures:
1.0: Average annual concentration of PM2.5

1.1: Average annual concentration of PM10

1.3: Average annual concentration of NOx

8.0: Annual CO_2e emissions per capita

11.0: Transport modal share in commuting

11.1: Transport modal share in total trips

11.6: Share of population having access to public transport within 15 min by foot

Cross-cutting Themes

Climate Action [Directly targeted]: By reducing the need for private vehicles and associated GHG emissions, this action directly contributes to climate action in Gaziantep.

Gender and Social Inclusion [Directly targeted]: The expansion of railway network in Gaziantep is expected to enable easier and cheaper commute for different population groups that may experience barriers to accessing private vehicles, including elderly, youth, and people with disabilities.

Smart Maturity [Some elements]: Through its focus on data collection and gathering, and the reliance on GIS for planning, this action has some elements that contribute to smart maturity of Gaziantep.

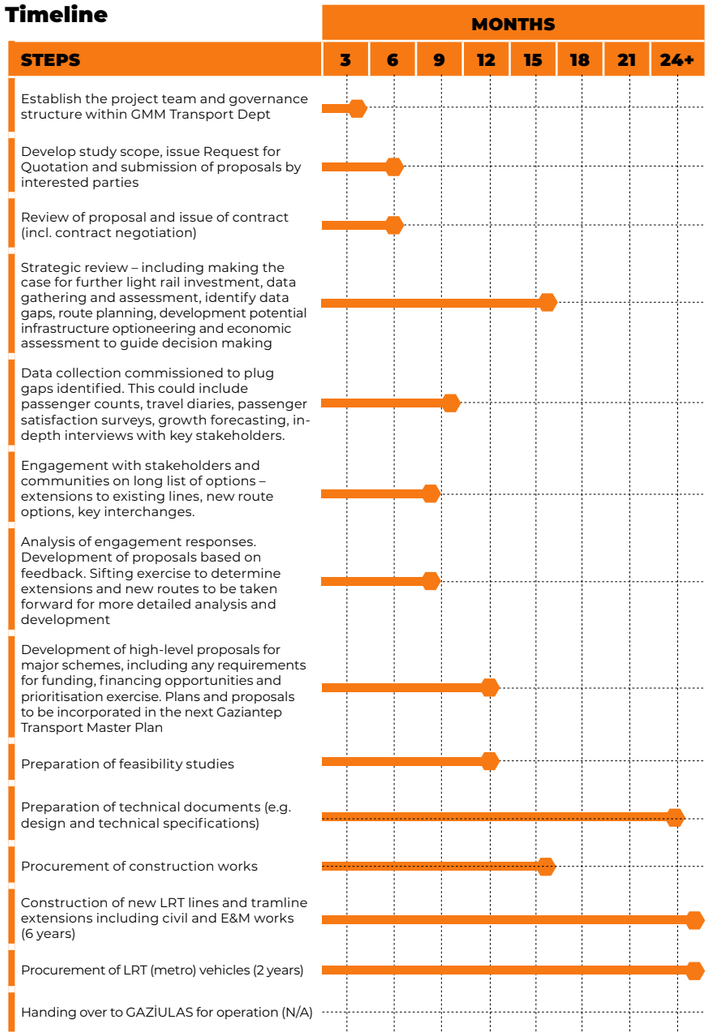
Co-Benefits

Resilience: N/A

Economic: (i) Reduced need for household vehicle ownership, (ii) Increased access to economic opportunities – education and employment.

Social: (i) Areas at highest risk of air pollution are those in urban core (Sehitkamil and Sahinbey) where most of the population, which includes the highest proportion demographically vulnerable population (children and elderly), is concentrated. These areas will benefit the most from measures to reduce vehicular traffic into the city, (ii) High quality public transport is more inclusive than private vehicle ownership since not everyone can afford, or is physically able, to drive a vehicle. There are therefore equality and inclusion benefits to investing in public transport and reducing the need for private vehicles, (iii) Increased access to social and leisure opportunities.

Timeline



IMPLEMENTATION

Operational Modality:
The new rail system lines that are to be built and extended will be implemented with the cooperation of the relevant Ministries under the coordination of GMM and will be operated by GAZIULAS.

Implementation Timeframe and Timeline:
2024-2030

Indicative Total Cost:
€2,221,020,000

Capital Cost:
€2,176,000,000

Development / Advisory Costs:
€45,020,000

5-year Operational Cost:
€217,600,000

Potential Financing Instruments:

Instrument:
Own source – GMM, Rail operator company

Grant – National government, IFI, International Organisations

Loan – Government-owned bank, IFI, commercial bank

Investment – IFI, private sector

Revenue Opportunities:
Yes, to be determined by the feasibility study

T4

Financing Approach

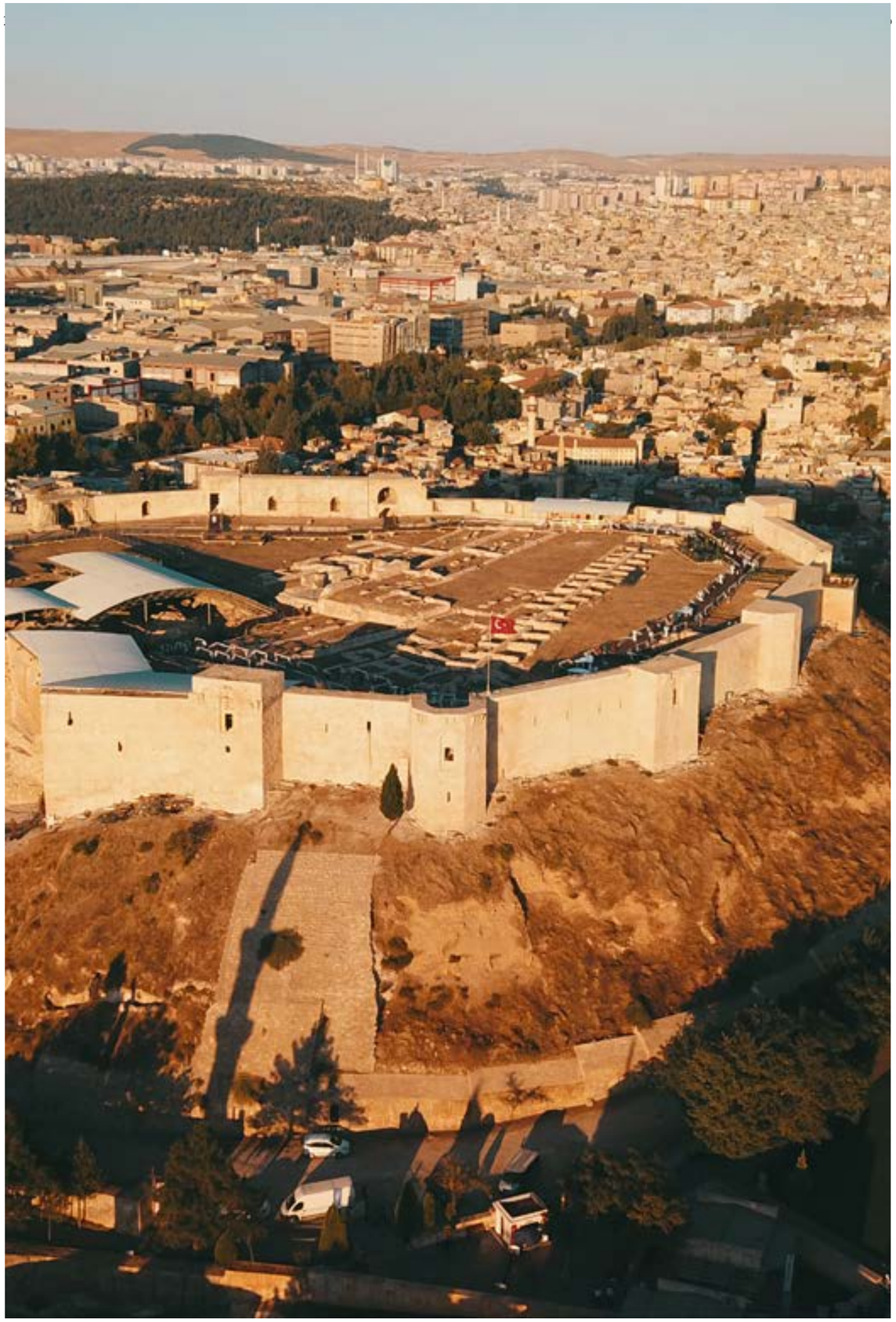
COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 45,020,000**	Industry standard for consultancy fees including strategic study, feasibility assessment, detailed designs, EIAs, and BoQs.
Component 1 - Strategic assessment and optioneering	EUR 300,000	16-month consultancy
Component 2 - Data collection, stakeholder engagement, passenger assessments	EUR 300,000	18-month consultancy
Component 3- Feasibility assessment	EUR 150,000	12-month consultancy
Component 4 - Concept designs, EIA, and outline permitting	EUR 750,000	24-month consultancy
Component 5 - Detailed designs, EIA, permitting and supervision of works applying 2% of construction costs	EUR 43,520,000	Construction duration
Capital Costs	**EUR 2,176,000,000**	Figures provided by GMM. The construction of the extension of the railway applied EUR 40 m per km, and applied EUR 4 m per km for the extension of the tramline.
Component 1 - Construction of 54 KM of new LRT Lines applying EUR 40,000,000 per KM	EUR 2,160,000,000	
Component 2 - Construction of 4 KM of new tramlines applying EUR 4,000,000 per KM	EUR 16,000,000	
Operational Costs (over 5 years)	**EUR 217,600,000**	The supervision of the works is 2% of construction costs. This excludes any land acquisition. The action assumed that the construction duration of the railway extension will take place beyond the GCAP timeline.

Stakeholders

STAKEHOLDERS	ENGAGEMENT
GMM Department of Zoning and Urbanisation	Collaborate
District municipalities	Collaborate
OIZ and small industrial sites management	Consult
Community groups in areas targeted for new stations and interchanges	Consult
Vulnerable population representatives (e.g., NGOs, civil society groups)	Consult
Universities and research institutes – e.g. departments of planning and transport engineering	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Funding not available to continue the expansion of the LTR and tramline.	Identify potential funding streams early in the process of preparing the feasibility study.
Technical	Lack of capacity to implement, maintain and operate new LRT projects.	The project will entail upskilling of workforce and training on how to maintain and operate systems.



LAND USE

LU1 **Develop an Integrated Landscape and Biodiversity Management Strategy**

LU2 **Pilot a Sustainable, Mixed-use, Mixed-income Housing Development**

LU3 **Plan and Pilot ‘Resilience Parks’**

LU4 **Implement a Meanwhile Uses Programme**

LU5 **Ecological Village Project**

LU1

Develop an Integrated Landscape and Biodiversity Management Strategy

Develop an integrated landscape and biodiversity management strategy to protect, leverage and revitalise land assets across the province

INFORMATION

Status:
New

Location:
- Gaziantep Province

Type:
- Strategies, plans, and programmes

Action Owner(s):
- GMM Department of Urban Aesthetics and Green Spaces

Supporting Institutions:
- GMM Department of Agricultural Services and Food
- GMM Department of Environmental Protection, Zero Waste, and Climate Change
- Provincial Directorate of National Education

Relevant Sector(s):

Related Actions:
LU3 - Plan and pilot 'resilience parks'

One of the outcomes of rapid population growth in the early 2010s has been an expansion of urban sprawl in the city, reflected in the increase in built up areas of the urban core by nearly 25% between 2018 and 2022. Much of this urban expansion has taken place on formerly agricultural and pastoral land surrounding the urban core. Climatic and anthropogenic pressures have also led to degradation of natural assets such as forest areas in the province. With increasing population within the urban core, the quality and quantity of open, green spaces available to Gaziantep's residents are declining.

Protecting and revitalising these key land assets within the province has the potential to enhance resilience, sequester carbon, and act as a catalyst for tourism and economic development. Through the development of an Integrated Strategy for Landscape and Biodiversity Management, GMM can identify feasible actions to protect and leverage forests, agricultural and pastoral land to enhance biodiversity, maximise natural carbon sinks within the province, improve resilience to climate risks (floods, extreme heat, droughts), and increase natural green spaces available to Gaziantep's residents.

The analysis and actions outlined in the strategy should be developed using a Natural Capital Value (NCV) approach. The NCV approach enables a holistic assessment of the value provided to society, by natural capital assets such as forests, fisheries, rivers, biodiversity, land, and minerals[50]. This approach enables valuation of the economic use of the asset (e.g., value of crops grown on agricultural land, value of timber) as well as non-economic uses (e.g., enhanced resilience to flooding, recreational space, tourism development etc.). Several standardised and/or publicly accessible NCV methodologies and tools may be used, such as EBRD's Natural Capital Valuation Model[51] or the UK Government's Natural Capital Approach[52], which typically describe the following steps:

- **Define a Vision for the Strategy,** in collaboration with stakeholders from the public, private, civil society, and academic sectors.
- **Compile a spatial inventory of natural capital assets** using GIS systems, available data (such as from Gaziantep's Environmental Plan), satellite imagery analysis, and information on land parcels from the National Land Registry. In addition to location, the inventory should include information on the quantity, quality, ecosystem services, social, economic, environmental benefits, and beneficiaries of the asset. The assessment should also translate the ecosystem services provided by the identified natural capital assets into economic/monetary terms. This spatial inventory may be of value to other similar actions within the GCAP and for other GMM initiatives as well.
- An assessment of the **key current and future social, environmental, economic, and climate risks** that are affecting or may affect the natural capital assets and the services they provide, along with their distance to key thresholds (e.g., environmental or regulatory tipping points) and **the regulatory and policy environment** governing natural capital assets. The assessment should also include a scenario analysis to determine how the identified risks and the value of natural capital assets will evolve over time under a "business as usual" and "sustainable future" scenario.
- **Identify appropriate measures to mitigate identified natural capital risk or optimize the value of the assets (or expand, or develop additional ones)** considered for the Strategy. Such measures can focus on key themes or topics aligned with the Vision, such as protecting or improving ecosystem services, enhancing resilience, absorbing carbon emissions, contributing to economic development, or social and cultural cohesion. The identification of measures may be supported by analysing successful initiatives and interventions from other contexts.
- **Outline an implementation plan for the most high-impact measures.** Actions may include policy or regulatory measures (e.g., protection of biodiversity hotspots), incentives (e.g., tax subsidies for adopting specific measures), or programmes (e.g., eco-tourism development programmes in rural parts of the province). The implementation plan should set out key details around (i) governance, (ii) implementation approach, (iii) costs and financing approach, (iv) timelines, (v) if relevant, procurement approaches that help optimise social and economic benefits, (vi) monitoring plan, (vi) key risks and mitigation measures for negative impacts and (vii) a communications strategy. The selection of high-impact actions and the implementation must be supported through consultation with key stakeholders from the public, private, civil society, and academic sectors.

This action aligns with GMM's **'Green Antep' programme**, which looks at afforesting open spaces in the city centre and protection of existing agricultural and forest areas.

50 https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance#introduction-to-natural-capital
51 https://www.ebrd.com/news/2022/transforming-our-economies-into-nature-positive.html#:~:text=The%20EBRD%20is%20leading%20work,opportunities%20associated%20with%20project%20activities.
52 https://www.gov.uk/government/publications/enabling-a-natural-capital-approach-enca-guidance/enabling-a-natural-capital-approach-guidance#place-based-natural-capital-approaches

2023 Green City Action Plan (GCAP) Gaziantep

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Degradation of forests, pastures and meadows affecting the provision of ecosystem services
- High proportion of degraded and damaged forests across province
- Failure to consider green infrastructure as an integrated policy issue

Green City Challenges:

- Increased use of private vehicles
- Lack of integrated approach to adaptation planning" and "Untapped potential for building resilience through nature-based solutions
- Public transport systems do not serve medium term needs

LU1

IMPACT

Strategic Goals Supported:

LU i | Promote urban development along a climate-resilient and low-carbon pathway

LU ii | Increase access and quality of green spaces for residents and visitors in the city

LU v | Foster natural and cultural heritage and biodiversity

WA iv | Enhance resilience to flood risk

CA i | Leverage natural assets to improve resilience to climate hazards

CA v | Improve resilience of agriculture and food systems to climate change

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
4.0 Contaminated sites

6.0 Open green space ratio per 100,000 inhabitants

Cross-cutting Themes

Climate Action [Directly targeted]: Actions identified in the strategy will leverage land assets to enhance resilience and reduce net carbon emissions in Gaziantep.

Gender and Social Inclusion [Some elements]: The inclusion of nature-based approaches targeting the value of agricultural and pastoral land can support economic resilience of rural households against climate risks.

Smart Maturity [Some elements]: The use of digital technologies for mapping and spatial analysis, such as satellite imagery analysis, drone-based mapping etc. can build capacity within GMM for monitoring impact of GCAP actions.

Co-Benefits

Resilience: (i) Protecting natural assets like floodplains and wetland areas in the province can help enhance resilience to flooding events, (ii) Increased forest cover can improve percolation and support groundwater recharge thus enhancing resilience to droughts, (iii) Increased tree canopy cover in urban areas can mitigate urban heat island effect iv) Reversing loss of species and increase in biodiversity value of site is central to building ecosystem resilience, which in turn supports broader climate resilience

Economic: (i) Actions around sustainable tourism and economic development focused on agricultural/pastoral land and natural habitats can support higher incomes for rural households.

Social: (i) Revitalisation of natural assets will augment recreational and open space stock available to Gaziantep's residents, which could also have positive impacts on the health of local communities, (ii) Improved livelihoods by providing and/or enhancing sustainable sources of income, food, and water for local communities, (iii) Strengthening local cohesion by bringing together different stakeholders and by promoting dialogue and cooperation, (iv) Preserving local knowledge and practices around agriculture and gastronomy.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Develop a Terms of Reference for the Strategy and identify key stakeholders for consultatio	●							
Compile spatial inventory and carry out assessment of current state and risks	●			●				
Identify potential approaches through desk-based study and stakeholder consultation		●						
Outline next steps for the most high-impact measures	●							

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 250,000**	Industry standard for consultancy fees for landscape and biodiversity strategy
Component 1 – Landscape and biodiversity strategy and implementation plan	EUR 250,000	12-22 months consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District municipalities	Collaborate
Ministry of Environment, Urbanisation and Climate Change	Involve
Ipekyolu Development Agency	Consult
Food and Agriculture Organization of the United Nations	Consult
Gaziantep Nature Protection Association	Consult
TEMA Foundation	Consult
Pistachio Research Institute	Consult
Gaziantep Chamber of Agricultural Engineers	Consult
Turkish Nature Conservation Association	Consult
Gaziantep Provincial Directorate of Agriculture and Forestry	Consult
Gaziantep 3rd Regional Directorate of Forestry	Consult
Gaziantep Directorate of Forest Management	Consult

IMPLEMENTATION

Operational Modality: Actions in the strategy to be implemented by various GMM departments.

Implementation Timeframe and Timeline: 2023-2024

Indicative Total Cost: €250,000

Capital Cost: N/A

Development / Advisory Costs: €250,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source - GMM

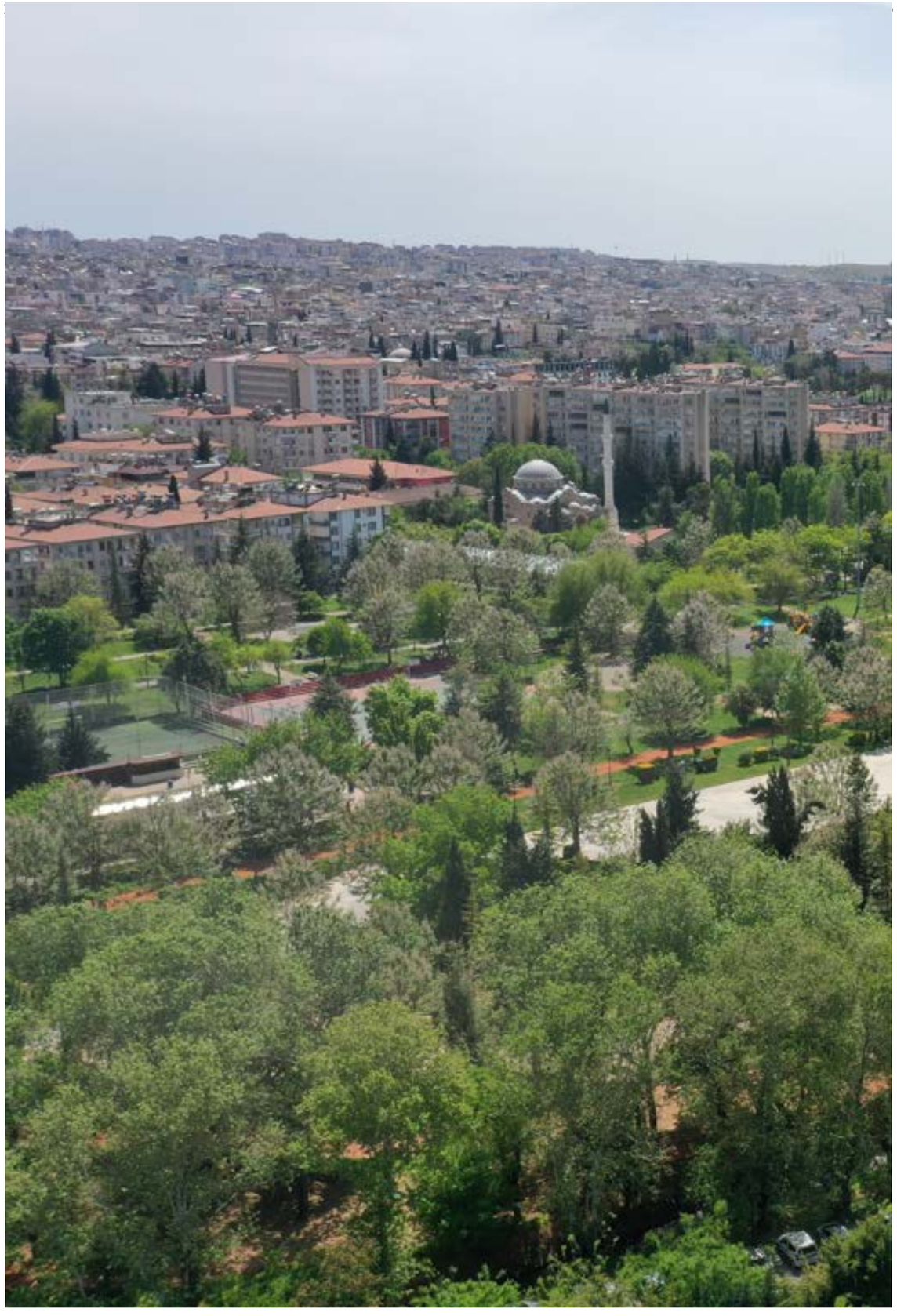
Grant - National government, IFI, International Organisations

Revenue Opportunities: No

LU1

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Cost of implementing actions may be unaffordable for GMM.	· Implementation plan can identify range of funding and financing sources and look to maximise private sector involvement · Potential of exploring innovative and/or green finance approaches to finance actions (e.g., carbon credits, natural capital value capture).
	Negative economic impacts from implementing actions in the strategy.	· Identify negative impacts in consultation with impacted communities and key stakeholders · Implementation plan must include approaches to mitigate negative impacts
Technical	Absent/poor quality data on land assets within Gaziantep.	· Leverage digital technologies to address data gaps e.g., machine learning-based (AI) tools to analyse satellite imagery · Use qualitative data obtained through stakeholder consultation for analysis
Environmental	Actions in strategy may not achieve desired results.	Implementation plan in strategy should be developed to maximise results, taking into account any implementation risks
Social	Lack of stakeholder buy-in or support for identified approaches.	Early and regular stakeholder consultation should be incorporated throughout the strategy, with stakeholder buy-in explicitly sought at key points such as Vision development and selection of approaches
	Insufficient environmental awareness among citizens.	Awareness raising campaigns, especially among school-age students



LU2

Pilot a Sustainable, Mixed-use, Mixed-income Housing Development

Pilot a PPP mixed-use/mixed-income housing development within walking distance from one of the rail system stations

INFORMATION

Status:
New

Location:
- Public land within walking distance of the rail station

Type:
- Capital Investment

Action Owner(s):
- GMM Department of Zoning and Urbanization

Supporting Institutions:
- Ministry of Environment, Urbanization and Climate Change
- TOKI
- GMM Department of Transportation

Relevant Sector(s):

Related Actions:
LU1 - Develop an integrated landscape and biodiversity management strategy
LU4 - Implement a meanwhile uses programme
T4 - Continue expansion of the railway network

Challenges Addressed:
Green City Challenges:

- Unavailable or unaffordable housing
- Public transport systems do not serve medium term needs
- Pressure on older neighbourhoods
- Urban sprawl and lack of integration of satellite cities
- Unsuitable, unsafe buildings

Good examples of transit-oriented development (like the Akkent neighbourhood in the south-west) exist in Gaziantep. However, there does not appear to be a wider application of these principles in the planning of new developments. This issue is particularly observed in satellite cities where housing for low-income households tends to be concentrated, leading to poor accessibility to urban services for lower-income households and contributing to the overcrowding in lower-income neighbourhoods in the urban core. This challenge is partly caused by the limited ability of GMM to influence the locations of affordable housing developments (which lies under the remit of the Housing Development Administration of Turkiye, or TOKI), and the development process for affordable housing which primarily relies on direct public sector intervention.

To address both the low availability of affordable housing and fostering transit-oriented development within Gaziantep, this action will focus on a public-private partnership (PPP) approach to develop mixed-use, mixed-income housing near a railway system station in Gaziantep. Analysis of GMM's own-source revenues suggests that leasing of publicly-owned land may already be supported by existing policy or regulation, hence the recommended PPP model will involve the long-term, no-cost lease of a public land parcel to a private-sector developer, in exchange for the construction of a pre-agreed number of units of affordable housing as part of the development on the land parcel, with the sale of market rate housing units constructed on the land parcel subsidising the construction of affordable housing units. The steps outlined below for this action are targeted to GMM and focus on facilitating completion of the development and ensuring requirements and standards are met in order to secure public benefit:

- **Identification of a suitable land parcel for the development:** To facilitate this development, GMM should evaluate the suitability of public land parcels it owns within a walking distance of an existing or soon to be opened railway station. Suitability may be determined through consultation with an urban economist or land surveyor, and also take into account site characteristics (e.g., size, flat topography, soil composition), neighbourhood characteristics (e.g., access to urban services like schools, neighbourhoods with high demand for low-income housing), and economic factors (e.g., land value, number of developable units, feasible number of affordable units).
- **Form a project team to represent public interest:** While developing the housing project, GMM will require guidance from technical specialists who can help optimise the public benefit from the PPP project. For this reason, a qualified and experienced project team should be set up within GMM comprising of staff or consultants with relevant technical expertise and local experience with housing development. The team should consist of at least a civil engineer, an architect, an expert in the field of expropriation and urban planner. The team's mandate will be to advise GMM on legal and technical matters throughout the process, with a view to maximise the quality and quantity of affordable housing units and maximise public benefit through the project.
- **Develop a project brief through consultation:** Following identification of the land parcel and the formation of a project team, GMM should follow a consultative process to develop a list of requirements to maximise public benefit from the development. The process should be led by the GMM project team, and include public consultation events, engagement with Chambers of Architects and Engineers, academic institutions and civil society organisations. The project team should validate the list of requirements developed through consultation to confirm their feasibility. Additionally, incorporation of suggested features and compliance with the goals of GMM's Ecological City Application Design Guide should be included within the project brief, as should design criteria to enable inclusive access and use of common spaces within the development.
- **Select private sector developer through a competitive procurement process:** Through a competitive procurement process, a reputable private sector developer for the PPP should be selected. In addition to qualifying criteria related to evidence of experience and reliability of the developer, selection criteria should look to select a developer who can offer the greatest number of affordable housing units, at the highest quality and sustainability performance. To maximise co-benefits from the project, the procurement process can incorporate criteria around apprenticeship programmes to upskill youth and existing workforce around design and implementation of sustainable and net zero building solutions.
- **Finalise lease of land parcel and develop PPP agreement:** Through the services of a qualified land surveyor, the value of the land parcel should be ascertained, and used to determine the value of GMM's 'in-kind' contribution to the PPP development. Based on advice from the project team and engaging GMM's legal team, the no-cost, long-term lease of the land parcel should be developed along with the PPP agreement. The PPP agreement may follow similar templates used by GMM in previous agreements (if suitable) and should include strict criteria around the number of affordable housing units, quality of construction, timeliness of delivery, and any considerations around operations and maintenance of housing. To facilitate timeliness and quality, GMM may consider including financial penalties within the PPP agreement.
- **Monitor and assess development progress:** The GMM project team should work closely with the selected developer to facilitate progress and monitor the PPP development, including securing financing, obtaining regulatory approvals, and design and construction of the development. On completion of the lease and PPP agreement, the project team should agree roles and responsibilities, review and approval/decision points over the course of implementation, and change management processes should be agreed with the developer. Over the course of the project, GMM and the project team should aim to carry out robust monitoring and supervision of construction to ensure that the project delivers against the agreed requirements and objectives.
- **Sale or lease of sustainable and affordable housing units:** In collaboration with TOKI and aligned with their policies on off-take of affordable housing units, GMM should determine whether the affordable housing units constructed in this project are better suited as units sold to low-income households at subsidised rates, or leased at low rents. GMM will also provide detailed requirements for sustainability standards of these new builds, including considerations such as energy efficiency, low-carbon design, etc. GMM may consider a marketing and communications campaign to elicit interest in the affordable housing units.

This action relates to GMM's ongoing efforts to mainstream use of the Gaziantep Ecological City Application Design Guide, and the Sazgin Ecological Village project, currently being planned by GMM near the Oguzeli Airport.

LU2

IMPACT

Strategic Goals Supported:

LU i | Promote urban development along a climate-resilient and low-carbon pathway

LU iv | Foster neighbourhood identity and raise public awareness through land use planning

BU v | Promote safe, affordable, and near-zero emission housing

CA ii | Improve collaboration, coordination, and integration for climate action

CA iv | Reduce vulnerability of disadvantaged groups against climate change

Estimated benefit(s):

CO_2 savings: 2,100 tCO_2e emissions per annum

Job Created: 960

Quantitative Impact measures:

11.6 Share of population having access to public transport within 15 min by foot

33.3 Population living within 20 minutes to everyday services

34.1 Share of brownfield development

Cross-cutting Themes

Climate Action [Directly targeted]: (i) Demonstration mixed-use, mixed-income project will act as proof-of-concept for similar transit-oriented housing developments across Gaziantep, (ii) Incorporation of sustainable design features from the Ecological City Application Guide will lower energy consumption, (iii) Proximity of project to a railway station will reduce demand for vehicular travel.

Gender and Social Inclusion [Directly targeted]: (i) Improved access to urban services for low-income households through location near public transport hub, (ii) Incorporation of design features to improve access and use of common spaces for people with disabilities and women.

Smart Maturity [No direct link]: N/A

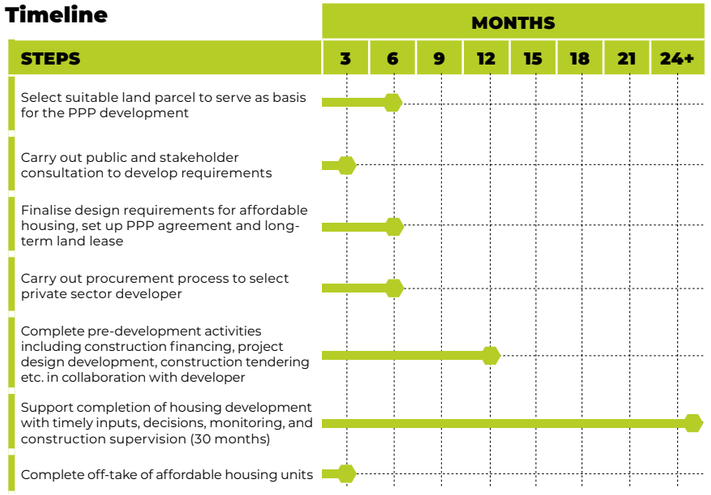
Co-Benefits

Resilience: (i) Monitoring and construction supervision to focus on structural stability and safety, (ii) Location near a public transit hub will improve access to urban services for low-income households, providing resilience to service disruptions during disaster events

Economic: (i) No capital investment required from GMM to develop low-income, affordable housing, (ii) Location near transport hub will enable low-income households to use public transport, minimising transportation costs, (iii) GMM may use unoccupied or brownfield land parcels for the PPP development, enabling productive use of a previously unutilised asset.

Social: (i) Improved access to housing and urban services for low-income households, (ii) Community involvement in design requirements will foster a sense of ownership with the development, (iii) The project can serve as a demonstration to private sector developers for similar mixed-use, mixed-income projects across Gaziantep.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 8,000,000**	Industry standard for feasibility, project management, legal fees, detailed designs, etc.
Component 1 – Feasibility assessment and land identification	EUR 100,000	6-9 month consultancy
Component 2 – Project management support, PPP expert, real estate experts, etc. Provision of 4 consultants with a salary of EUR 50,000 per annum for 4 years	EUR 800,000	4 consultants x 4 year duration. This action includes establishing a Project Management Unit of expert consultants for 2 years which would be housed within GMM.
Component 3 – Legal fees, surveys, and due diligence. Provision of 2 consultants with a salary of EUR 50,000 per annum	EUR 100,000	2 consultants x 1 year duration
Component 4 – Detailed designs, EIA, permitting and supervision of works applying 7% of construction costs	EUR 7,000,000	Construction duration. Industry standard for design, permitting and supervision of works using 7% of total construction value which will be burdened by TOKI and the Private Developer.
Capital Costs	**EUR 100,000,000**	The land, quantity of units and a mixture of uses will be identified from the feasibility study, planning policy and the land identified. This action has assumed a development providing 2,500 housing units and has applied a EUR 500 per m^2 for new build residential construction and has assumed an average unit size of 80 m^2. The construction will be a 50:50 split between TOKI and a private developer.
Component 1 – Construction of assumed 2,500 housing developments with an average apartment size of 80 m^2 applying a EUR 500 per m^2 for construction costs	EUR 100,000,000	
Operational Costs (over 5 years)	**EUR 10,000,000**	The OPEX is assumed at 2% of the construction costs and will be the responsibility of TOKI and the private developer. This action assumes land is to be public land and with no acquisition costs.

IMPLEMENTATION

Operational Modality: GMM or TOKI to manage affordable housing units in line with existing practices and protocol

Implementation Timeframe and Timeline: 2024-2029

Indicative Total Cost: €108,000,000

Capital Cost: €100,000,000

Development / Advisory Costs: €8,000,000

5-year Operational Cost: €10,000,000

Potential Financing Instruments:

Instrument:

Own source: GMM, private sector development

Grant: National government, IFI, International Organisations

Loan: Government-owned bank, IFI

Investment: private sector

Revenue Opportunities: Yes, to be determined from the land identified and number of housing units

LU2

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Private developers	Empower
District municipalities	Involve
Chamber of Civil Engineers, Gaziantep branch	Consult
Gaziantep Urban Transformation Association	Consult
Chamber of City Planners, Gaziantep branch	Consult
Chamber of Architects	Consult
Gaziantep University	Consult
Hasan Kalyoncu University	Consult
Gaziantep Islamic Science and Technology University	Consult
Gaziantep The Chamber of Environmental Engineers	Consult
GMM Department of Urban Aesthetics and Green Spaces	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Demand for the development may be lower than expected due to change in market conditions.	· Building on recent approaches to social infrastructure (e.g. 100 Schools Initiative), explore opportunity for funding from industrial or business stakeholders. · Articulate impacts from air pollution and net carbon emissions to explore pay-for-results (P4R) type financing from charitable foundations and development organisations.
Technical	Development may not be financially viable.	· Validation of feasibility by the GMM project team prior to the procurement process can provide a strong indication of financial viability · Low risk to GMM's financial resources, considering 'in-kind' contribution in form of a lease
	Proposed development may not obtain regulatory approval.	· GMM project team and developer to collaborate closely during pre-development stage to confirm regulatory alignment of the proposed development · Procurement for developer can include requirement for explanation on regulatory alignment for proposed development.
	The development may not be operated and managed effectively, leading to problems such as high maintenance costs or tenant dissatisfaction, and the potentially the development not being used.	· Project requirements determined prior to procurement should cover design or budgetary aspects related to operations and maintenance as well · For maintenance and operations, GMM may explore a separate PPP agreement to contribute or subsidise operational costs linked to the affordable housing units.
Political	Public property.	There may be problems in transferring the publicly owned land from Ministries to GMM. In order to prevent this, necessary consultations with the central government should be initiated during the feasibility study phase.

LU3 Plan and Pilot 'Resilience Parks'

Develop an integrated plan and pilot 'resilience parks' within the historical centre / city centre to increase access to open space and serve as evacuation areas during disasters

INFORMATION

Status:
New

Location:
- Urban areas in Islahiye, Nurdagi and Sahinbey

Type:
- Capital Investment

Action Owner(s):
- GMM Department of Urban Aesthetics and Green Spaces

Supporting Institutions:

- Ministry of Environment, Urbanization and Climate Change
- GMM Department of Zoning and Urbanization
- AFAD
- TOKI
- Ministry of Agriculture and Forestry
- GMM Department of Transportation
- GMM Department of Technical Works

Relevant Sector(s):

Related Actions:

LU1 - Develop an integrated landscape and biodiversity management strategy

LU4 - Implement a meanwhile uses programme

At 8.66 sq.m per person, the open space ratio in urban areas of Gaziantep is below the national standard of 10 sq.m per capita. Additionally, green and open spaces are concentrated in specific parts of the city (e.g., along Alleben Creek) and most city residents do not have access to green spaces within walking distance. To address a similar challenge around access to open and green spaces, many cities around the world have been successfully implemented dual purpose open spaces that serve a recreational as well as a climate action function. In Gaziantep, similar dual purpose open spaces can be implemented to address the key climate risks (urban heat and flooding) in Gaziantep through their design and operation. For example, in Copenhagen, 'climate parks'[53] are designed to retain water during storm surges and heavy rainfall and function as green, community space during normal times. Open spaces can also be designed to serve as emergency response hubs and evacuation areas during disaster events like earthquakes, as with the network of disaster prevention parks[54] in Tokyo, which are designed to operate as disaster management hubs and emergency shelters after earthquakes.

This action will involve developing a plan for a network of 'Resilience Parks' for Gaziantep that address the dual function of improving access to recreational spaces and enhancing resilience to climate and disaster risk for Gaziantep's residents and implementing three Resilience Parks as a pilot

Develop an Integrated Plan for a Resilience Parks network: An assessment of urban mahalles (neighbourhoods) should be carried out based on their vulnerability to the most significant climate and disaster hazards in Gaziantep: earthquakes, extreme heat, and flooding. The assessment should consider the topographic, demographic, environmental, economic, , and built environment characteristics of mahalles to determine the extent of vulnerability. Alongside the risk assessment, population densities within the mahalle should be mapped, and areas that are not served by a green space within a walking distance identified. Next, potential land parcels for inclusion in the network should be identified, including existing green or open spaces, unbuilt land parcels owned by GMM or district municipalities, unbuilt privately owned land parcels, or brownfield land. A suitability assessment would then be carried out to determine their potential for improving access to green space for the mahalle's residents, and for addressing the key hazards relevant to the mahalle in question. This activity should be accompanied by an awareness-raising and public engagement campaign that helps create buy-in for the Plan and any projects emerging out of it.

For each land parcel with the highest potential, a design brief should be prepared based on (i) the size of the site, (ii) specific open space needs of the mahalle (e.g., a children's play area for a mahalle with large population of under-15s), and (iii) features to mitigate climate or disaster risk (e.g., a site identified as well-suited to address heat stress can include sustainable water features and significant tree coverage). In consultation with AFAD, certain land parcels may be identified as evacuation sites, shelter space, or emergency response bases and the requirements for the parcel developed accordingly. For privately owned land parcels, the plan should identify incentives to encourage development as resilience parks or suitable approaches for land acquisition. For existing open and green spaces, the plan should identify retrofit measures to better serve a climate and disaster resilience function.

Design and implement three Resilience Parks: For three readily available land parcels identified as potential sites within the network (ideally one of each type: an existing green space, a publicly-owned land parcel, and a privately-owned land parcel) a design competition should be organised for architectural or landscape design firms, design institutions, and civil society organisations. The brief for the competition should define key outcomes and outline measures that need to be included within the design scheme, based on the requirements for the land parcel. Competition entries should be judged for the contribution to enhancing resilience and local biodiversity, improving access to green space, and programmatic or design features that contribute to building a sense of neighbourhood identity. Additional points should be allocated for entries that can demonstrate support from resident communities, incorporate features or programmes to make the park safe, inviting and accessible for women, people with disabilities, and low-income households.

AFAD and GMM's Urban Aesthetics and Green Spaces Department should work with the competition winners to develop an implementation plan, based on the successful design scheme. The implementation plan should include a description of regulatory alignment, financing approach for construction and operations, monitoring plan, and an operations and maintenance plan before beginning implementation works. To build a sense of neighbourhood identity, the implementation plan should consider involvement of neighbourhood groups and civil society organisations in the operations and programming of the Resilience Park and explore co-funding of implementation works by local businesses and industries as part of their corporate social responsibility (CSR) activities. Implementation of the pilots should look to secure local buy-in and create enthusiasm among the communities where the Resilience Parks will be located. On completion of works, the Urban Aesthetics and Green Spaces Department should maintain and operate the park in line with policies on which AFAD is consulted.

This action also aligns with GMM's 'Green Antep' programme, which looks at afforesting open spaces in the city centre and protection of existing agricultural and forest areas.

53 https://www.fastcompany.com/90557179/this-climate-park-in-copenhagen-now-doubles-as-flood-infrastructure
54 https://www.tokyorinkai-koen.jp/en/about

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Inadequate and unequal access to green spaces
- Increased intensity of heatwaves and droughts

Green City Challenges:

- Insufficient green and open spaces
- Lack of integrated approach to adaptation planning
- Empty sites / brownfield sites in existing settlements

LU3

IMPACT

Strategic Goals Supported:

LU i | Promote urban development along a climate-resilient and low-carbon pathway

LU ii | Increase access and quality of green spaces for residents and visitors in the city

LU iii | Foster neighbourhood identity and raise public awareness through land use planning

CA i | Leverage natural assets to improve resilience to climate hazards

CA iv | Reduce vulnerability of disadvantaged groups against climate change

Estimated benefit(s):

CO_2 savings: N/A*

Job Created: 200

Quantitative Impact measures:

6.0 Open green space area ratio per 100,000 inhabitants

6.1 Share of green space areas within urban limits

34.1 Share of brownfield development

* Not possible to estimate on the basis of existing data.

Cross-cutting Themes

Climate Action [Directly targeted]: (i) Improved availability of space for disaster management hubs, and access to evacuation spaces and during climate-related disasters, (ii) Improved resilience to flooding and extreme heat, (iii) Increased tree canopy cover in urban cores to mitigate urban heat island effect.

Gender and Social Inclusion [Directly targeted]: Improved access to green and open spaces for underserved neighbourhoods, (ii) Improved access to green and open spaces for women.

Smart Maturity [No direct link]: N/A

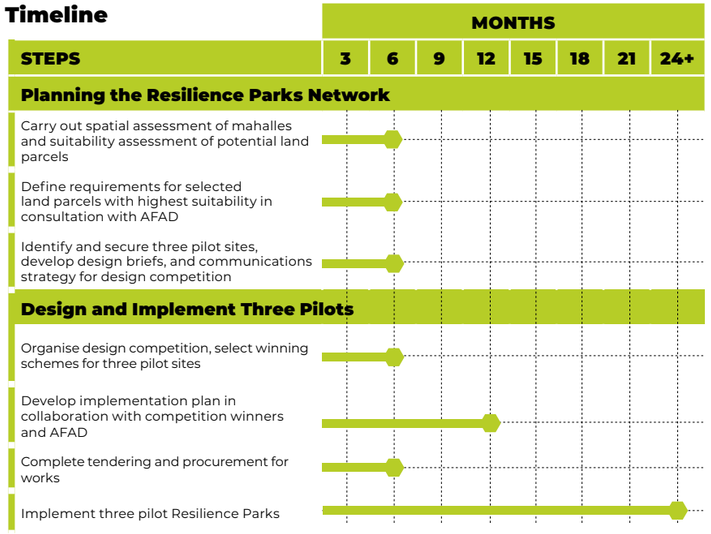
Co-Benefits

Resilience: (i) Additional evacuation zones, shelters and disaster management hubs within dense urban areas, (ii) Improved access to green spaces for residents to mitigate impact of heat waves, (iii) Improved resilience to flooding, (iv) Reduction in urban heat island effect through locating more green spaces within dense urban areas.

Economic: (i) Co-locating with open spaces may support reduction of operational costs for disaster management infrastructure, (ii) Reduced damage from flooding in neighbourhoods where open spaces are designed to retain water

Social: (i) Improved access to recreational spaces for residents of Gaziantep, (ii) Involvement of neighbourhood in design and operations of parks will foster a sense of neighbourhood identity, (iii) Parks can serve as a hub for communication and awareness-raising campaigns, (iv) Open spaces may lead to improved health outcomes for residents, not just through reduced exposure to heat and air pollution, but also through access to space for physical activity.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 850,000**	Industry standard for consultancy fees for three designs for parks.
Component 1 – Development of an integrated plan for resilience parks	EUR 250,000	18 month consultancy
Component 2 – Detailed designs, EIAs and permitting	EUR 75,000	12 month consultancy
Component 3 – Supervision of works applying 7% of construction costs	EUR 525,000	Construction duration
Capital Costs	**EUR 7,500,000**	An example provided, feasibility will identify land and area. This action includes the assumption of 25,000 m^2 and EUR 100 per m^2 of landscaping construction costs. It is assumed that the land is public land and that there are no acquisition costs.
Component 1 – Construction of 3 resilience parks assuming an area of 25,000 m^2 each applying EUR 100 per m^2 for construction costs	EUR 7,500,000	
Operational Costs (over 5 years)	**EUR 750,000**	Estimated 3% of investment cost.

IMPLEMENTATION

Operational Modality: GMM Urban Aesthetics and Green Spaces Department to be responsible for maintenance and upkeep of resilience parks in line with existing processes and protocols, with technical advice and support from AFAD

Implementation Timeframe and Timeline: 2024-2029 [5 years] with possibility of continuation past GCAP implementation period

Indicative Total Cost: €8,350,000

Capital Cost: €7,500,000

Development / Advisory Costs: €850,000

5-year Operational Cost: €750,000

Potential Financing Instruments:

Instrument: Own source -GMM

Grant -National government, IFI, International Organisations

Loan - Government-owned bank

Investment - Private sector (CSR)

Revenue Opportunities: No

LU3

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District municipalities	Empower
GMM Department of Women, Family, Education and Social Services	Consult
GMM Department of Health Services and People with Disabilities	Consult
GMM Department of Fire Brigade	Consult
GMM IT Department	Involve
Chamber of Civil Engineers, Gaziantep branch	Consult
Union of Chambers of Turkish Engineers and Architects	Consult
Chamber of City Planners Gaziantep Provincial Representative	Consult
Chamber of Landscape Architects Gaziantep Provincial Representative	Consult
Gaziantep Urban Transformation Association	Consult
Chamber of Architects	Consult
TEMA Foundation	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	Cost for implementation of the pilots and/or plan is not affordable.	· Building on recent approaches to social infrastructure (e.g. 100 Schools Initiative), explore opportunity for funding from industrial or business stakeholders. · Articulate impacts from air pollution and net carbon emissions to explore pay-for-results (P4R) type financing from charitable foundations and development organisations.
	Cost for operations and maintenance is not affordable.	· The dual-purpose nature of Resilience Parks may be leveraged to seek operational funding from a range of international, national, and local sources. · Where suitable, private sector companies may be engaged to cover operational costs of some parks through their CSR budgets.
Technical	Suitable number of land parcels may not be located for developing Resilience Parks.	· The plan can choose to prioritise and formulate detailed plans for existing green spaces and publicly owned land parcels only · The plan can focus on improving access to existing open spaces during disasters through interventions within the transport network (e.g., pedestrianised streets, 'superblocks' etc.)
	Technical solutions to address climate risks are not found.	· Implemented projects from other contexts where similar climate risks have been addressed can be used as case studies. · The design competition will provide an opportunity for creative and feasible technical solutions for climate risk to be identified.
Social	Pilots are not supported by local resident communities.	· The design competition can award additional points for entries that demonstrate support from resident communities around the proposed site · Robust stakeholder engagement and public consultation at key points during both plan development and pilot implementation · A communications campaign to create awareness of benefits in the communities where pilots are located. · Incorporate apprenticeships, employment, and upskilling programmes within the procurement approach for each pilot, to seek support and buy-in from resident communities

Implement a Meanwhile Uses Programme

LU4

Implement a meanwhile use/living streets programme to encourage occasional, temporary use of streets and empty plots of land within the urban core for social and recreational purposes.

INFORMATION

Status:
New

Location:
- Urban areas in Sahinbey, Sehitkamil, Nizip districts

Type:
- Strategies, plans, and programmes

Action Owner(s):
- GMM Urban Aesthetics and Green Spaces Department
- GMM Department of Transportation

Supporting Institutions:
- GMM Department of Zoning and Urbanization
- Police Department
- UKOME
- GMM Department of Culture and Tourism

Relevant Sector(s):

Related Actions:
LU1 - Develop an integrated landscape and biodiversity management strategy
LU3 - Plan and pilot 'resilience parks'

The rapid population increase and refugee influx in the early 2010s has put immense strain on the availability of open and recreational spaces within the city. These spaces not only serve a recreational function, but also provide key locations for cultural activities, and act as catalysts for social cohesion and developing a neighbourhood identity. The urban core of Gaziantep has many privately-owned empty or brownfield sites that may support in relieving this pressure; however, as identified by GMM staff, facilitating private sector housing or commercial development on these land parcels has been challenging, often due to reasons entirely outside the remit or control of GMM. The only recourse to bring such land parcels into use is expropriation, which involves a lengthy and costly process.

A viable and increasingly popular alternative in cities around the world is to facilitate 'meanwhile uses' in brownfield and empty land parcels. Meanwhile uses involve enabling the temporary use of land parcel while it awaits permanent development to occur. Many cities have deployed meanwhile uses to activate derelict land parcels or make use of existing buildings awaiting demolition, using commercial and recreational uses to attract a wide range of visitors, deliver economic and social benefits, and catalyse a sense of neighbourhood identity around the temporary activity. To enable rapid conversion to the original state of the land parcel, meanwhile use permits are typically only granted for temporary or reusable structures, often supporting interesting examples of material (re)use (e.g., Boxpark[55] in London, built in 2011 using shipping containers) or the use of innovative building design and technology (e.g., Chanel Contemporary Art Container[56] in Tokyo, dismantled and reused in Hong Kong, New York, and Paris). Many developers have also used meanwhile uses to test viability of social and commercial uses on a site, and often incorporate successful uses into the permanent development planned on the land parcel.

To deriver further social and cultural benefits, 'car-free street' days can further encourage the temporary use of roads for community use. The temporary pedestrianization of roads can be implemented during holiday periods or at a regular monthly schedule to temporarily expand community or recreational use (e.g. Oakland Art Murmur[57] in Oakland, USA) and encourage the take-up of sustainable transport modes (e.g. Ciclovia[58] in Bogota, Colombia). 'Car-free streets' also encourage greater footfall in commercial areas, leading to social and economic benefits.

This action will involve a review of possible GMM collaborations with civil society and private sector organisations to organise temporary uses on privately owned land parcels and road networks across mahalles in Gaziantep. A review of the feasibility of such a programme will be undertaken, looking into options such as planning permits for temporary and reusable structures housing recreational or commercial uses serving the resident community (e.g., a food or handicrafts market) on empty or brownfield land where permanent development has been stalled or delayed for any reason.

As part of the programme review, consideration will also be given to the governance structure, application processes, monitoring and evaluation processes, and auditing protocols for the programme. This will also involve a review of any regulatory changes required for operation of the programme. GMM should consider a range of approaches to finance the programme, including seeking funding from industrial and business organisations as part of their Corporate Social Responsibility (CSR) initiatives. The programme should be limited to one district (e.g., Sahinbey) for a 2-year period during which positive and negative impacts are carefully monitored and considered for scaling up to other parts of the city after this initial phase. For the pilot, GMM should proactively identify potential land parcels and streets where the programme may be implemented, and engage with relevant private sector firms, civil society organisations, and neighbourhood groups who may be interested in applying for meanwhile use permits. A marketing or awareness raising campaign may support the proactive identification of land parcels and interested organisations.

55 https://www.boxpark.co.uk/about/#_
56 https://www.zaha-hadid.com/architecture/chanel-art-pavilion/
57 https://oaklandartmurmur.org/first-friday/
58 https://velo.outsideonline.com/road/road-culture/when-bogota-belongs-to-the-bicycles-how-ciclovia-has-shaped-colombias-capital-city/

2023 Green City Action Plan (GCAP) Gaziantep

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:
- Inadequate and unequal access to green spaces

Green City Challenges:
- Insufficient green and open spaces
- Empty sites / brownfield sites in existing settlements

LU4

IMPACT

Strategic Goals Supported:

LU iii | Foster neighbourhood identity and raise public awareness through land use planning

LU v | Foster natural and cultural heritage and biodiversity

CA i | Leverage natural assets to improve resilience to climate hazards

CA ii | Improve collaboration, coordination, and integration for climate action

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:

6.0 Open green space area ratio per 100,000 inhabitants

34.1 Share of brownfield development

Cross-cutting Themes

Climate Action [Some elements]: (i) 'Car-free street' days can enable testing pedestrianization within certain neighbourhoods, (ii) Temporary use sites may serve as locations for creating awareness around sustainability.

Gender and Social Inclusion [Directly targeted]: Improved access to social and commercial amenities in underserved neighbourhoods, and for women and people with disabilities

Smart Maturity [No direct link]: N/A

Co-Benefits

Resilience: Temporary uses of scarce land can augment social and open space infrastructure for residents in underserved areas.

Economic: (i) Catalysing economic development, particularly in neighbourhoods with large numbers of derelict or unoccupied buildings, (ii) Opportunities for testing potential long term commercial or social amenity.

Social: Opportunities for building neighbourhood identity and social cohesion thorough temporary uses and 'car-free street' day events.

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Unavailability of land parcels for temporary uses.	· During programme governance, any regulatory or policy changes that can encourage temporary use of land parcels should be identified and implemented · Proactive and early engagement with owners of empty or brownfield land parcels to determine availability · Permits to include a minimum period for which a temporary use serving a social or community purpose should be maintained or operated (e.g., 2 years)
Social	Lack of support or buy-in from local communities.	· Early engagement with civil society organisations and neighbourhood groups to understand needs within different neighbourhoods · A communications campaign to create awareness of the programme among resident communities

Timeline

STEPS	MONTHS: 3	6	9	12	15	18	21	24+
Set up programme governance, identify suitable financing approaches, and enact required regulations	●							
Identify suitable land parcels, streets, and civil society/private sector organisations for pilot in one district	●							
Support at least 5 meanwhile use permit applications and issue seed grants in pilot district	●							
Support implementation and operation of 5 meanwhile use activities	●							●
Assess negative and positive impacts, identify lessons learnt, and consider scaling up across Gaziantep	●							

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 165,000**	Industry standard for consultancy for identifying meanwhile uses.
Component 1 – Project management and coordination support for 2 years applying an annual salary of EUR 50,000 for a consultant	EUR 100,000	24 month consultancy
Component 2 – Implementation of living street programs to take place 2 times a year for 2 years applying a budget of EUR 15,000 per program. Comparable with London Car Free Days programme.	EUR 60,000	24 month consultancy
Component 3 – Feedback survey and study for future expansion	EUR 5,000	3 month consultancy
Capital Costs	**EUR 175,000**	Indicative max grant amount
Component 1 – Grant provision for 5 meanwhile uses applying EUR 35,000 for 2 years duration	EUR 175,000	
Operational Costs (over 5 years)	**EUR 75,000**	Estimated 5 grants for meanwhile parks O&M applying EUR 15,000 for the 2 years

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Landowners	Collaborate
Small and medium-sized businesses	Collaborate
Gaziantep Urban Transformation Association	Involve
Gaziantep Association of the Protection of Nature, History and Cultural Values	Involve
The Foundation for the Protection and Promotion of the Environment and Cultural Heritage (CEKUL)	Involve
TEMA Foundation	Involve
Association for Solidarity with Asylum Seekers and Migrants (ASAM)	Involve
Turkish Nature Conservation Association (TTKD) Gaziantep Branch	Involve
Gaziantep Arboriculture and Conservation Association	Involve

IMPLEMENTATION

Operational Modality: GMM Urban Aesthetics and Green Spaces Department to be responsible for programme operation, in collaboration with civil society/private sector organisations

Implementation Timeframe and Timeline: 2024-2028 with possibility of scale-up/extension

Indicative Total Cost: €340,000

Capital Cost: €175,000

Development / Advisory Costs: €165,000

5-year Operational Cost: €75,000

Potential Financing Instruments:

Instrument: Own source: GMM, landowner

Grant: National government, IFI, International Organisations

Revenue Opportunities: No

Ecological Village Project

LU5

Creation of a sustainability pilot in a local village, characterized by energy-efficient and eco-friendly infrastructure, a commitment to eco-friendly transportation and production, and the incorporation of climate-friendly land use patterns, including green infrastructure and architectural practices.

INFORMATION

Status:
Ongoing

Location:
- Oguzeli district, Sazgin village

Type:
- Capital Investment

Action Owner(s):
- GMM Department of Environmental Protection, Climate Change, and Zero Waste

Supporting Institutions:

- GMM Department of Zoning and Urbanization
- GMM Department of Agricultural Services and Food
- GMM Department of Transportation
- GMM Department of Urban Aesthetics and Green Spaces
- GMM Department of Culture and Tourism
- GMM Department of Technical Works
- GMM Department of Women's Family Education and Social Services
- GASKI

Relevant Sector(s):

Related Actions:

LU1 - Develop an integrated landscape and biodiversity management strategy
LU3 - Plan and pilot 'resilience parks'
LU4 - Implement a meanwhile uses programme

A sustainability pilot applied to a small settlement has the potential to create an ecological village, also known as an ecological-village (or eco-village). An eco-village can be defined as a small community designed and organized with a strong emphasis on environmental sustainability and harmony with nature. Eco-villages prioritize practices that minimize their ecological footprint, promote self-sufficiency, and reduce their negative impact on the environment.

Following the extensive infrastructure damage from the consecutive earthquakes of magnitudes 7.7 and 7.6 on 6th February 2023, GMM took the decision to pilot the implementation of an ecological village. The initiative aims to create a pilot demonstration of sustainable land use and infrastructure project that is aligned with Gaziantep's specific geographical and climatic conditions, with an emphasis on harmony with nature, efficient use of energy, and a demonstration/learning points of how the city as a whole might eventually be transformed into a more environmentally conscious and nature-sensitive place.

The pilot project will transform the village into a model of sustainability, employing various methods such as ecological design, green production, ecological architecture, alternative energy, energy efficiency, green transportation, zero waste, habitat restoration and / or enhancement, water saving practices and other similar approaches.

Sazgın village in Oguzeli district in Gaziantep has been selected as the pilot location for this action, following its extensive earthquake damage, alongside energy supply and housing issues. The residents of the village are socio-economically disadvantaged; thus the project aims to support re-building in a sustainable and green manner to enhance overall living conditions.

The project will also include an earthquake damage assessment, and incorporate ecological approaches such as landscaping and resilient, eco-friendly building structures. It will also focus on renewable energy, environmental agricultural practices, and better water and waste management, offering solutions to environmental pollution and greenhouse gas emissions. Recognizing that 40% of village residents are young people, the project will also create a wider range of youth employment opportunities, fostering their increased participation in the local economy. Workshops and educational content on ecology, energy conservation, and the environment will be developed to raise awareness further among local residents.

In addition to investment proposals targeting improvements in social life, proposals focussed on agriculture, transportation and tourism are also thought to create social benefits and will be incorporated in the implementation of the ecological village.

These include:

- Strengthening agricultural and livestock activities to reduce dependence on foreign imports
- Improving public transportation to better integrate the neighbourhood with surrounding areas
- Promoting social activities accessible to women and children, fostering unity and solidarity among community members who embrace the concept of eco-friendly lifestyles.

This action supports the Strategic Plan of the Ministry of Agriculture and Forestry, the Integrated Urban Development Strategy and Action Plan and the 11th Development Plan (2019-2023).

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Failure to consider green infrastructure as an integrated policy issue, offering environmental, social and economic benefits to the province as a whole
- Untapped potential for building residence through nature-based solutions (NbS)

Green City Challenges:

- Lack of long-term planning
- Insufficient green and open spaces
- Inadequate innovative measures, non-inclusive plans and strategies

LU5

IMPACT

Strategic Goals Supported:

LU i | Promote urban development along a climate-resilient and low-carbon pathway

LU ii | Increase access and quality of green spaces for residents and visitors in the city

BU iii | Incentivise take-up of green building measures in construction

BU v | Promote safe, affordable, and near-zero emission housing

ENG ii | Increase efficiency across the energy system

ENG iii | Improve resilience of energy infrastructure

ENG iv | Maximise the share of renewable energy and fuels within the energy system

CA i | Leverage natural assets to improve resilience to climate hazards

CA ii | Improve collaboration, coordination, and integration for climate action

CA iii | Explore new technologies for carbon emission management

CA iv | Reduce vulnerability of disadvantaged groups against climate change

Cross-cutting Themes

Climate Action [Directly targeted]: Incorporating sustainable design features listed in the Ecological City Application Design Guide will reduce energy consumption and carbon emissions.

Gender and Social Inclusion [Directly targeted]: (i) Improved access to green and open spaces for underserved neighbourhoods, (ii) Improved access to green and open spaces for women.

Smart Maturity [No direct link]: N/A

Co-Benefits

Resilience: (i) Additional evacuation zones, shelters and disaster management hubs within dense urban areas, (ii) Improved access to green spaces for residents to mitigate impact of heat waves, (iii) The use of alternative energy systems and an understanding of ecological architecture will ensure that residential areas are resilient in the face of interruptions in services that may occur during disaster events.

Economic: Actions around sustainable tourism and economic development focused on agricultural/pastoral land and natural habitats can support higher incomes for rural households.

Social: (i) Strengthening local cohesion by bringing together different stakeholders and by promoting dialogue and cooperation, (ii) Revitalisation of natural assets will augment recreational and open space stock available to Gaziantep's residents, which could also have positive impacts on the health of local communities , (iii) Improved livelihoods by providing and/or enhancing sustainable sources of income, food, and water for local communities, (iv) Improved low-income households' access to housing and urban services, (v) Involvement of the community in the design requirements will ensure their ownership of the project.

2023 Green City Action Plan (GCAP) Gaziantep

IMPACT

Estimated benefit(s):

CO_2 savings: 1,408 tCO_2e per annum*

Job Created: 30**

Quantitative Impact measures:

6.0 Open green space ratio per 100,000 inhabitants

6.1 Share of green space areas within urban limits

8. Annual CO2e emissions per capita

9. Estimated economic damage from natural and climate disasters

9.1 Percentage of public infrastructure at risk

9.2 Percentage of households at risk

16. Share of renewable energy in total energy consumption

19.4 Share of buildings with green certification

19.5 Share of buildings with Energy Performance Certificates (EPC)

*(Note: this estimate was provided by GMM calculated from the Ecological Village Project Feasibility Study prepared in 2020; it was not calculated in the GCAP development .which is why it was not included in the total carbon emission reduction figure for all actions)

**(Note: this estimate was provided by GMM calculated from the Ecological Village Project Feasibility Study prepared in 2020; it was not calculated in the GCAP development .which is why it was not included in the total jobs created figure for all actions)

LU5

IMPLEMENTATION

Operational Modality:
The operating model will be determined by Gaziantep Metropolitan Municipality.

Implementation Timeframe and Timeline:
2023-2024

Indicative Total Cost: € 5,029,680

Capital Cost:*
€ 4,939,680

Development / Advisory Costs:
€ 90,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source - GMM, private sector

Grant - National government, IFI, International Organisations

Loan - Government-owned bank, IFI

Investment - Private sector

Revenue Opportunities:
No

(Note: this estimate was provided by GMM calculated from the Ecological Village Project Feasibility Study prepared in 2020; it was not calculated in the GCAP development .which is why it was not included in the total cost figure for all actions)

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Project Planning and Training Process								
· Review and Data Collection								
· SWOT Analysis								
· Concept Design								
· Application Design								
· Training of Village Residents and Consultation of the New System	●							
· Planning and Project Planning								
· Preparation of Application Projects								
· Preparations for Specifications, Quantities and Construction Works								
Construction Process								
· Delivery of work								
· Strengthening and Renewal of Existing Structures	●	●	●					
· Construction of Infrastructure Works								
· Construction of New Buildings								
· Identifying Deficiencies								
Finalization Process								
· Receiving Feedback from Village Residents	●							
· Area Management and Maintenance								
· Training of Village Residents								

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**90,000 EUR**	Industry standard for consulting fees for ecovillage design
Component 1 - Culture and Tourism Activities	15,000 EUR	Recycling workshop
Component 2 - Project Costs	75,000 EUR	Creation of urban design projects (1/500 scaled), Implementation Plan (1/1,000 scaled), Implementation Projects
Capital Costs	**EUR 4,939,680**	
Component 1 - Environment and Infrastructure Costs	EUR 3,319,680	Building Reinforcement and Construction Application 10,791 m² x 189.2 € · Landscaping 14,000 m² x 18 € · Anaerobic Sewage Treatment · Central Heating Systems
Component 2 - Energy Investment Costs	EUR 1,520,000	Energy Requirement - Installation of solar power plant 1.9 MW x 800,000 €
Component 3 - Agricultural Activities	EUR 100,000	Agricultural Irrigation
Operational Costs (over 5 years)	**EUR 0**	

Note: this estimate was provided by GMM calculated from the Ecological Village Project Feasibility Study prepared in 2020; it was not calculated in the GCAP development .which is why it was not included in the total cost figure for all actions

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ipekyolu Development Agency	Involve
Oguzeli Municipality	Involve
Ministry of Environment, Urbanization, and Climate Change	Collaborate
Gaziantep Chamber of Urban Planners	Collaborate
Gaziantep Chamber of Architects	Collaborate
Gaziantep Chamber of Civil Engineers	Collaborate

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Occupational health and safety risks that may occur during activities requiring construction and restoration.	· Creating and implementing an Occupational Health and Safety Plan · Creating and implementing an Emergency Preparedness Plan · Providing occupational health and safety and first aid training to employees · Conducting regular health checks
Social	Possibility of local communities not embracing the Ecological Habitat Project.	· Participation of local people, especially women and children, in the Ecological Habitat Area project stages should be ensured through various activities. · Conducting awareness-raising activity with local residents, including holding information meetings about eco-living before and during project implementation. This will increase the interest in the project and contribute to local ownership by ensuring enhanced understanding among local residents.

BUILDINGS

B1 Develop a Digital Buildings Database

B2 Develop Feasible Approaches for Improving Compliance with Building Standards

B3 Incentivise Low-carbon Heating and Cooling, and Energy Efficiency in Residential Buildings

B4 Retrofit or Reconstruct Public Buildings for Improved Energy Performance

B1 Develop a Digital Buildings Database

Develop a digital database of information on existing and new buildings, through the collation of existing building permits, EPCs (Energy Performance Certificates), GIS data, satellite imagery, and any other appropriate data sources to support policy makers, regulatory development and enforcement, climate action, and development monitoring.

INFORMATION

Status:
New

Location:
Province-wide, with initial implementation in Islahiye and Nurdagi districts

Type:
- Other Investment
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM Department of Zoning and Urbanisation
- GMM IT Department
- Local Universities

Supporting Institutions:
- Provincial Directorate of Environment, Urbanisation and Climate Change
- Building Permitting and Monitoring departments in District Municipalities
- National Land Registry (Provincial Directorate of Land Registry and Cadastre)
- GMM Police Department

Relevant Sector(s):

Related Actions:
CA2 - Integrated and evidence-based climate action planning in Gaziantep

B2 - Develop feasible approaches for improving compliance with building standards

B4 - Retrofit or reconstruct public buildings for improved energy performance

The buildings sector contributes approximately 20% of Gaziantep's greenhouse gas emissions and is highly exposed to seismic risk; however, the absence of consistent, accurate and up-to-date data on the building stock in the city impedes the design and planning of programmes for this sector, and monitoring/enforcement activities. The unavailability of basic data such as age and typology emerged as the most significant challenge during consultations with GMM staff in Department of Zoning and Urbanisation as well as the Chamber of Architects. An integrated spatial database containing information on land parcels, buildings, and permitted building applications is an essential enabler of any policy or regulatory action around sustainability within the Buildings sector.

This action seeks to directly address this challenge through the creation of a buildings database as a tool for GMM and district municipalities to support policy development, regulatory enforcement, and development monitoring for resilience and sustainability. This action can be implemented through the following steps:

- **Setting up a Harmonized Building Application Template:** A unified digital template for new building applications should be created, based on consultation with District Municipalities and the Department of Zoning and Urbanisation, and a review of existing building permit application templates. This template should capture, at a minimum, relevant data on the proposed development's typology (area, number of storeys, number of units, uses etc.), energy performance (EPC grade, energy-saving design features, etc.), and other relevant aspects (e.g., data to assess EV readiness of the development). In consultation with stakeholders, the feasibility of capturing data around buildings materials may be explored, anticipating the future development of a 'buildings passport' system. To minimise back-filling of information, the template should be developed, approved, and implemented as soon as possible to be usable in districts where significant post-earthquake reconstruction is expected to take place.
- **Developing operational protocol and processes:** Operational processes for use of the database should be developed by GMM, that consider relevant data privacy and sharing protocols. Use of the database will require compliance with the EU's General Data Protection Regulation (GDPR).
- **Design of the Database Management System (DBMS):** Linked to the criteria within the harmonized template and in line with the operational processes, a robustly designed and tested database management system (DBMS) should be implemented, by GMM's IT Department or by interested staff and students within local universities. Early versions of the DBMS and Application Template should be rolled out in districts where significant post-earthquake reconstruction activity is anticipated.
- **Collation of baseline data and addressing gaps:** Relevant spatial data (e.g., land parcels, land use zones, utility and transport networks etc.) already exist as GIS shapefiles with different GMM departments, which can be compiled to provide the baseline spatial information for the buildings database. The National Land Registry (TAKBIS) already holds up-to-date data on land parcels, which may be linked to other spatial baseline data collated as part of this step. The baseline analysis suggests GMM has access to a database with detailed information on energy consumption across 1000 public buildings, and may be integrated with the buildings database as part of this step.
- **Digitization of information on existing buildings:** Information on existing buildings currently held by various institutions and agencies in a disaggregated manner (e.g., issued building permits, monitoring reports, EPCs database, data from the Address-based Population Registration System) should be reviewed and data compiled for each building on the various criteria in the Harmonized Building Application Template. It is expected that while documentation will be in a variety of formats and quality, all information should be possible to link to a unique land parcel within the land registry. The digitization process can be carried out in collaboration with local universities – consideration is needed for the resource allocation required for populating and updating the database (this will be determined as part of the assessments in earlier tasks outlined above). Drone-mapping, satellite imagery analysis and AI-assisted mapping products (e.g. Microsoft Building Footprints[59] or Google Environmental Insights Explorer[60]) may also provide useful (low-resolution) data on existing buildings for the database.
- **Pilot and roll-out of the buildings database:** Based on the harmonized template and baseline spatial data, a GIS-based interface should be developed on a platform already used by GMM and district municipality staff. The user interface should enable easy search and analysis of data entered using the harmonized template and link to shapefiles for specific land parcels or buildings within Gaziantep. The DBMS as well as the user interface should be tested for reliability of use and piloted for the districts of Islahiye and Nurdagi which will be seeing significant post-earthquake reconstruction activity; and then rolled out for use in all other districts.

This action aligns with the following actions in GMM's 2023 Net Zero Carbon Buildings Plan (draft): (MB1.PE1) Scanning of existing building stock, including at least for construction year, usage area, purpose, structural performance, and energy performance of the buildings, (MB1.TE7) Leveraging innovative technologies to support existing building stock scanning studies (e.g. satellite images, drone-mapping, GIS tools, thermal camera). The action is also aligned with the Sustainable Energy and Climate Action Plan (2018), the Gaziantep Climate Change Adaptation Plan (under preparation), and Gaziantep Ecological City Application Design Guide.

59 https://www.microsoft.com/en-us/maps/building-footprints
60 https://insights.sustainability.google/

INFORMATION

B3 - Incentivise low-carbon heating and cooling, energy efficiency in residential buildings

Challenges Addressed:
Green City Challenges:

- Lack of up-to-date buildings data
- Lack of standards/ enforcement of building permits and Energy Performance Certificates

B1

IMPACT

Strategic Goals Supported:
B i | Ensure availability of up-to-date data on building stock

CA ii | Improve collaboration, coordination and integration for climate action

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: 9*

Quantitative Impact measures:
This action will enable the delivery and monitoring of other actions that seek to address environmental challenges in Gaziantep. The following impact measures can be tracked for this action:

By 2026, 100% of new permitted buildings will be captured on the database

By 2029, data for 80% of existing buildings will be digitized and captured on the database.

* Note broad estimates based on the number of consultants involved

Cross-cutting Themes

Climate Action [Directly targeted]: The database will support monitoring the adoption of green building standards and compliance with EPCs to reduce and track GHG emissions from buildings. The database will provide evidence to support future climate policies and green building regulations.

Gender and Social Inclusion [Some elements]: The implementation in two districts will help prioritise the reconstruction efforts for quality and resilient buildings, that will be scaled across Gaziantep.

Smart Maturity [Directly targeted]: The database will collate and generate several data points that are spatially informed to provide a greater understanding of the building sector and its performance for existing and new buildings. To consider options for integrating machine learning and autonomous intelligence (AI) capabilities over time.

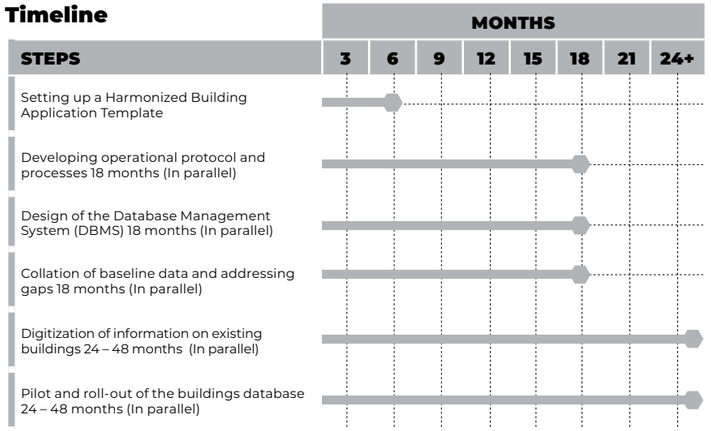
Co-Benefits

Resilience: (i) The database will facilitate the reduction of buildings in high-risk and hazardous areas. (ii) More data-informed decision-making tool for permitting new buildings and policies. (iii) Improved ability to monitor compliance with building standards and ways to monitor new builds.

Economic: (i) Increased efficiency and control mechanism for capturing incentives and tax collection (ii) the database will inform the development of new policies/ programmes including loans, grants, subsidies, etc.

Social: (i) Increased transparency mechanism for permitting new buildings (ii) Improved security of tenure by digitizing permits and land registry information (iii) the database could help improve/ enable the targeting of buildings-related policies and programmes to appropriate socio-economic groups.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 285,000**	Industry standard for design, development and delivery of digital database including provisions for 2 consultants to input data on exiting buildings.
Component 1 – Design and implementation of database	EUR 150,000	12-18 month consultancy
Component 2 – Data input and population of database of existing building information .	EUR 100,000	2 consultants x 24 months duration
Component 3 – Capacity building	EUR 35,000	12-18 month consultancy
Capital Costs	**EUR 75,000**	
Component 1 – Development of digital database	EUR 75,000	12-18 months
Operational Costs (over 5 years)	**EUR 11,250**	Estimated 3% of investment cost. There is a need to include OPEX budget for licence fees, hosting and maintenance.

Stakeholders

STAKEHOLDERS	ENGAGEMENT
AFAD	Involve
Residential building owners / developers	Inform / Consult
University of Gaziantep, other local universities	Collaborate
Private sector satellite imagery analysis or AI-assisted mapping products	Involve

IMPLEMENTATION

Operational Modality:
Once developed by the GMM IT Department, the Department of Zoning and Urbanisation will be the lead agency for the operation of the digital database. District Municipalities will be responsible for uploading new building permits and applications to the database and will require capacity building support during implementation. As the lead agency, the Department of Zoning and Urbanisation will need to ensure compliance with relevant regulatory frameworks related to data sharing, data privacy protections, and legal permissions, in line with the requirements of the EU's General Data Protection Regulation (GDPR).

Implementation Timeframe and Timeline:
2024-2029

Indicative Total Cost: €360,000

Capital Cost:
€75,000

Development / Advisory Costs:
€285,000

5-year Operational Cost:
€11,250

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

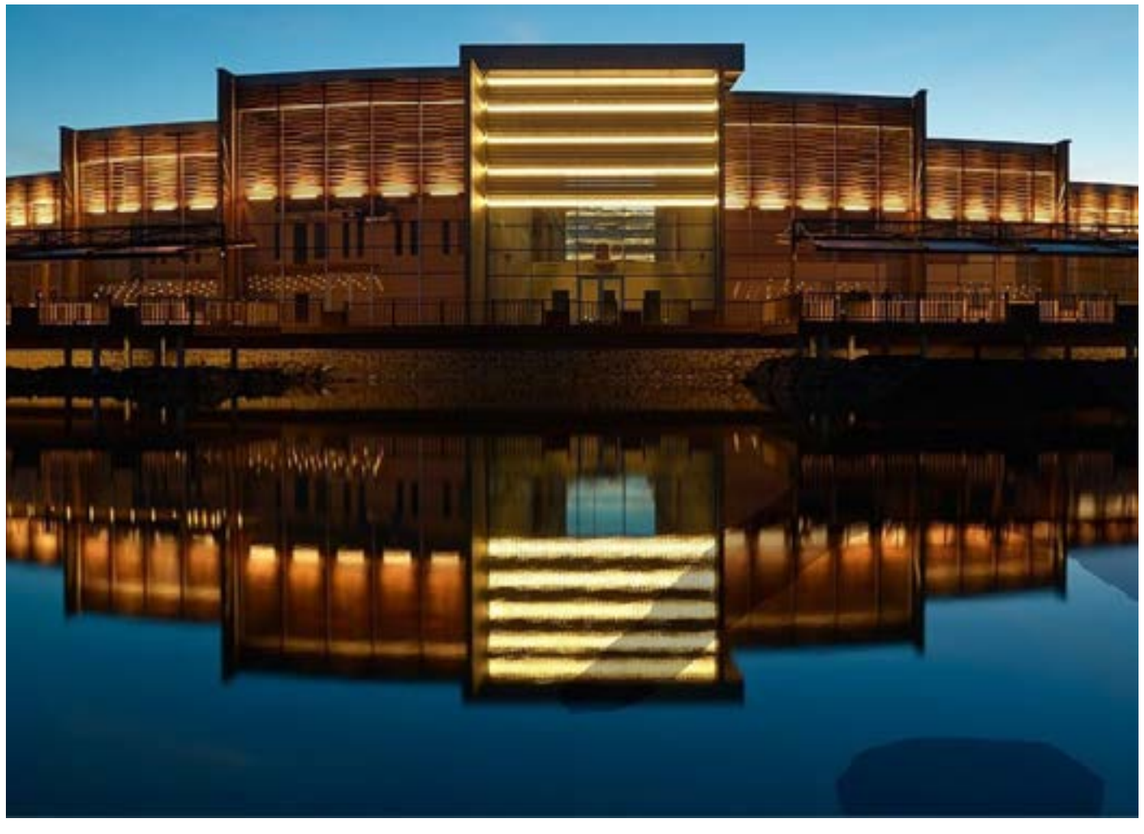
Loan - Government-owned bank

Revenue Opportunities:
No

B1

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Lack of capacity to design, develop and maintain the database.	· Appointment of database experts for design, development and maintenance. · Capacity building and on-the-job training opportunities to be provided during the development, piloting and rollout of the database. · Engagement with the University of Gaziantep to provide additional training if required and/or to support with the digitization process.
	Access to existing building information and inconsistency of documentation.	· A review of historic building permits, benchmarked against the developed templates to determine the limitations of existing buildings accuracy on the database. · Engagement with the University of Gaziantep to provide additional resources. · Depending on needs, create new jobs (at Uni, GMM, or other partners) focused on manual data entry.
	Data gaps and outdated data sources.	· A gap analysis will identify any data gaps and/or the need to commission additional studies. · The development of a standard operating procedure (SOP) to improve data sharing.
Economic	Not securing a multi-year budget to maintain the database and secure relevant licenses for hosting, servers, equipment, etc.	· This action is an enabler for other actions to be implemented and awareness needs to be raised to decision makers and budgeting staff. · Engaging early with the Financial Services to raise awareness of the database and its function can help alleviate any financing gaps. · Explore whether there are any existing DB that could enable or support further development to address buildings-related objectives as described herein and reduce costs
Institutional / Policy	Data breaches or improper publication of personal information, including vulnerabilities from cyber hacking.	· Alignment with the regulatory frameworks on data sharing and privacy protection with the EU GDPR will minimise this risk. · The design of the DBMS should be carried out with appropriate security measures including data anonymization.



B2 Develop Feasible Approaches for Improving Compliance with Building Standards

Identify and implement suitable approaches (e.g., improved enforcement capacity, more stringent penalty regime), to improve compliance with building standards, including structural stability, safety, and energy efficiency

INFORMATION

Status:
New

Location:
City-wide

Type:
- Organisational measure
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM Department of Zoning and Urbanisation
- Architecture or Planning department at local university

Supporting Institutions:
- GMM Directorate of Environmental Protection, Zero Waste and Climate Change

Relevant Sector(s):

Related Actions:
B1 - Develop a digital buildings database

Challenges Addressed:
Priority Environmental Challenges:
- Significant increase in emissions associated with energy consumption

Green City Challenges:
- Lack of suitable standards for energy efficiency
- Use of GHG emitting and polluting energy sources

During consultation meetings, participants from GMM's Department of Zoning and Urbanisation and the Chamber of Architects estimated that about 70% of buildings in Gaziantep do not meet building codes or standards. While this figure also includes minor non-conformances such as non-structural extensions, the high figure suggests that monitoring and enforcement of building standards is a key challenge. Participants also noted that the lack of compliance with building standards extends across various themes – including structural stability, fire safety, and energy efficiency – and can mainly be attributed to the lack of sufficient capacity to monitor and enforce issued building permits and Energy Performance Certificates (EPCs). In the context of building collapses and loss of life during the 6 February 2023 earthquakes, a robust monitoring and enforcement regime could support Gaziantep with not just decarbonizing the buildings sector, but also enhance resilience to climate and disaster hazards (such as earthquakes).

This action looks to develop a study that identifies challenges and contributing factors, and formulates feasible, ready-to-implement approaches to improve compliance with building standards in Gaziantep. To provide a rounded and balanced perspective, the study may be carried out by students or staff within the architecture, engineering, or law departments of a local university, and engage a range of public, private, and civil society groups as key stakeholders. At a minimum, the study should cover the following topics:

- **Status quo Summary:** A summary of the current regulatory context around building standards enforcement (across national, provincial, metropolitan, and district levels), the sharing of powers and responsibilities between metropolitan and district governments around building permitting, monitoring and enforcement, trigger points for undertaking inspections (from building design through completion), enforcement remedies e.g., formal warnings, penalties or punitive actions for non-conformance, data access and systems, and current technical and resource capacity for monitoring and enforcement. Any forthcoming changes to the current regime, known within a reasonable degree of certainty, should be addressed by the status quo summary.
- **Assessment of Performance and Identification of Challenges:** Based on the status quo summary, the study should seek inputs from diverse stakeholders who typically engage with building permitting and enforcement, including district municipality staff involved in building permitting and enforcement, representatives from the Chambers of Architects and Commerce, engineers, and developers. The purpose of this consultation will be to understand how specific parts of the current regime perform and outline specific and detailed challenges and drawbacks at different points within the current system.
- **Identification of Potential Approaches:** Once challenges have been identified, the study should look to group these under common topics or themes (e.g., regulatory framework, data access, enforcement capacity, development monitoring, incentives and penalties). For each topic, case studies of building permitting and enforcement systems from other contexts may be developed, where relevant challenges or drawbacks have been successfully addressed, especially if innovative and cost-effective approaches were deployed that could be replicated. Based on the case studies and additional stakeholder consultation, potential approaches to improve compliance with building standards should be developed. Potential approaches should also look to outline suitability for specific topics e.g., public sector-led approaches may be appropriate for monitoring and enforcement of life-critical aspects such as structural integrity and fire safety, while third-party, private sector verification[61] may be suitable for non-life-critical aspects of building regulations such as energy performance of buildings. Incentives for retrofitting existing buildings to improve compliance with building standards should also be explored under this topic.
- **Developing Feasible Approaches:** After assessing the practicalities and potential impacts (positive and negative) of each approach, the most high-impact approaches should be selected, and a detailed plan to implement each shortlisted approach developed. For each approach, the plan should outline technical and human resource requirements, cost of implementation and operationalisation of the approach, potential impacts, and alignment to current or upcoming regulations.
- **Outline an Implementation Plan:** Finally, the study should formulate an implementation plan for the high-impact approaches developed. The plan should include, at a minimum, pathways to implementing any required regulatory changes, monitoring performance and incorporating improvements or modifications for implemented approaches, and the plan for piloting, refinement, and roll-out.

This action aligns with Actions 'YB.PE9 - Developing effective inspection mechanisms for building design in accordance with the BEP Regulation (Building Inspection)', 'YB.PE10 - Developing effective control mechanisms to ensure that the building construction process is carried out in accordance with the design', 'YB.TE5 Use of thermal cameras to examine the thermal permeability of the building envelope during inspections', 'YB.TE6 The use of innovative technologies to monitor construction processes and increase their efficiency', and 'YB.TE7 Expanding the execution of construction planning stages over BIM-based systems, and thus preventing repetitive faulty practices that will create delays' in GMM's **2023 Net Zero Carbon Buildings Plan (draft).**

61 For example, the State of California, USA enforces the California Green Building Standards Code (CALGreen) through accredited private-sector inspectors and plan reviewers. More information can be accessed here: https://www.dgs.ca.gov/BSC/CALGreen

B2

IMPACT

Strategic Goals Supported:
B ii | Minimise GHG emissions from residential and commercial buildings

B iii | Incentivise take-up of green building measures in construction

B v | Promote safe, affordable, and near-zero emission housing

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:
19.4 Share of buildings with green certification

19.5 Share of buildings with Energy Performance Certificates (EPC)

Cross-cutting Themes

Climate Action [Directly targeted]: Improved monitoring and enforcement of building standards will support a reduction in GHG emissions associated with residential, commercial, and public buildings as well as minimise damage and loss of life during climate and disaster hazard events.

Gender and Social Inclusion [Some elements]: An improved enforcement regime will support enhanced structural safety and energy performance in buildings and ensure quality buildings for all social groups, including vulnerable populations.

Smart Maturity [Some elements]: Monitoring approaches that deploy innovative technology (e.g., remote sensing, drones) have the potential for improving efficiency and reducing load on building inspectors.

Co-Benefits

Resilience: (i) Improved compliance with building standards will minimise damage to buildings during disasters and reduce energy demand for heating and cooling from buildings will help create spare capacity within the electricity and natural gas supply system.

Economic: (i) Better enforcement approaches have the potential to increase district and metropolitan municipality revenues, through collection of appropriate penalties for non-compliance, (ii) Improved affordability and lower energy costs for building residents through enforcement of EPCs, (iii) Structurally stable construction techniques will reduce costs of recovery from future disasters.

Social: (i) Reduced loss of life during disasters, through structurally safe and resilient building stock, (ii) Lower energy costs through enforcement of EPCs, especially for lower income households.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Select study team from architecture, engineering and/or law departments of local universities	●							
Develop status quo summary and identify challenges report through desk-based reviews and stakeholder consultation		●						
Identify potential approaches and develop implementation plan for shortlisted approache		●						
Implementation of shortlisted approaches (TBD)								

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 100,000**	Establish a partnership with the local university to undertake policy reviews and assessments. Outputs could include regulatory assessment, roadmap and / or framework to improve compliance and standards.
Component 1 – University grant and support for equipment licenses and advisory outputs	EUR 100,000	12 month engagement
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Ministry of Environment, Urbanisation and Climate Change	Involve
Chamber of Architects / Engineers / Solicitors / Developers	Empower / Involve
Building sector technical colleges, universities, trade organisations	Consult
Staff in district municipality building permitting, monitoring, and enforcement departments	Empower / Involve
Private sector developers and citizens	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Lack of data around existing system, or lack of information on suitable approaches.	· Leverage available knowledge and capacity within local universities for study of this nature · Suitably designed stakeholder engagement sessions will provide qualitative information to offset the lack of quantitative data
Economic	Cost of implementing approaches is not affordable.	· Relevant recommendations or approaches can be integrated with related GCAP actions to minimise capital cost of some approaches e.g., digital buildings database · Means-tested, enhanced application fees and penalties may provide a dedicated revenue source for operational costs · The design of new approaches can reduce costs e.g., licensing third party organisations to validate EPCs and creating a regulatory framework for charging building developers for this verification.
Institutional / Policy	Stakeholders do not provide frank and open feedback on performance of existing system.	· Stakeholder engagement to include different modes of consultation, including anonymised surveys, carefully designed focus group sessions, using neutral facilitators etc.

IMPLEMENTATION

Operational Modality: N/A

Implementation Timeframe and Timeline: 2023-2024

Indicative Total Cost: €100,000

Capital Cost: N/A

Development / Advisory Costs: €100,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source: GMM

Grant: National government, IFI, International Organisations

Revenue Opportunities: No

B3 Incentivise Low-carbon Heating and Cooling, and Energy Efficiency in Residential Buildings

Implement a financing programme aimed at retrofitting or reconstructing residential buildings for improving sustainability of buildings (including energy efficiency) and increasing take-up of low-carbon modes of heating and electrification

INFORMATION

Status:
Planned

Location:
Residential buildings in Gaziantep

Type:
- Capital Investment

Action Owner(s):
- GMM Directorate of Environmental Protection, Zero Waste and Climate Change
- GMM Department of Zoning and Urbanisation

Supporting Institutions:
- District municipalities
- Commercial Banks
- National or international infrastructure finance institutions

Relevant Sector(s):

Related Actions:
B2 - Develop feasible approaches for improving compliance with building standards

B4 - Retrofit or reconstruct public buildings for improved energy performance

Challenges Addressed:
Priority Environmental Challenges:
- Significant increase in emissions associated with energy consumption
- Use of coal and wood for heating

Green City Challenges:
- Use of GHG emitting and polluting energy sources

The continued use of coal for heating in residential buildings and the low proportion of buildings insulated to minimum standards are key environmental and sustainability challenges for Gaziantep. As of 2020, the use of coal and lignite as fuel for heating constitutes 17% of the total annual energy consumption (in residential buildings). Additionally, only 10% of buildings in the city were thought to be meeting minimum insulation standards as of 2018, leading to additional demand for energy for both heating and cooling. In line with the ambition set out in the 2018 Sustainable Energy and Climate Action Plan (SECAP), this programme will look to **reduce energy consumption and associated GHG emissions with heating and cooling** in residential buildings by promoting the take-up of low-carbon heating and energy efficiency retrofits. This action aligns with the ambition of increasing the proportion of buildings meeting minimum insulation standards from 10% in 2018 to 30-40% by 2030, as stated in the 2018 Sustainable Energy and Climate Action Plan (SECAP).

Subject to financial and technical feasibility, the programme is expected to focus on financing the following elements: (i) retrofitting existing buildings for improved thermal performance and comfort, (ii) installation of heat pumps in qualifying households and district heating/cooling systems for suitable large/multi-building residential areas, (iii) installation of rooftop solar panels for hot water and (where suitable) electrification, (iv) installation of smart electricity / gas meters and smart thermostats, and (v) biomass boilers for rural households (with wood or animal waste). GMM would look to develop partnerships with financial institutions to support finance the actions identified. Considering the scale of the programme's ambitions, a step-by-step approach will need to be implemented as follows:

- **Design the programme and explore/seek financing partnerships:** GMM should set up sound programme governance and consider whether a new or existing public entity may be best positioned to operationalise the programme. Any policy or legislative enactments to enable the programme must also be determined and implemented at this stage. GMM should determine the number of buildings that must be targeted for each element, supporting the identification of suitable funding or financing approaches (e.g., grants, zero-interest loans, loan guarantees to commercial banks etc.), performance thresholds and measures based on technical and economic feasibility, application procedures, approach to verifying completion of works and eligibility for the programme. Programme design must be carried out in a collaborative manner, involving the key stakeholders listed in the 'Summary' section above. As part of programme design, GMM should consider approaches to share information and promote the use of efficient technologies (e.g., through a website or helpdesk service).
- **Pilot various programme components:** Depending on the available of financing/funding, suitability of building stock, and the opportunity for maximum impact, the programme should pilot specific components in at least one district within GMM – e.g., installation of heat pumps and district/ heating cooling systems may be piloted in Nurdagi and Islahiye districts where post-earthquake reconstruction is currently being planned, or retrofitting may be piloted out in Nizip district where the number of eligible buildings might provide a suitable scale to test feasibility of various retrofitting measures.
- **Review pilot achievements and explore/seek additional financing partnerships for scale-up:** Throughout the pilot, there should be regular reviews of progress through quarterly audits, and annual reviews to identify improvements to the programme design. At the end of the pilot phase, achievements and lessons learnt must be analysed in collaboration with the key stakeholders identified above, and any amendments to the programme design agreed and carried out prior to roll-out.
- **Update and roll-out programme across GMM:** After completion of the pilot and updating its design, the programme may be rolled out across GMM. The roll-out must be implemented with a sustainable approach to programme funding and financing of works e.g., financing via a revolving, zero-interest loan programme may prove to be more sustainable over the long-term than awarding grants. Roll-out must be supported with the design and implementation of a communications campaign to create awareness and increase uptake among the public about the programme.

This action looks to **consolidate existing actions in GMM's 2018 SECAP under a single implementation programme**, specifically: (B2) Improve insulation in residential buildings to align with required standards, (B4) Install solar thermal systems to reduce energy consumption through hot water use, (B5) Increase use of photovoltaic panels in residential buildings.

This programme also aligns with Action 'MB.FE1 – Cooperation with financial institutions for comprehensive renovations of existing buildings' and 'MB.FE2 – Developing a green incentive program for comprehensive and energy efficient renovations of existing buildings' in GMM's **2023 Net Zero Carbon Buildings Plan (draft)**, and looks to consolidate several technical actions within the same Plan, including (MB.TE6) Creating smart applications for building users to monitor and improve their household waste, energy and water consumption, (MB1.PE3) Completion of conversion from fuels with high carbon emissions to clean fuels for heating purposes in residences, (MB1.PE5), Energy monitoring in all buildings, (MB.TE6) - Creating smart applications for building users to monitor and improve their household waste, energy and water consumption, (YB.TKE 3) – Creating awareness among citizens on sustainable buildings, energy efficiency, sustainable materials, smart buildings etc. The action is also aligned with the Gaziantep Climate Change Adaptation Plan (upcoming).

B3

IMPACT

Strategic Goals Supported:
B ii | Minimise GHG emissions from residential and commercial buildings

B iii | Incentivise take-up of green building measures in construction

B v | Promote safe, affordable, and near-zero emission housing

ENG i | Eliminate the use of coal for heating

Estimated benefit(s):

CO_2 savings: Not possible to calculate on the basis of existing data.

Job Created: 1,721*

Quantitative Impact measures:
8.0 Annual CO2e emissions per capita

19.1 Fossil fuels consumption for heating and cooling in residential buildings

19.2 Fossil fuels consumption for heating and cooling in commercial buildings

* Note To be determined on the basis of the size of the programme, potentially up to 1,721. This is a very high-level estimate that assumes a relatively large programme.

Cross-cutting Themes

Climate Action [Directly targeted]: Improved insulation of residential buildings and installation of renewable energy, electrification of heating/ cooling systems, and incorporation of passive ventilation elements will support achieving the goal of phasing out the use of coal in residential buildings, with a direct impact on associated GHG emissions.

Gender and Social Inclusion [Some elements]: The proportion of costs for installation of new systems and retrofitting subsidised by grants and low-interest loans can be means-tested i.e., a higher proportion of the cost can be borne for lower income households.

Smart Maturity [Some elements]: Installation of smart electricity, gas meters, and thermostats as part of the retrofit programme can contribute to reduced energy demand and provide data to support future initiatives on energy efficiency.

Co-Benefits

Resilience: (i) Reduced energy demand for heating and cooling from residential buildings will help create spare capacity within the electricity grid and minimise need for supply interruptions during periods of peak demand, (ii) Installation of decentralised or passive heating/cooling systems will minimise disruption to normal functioning within households during disaster or climate hazard events, (iii) Improved thermal comfort within residential buildings will enhance resilience to heat waves, heat stress and extreme cold weather.

Economic: (i) In general, improved energy efficiency in public buildings will reduce energy costs for heating and cooling for households, (ii) The scale of the programme has the potential to create market demand for green products and retrofitting/ net zero systems skills, providing a strong signal for the construction sector to focus on sustainability as a growth area, (iii) Piloting the programme in 1-2 districts is expected to generate interest and incentivise private sector interest and improve capacity to retrofit or build to higher/ net zero standards.

Social: (i) The first component of the action targets phasing out coal as a fuel source for heating, which is a challenge especially in lower-income neighbourhoods in the city and will also have a positive impact on air quality. (ii) Disbursing grants for replacement of coal-fuelled boilers on a means-tested basis can enable the benefits of the action to be shared equitably.

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Design the programme and secure financing	●			●				
Pilot various components in 1-2 districts (36 months)	●							●
Review pilot achievements and secure additional financing for scale-up	●			●				
Update and roll-out programme across GMM (60 months)	●							●

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 700,000**	Industry standard for consultancy fees for energy efficiency mechanisms, including the provision of 2 consultants to manage the programme. The action will be defined by the consultancy and supported by GMM by forming a partnership with a financial institution.
Component 1 – Cost-benefit analysis for financing options for the EE program	EUR 200,000	12 month consultancy
Component 2 – Project Management for the EE Program provision	EUR 500,000	2 Consultants for a duration of 5 years
Capital Costs	**EUR 312,500,000**	Example assumes EUR 12.5K loan for 25k homes
Component 1 - A loan mechanism for EE / Home Improvements	EUR 312,500,000	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Chamber of Architects / Mechanical Engineers	Consult
Heat pump / solar thermal system suppliers and installers	Collaborate / Empower
Retrofitting contractors and developers	Collaborate / Empower
National grid operator	Involve
Private building owners	Empower
Not-for-profit entities with technical knowledge on this topic (e.g., World Resources Institute)	Consult

IMPLEMENTATION

Operational Modality:
Grant programme to be managed by GMM Directorate of Environmental Protection, Zero Waste and Climate Change or new/existing public entity

Implementation Timeframe and Timeline:
2023 – 2033 [10 years], with continuation review point in 2028 at the end of GCAP implementation period

Indicative Total Cost: €313,200,000

Capital Cost:
€312,500,000

Development / Advisory Costs:
€700,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source: GMM

Grant: IFI, International organisations

Loan: IFI, Commercial bank

Revenue Opportunities:
No

B3

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Lack of capacity within GMM to monitor programme implementation.	· Align confirmation / monitoring of works with existing processes e.g., property tax rebates issued alongside occupancy certificates confirming completion of works
Economic	Cost of installation is unaffordable.	· Affordability of measures to be determined during programme design, and range of financing/funding measures to offset cost to households should be explored. · Operational savings on energy use may be used as a source of revenue to offset any additional capacity or maintenance costs
Environmental	Programme may not achieve desired impact on carbon emission reduction or energy savings.	· Regular and independent reviews and audits of the programme to help identify lessons learnt and course correct requirements or processes · The monitoring and evaluation plan will similarly support identification of key issues or areas where the programme needs to be improved to achieve the desired result.
Social	Programme may not see expected take-up from public.	· A marketing campaign launched alongside the programme should support creating awareness and improve uptake · Quarterly reviews and annual audits can analyse uptake of the programme and consider any additional activities for improvement. · Utilise apprenticeships, employment, and upskilling programmes to seek support and buy-in from resident communities. · Public interest can be tested during the programme's pilot phase to anticipate and address concerns during roll-out across GMM.

B4 Retrofit or Reconstruct Public Buildings for Improved Energy Performance

Retrofit or reconstruct all existing buildings which are owned and operated by, metropolitan and district municipalities to significantly improve energy performance and contribute to net zero emissions from public buildings by 2035

INFORMATION

Status:
Planned

Location:
Public buildings across Gaziantep Province

Type:
- Capital Investment

Action Owner(s):
- GMM Directorate of Technical Works
- GMM Directorate of Environmental Protection, Zero Waste and Climate Change
- Gaziantep Provincial Directorate of National Education and Its District Offices
- Gaziantep Provincial and District Muftiates
- Investment Monitoring and Coordination Department)

Supporting Institutions:
- GMM Department of Zoning and Urbanisation
- GMM Department of Educational and Voluntary Organisations

Relevant Sector(s):

Related Actions:
B2 - Develop feasible approaches for improving compliance with building standards

B3 - Incentivise low-carbon heating and cooling, and energy efficiency in residential buildings

Building on the existing efforts to implement LED lighting in all municipal buildings and in line with the ambition set in the 2018 Climate Change Action Plan and the 2023 Net Zero Carbon Buildings Plan, this programme's primary aim will be **decarbonising heating and cooling and improving thermal performance across all public buildings in Gaziantep, through retrofit or reconstruction** to contribute to the goal of net zero emissions from public buildings by 2035.

The following elements will be considered for implementation through this programme by retrofitting existing buildings or integrating within plans for new or reconstructed buildings, determined on a building-by-building basis based on a cost-benefit analysis: (i) installation of double-glazed windows with high thermal performance standards, (ii) implementation of design features to enable natural / passive ventilation, (iii) insulation of external walls, roofs, and floors [including through nature-based solutions such as green roofs/walls] (iv) installation of passive heating and cooling systems, (v) electrification of heating systems [e.g., heat pumps] with smart thermostats, (vi) rooftop solar panels for hot water and/or electricity supply, (vii) batteries to store energy produced from solar panels, and (vii) installation of EV chargers. The goal of the programme will be for as many public buildings as possible and where technically and economically feasible, to achieve at least EPC 'B' level standards on energy efficiency (in line with the recently announced national mandate for new constructions). This will also support net-zero emissions for GMM- and district-municipality owned assets in line with other GMM initiatives. Within the 5-year GCAP timeframe, the programme can be implemented in in **following steps:**

- **Undertaking energy performance studies of existing buildings:** This is the first step to identify technically and economically viable opportunities to improve energy efficiency in buildings.
- **Decarbonisation of heating and cooling systems in municipal administrative buildings:** This activity will look to (i) decarbonise heating in all GMM and district municipality administrative buildings through measures such as installation of heat pumps and solar thermal systems, and (ii) improve thermal performance of buildings through measures such as passive ventilation approaches and installation of double-glazed windows. Prior to implementation, a portfolio-level Needs Assessment should be carried out to determine current energy performance and improvement opportunities on a building-by-building basis which can contribute to net-zero emissions by 2035, whether buildings should be retrofitted or require reconstruction, and economically and technically feasible solutions for each building. The activity may be phased depending on planned maintenance and asset replacement schedules or other contextual factors e.g., implementation works can commence with administrative buildings in Nurdagi and Islahiye districts which are the focus of post-earthquake reconstruction efforts.
- **Pilot an energy-efficiency retrofit programme for schools and places of worship:** This pilot can provide a basis for scaling up retrofitting initiatives in public buildings and build on existing GMM initiatives that engage with religious and community leaders to create awareness and reduce energy consumption. Retrofitting buildings with high-visibility / high-traffic uses such as schools and places of worship will also support awareness-raising about sustainable building methods among the public. The pilot should commence with a transparent process to select participating schools and places of worship, prioritising schools and places of worship buildings in high-density parts of the inner urban core. The pilot should be implemented in a ground-up manner, securing local buy-in and creating enthusiasm among the communities where the pilots are located in. The pilot can also be implemented in tandem with an apprenticeship programme to upskill youth and existing workforce around design and implementation of sustainable and net zero building solutions, and communications initiative that leverages the pilots to make the benefits of sustainable construction tangible.

This programme mainly aligns with Action 'MB.FE5 – Allocating funds for the extensive renovation of existing municipal buildings' in GMM's **2023 Net Zero Carbon Buildings Plan (draft)**, and looks to consolidate several technical actions within the same Plan, including (MB1.PE4) Energy monitoring in municipal buildings, (MB1.PE6) Implementation of efficiency-enhancing projects by conducting detailed energy studies of existing buildings, (MB1.PE7) As a result of energy monitoring studies in municipal buildings, energy studies are carried out to determine inefficiency levels and to carry out improvement studies, (MB1.PE8) Develop comprehensive retrofitting programmes (insulation, windows, air leaks, etc.), (MB1.PE10) Use of photovoltaic and/or solar thermal systems in municipal buildings, (MB1.PE19) Replacing the lighting elements used in public buildings with efficient fixtures (e.g., LED).

This action also consolidates existing actions in GMM's **2018 Sustainable Energy and Climate Action Plan** under a single implementation programme, specifically: (B6) Scale-up retrofits to existing GMM buildings to improve sustainability, (B8) Improve uninsulated GMM buildings in accordance with standards, (B9) Encourage usage of highly efficient devices for heating, cooling, and ventilation, (B10) Replace lighting elements used in public buildings with energy saving products (like LED lights), and (B11) Install renewable and passive energy systems in public buildings.

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:
- Significant increase in emissions associated with energy consumption.

Green City Challenges:
- Lack of suitable standards for energy efficiency
- Use of GHG emitting and polluting energy sources

B4

IMPACT

Strategic Goals Supported:

B iii | Incentivise take-up of green building measures in construction

B v | Promote safe, affordable, and near-zero emission housing

CA ii | Improve collaboration, coordination, and integration for climate action

Estimated benefit(s):

CO_2 savings: 1,560 tCO_2e emissions per annum n.

Job Created: 149

Quantitative Impact measures:

8.0 Annual CO2e emissions per capita

18.3 Electricity consumption in public buildings

19.3 Fossil fuels consumption for heating and cooling in public buildings

19.5 Share of buildings with Energy Performance Certificates (EPC)

Cross-cutting Themes

Climate Action [Directly targeted]: IImproved insulation of buildings and installation of passive heating and cooling technologies will reduce demand for electricity and other fuels, with a direct impact on associated GHG emissions.

Gender and Social Inclusion [Some elements]: Selection of pilot schools and places of worship that prioritise locations within the inner urban core may directly benefit the resident communities therein.

Smart Maturity [Some elements]: Installation of smart heat meters and thermostats through the programme can contribute to reduced energy demand and provide data to support future initiatives on energy efficiency.

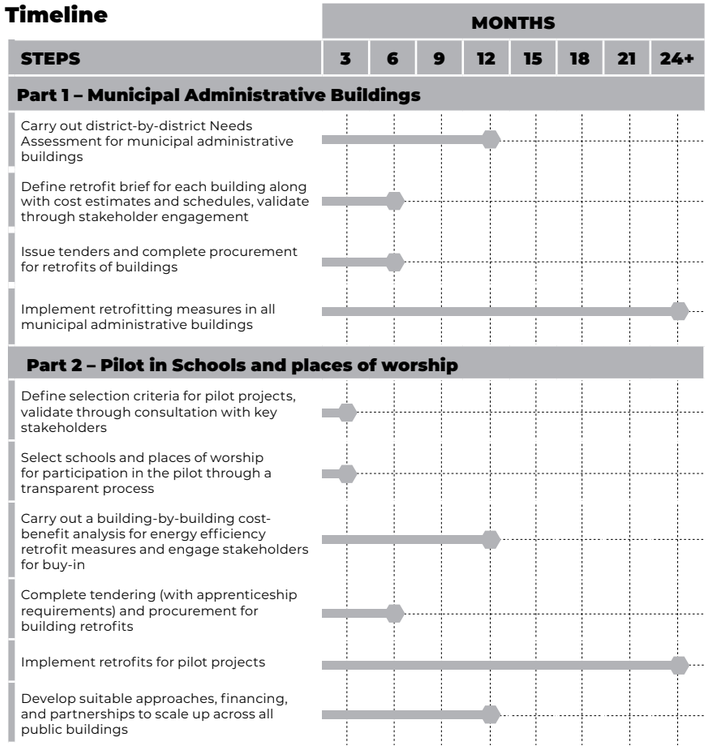
Co-Benefits

Resilience: (i) Reduced energy demand for heating and cooling from public buildings will help create spare capacity within the electricity and natural gas supply system. (ii) Installation of decentralised solar energy and passive heating/cooling systems will minimise disruption to normal functioning of key public buildings during disaster or climate hazard events, (iii) Improved thermal comfort within public buildings will enhance resilience to heat waves, heat stress and extreme cold weather.

Economic: (i) In general, improved energy efficiency in public buildings will reduce operational costs, (ii) Apprenticeship programmes in tandem with the pilots in schools and places of worship will help develop skills for 'green jobs' in the Buildings sector, (iii) The scale of the programme will result in additional demand for green products and construction skills over a 10-year period, providing a strong signal for the construction sector to focus on sustainability as a growth area. (iv) The promotion of demonstrator projects (such as the sustainable retrofitting of high profile buildings) is expected to generate interest and incentivise others (e.g. private sector) to retrofit or build to higher/ net zero standards, thus generating further benefits.

Social: (i) Apprenticeship programmes targeting youth in low-income neighbourhoods will enable employment and skill-building in a 'future-facing' field, (ii) upskilling the existing building sector workforce with new net zero technologies and practices will future proof the workforce, improve employment security and workforce pride and commitment to the sector (iii) Communication and awareness-raising campaigns around the pilot may enable strengthening neighbourhood identity as green neighbourhoods.

Timeline



IMPLEMENTATION

Operational Modality: Following completion of retrofits, relevant maintenance staff to be trained on requirements for new installations, and maintenance and operations approaches/plans for all buildings to be updated

Implementation Timeframe and Timeline: 2024-2029 with possibility of continuation past GCAP implementation period

Indicative Total Cost: €24,560,000

Capital Cost: €23,200,000

Development / Advisory Costs: €1,360,000

5-year Operational Cost: €2,320,000

Potential Financing Instruments:

Instrument: Own source - GMM

Grant - National government, IFI, International Organisations

Loan - Government-owned bank, IFI

Revenue Opportunities: No

B4

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 1,360,000**	Industry standard for consultancy fees for undertaking assessments of municipal buildings, including the preparation of BoQs for individual buildings.
Component 1 – Needs assessment for municipal buildings	EUR 100,000	12-18 month consultancy
Component 1B – Supervision of works for municipal buildings	EUR 660,000	Based on construction costs for retrofitting all municipal buildings applying 5% of construction costs
Component 2A – Needs assessment for schools and places of workshop	EUR 100,000	12-18 months consultancy
Component 2B – Supervision of works for schools	EUR 375,000	Construction period 24 months
Component 2C	EUR 125,000	Construction period 24 months
Capital Costs	**EUR 23,200,000**	This assumes the upgrading of 22 municipal buildings to improve energy efficiency and assumes an average size of 4,000 m^2 per building and applies EUR 150 retrofitting costs per m^2. It also assumes retrofitting costs of EUR 100 per m^2 for schools and places of workshop (75,000 m^2 for schools and 25,000 m^2 for places of worship).
Component 1 – Retrofitting of GMM buildings applying EUR 150 per m^2 costs	EUR 13,200,000	Assumed for 22 GMM owned buildings and areas of 4,000 m^2 each
Component 2A – Schools energy efficiency retrofitting measures applying EUR 100 per m^2	EUR 7,500,000	Assumed areas of 75,000 m^2 of retrofitting schools
Component 2B – Places of workshop energy efficient retrofitting measures applying EUR 100 per m^2	EUR 2,500,000	Assumed areas of 25,000 m^2 of retrofitting Places of Worship.
Operational Costs (over 5 years)	**EUR 2,300,000**	Estimated 2% of investment costs

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Schools for Gaziantep Provincial Directorate of National Education and Its District Offices	Empower / Involve
Places of worship for Gaziantep Provincial and District Muftiates	Empower / Involve
Building sector training centres, technical colleges, universities	Consult
Chamber of Architects / Mechanical Engineers	Consult
District municipalities	Involve
Not-for-profit organisations (World Resources Institute)	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Sustainability measures may not achieve the desired efficiency outcomes.	· Maximise opportunities for renewable energy production within government building campuses as part of retrofit programme · Carry out a Needs Assessment that includes a technical and cost-benefit analysis of various measures to include in the retrofit brief for each building
Economic	Skills for large scale retrofitting are not easily available within Gaziantep.	· Piloting retrofits in public buildings can enable building up to sufficient scale within private sector · Apprenticeship, employment and upskilling programmes will support long-term mitigation of capacity challenges
	Cost of retrofitting is unaffordable.	· Capital financing through programme will offset large proportion of cost for retrofitting · Explore other financing opportunities (national and international) available to GMM for the proposed pilots · Operational savings on energy use may be used as a source of revenue to offset any additional capacity or maintenance costs
Environmental	Programme may not achieve desired impact on carbon emission reduction or energy savings.	· Regular and independent reviews and audits of the programme to help identify lessons learnt and course correct requirements or processes
Social	Pilots are not supported by communities.	· Robust stakeholder engagement and public consultation at key points during both activities · A communications campaign to create awareness of benefits in the communities where pilots are located · Utilise apprenticeships, employment, and upskilling programmes to seek support and buy-in from resident communities

INDUSTRIES

IN1 **Digital Data Management Centre for Environmental Monitoring**

IN2 **Establish a Renewable Energy Generation Industrial Zone**

IN3 **Enforcing Businesses Accountability for Environmental Non-Compliance**

IN1 Digital Data Management Centre for Environmental Monitoring

Launch a digital data management centre for collection and analysis of environmental monitoring data (air, water, soil quality, as well as noise, carbon emissions, energy efficiency and solid waste), enforcement actions and investment decisions in sustainability

INFORMATION

Status:
New

Location:
N/A

Type:
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM Directorate of Environmental Protection, Zero Waste and Climate Change
- Gaziantep Chamber of Industry
- Gaziantep Chamber of Commerce
- Gaziantep Governorship Department)

Supporting Institutions:
- GMM IT Department
- Gaziantep OIZ
- Provincial Directorate of Environment, Urbanization, and Climate Change
- Oguzeli Chamber of Industry

Relevant Sector(s):

Related Actions:
IN3 - Enforcing business accountability for environmental non-compliance

WA2 - Introduce standard processes for data collection and monitoring of ground and surface water

B1 - Develop a digital buildings database

The five Organized Industrial Zones (OIZs) in Gaziantep and several small Industrial Zones (IZs) are one of the contributors to environmental pollution and degradation in Gaziantep. The industrial sector alone is responsible for over a third (37%) of all emissions and uses nearly 5 times more electricity than all combined households of Gaziantep. The manufacturing of food, metal and heavy machinery, plastics, chemicals and leather and textiles is resource-intensive and requires substantial quantities of water, in an already water-scarce region. But while some of the environmental impacts of the industrial sector in Gaziantep are well-known, others are more driven by qualitative assessments and local evidence, as there is no integrated database that would facilitate insights into the industrial sector's impact on water, land and air (for example on the waterbodies through discharge of untreated wastewater, soil pollution through release of heavy metals into the environment, and air and noise pollution through industrial processes and burning of fossil fuels). There is also limited information about how industrial waste is treated, what percentage of that waste is recycled and reused, and crucially, what measures have been taken to address some of these issues.

Through the creation of a digital data management centre that will collect key data for environmental monitoring (on air, water, soil quality, noise, carbon emissions, energy efficiency and solid waste) and contain up to date information on enforcement actions, GMM will strengthen its capacity to develop appropriate responses (through fines or incentives) and enforce environmental regulations in the industrial sector in Gaziantep. Effectively, the data management centre will enable rapid identification of 'hot spots' of environmental hazards generated by industries, record the enforcement actions taken, and, by providing insights into the 'hot spots', allow for evidence-based planning for actions to reduce the environmental impacts. These could focus on, for example, investments for improved processes for waste recycling and reuse, increasing the capacity for industrial wastewater treatment, etc. This action will provide an opportunity for the OIZs and IZs to play an important role in driving green transformation of the industrial sector in Gaziantep and support the city's broader climate agenda.

Some of the data that should be collected in the digital data management centre will include:

- Quarterly data on air quality taken from monitoring stations next to the largest OIZs and IZs related to the main industrial pollutants (PM10, SOx, NOx)
- Annual or bi-annual data on water and soil quality samples in areas where OIZs and IZs operate or discharge their waste
- Annual data on water extraction for industrial purposes in Gaziantep
- Annual data on carbon emissions, split per source and industrial sector (including from fuels, such as natural gas)
- Annual data on energy intensity per unit of industrial GDP, and share of industrial energy consumption from renewable sources
- Annual data on noise pollution
- Annual or bi-annual data on the share of industrial waste that is recycled and reused
- Annual or bi-annual data on the management, recycling rate, and disposal of industrial waste
- Enforcement actions listing entities involved, type of action taken (i.e. fine, prosecution, etc.) and evidence of response

Setting up and launching the digital data management centre will include the following steps:

- **Assessing the current data environment:** This will involve the initial assessment of the data that is currently collected, stored and used. It is expected that much of this data is not currently collected, so at this step, a strategy should be developed to close those data gaps (this will likely require engagement and coordination with other data-collecting entities, OIZs and GMM departments).
- **Clearly defining the goals and objectives for the data management centre:** In addition to monitoring, and information on the enforcement actions, this step is essential for creating a common ground to understand what the ultimate objective of the centre is.
- **Selecting the appropriate software and doing user research:** This step will ensure that the appropriate software has been selected and can be designed to be accessible for all users.
- **Design, launch and management** of the data centre: The launch can be preceded by a pilot to test the functionality. It will be subsequently managed and maintained by GMM, the Chamber of Industry and the Chamber of Commerce.
- **Training of the staff:** This will allow relevant GMM, the Chamber of Industry, and the Chamber of Commerce staff to use the system effectively. This will involve training on data entry, access, and using the data centre's analytical tools, etc.

This action supports the implementation of the existing Sustainable Energy and Climate Action Plan (2018).

2023 Green City Action Plan (GCAP) Gaziantep

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:
- Limited control over pollutants originating from small businesses
- Lack of detailed and easily accessible data on soil pollution, especially associated with the industrial sector

Green City Challenges:
- Environmental hazards generated by industries
- Weak and overly bureaucratic institutional structure
- Lack of incentives for proper wastewater / solid waste management in OIZs

IN1

IMPACT

Strategic Goals Supported:
IN i | Minimize environmental impact of industrial growth

IN ii | Improve data collection and monitoring of industrial incentives

IN iii | Incentivise transition towards low-carbon industrial development

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: 4

Quantitative Impact measures:
This action will enable the delivery and monitoring of other actions that seek to address environmental challenges in Gaziantep. The following impact measure can be tracked for this action:

By 2025, the data management centre will contain complete data for at least 3 indicators for each of the thematic areas (air, water, soil quality, noise, carbon emissions, energy efficiency and solid waste)

Cross-cutting Themes

Climate Action [Directly targeted]: This action will support integrated climate action planning in Gaziantep by strengthening the reporting on emissions from the largest source, industries

Gender and Social Inclusion [No direct links]: As the action is focused on the industries in Gaziantep, there are no direct links to gender and social inclusion.

Smart Maturity [Directly targeted]: This action directly contributes to the city's smart maturity, by enabling evidence-based decision-making on key environmental issues the city faces. The platform itself is well-aligned with the ongoing national-level efforts to digitalise and make more accessible key environmental data.

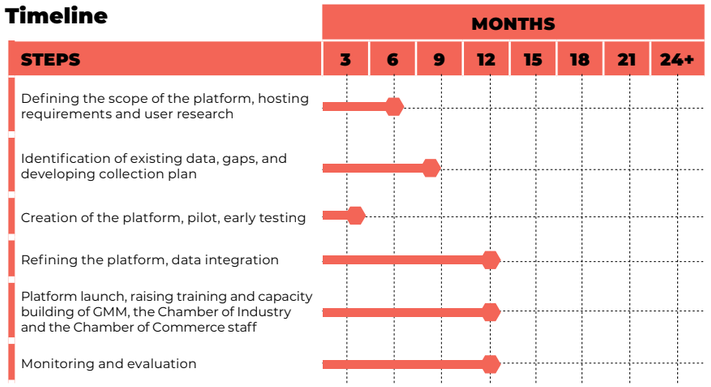
Co-Benefits

Resilience: Through improved environmental monitoring, this action is expected to contribute to the city's resilience by reducing exposure to environmental hazards.

Economic: Indirectly, by facilitating stronger environmental monitoring and enforcement of environmental regulations, this action could help save costs associated with industrial pollution (e.g. clean up).

Social: As this action in the long run aims to contribute to the protection of Gaziantep's natural capital assets (water, air, and soil) through strengthened monitoring and enforcement of environmental regulations, it will benefit all residents of Gaziantep.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 170,000**	Industry standard for consultancy fees for developing a digital database and monitoring system.
Component 1 – Design and development data platform	EUR 150,000	18-24 month consultancy
Component 2 – Project Management for the EE Program provision	EUR 20,000	6 month consultancy
Capital Costs	**EUR 120,000**	The action assumes procurement of some equipment for air, water and soil quality monitoring.
Budget for procurement of equipment for monitoring and testing. Assumed the requirement to procure monitoring and testing equipment applying an average of EUR 10,000 to acquire 12 units	EUR 120,000	Sourced from UK Government Air Monitoring Project (2016) Automated air quality monitoring system
Operational Costs (over 5 years)	**EUR 12,500**	OPEX costs covering hosting, licences, and maintenance.

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District municipalities	Involve
All Organized Industrial Zones (OIZs)	Collaborate
Industrial Zones (IZs)	Collaborate
Ministry of Industry and Technology, Provincial Directorate	Collaborate
Ipekyolu Development Agency	Consult
Chamber of Environmental Engineers Gaziantep Branch	Consult
Gaziantep University	Consult
Hasan Kalyoncu University	Consult
Gaziantep Islamic Science and Technology University	Consult

IMPLEMENTATION

Operational Modality:
The data management centre will be run by the GMM Directorate of Environmental Protection, Zero Waste and Climate Change, supported by GMM IT Department. Support will be provided by the Chamber of Industry and the Chamber of Commerce.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost: €290,000

Capital Cost:
€120,000

Development / Advisory Costs:
€170,000

5-year Operational Cost:
€12,500

Potential Financing Instruments:

Instrument:
Own source - GMM

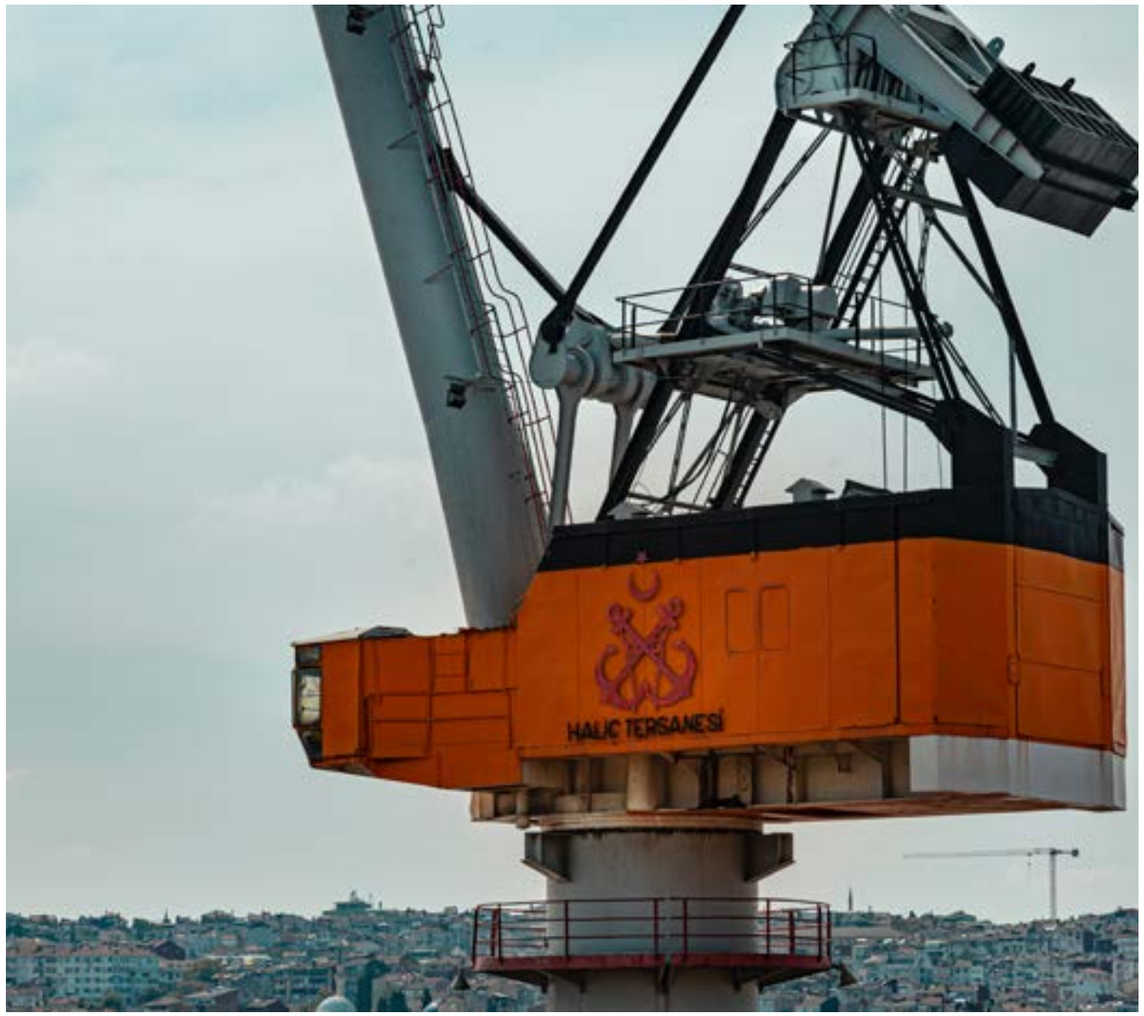
Grant - National government, IFI, International Organisations.

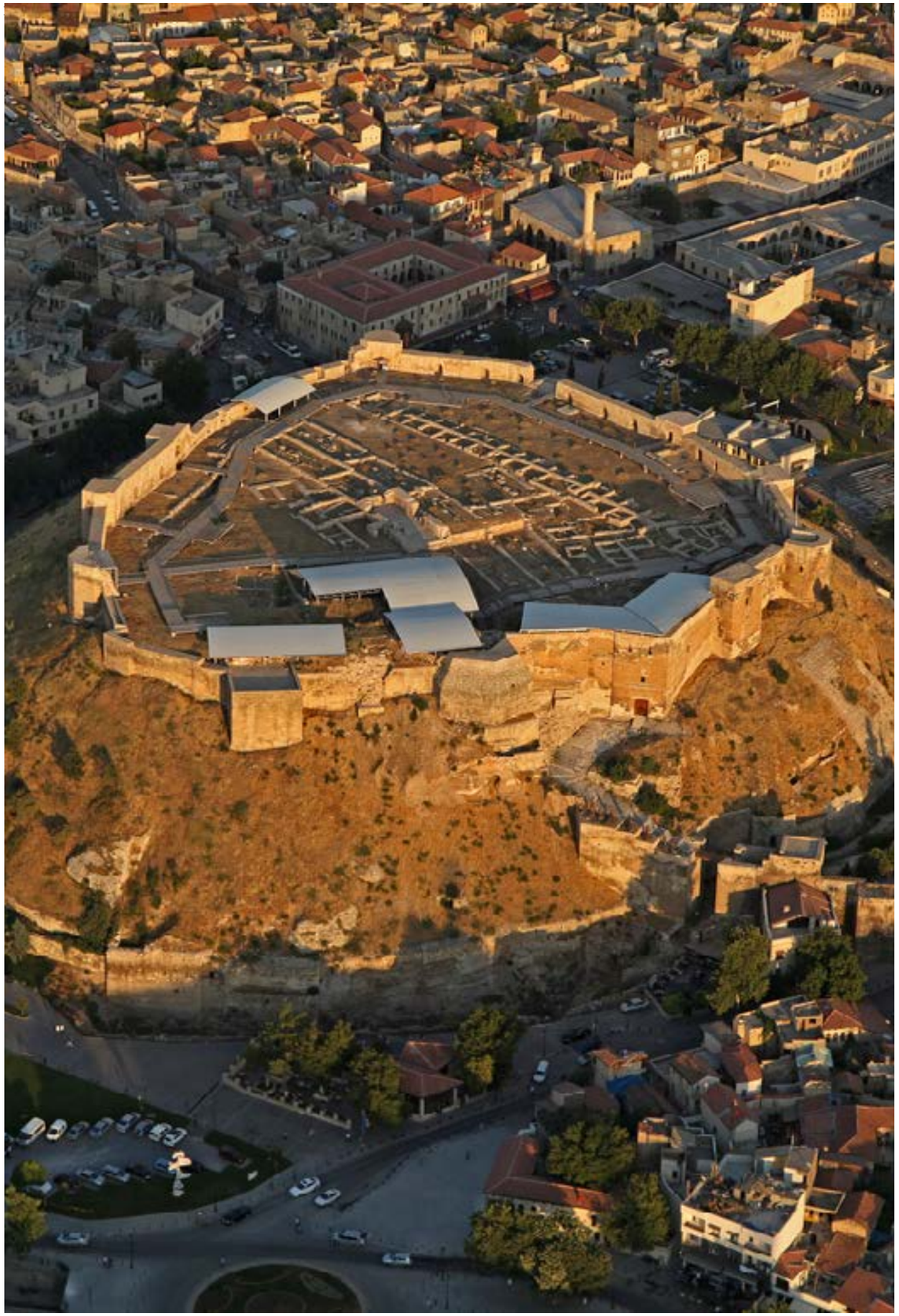
Revenue Opportunities:
No

IN1

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	The smart maturity assessment undertaken for Gaziantep noted that there are areas for improvement in terms of depth and diversity of technologies available in Gaziantep, and insufficient human resources to support the transition to 'smart' programmes.	· Undertake additional assessment to ensure there are internal capacities to deliver this action, and that it is prioritised.
	Some of the data collected may not be sufficiently reliable or of adequate standard.	· As described in the 'Information' section above, the first step of initial data scoping and assessment will be key to data filtering and ensuring appropriate data is being selected for the data centre
Political	Some of the data needed for this action may not be readily available or is considered property of OIZs (or perceived as 'sensitive') so there may be reluctance to start collecting or sharing it.	· Build a strong alliance with the Ministry of Industry and Technology and Ministry of Environment, Urbanisation and Climate Change to ensure their support and buy-in for this action.
	GMM's authority over OIZs is limited (OIZs are regulated by the Ministry of Industry and Technology).	· Gaziantep Governorship will lead on the coordination of activities between different entities.





IN2 Establish a Renewable Energy Generation Industrial Zone

Establish a Renewable Energy Generation Industrial Zone in a suitable location within Gaziantep

INFORMATION

Status:
Planned

Location:
To be determined jointly by GMM and Gaziantep OIZ.

Type:
- Capital investment

Action Owner(s):
- GMM Directorate of Environmental Protection, Zero Waste and Climate Change
- Gaziantep OIZ
- Gaziantep Governorship
- GMM Enerji

Supporting Institutions:
- The Union of Chambers and Community Exchanges of Turkiye
- EDAS
- TEIAS
- Ministry of Industry and Technology

Relevant Sector(s):

Related Actions:
ENG1 - Identify feasible battery energy storage system (BESS) opportunities

Industrial energy use is one of the main contributors to GHG emissions in the city. There are currently five OIZs in Gaziantep developing, manufacturing, and processing across a variety of industries which utilise a large amount of natural gas in their operations. Industrial electrification will contribute to the decarbonisation of industry across the OIZs and will have a significant impact on reducing the city's GHG emissions but will require an increase in electricity generation to meet the increased demand.

Development of a Renewable Energy Generation Industrial Zone (REIZ) comprising a solar PV plant and/or other energy generation technologies could increase Gaziantep's renewable energy capacity and serve the industrial loads to reduce their associated operational GHG emissions. Not only will the end result support decarbonisation, but the construction, operation and maintenance of the REIZ will increase employment opportunities in the region. Additional consultations will take place to ascertain whether some support could be given for large-scale rooftop solar installations on rooftops of industrial buildings. Consideration could be given in the future for a roll out of incentives and subsidies for these types of large rooftop solar installation projects.

In order to develop a REIZ that is suitable for the region, a feasibility study to determine suitable location and scale of implementation should be undertaken. This action proposes the undertaking of this study then development through to operation. It should be noted that each step is reliant on the success of the previous. An overview of the actions involved with each step are as follows:

- **Location Feasibility Study:** A study should be undertaken to determine a suitable location for the REIZ. This study should evaluate available land, its agricultural quality and alternative uses, as well as any ecological, planning or other constraints that may prevent the development of a REIZ. This study should also include an assessment of grid connection or private connection to a nearby industrial load.
- **Technology Feasibility Study:** Once suitable locations are identified, a technology feasibility study should be undertaken to determine, at a high-level, the potential feasibility and install capacity of the identified technologies in the selected area(s). This study should include a review of current legislation, best practice, economic considerations and current technologies. Demand analysis should be undertaken and staging of the REIZ developing should be considered. The technologies to consider could include:
- **Solar PV:** Solar PV opportunities could be developed on non-agricultural land (e.g., brownfield), or where agricultural land is the only available option, agrivoltaic opportunities could be explored. Agrivoltaic opportunities include both arable and pastoral farming. Not only do agrivoltaic opportunities utilise space more efficiently, but evidence also shows a decrease in water evaporation, improvements in crop yield and decreased livestock mortality rates due to shade and shelter provided by the panels.
- **Solar Thermal:** Solar thermal opportunities should be explored for inclusion in the REIZ where there is a large heat demand within any nearby industrial processes. Innovative solutions for the storage of the collected heat (e.g. phase change materials) or generation of electricity (e.g., steam turbines) could also be explored.
- **Energy from Waste:** Where an industrial zone is a large producer of waste, energy from waste opportunities should be explored for inclusion in the REIZ. Energy can be generated from waste by both heat recovery processes and electricity generation. Where there are industrial processes creating organic waste products that can be processed by digestors, biogas can be produced and utilised in combined heat and power systems.
- **Wind:** Wind generation opportunities should be explored for inclusion in the REIZ. Where there is sufficient wind resource, wind power generation can be complementary to that of solar (e.g., at night) and can therefore improve resilience and reliability of supply.
- **Scoping, Environmental Impact Assessment, Design, Construction and Operation:** The appropriate permitting, surveys, land agreements and grid connection applications should be submitted for any technology that is deemed feasible through appropriate assessment. The design of the REIZ should be progresses through planning and into detailed design, prior to procurement, construction, testing, commissioning and operation.

Development of a REIZ should take into consideration the other renewable energy projects that are also in development at a city level. Integration with energy storage opportunities and complementary technologies (e.g., wind turbines) will improve resilience and reliability of supply.

This action supports the implementation of the Sustainable Energy and Climate Action Plan (2018) and is aligned with several other national-level documents (e.g. Turkiye's Eleventh Development Plan, and National Energy Efficiency Action Plan).

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Significant increase in emissions associated with the industrial sector

Green City Challenges:

- Environmental hazards generated by industries
- Increasing energy consumption

IN2

IMPACT

Strategic Goals Supported:
ENG iv | Maximise the share of renewable energy and fuels within the energy system

IN iii | Incentivise transition towards low-carbon industrial development

IN iv | Increase the share of industrial energy consumption from renewables

Estimated benefit(s):

CO_2 savings: N/A

Job Created: To be determined by the feasibility study.

Quantitative Impact measures:
22.2 Share of industrial energy consumption from renewable energy

Cross-cutting Themes

Climate Action [Directly targeted]: This action will directly contribute to climate action by reducing GHG emissions associated with energy consumption of the industrial sector, which is the largest contributor to emissions in Gaziantep.

Gender and Social Inclusion [No direct links]: As this action targets the industrial areas, there are no particular aspects that relate to gender and social inclusion.

Smart Maturity [No direct links]: There are no specific smart maturity elements for this action.

Co-Benefits

Resilience: By diversifying energy sources powering industrial processes, this action will make the energy system more robust and consequently, less vulnerable to power outages, and fluctuation in prices of other fuels currently used to generate energy for industries.

Economic: In addition to cost savings through lower energy costs and ROI, this action is expected to result in creation of additional jobs during the construction, operational and maintenance phases.

Social: Transition to cleaner energy sources will also generate social benefits by reducing environmental pollution.

Timeline

STEPS	MONTHS: 3	6	9	12	15	18	21	24+
Location Feasibility Study								
· Evaluate available land, its agricultural quality and alternative uses, as well as any ecological, planning or other constraints including grid/ private connection.		●						
· Assessment of agrivoltaic opportunities.								
Technology Feasibility Study								
· Technology feasibility study to determine the potential install capacity and need for different technologies within the selected area(s).								
· Review of current legislation, best practice, economic considerations and current technologies.		●						
· Demand analysis should be undertaken and staging of the REIZ developing should be considered.								
· The feasibility study should be prepared according to the existing requirements published by the Ministry of Industry and Technology.								
Establishment of a managing company		●						
Scoping								
· Obtaining energy permits from relevant ministries								
· Grid connection application				●				
· Scoping design								
· Site surveys								
· Stakeholder consultation								
Making an industrial zone application to the Ministry of Industry and Technology			●					
Planning process								
· Expropriation of the designated area(s)								
· Preparation of existing maps								
· Preparation of geotechnical and geological studies				●				
· Preparation of the zoning and subdivision plan								
· Preparation of infrastructure projects								
· Construction of infrastructure								
Agreements with the investor companies		●						
Construction, Testing & Commissioning								
· Performance testing				●				
· Grid integration and synchronisation								
· Inspection and approval by the Ministry								
Operation and Maintenance (240 – 300 months)								●

IMPLEMENTATION

Operational Modality:
To be determined by the feasibility study.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost: €350,000

Capital Cost:
N/A

Development / Advisory Costs:
€350,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source - GMM, Private sector

Grant: National government, IFI, International Organisations

Loan - Government-owned bank, IFI, commercial bank

Investment - private sector

Revenue Opportunities:
Yes, to be determined by the feasibility study

IN2

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 350,000**	Industry standard for feasibility study, detailed designs, EIA and permitting. The size, capacity and financing required for establishing a renewable energy park will be determined from the feasibility study. Note: For a 10 acre renewable energy park in the UK the costs for installing infrastructure is equivalent to EUR 8,000,000.
Component 1 – Feasibility study for identification of land for a renewable energy park	EUR 100,000	12 month consultancy
Component 2 – Concept design, EIAs, and permitting	EUR 250,000	24 month consultancy
Capital Costs	**EUR 0**	To be determined by the feasibility study.
Operational Costs (over 5 years)	**EUR 0**	To be determined by the feasibility study.

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Industrial Zones (IZs)	Empower
Ministry of Energy and Natural Resources	Consult
Ipekyolu Development Agency	Involve
National and International Finance Corporations	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Constraints (e.g., ecological) meaning site unsuitable.	· Undertake location feasibility study prior to investing significant capital into the project to ensure no funding is waste if the identified area is not feasible for REIZ implementation. · Identify alternative locations.
	Technology not suited to industrial demand implemented.	Ensure industrial demand is considered in the feasibility process to ensure the correct technologies are selected for inclusion in the REIZ.
	Lead time of materials.	Begin procurement process early and consider in program.
	Wider grid constraints.	Consider wider grid implications and other planned/ ongoing projects.
Economic	Funding not available.	Identify potential funding streams early in the feasibility study process.
	Early feasibility study shows that identified opportunity is not financially viable.	Undertake feasibility study prior to investing significant capital into the project to ensure no funding is wasted if the opportunity is not feasible.

IN3 Enforcing Businesses Accountability for Environmental Non-Compliance

Introduce and enforce private sector penalties and fines for non-compliance with planning and environmental regulations

INFORMATION

Status:
New

Location:
All Organized Industrial Zones (OIZs) and Industrial Zones (IZs) in Gaziantep

Type:
- Standards, guidelines, and regulations

Action Owner(s):
- Gaziantep Provincial Directorate of Environment, Urbanization, and Climate Change

Supporting Institutions:
- GMM Finance Directorate
- Gaziantep Chamber of Industry

Relevant Sector(s):

Related Actions:
IN1 - Digital data management centre for environmental monitoring

IN2 - Establish a renewable energy generation industrial zone

Gaziantep is a major industrial city in Turkiye, and as such, it faces a number of environmental challenges, including air, water and land pollution, deforestation, and loss of biodiversity. The key industrial sectors in Gaziantep include manufacturing, textile, food, metal and machinery, chemical, plastic, and the production of paper products. The particularly important manufactured products in the area are cotton and acrylic yarn, carpets, flour, semolina, pasta, foodstuffs, vegetable oil, plastic, detergent production and leather. These industries emit a variety of pollutants to the air (such as sulphur dioxide, nitrogen oxides, particulate matter, and volatile organic compounds), water (such as heavy metals, organic pollutants, and nutrients) and land (such as hazardous waste, solid waste, and sewage).

A penalty scheme that could address industrial non-compliance with planning and environmental regulations could help to overcome the polluting challenges Gaziantep faces by deterring polluters from breaking the law. By making it clear that there are consequences for non-compliance, such as fines or even imprisonment, businesses would be more likely to comply with the regulations. This would help to reduce pollution levels in the city and improve the health of its residents.

In addition, a penalties and fines scheme could help to raise revenue that could be used to fund environmental protection measures. This could include things like investing in better environmental monitoring and upgrading environmental infrastructure (as proposed by other actions in this GCAP), cleaner production technologies and decarbonisation of energy infrastructure, etc. By investing in these measures, GMM could help to reduce pollution levels in the city even further.

To introduce and enforce private sector penalties and fines for non-compliance of planning and environmental regulations, the following steps should be undertaken:

- **Assess challenges and barriers for the scheme to overcome.** The first step is to undertake a holistic consultation covering challenges, barriers, threats being faced; this would need to cover a range of topics, such as data access, enforcement powers, regulations, suitability of current penalties/fines. Identifying these issues will inform the scheme design in later steps.
- **Identify the relevant regulations.** The next step is to identify the planning and environmental regulations that are relevant to the private sector. This may involve reviewing a variety of sources, such as legislation, regulations, and guidance documents. This step would also involve the assessment on whether new enabling regulations or the amending of existing regulations would be needed.
- **Determine the scope and system for enforcing the penalties and fines.** Once the relevant regulations have been identified, the next step is to determine the scope of the penalties and fines. This will involve considering factors such as the severity of the non-compliance, the potential impact on the environment or the public, and the need to deter future violations. Once the scope of the penalties and fines has been determined, the next step is to develop a system for enforcing them. This will involve establishing procedures for identifying non-compliance, issuing penalties and fines, and collecting payments.
- **Consider incentives to reward innovation or leadership in mitigating impacts.** A review of incentives options to be undertaken to determine those most feasible for incorporating into the design of the scheme for each sector captured by the scheme. Incentives could target adoption of circular economy approaches, carbon capture systems, afforestation/reforestation measures, wastewater treatment etc., as examples for consideration.
- **Provide education and outreach.** It is important to provide education and outreach to the private sector about the new penalties and fines. This will help to ensure that businesses are aware of their obligations and the consequences of non-compliance. A portal for publicly disclosing/reporting on the number of enforcement actions/fines collected can be designed to further promote positive environmental performance. The results can be presented anonymised and aggregated to overcome privacy/legal concerns.
- **Monitor and evaluate the system.** It is important to monitor and evaluate the system for enforcing penalties and fines. This will help to identify any problems and make necessary adjustments.

It is important to ensure that the scheme is fair and equitable, and that the penalties are proportionate to the severity of the offense. It is also important to enforce the scheme effectively, so that businesses know that they will be held accountable for their actions.

The roll out should be across all of the Organized Industrial Zones (OIZs), which would include Gaziantep OIZ, Nizip, Ishaliye and Oguzeli Airport Improvement. It would involve an initial design and consultation phase. A pilot phase would then be implemented to 2-3 years which would be evaluated and revised, if needed. The implementation of the finalise penalisation for non-compliance could then run subsequently for five-year phases. Monitoring and evaluation of the scheme would be incorporated in the design and updated following the completed of each phase.

This action has linkages to the Gaziantep Sustainable Energy and Climate Action Plan (2018) and Gaziantep Provincial Environmental Plan 2040.

2023 Green City Action Plan (GCAP) Gaziantep

INFORMATION

Challenges Addressed:
Priority Environmental Challenges:

- Limited control over pollutants originating from small businesses
- Lack of detailed and easily accessible data on soil pollution, especially associated with the industrial sector

Green City Challenges:

- Environmental hazards generated by industries
- Lack of enforcement of standards for treated wastewater used in irrigation

IN3

IMPACT

Strategic Goals Supported:

IN i | Minimize environmental impact of industrial growth

IN ii | Improve data collection and monitoring of industrial incentives

IN vi | Improve disposal and management of industrial waste

WA i | Sustainably manage water resources to build long-term water security

LU ii | Increase access and quality of green spaces for residents and visitors in the city

SW iv | Incentivise sustainable management of hazardous waste

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: 1

Quantitative Impact measures:
The following quantitative impact measure can be used for this action:

By 2030, reduce the number of non-compliant enterprises by 50%.

Cross-cutting Themes

Climate Action [Some elements]: This action will support environmental and emission reporting in Gaziantep as this would be a requirement on companies/ businesses in the OIZs.

Gender and Social Inclusion [Direct links]: This action will support tackle environmental justice issues such as the land, air and water pollution/contamination caused by some industrial areas that are located near low-income residential communities and/or near agricultural land.

Smart Maturity [Some elements]: This action would indirectly support enhancing the smart maturity, as companies would be required to enhance their data monitoring and reporting. In the design of the scheme, digital reporting could be incorporated as a requirement.

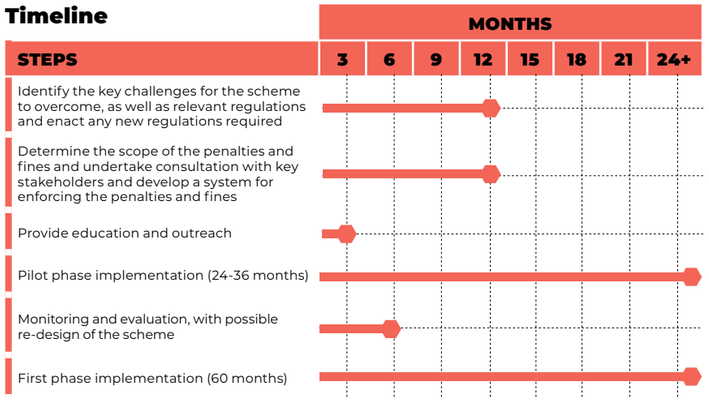
Co-Benefits

Resilience: Through improved environmental monitoring, this action is expected to contribute to the city's resilience by reducing exposure to environmental hazards.

Economic: Through avoided environmental pollution, there would be a reduction in the funding needed for cleaning spills or natural resources for use (commercial and non-commercial use). Thorough enhanced health benefits, additional economic benefits could be brought about, such as from the reduction of sick days taken and improved productivity.

Social: As this action in the long run aims to reduce air, water and land pollution, aiming to improve the health of the residents of Gaziantep.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 175,000**	Industry standard for consultancy fees for analysis and policy development. This action also includes capacity development for GMM staff and the private sector actors.
Component 1 – Assessment and development of penalties and incentive schemes	EUR 125,000	12 month consultancy
Component 2 – Capacity development for GMM staff and private sector industry operators	EUR 50,000	6 month consultancy x 2
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Organized Industrial Zones (OIZs)	Collaborate
Industrial Zones (IZs)	Collaborate
Provincial Directorate of Environment, Urbanisation and Climate Change	Involve
Ministry of Industry and Technology	Involve
District municipalities	Involve
Gaziantep Chamber of Commerce (representing businesses)	Collaborate
Environmental Protection Agency	Involve
Local NGOs (environmental focussed)	Consult
Business associations	Empower
Academics	Collaborate

IMPLEMENTATION

Operational Modality:
The action would involve a range of activities to design what the penalties and fines scheme could be implemented; a pilot phase would then be run to test the design and assess it adequateness and fairness. The scheme can then be run in five-year phases thereafter, updated based on on-going monitoring and evaluation.

Implementation Timeframe and Timeline:
Design and consultation: 2023-2024

First phase: 2024-2027

Five-year phases thereafter

Indicative Total Cost: €175,000

Capital Cost: N/A

Development / Advisory Costs: €175,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source - GMM

Grant - National government, IFI, International Organisations

Revenue Opportunities: Yes, to be determined by the initial assessment of possible incentives and penalties.

IN3

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	The penalties and fines may be seen as unfair or discriminatory. If the penalties and fines are not applied fairly and consistently, businesses may feel that they are being unfairly targeted. Further, the penalties and fines may have unintended consequences. For example, if the penalties and fines are too high, they could put businesses out of business, which could have a negative impact on the economy.	The penalties and fines should be proportionate to the severity of the offense. For example, a small business that accidentally pollutes a river should not be fined as much as a large factory that deliberately pollutes the air. The fines and penalties will be determined through stakeholder consultation with a variety of actors. Further, the penalty regimes for OIZs and GMM/district-operated industrial zones could be introduced in the design.
	The penalties and fines may be difficult to enforce. If the system for enforcing penalties and fines is not effective, businesses may be able to avoid paying them.	In the design of the scheme the penalties and fines should be clear and unambiguous, this will make them easier to enforce. Compliance officers will also have clear roles and responsibilities to support enforcement.
Political	The political climate can change, and a new administration may not be as supportive of private sector penalties and fines. This could lead to changes in the law or the way that penalties and fines are enforced.	In the design of the scheme, it will be important to get support from a broad range of stakeholders, as this will make it more difficult for a new administration to make changes to the scheme. The results of the enforcement and the amounts collected could be published anonymised, as a means to add public pressure. Further a clear and strong business case will be developed for the need of the scheme, which will help to convince a new administration of the importance of the scheme and the need to keep it in place. By making the scheme as transparent and accountable as possible, will also make it more difficult for a new administration to make changes to the scheme without public scrutiny. A system for monitoring and evaluating the scheme will also be established to help to identify any problems with the scheme and make necessary adjustments.
Economic	The penalties and fines may not be effective in deterring non-compliance. If the penalties and fines are not seen as being severe enough, businesses may be more likely to take the risk of non-compliance.	The price will be determined through stakeholder consultation. The scheme could also consider a graded penalties scheme, which would increase in severity for repeat offenses. This would make it more expensive for businesses to break the law, and it would also send a clear message that non-compliance will not be tolerated.

CLIMATE ACTION

CA1 Climate-Smart Irrigation and Renewable Energy Systems

CA2 Integrated and Evidence-Based Climate Action Planning in Gaziantep

CA3 Develop a Study on Carbon Capture, Utilization and Storage

CA4 Raising Awareness on Sustainable Consumption in Gaziantep

CA1 Climate-Smart Irrigation and Renewable Energy Systems

Implement climate-smart irrigation and on-grid renewable energy systems through agricultural cooperatives

INFORMATION

Status:
Planned

Location:
Gaziantep province – exact locations to be determined with irrigation unions

Type:
- Capital Investment

Action Owner(s):
- GMM Agricultural Services and Food Department

Supporting Institutions:
- Irrigation unions and cooperatives
- Ministry of Agriculture and Forestry
- Gaziantep Provincial Directorate of Agriculture and Forestry
- GAP Administration
- DSI
- EDAS
- Ministry of Energy and Natural Resources
- TEIAS
- Ipekyolu Development Agency

Relevant Sector(s):

Related Actions:
ENG1 - Identify feasible battery energy storage system (BESS) opportunities

Challenges Addressed:
Green City Challenges:

- Long-term water insecurity
- Potentially high energy use from future water supply

While Gaziantep is primarily known as an industrial hub, agriculture plays a key role in the province's economy, accounting for around 10% of Turkiye's total agricultural exports. Gaziantep's geographical location and climate provide a strategic advantage in terms of plant production capacity, size of agricultural land, and cultivation of products like pistachios, olives, cotton, grapes and legumes.

While agriculture is critical for the provincial economy and the livelihoods of over 30,000 farmers in Gaziantep, irrigation of the agricultural land is highly energy-intensive and also has a high demand on water resources in an already water scarce region. Moreover, changing rainfall pattens and an increase in temperature are projected for the region of South-eastern Anatolia, which place the province at high risk of drought.

Irrigation in Gaziantep relies on water from a nearby dam and treated wastewater. The existing irrigation facilities use grid electricity to operate, which makes them vulnerable to power outages during the irrigation season (June-August). The recent increase in electricity prices has made it difficult for many irrigation facilities to operate their pumping stations, either because they cannot afford the high electricity costs or because the power outages have made it impossible to pump water. This has exposed farmers to the risk of crop failure.

Introducing low-cost clean energy alternatives for electricity generation (solar-powered irrigation) through agricultural cooperatives, and modernising irrigation network, will reduce operational costs and greenhouse gas emissions, as well as help conserve and rationalise the consumption of vital water resources in Gaziantep.

Previously, GMM and Gaziantep Governorship have collaborated with irrigation unions to pilot the installation of renewable energy on existing pumping stations, and the farmers subscribing to them have not been affected by the increase in energy prices. Through the implementation of this action, an additional 10 MW of solar PV will be installed on the remaining pumping stations in collaboration with 5 irrigation unions. Additional investment into irrigation infrastructure will also be carried out to reduce leakage and improve water efficiency (this can be supported through a leak detection and damage assessment of existing infrastructure). This will include renovation of existing irrigation channels, conversion to pressurised systems, and improved monitoring of water use. The main objectives are to:

- Increase irrigation efficiency through modernisation of the irrigation network;
- Provide low-cost solar energy electricity generation for all pumping stations and reduce GHG emissions;
- Reduce the vulnerability of farmers to climate impacts and ensure sustainable livelihoods.

Feasibility studies and the identification of appropriate implementation sites have been initiated by GMM in collaboration with Gaziantep Governorship.

This action supports the existing Sustainable Energy and Climate Action Plan (2018) developed for Gaziantep.

CA1

IMPACT

Strategic Goals Supported:
CA v | Climate Action #v: Improve resilience of agriculture and food systems to climate change

ENG iv | Maximise the share of renewable energy and fuels within the energy system

WA i | Sustainably manage water resources to build long-term water security

Estimated benefit(s):

CO_2 savings: 12,820 tCO_2e per annum

Job Created: 205

Quantitative Impact measures:
16. Share of renewables in total energy consumption

* Note broad estimates based on the number of consultants involved

Cross-cutting Themes

Climate Action [Directly targeted]: Through expansion of solar-powered irrigation systems, this action will reduce the GHG emissions from the energy used in the agricultural sector.

Gender and Social Inclusion [Some elements]: Women account for a significant proportion of the agricultural workforce in Gaziantep, and research suggests that gender gaps in irrigated agriculture relate to lower access to assets and services, which can hold back economic opportunities for women. By facilitating inclusion of women into the consultation and stakeholder engagement process for the project, this action will aim to reduce gender-related disparities in this sector and promote stronger integration of women into the labour force.

Smart Maturity [Directly targeted]: The modernisation of the irrigation network provides ample opportunities for instruction of 'smart' elements that could optimise high crop yield, including different smart meters, drones, automated systems, etc.

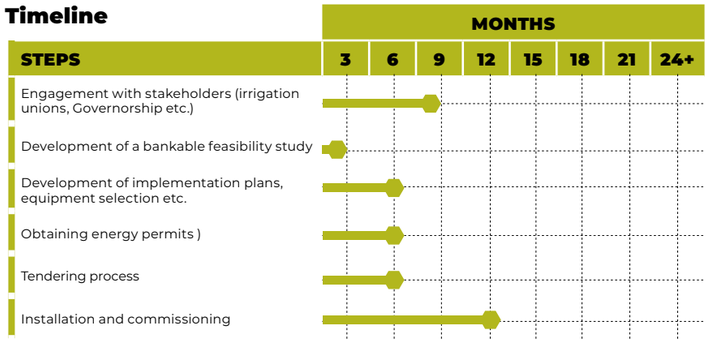
Co-Benefits

Resilience: This action will reduce the vulnerability of small-scale farmers in Gaziantep to climate hazards (such as drought) and economic stresses associated with rising energy costs.

Economic: In addition to saving costs on electricity, this action will yield higher crop outputs, increasing income for the farmers.

Social: The action will have important social benefits for the agriculture water users through improved irrigation systems that will support local livelihoods.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 661,000**	Industry standards for consultancy fees for a feasibility study including preparation of design and tender documents.
Component 1 – Feasibility study	EUR 50,000	4 month consultancy
Component 2 – Detailed design, EIAs and permitting	EUR 100,000	6 month consultancy
Component 3 – Supervision of works applying 7% of construction costs	EUR 511,000	Construction duration
Capital Costs	**EUR 7,412,500**	This action assumes the installation of 10 MW of solar PV, the financing has applied EUR 735,000 MW cost provided by GMM, and includes repair works to the irrigation network
Component 1 – Installation and commissioning of 10 MW solar PV applying EUR 730,000 per MW	EUR 7,300,000	Based on EBRD figures
Component 2 – Repair works to the irrigation network assumed 25 hectares applying EUR 4,500 per hectares	EUR 112,500	Based on FAO project database
Operational Costs (over 5 years)	**EUR 1,111,875**	Estimated 3% of investment costs

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Gaziantep Governorship	Collaborate
GMM Department of Urban Aesthetics and Green Spaces	Involve
International Financial Institutions	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Some of the users may be less familiar with 'smart' elements of this action (e.g. smart meters, automated systems) so some knowledge transfer and training may be required.	Knowledge transfer sessions, capacity-building and training on less familiar elements of this action.
	Insufficient capacity of TEIAS and failure to obtain necessary preliminary permits.	Early stakeholder engagement to include TEIAS (including at the phase determining appropriate locations).
Political	The implementation of the scheme depends on the willingness of irrigation unions and local farmers to accept and adopt new irrigation systems, so ensuring their proper buy-in will be essential for this action.	Regular stakeholder engagement before, during and after implementation of the action.

IMPLEMENTATION

Operational Modality:
The institution that has the agreement of the system connection (i.e. whichever institution the Facility Call Letter is on) will be in charge of the operation.

Implementation Timeframe and Timeline:
2023-2028

Indicative Total Cost: €8,073,500

Capital Cost:
€7,412,500

Development / Advisory Costs:
€661,000

5-year Operational Cost:
€1,111,875

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Loan - Government-owned bank, IFI

Revenue Opportunities:
Yes – to be determined in the early stages of project preparation.

CA2

Integrated and Evidence-Based Climate Action Planning in Gaziantep

Create GIS-based platform that spatializes key hazards and vulnerability characteristics to integrate evidence-based climate action planning across GMM departments and entities and support cross-departmental cooperation and serve as a best practice for other cities

INFORMATION

Status:
New

Location:
Gaziantep Metropolitan Municipality

Type:
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM IT Department
- GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:
N/A

Relevant Sector(s):

Related Actions:
WA1 - Develop an integrated plan for water resources management

IN1 - Digital data management centre for environmental monitoring

B1 - Develop a digital database

Challenges Addressed:
Green City Challenges:

- Lack of integrated approach for adaptation planning
- Lack of data for understanding impacts of climate change

A significant barrier to effective climate action in Gaziantep is the lack of shared access to data that would allow integrated, evidence-based climate action planning between key departments and entities within GMM and government entities (such as AFAD, GASKI, etc). In Gaziantep, the access to relevant data that would be relevant to understanding the impact of climate and natural hazards (e.g., heat stress, drought, and flooding) is restricted, non-existent, or laborious to obtain as it sits outside existing data management platforms, or within a particular system specific to a single department or entity. Within GMM, every department is responsible for collecting its own data and managing its own internal GIS system and databases (which are mainly used for transport and land use planning, and disaster risk management) resulting in a siloed approach to climate action planning.

This action will result in the creation of a cloud-based GIS-based platform that will combine available datasets across all GMM departments and government entities that relate to climate and natural hazards (as climate change can also affect the frequency and/or magnitude of non-climate hazards) and vulnerability features of infrastructure assets, natural assets, and population of Gaziantep. The access to the platform will be shared with all GMM departments, AFAD and GASKI in the first instance, with the possibility of enabling the access to other relevant (external) entities in the future to enable integrated climate action planning across Gaziantep.

The datasets to be integrated in the platform will cover the most relevant hazards and vulnerability characteristics previously identified for Gaziantep, including historical, covering at least:

- Geophysical hazards (earthquakes, landslides, rockfall, erosion)
- Hydrometeorological hazards (pluvial and fluvial flooding, heat stress, drought and wildfires)
- Environmental hazards (air, water and soil pollution)
- Features of key infrastructure assets (age, material, state) for the energy, water, solid waste, transport, buildings and industrial sectors
- Features of natural assets in Gaziantep (health, sensitivity to climatic and anthropogenic stressors) including trees and forests, open green space, soils, waterbodies
- Latest population data, demographics (gender and age), population density, income, and residence status

Once established, the platform will be updated on an annual basis (as a minimum) and maintained by GMM IT Department.

This action relates to the following plans and strategies already developed by GMM:

- **Gaziantep Smart City Roadmap [upcoming]**
- **Gaziantep Climate Change Adaptation Plan [upcoming]**
- **Gaziantep Sustainable Energy and Climate Action Plan (2018):** actions CCA2, CCA3, CC4, CC6, CC9, all directly relate to this action by calling for a detailed assessments of climate-related risks and vulnerabilities, development of comprehensive social, economic and environmental indicators, assessing sectoral impacts of climate change, eliminating bottlenecks for implementing climate change adaptation actions, and building bridges among climate change adaptation, sustainable development and disaster risk mitigation goals.

CA2

IMPACT

Strategic Goals Supported:
LU i | Promote urban development along a climate-resilient and low-carbon pathway

CA ii | Improve collaboration, coordination, and integration of climate action

CA iv | Reduce vulnerability of disadvantaged groups against climate change

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: 1

Quantitative Impact measures:
9. Estimated economic damage from natural and climate disasters

9.1 Percentage of public infrastructure at risk

9.2 Percentage of households at risk

Cross-cutting Themes

Climate Action [Directly targeted]: This action directly targets climate action as it will result in an integrated approach to climate action planning across GMM departments and key government entities.

Gender and Social Inclusion [Directly targeted]: By integrating disaggregated population data (including on income, gender, and age), this action will allow for tailored action planning that considers unique features and vulnerabilities of different segments of Gaziantep's population.

Smart Maturity [Directly targeted]: This action will help further develop GMM's capacities in the areas of data collection and management, thereby directly contributing to its smart maturity.

Co-Benefits

Resilience: This action is expected to help build resilience by increasing the capacity of GMM and partner entities, to identify, recognise, and manage climate and natural hazards.

Economic: By improving the capacity of GMM to manage and respond to shocks and stresses, it is expected that the action will help save costs through avoided damages (e.g., to infrastructure assets) or increased costs in the future (e.g., for natural assets).

Social: As this is an action that primarily concerns GMM and partner entities, it is expected that social benefits will be accrued indirectly, through improved governance and planning capacity.

Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 175,000**	Industry standard for consultancy fees and knowledge in establishing a digital database. It includes capacity building for GMM staff.
Component 1 – Development of a GIS platform	EUR 150,000	12 month consultancy
Component 2 – Capacity development	EUR 25,000	3 month consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 12,500**	Estimate for: licencing renewals, hosting, maintenance, etc.

Timeline

STEPS	MONTHS: 3	6	9	12	15	18	21	24+
Defining the scope of the platform, identifying existing datasets	●							
Data collection	●	●						
Training and increasing the capacity of the personnel in the units that will take part in the implementation of the project	●							
Platform development, integration of data, and testing	●	●	●					
Launch event	●							

Stakeholders

STAKEHOLDERS	ENGAGEMENT
GMM Department of Zoning and Urbanization	Involve / Empower
GMM Transportation Department	Involve / Empower
GMM Department of Urban Aesthetic and Green Areas	Involve / Empower
Provincial Directorate of Environment, Urbanisation and Climate Change	Involve
GMM Department of Fire Brigade	Involve / Empower
Gaziantep Regional Directorate of Meteorology	Involve
GASKI	Involve / Empower
AFAD	Involve / Empower
DSI	Involve
OIZs	Involve
GAZDAS	Involve
General Directorate of Highways (KGM)	Involve
Gaziantep Provincial Directorate of Agriculture and Forestry	Involve
GMM Department of Agricultural Services and Food	Involve
EDAS	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	The quality of data is questionable due to lack of technical quality checks.	In each institution, at least 1 key and 1 replacement staff should be assigned responsibility for quality checks.
	GMM-external parties (GASKI, AFAD) are not able to access the platform due to hosting issues and / or staff is not trained to use the platform.	Use the software provider that enables non-institutional access to the platform, and plan appropriate time and resources for staff training on how to use the platform
	Connectivity issues to the platform, due to unstable cloud network or performance technicalities, meaning the platform temporarily cannot be accessed by all staff.	Maintenance and monitoring of the cloud-based system by IT team, ensuring a helpline or restart of the system is available if it crashes. Quarterly download of GIS database to offline server meaning that if data is required urgently, a semi-recent version can be accessed.
	Lack of availability of hazard and vulnerability datasets for cloud-based storage and future analysis.	Completion of a gap analysis by all departments, and regular contact with government entities, to ensure transparency of datasets and availability.
Political	Some of the data is considered property of individual departments and is not possible to share or used in a shared platform.	Prepare a Memorandum of Understanding or a similar type of arrangement that clearly defines the scope of data, addresses confidentiality issues, etc.

IMPLEMENTATION

Operational Modality:
Once the platform has been created, it will run by and maintained by GMM's IT Department.

Implementation Timeframe and Timeline:
2023-2025

Indicative Total Cost: €175,000

Capital Cost:
N/A

Development / Advisory Costs:
€175,000

5-year Operational Cost:
€12,500

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Revenue Opportunities:
No

CA3 Develop a Study on Carbon Capture, Utilization and Storage

Develop an exploratory study that assesses and compares carbon capture, utilization and storage alternatives for industrial processes, and identifies implementation approaches for suitable alternatives.

INFORMATION

Status:
New

Location:
N/A

Type:
- Monitoring, data collection, analysis, and studies

Action Owner(s):
- GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:
- Provincial Directorate of Environment, Urbanization and Climate Change
- Ipekyolu Development Agency
- GASKI
- Provincial Directorate Agriculture and Forestry
- GMM Department of Agricultural Services and Food
- GAZDAS
- BOTAS

Relevant Sector(s):

Related Actions:
IN1 - Digital data management centre

IN3 - Enforcing business accountability for environmental non-compliance

Challenges Addressed:
Green City Challenges:

- Environmental hazards generated by industries
- Inadequate innovative measures, non-inclusive plans and strategies

The industrial sector is the single largest source of emissions in Gaziantep, accounting for over 37% of all emissions in 2020 and this figure has been increasing significantly over the past decade. With Gaziantep's growing attractiveness as an industrial hub, and planned new Organized Industrial Zones, significant investment will be required to find new technologies to curb some of these emissions – which remain disproportionally high and are likely to continue to grow. In the future exploring new mechanisms to capture, utilize and store emissions that may not be possible to cut or reduce, and comparing the alternatives, could support the city's decarbonisation goals.

By preparing an exploratory study looking at carbon capture, utilization and storage (CCUS) alternatives for industrial processes, GMM will explore additional avenues for achieving its climate-related goals in the future. Presently, as regulatory and policy environment around different CCUS technologies is not clearly defined and there is an absence of penalties for high emitters and carbon pricing, there is a lack of a clear business case considering the high upfront cost of these technologies. This is a rapidly evolving area, but one that is potentially of interest to places with concentrated carbon-intensive industries, like Gaziantep.

This study will explore:

- Current regional and national regulatory and policy environment around CCUS, and prospects for market-based incentives (carbon pricing) in Turkiye
- Source-point analysis of industrial emissions and concentration of the most carbon-intensive industries (like cement production) in Gaziantep that are hard to abate
- Examples of CCUS projects globally and context and conditions in which they were implemented in
- Modelling of costs and benefits
- Potential for using captured carbon dioxide to produce commercial products or services
- Potential for conversion of existing gas networks to run on "blue" hydrogen, with local production and carbon capture enabling smaller emitters to be decarbonised with fewer carbon capture installations required
- Potential sequestration locations within the region (e.g. exhausted fossil fuel reservoirs) and indicative potential pipeline routes and infrastructure requirements
- Comparison of possible alternatives to CCUS that would be best suited to industries in Gaziantep and implementation approaches

The action is not directly linked to any of the existing GMM plans and strategies, although it is indirectly linked to its Climate Change Action Plan which sets out actions to reduce city-wide emissions, including from the industrial sector, as well as the upcoming Climate Change Adaptation Plan.

Cross-cutting Themes

Climate Action [Directly targeted]: This action is directly concerned with finding a way to reduce the city's emissions from the growing industrial sector, and aims to contribute to the city's decarbonisation goals.

Gender and Social Inclusion [No direct links]: There are no immediately relevant elements to this action that relate to gender and social inclusion.

Smart Maturity [No direct links]: There are no immediately relevant elements to this action that relate to smart maturity.

Co-Benefits

As this is an exploration study, it will also identify possible co-benefits (which are very much dependent on the type of alternative identified).

IMPACT

Strategic Goals Supported:
IN iii | Incentivise transition towards low-carbon industrial development

CA iii | Explore new technologies for carbon emission management

Estimated benefit(s):

CO_2 savings:
No direct reduction expected as this is a 'soft' action.

Job Created:
N/A

Quantitative Impact measures:
As this is a study, quantitative impact measures will be identified during its preparation.

CA3

IMPLEMENTATION

Operational Modality:
The development of the study will be led by GMM Department of Environmental Protection, Climate Change and Zero Waste.

Implementation Timeframe and Timeline:
2023-2025

Indicative Total Cost: €200,000

Capital Cost:
N/A

Development / Advisory Costs:
€200,000

5-year Operational Cost:
N/A

Potential Financing Instruments:

Instrument:
Own source - GMM

Grant - National government, IFI, International Organisations

Investment - To be determined by the study.

Revenue Opportunities:
No

Timeline

STEPS	MONTHS 3	6	9	12	15	18	21	24+
Defining the scope of the study, commissioning and issuing an RFP	●							
Consultancy tender	●							
Development of the study	●	—	—	●				
Dissemination of key findings and next steps	●							

Financing Approach

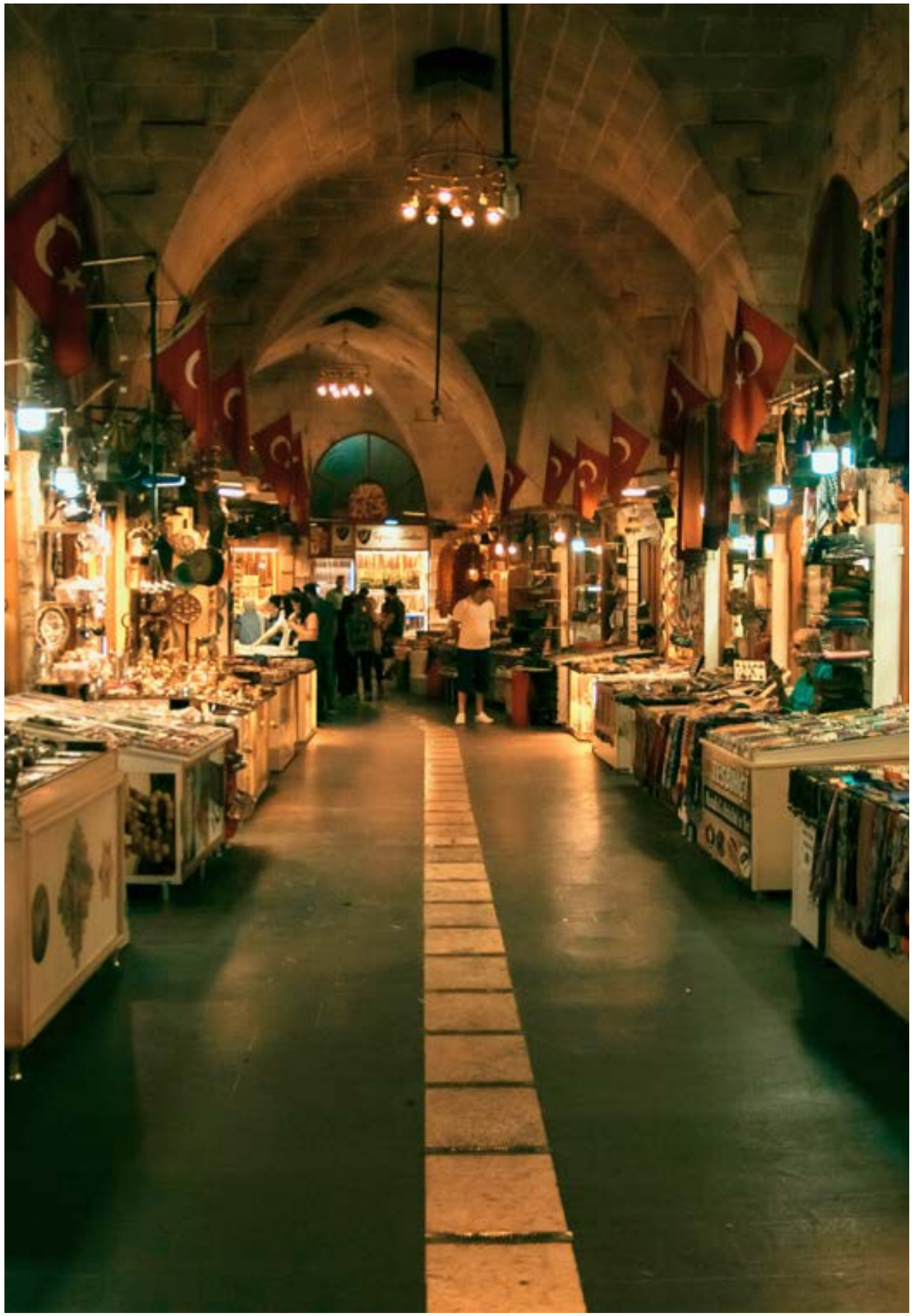
COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 200,000**	Industry standard for similar studies.
Component 1 – Exploratory study on carbon capture, storage and utilisation technologies	EUR 200,000	12 month consultancy
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
Gaziantep Provincial Directorate of Agriculture and Forestry	Involve
Gaziantep Organized Industrial Zone	Involve
Gaziantep Chamber of Industry	Involve
Gaziantep University	Consult
Hasan Kalyoncu University	Consult
Gaziantep Islamic Science and Technology University	Consult

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Economic	This is more pertinent to the findings of the study than the study itself – the study may not be able to find suitable alternatives that would be economically feasible for Gaziantep.	If this is indeed one of the key findings of the study, this will help identify suitable channels for resources in the future.



CA4 Raising Awareness on Sustainable Consumption in Gaziantep

Implement programme to raise awareness among Gaziantep's residents on sustainable consumption (covering water conservation, energy savings, waste reduction, and sustainable transport options)

INFORMATION

Status:
New

Location:
Province-wide, with majority of activities in the most populated districts (Sehitkamil and Sahinbey)

Type:
- Behavioural measure

Action Owner(s):
- GMM Department of Environmental Protection, Climate Change and Zero Waste

Supporting Institutions:
- GMM Department of Communication
- GMM Department of Education and Voluntary Organisations
- GMM Department of Transportation
- GASKI
- GAZDAS
- EnerjiSA
- DSI
- Provincial Directorate of Agriculture and Forestry
- Provincial Directorate of National Education
- GMM Department of Urban Aesthetics and Green Spaces

Relevant Sector(s):

The population of Gaziantep grew considerably in the past decade (2010-2021), placing a substantial pressure on the existing water, energy, waste, and transport infrastructure. In addition to 'hard' investments in the infrastructure across these sectors, raising awareness among Gaziantep's residents on sustainable consumption (covering issues like water conservation, energy savings, waste reduction, and sustainable transport) will be essential to achieving the strategic goals and overall objectives of the Green City Action Plan.

GMM Department of Environmental Protection, Climate Change and Zero Waste will develop a two-year programme (with different activities taking place across 2024 and 2025) that will promote increased awareness on sustainable consumption in Gaziantep. The programme will cover water, energy, waste and transport sector, and be implemented together with main relevant departments within GMM (including the Department of Transportation, Department of Communication, and Department of Education and Voluntary Organisations) and public service providers (i.e., GASKI and GMM Enerji). There are several key elements to planning and delivering a sustainable consumption campaign:

- **Understand the audience.** Successful behaviour change campaigns typically focus on a specific group. For each sector, GMM will need to work with partners to identify target audiences, considering their consumption patterns (i.e., are they high consumers) and other socio-economic factors, for example, residence status, gender, whether they face energy poverty etc. to ensure inclusion and access.
  - **Review available data -** e.g., quantitative consumption figures, qualitative information on attitudes, barriers etc. – to enable the creation of a baseline as well as researching traits and patterns that influence behaviour.
  - **Be consultative –** use surveys, polls, QR codes to crowd-source ideas, get feedback, or collect lacking market research data.
- **Set clear goals and milestones.** Once the target audiences are agreed, set objectives and key performance indicators so that change can be monitored, and interventions evaluated. This will also allow identification of any gaps in GMM's data infrastructure. Once the objectives are set, GMM can choose the best methods for targeting the respective audiences. For example, a transport campaign targeting daily commuters, especially young and middle-aged adults, may be delivered through smart phones, whilst a campaign tackling fuel poverty might include leaflets and in-person engagement.

- **Develop the messaging and materials** tailored to the target audience and behaviour change objective, working alongside the GMM Department of Communication. Develop an over-arching brand and visual identity so that messages are recognisable and mutually reinforcing across sectors e.g., for example, that saving energy/water saves household money.
- **Choose the right methods to get the word out.** A lighter-touch intervention might include a series of posters or visuals shared online, whereas more in depth targeted interventions may include a series of workshops/drop-in clinics delivered in conjunction with schools, community and not-for-profit entities. Consider each target audience's touch points – where are they, what public services do they use, how do they receive information etc.
  - Utilise public buildings and spaces – libraries, museum, parks – to disseminate resources/materials and consider co-organising events that influence and inspire, e.g., interactive exhibitions, educational/training opportunities, public meetings/consultations etc.
  - Given Gaziantep's smart maturity, it could consider opportunities for working with developers and/or universities on innovative solutions including apps (e.g., for booking e-bikes/scooters), and creative challenges e.g. competitions, hackathons.
- **Plan each intervention e.g. location, duration, cost, etc**. The programme will entail at least 5 activities per calendar year (10 in total) and should be designed to include different population groups within Gaziantep to ensure equity and inclusivity. The programme will be led by the GMM Department of Environmental Protection, Climate Change and Zero Waste supported by key departments within the Municipality, and delivered alongside relevant stakeholders in academia, and private and not-for profit sectors (the full list of initially identified stakeholders is provided below). Partners will be instrumental in co-delivering activities and disseminating messages so identifying and collaborating with these from the outset will be critical.

This action relates to the following plans and strategies already developed by GMM:

- **Gaziantep Sustainable Energy and Climate Action Plan 2018:** the 2018 action plan makes a reference to awareness-raising campaigns for promoting positive effects of micro-mobility on the environment and human health, energy consumption and efficiency.
- **Gaziantep Strategic Plan 2020-2024:** the plan has raising awareness on sustainability among Gaziantep's residents as one of its key strategic objectives.

2023 Green City Action Plan (GCAP) Gaziantep

INFORMATION

Related Actions:
T1 - Continue expansion of the active travel and micro mobility network

WA4 - Conduct a study on authorised unbilled and unauthorised water consumption and develop a phased reduction plan

SW1 - Feasibility study for a 2-bin waste separation system for households

Challenges Addressed:
Green City Challenges:

- Long-term water insecurity
- Potentially high energy use from future water supply
- Increasing energy consumption
- Lack of source separation for households or commercial buildings
- Increased use of private vehicles
- Pressure of rapid population growth on infrastructure

CA4

IMPACT

Strategic Goals Supported:

WA i | Sustainably manage water resources to build long-term water security

WA ii | Reduce the rate of non-revenue water and per capita consumption

ENG ii | Increase efficiency across the energy system

SW i | Promote zero-waste initiatives

SW ii | Increase uptake of waste segregation in residential areas.

T iii | Make the city a micro-mobility champion

T iv | Minimize the use of private vehicles

Estimated benefit(s):

CO_2 savings: No direct reduction expected as this is a 'soft' action.

Job Created: N/A

Quantitative Impact measures:

8. Annual CO_2 emissions per capita

25. Domestic water consumption per capita

25.3. Energy used for urban water production and supply

18. Electricity consumption in buildings

29. Total municipal solid waste generation per capita

11. Transport modal share in commuting

11.1. Transport modal share in total trips

Cross-cutting Themes

Climate Action [Directly targeted]: This action directly targets reduction in emissions associated with energy use for water supply, electricity consumption in residential buildings, waste processing, and private transport.

Gender and Social Inclusion [Directly targeted]: The campaign will aim to demonstrate how sustainable consumption patterns could reduce energy, water and transport bills and overall household expenditure, which will primarily benefit vulnerable and low-income population in Gaziantep. Through educational outreach and fact-based campaigning based on current consumption patterns, the action will also support GMM's ongoing efforts to promote social cohesion between native residents and migrants and refugees that have settled in Gaziantep over the past decade.

Smart Maturity [Some elements]: The programme will be looking to build on existing data infrastructure (collected by individual GMM departments) in Gaziantep to target the right audience and draw on GMM's smart maturity to develop tech-based solutions that would support the implementation of the programme (e.g., apps that reduce food waste, facilitate fast and easy booking of e-bikes and e-scooters, etc).

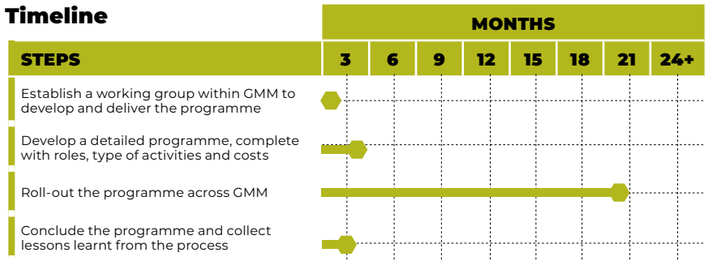
Co-Benefits

Resilience: As a 'soft' action, this action will contribute to building community resilience by reducing overconsumption and enabling better adaptation to situational resource scarcity, particularly in light of Gaziantep's relatively high risk of drought.

Economic: Through reduced water and energy bills, the action will result in significant cost-savings for the residents and businesses that follow through the recommendations from the programme.

Social: This action is expected to bring a variety of social co-benefits, including stronger social cohesion through evidence-based campaigning on consumption patterns. This is particularly important in the context of Gaziantep as there is a tendency to consider the refugees as a significant contributor to some of the key environmental challenges (e.g., additional waste generation and picking, water scarcity and excessive energy consumption in some residential buildings). More broadly, the action will aim to educate, inspire and encourage collective action on issues that are relevant for all residents of Gaziantep.

Timeline



Financing Approach

COST AREA	COST ESTIMATE	ASSUMPTIONS
Development/Advisory Costs	**EUR 150,000**	This includes fees for a communication campaign, including printing, advertising, etc.
Component 1 – Communications and awareness-raising campaigns applying EUR 15,000 budget per campaign including printing, advertising, etc.	EUR 150,000	Planned 5 campaigns per year for a duration of 2 years (10 in total)
Capital Costs	**EUR 0**	
Operational Costs (over 5 years)	**EUR 0**	

Stakeholders

STAKEHOLDERS	ENGAGEMENT
District municipalities	Involve
Gaziantep City Council Migration and Refugees Working Group	Consult
Gaziantep University	Involve
Hasan Kalyoncu University	Involve
Gaziantep Islamic Science and Technology University	Involve

Risk

RISK TYPE	RISK	POTENTIAL MITIGATION
Technical	Failure of awareness-raising activities to achieve substantial reduction in the consumption patterns.	The programme plan will cover in detail the intended audience and develop appropriate outreach mechanisms tailored to that audience
Social	Programme may not see the expected level of engagement and take-up from the public.	A marketing campaign will be launched to promote the programme and disseminated through commonly used mediums in Gaziantep (e.g., social media)
Economic	Programme may end up being too costly in light of expected annual budget.	Identify cost-effective ways of disseminating campaign materials/ messaging, collaborating with implementation partners to reach audiences.

IMPLEMENTATION

Operational Modality: As this is a short-term action that will be delivered by GMM and partner institutions, no specific operational modality has been identified.

Implementation Timeframe and Timeline: 2023-2025

Indicative Total Cost: €150,000

Capital Cost: N/A

Development / Advisory Costs: €150,000

5-year Operational Cost: N/A

Potential Financing Instruments:

Instrument: Own source - GMM

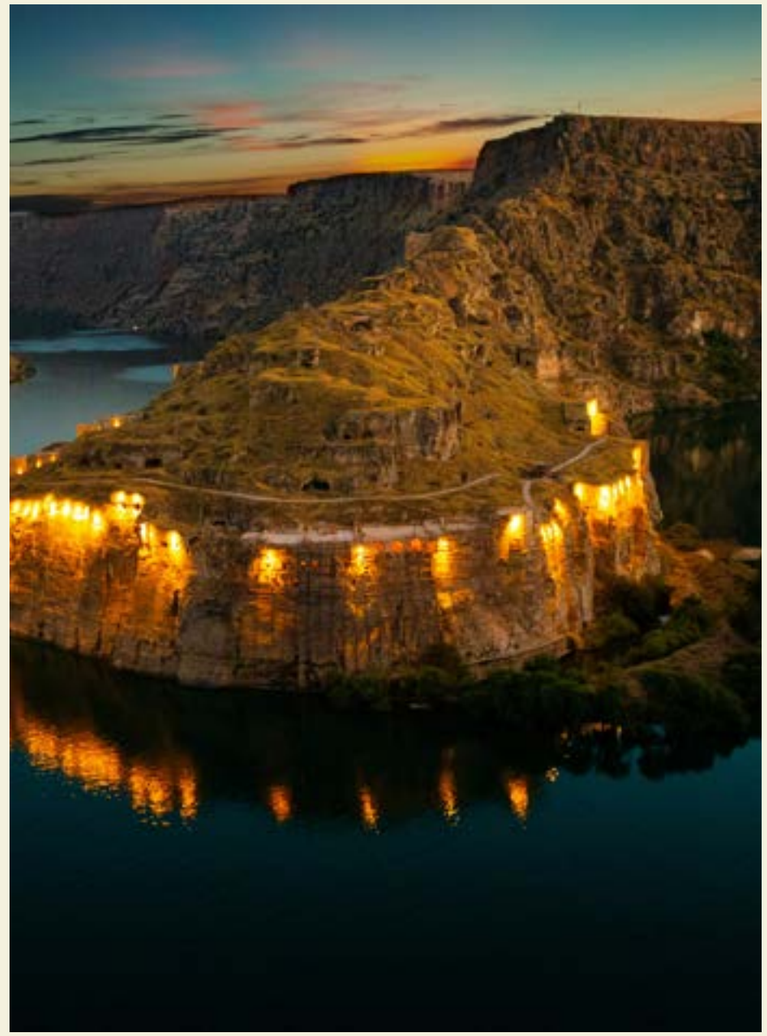
Grant - National government, IFI, International Organisations

Revenue Opportunities: No

5

Implementation and Monitoring

The Implementation and Monitoring Plan has been developed in consultation with GMM and EBRD to support the effective implementation of the GCAP for Gaziantep and track its progress and impact going forward.



Objectives

The Implementation and Monitoring Plan has been developed in consultation with GMM and EBRD to support the effective implementation of the GCAP for Gaziantep and track its progress and impact going forward.

The approach outlined below will ensure that GMM has an effective structure to:

- Support and track the implementation of its GCAP
- Review and report the results and impacts of each Green City Action
- Identify opportunities for amending or enhancing Green City Actions.

Two excel-based tools have been developed to support GMM in this activity: a **Progress Monitoring Plan** (see Figure 14) and an **Impact Monitoring Plan** (see Figure 15). These tools will enable GMM to regularly review its performance, promoting transparency and facilitating continuous improvement of both actions and their corresponding implementation structures.

This chapter also outlines the key roles and responsibilities necessary to implement the GCAP and maintain accountability of its progress. The implementation and monitoring roles for the GCAP are further detailed below in Table 15, while Figure 13 provides an overview of the key organisation structure for the related processe.

Implementation Approach and Governance

A robust governance structure, including formalised responsibilities, is critical to the successful implementation of the GCAP. Table 15 outlines key roles and responsibilities, including forming a new 'Coordination Unit' based in the Department of Environmental Protection, Zero Waste and Climate Change to ensure joined-up delivery of the GCAP and support its ongoing monitoring.

Embedded within GMM's organisational structure, the new GCAP Coordination Unit is the governance structure which will effectively mobilise those responsible for implementing the GCAP, ensuring its longevity and resilience to administrative or wider changes. Given that many of the actions are interdisciplinary, a collaborative approach will ensure efficient implementation and the opportunity for mainstreaming new knowledge, good practice and learnings. The Unit will establish the institutional space and resources, supporting GMM's capacity to innovate and upskill in line with the common goals.

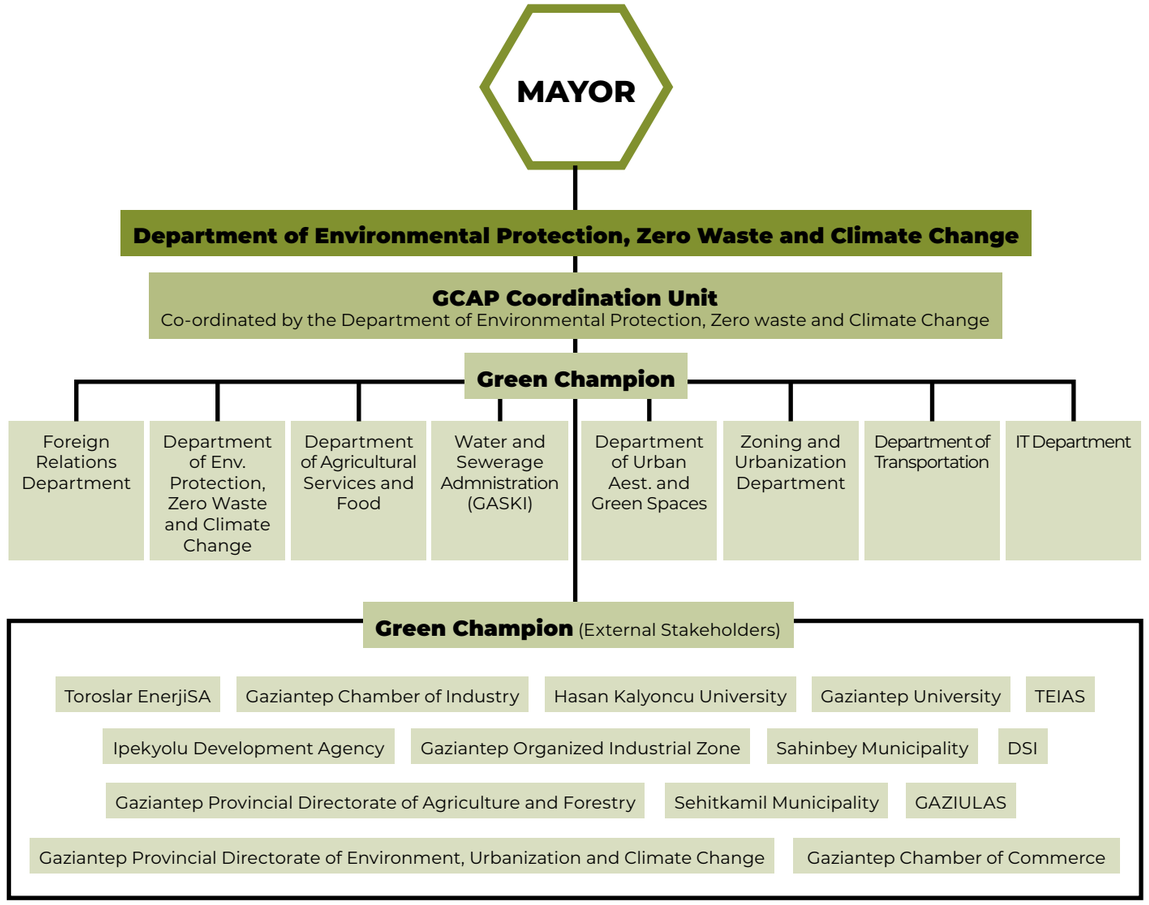
The Coordination Unit will include a range of representatives from GMM departments and different institutions, referred to as 'Green Champions', and be facilitated by Gaziantep's GCAP Coordinator. These roles will maintain accountability for the progress of the GCAP over the timelines set out in this document. GMM's IT Department will provide technical capabilities and data management support. A Terms of Reference will define the purpose and structure of the Coordination Unit, ensuring a common understanding of the scope of activities and basis for decision-making.

An Annual Progress Report will be produced to summarise the implementation status and any issues encountered and mitigated, as well as any revisions and/or new GCAP actions for consideration. A shareable version of this report will be made available on GMM's website and social media in line with the GMM's decision, in accordance with the Stakeholder Engagement Plan that has been prepared for this GCAP. A written approval will be obtained from GMM for all documents to be shared by the consultant team and EBRD.

Table 15. GCAP Monitoring and Implementation Roles

Role	Role Details
GCAP Coordination Unit	The Coordination Unit will be responsible for overseeing the implementation and monitoring of Green City Actions, as well as general decision-making during the implementation period. It will be largely composed of representatives from departments of GMM and external institutions engaged in the GCAP design and delivery, feeding into departmental priorities and identifying opportunities for new green city actions. The GCAP Coordinator will oversee the Unit, ensuring its objectives are met. The Coordination Unit will meet on a quarterly basis to: · Be accountable for action implementation and monitoring, providing bi-annual updates on the PMP and annual updates on the IMP · Review progress, identifying and mitigating technical and institutional barriers to GCAP uptake/success · Work collectively to set standards and maintain data collection, sharing and storage · Provide technical oversight and advice to the Green Champions and GCAP Coordinator · Work collectively on delivering an Annual Action Progress Report.
GCAP Coordinator	Gaziantep's GCAP Coordinator will have overall responsibility for meeting the objectives of the Coordination Unit, ensuring all actions/decisions are in line with the Terms of Reference. The Coordinator will: · Have responsibility for deliverables and milestones pertaining to the Coordination Unit, including the Annual Action Progress Report, and ensuring that the Progress Monitoring Plan (PMP) and Impact Monitoring Plan (IMP) are updated · Liaise with relevant municipal departments and external institutions, collaborating with action leads to ensure the progress monitoring of actions and identifying opportunities to influence departmental policies/programmes · Communicate the progress of the GCAP and provide a focal point for internal and external stakeholders
Departmental and External Institution Green Champions	Each municipal department with responsibility for a GCAP action will appoint a Green Champion. The Champions will be responsible for: · Implementing the GCAP actions relevant to their city departments and external institutions, working collaboratively within the Coordination Unit on cross-cutting issues · Monitoring the progress of the relevant actions within their department and completing relevant sections of the PMP and IMP tools · Liaising with appropriate stakeholders for data collection and action implementation, troubleshooting data collection and management issues so that any barriers can be mitigated efficiently · Facilitating engagement with external stakeholders in accordance with the Stakeholder Implementation Plan, ensuring appropriate communication, consultation, and co-development to deliver respective GCAP actions · Identifying opportunities to influence departmental policy and action those that will contribute to the goals and actions of the GCAP.

FIG 13. GCAP MONITORING AND EVALUATION ORGANISATIONAL STRUCTURE



Monitoring Progress of Implementation

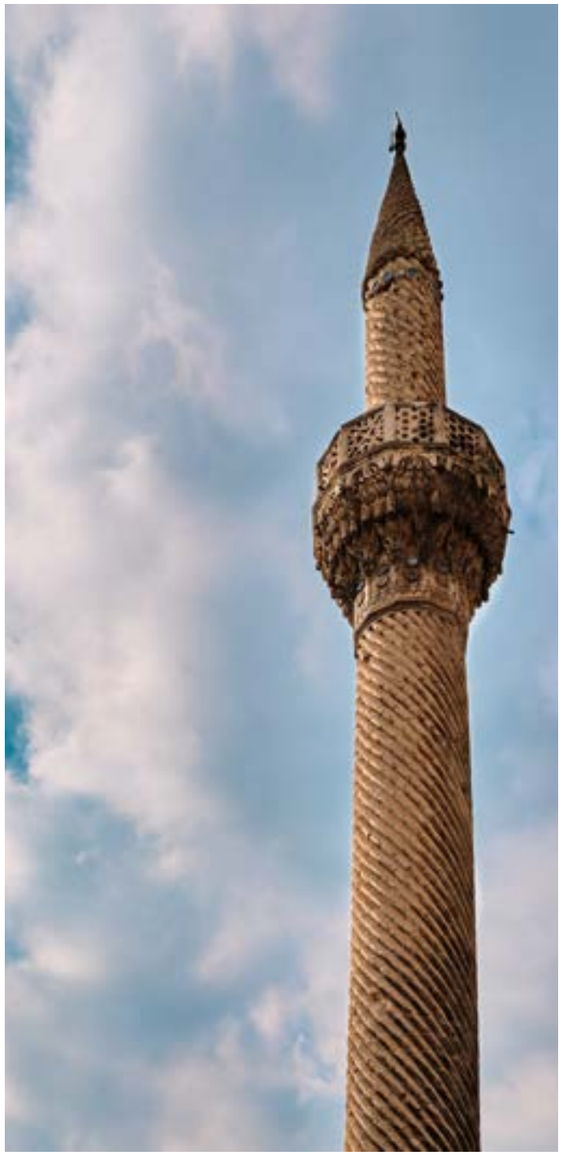
The Progress Monitoring Plan (PMP) sets out all the GCAP actions broken down by strategic objective and target, including the body responsible for implementation and key milestones. The PMP also provides the sequence of action milestones over the life of the action. A screenshot of the PMP is provided in Figure 14 at the end of this chapter.

The GCAP Coordinator will have overall responsibility for the PMP, providing bi-annual updates, with the Green Champions responsible for updating their respective actions. The PMP will be reviewed regularly at the GCAP Coordination Unit meeting, ensuring adequate progress against the actions. The results of the monitoring will inform the planning of subsequent stages of each action as well as any required amendments to timeframes, and resources .

The GCAP Coordinator will have overall responsibility for the **Annual Action Progress Report**, managing the involvement and inputs from across the Coordination Unit.

The **Annual Action Progress Report** should include a summary of the following:

- Implementation status of each action, including any issues encountered and mitigation measures
- Recommendations for revisions to any GCAP actions and any potential additional actions
- Change in a 'dashboard' of key state and pressure indicators
- A shareable version of this report will be made available on GMM's website and social media (in line with the GMM's decision), in accordance with the Stakeholder Engagement Plan that has been prepared for this GCAP. Prior to sharing any documents, the consultant team and EBRD will ensure that written approval is obtained from GMM.



Monitoring Impact of Green City Actions

The Impact Monitoring Plan (IMP) is based on the Indicators Database used to inform the Technical Assessment that was a key basis for this GCAP report. The IMP sets out the baseline condition for each indicator against which an annual evaluation will be undertaken. A screenshot of the IMP is provided in Figure 15.

The GCAP Coordinator will have overall responsibility for the IMP, while each Green Champion will be responsible for monitoring the set of indicators that are linked to that department's and external institutions' actions. Progress will be reviewed periodically within the GCAP Coordination Unit meetings.

Successful monitoring has to be grounded in **good quality data**. In general, Gaziantep has a solid coverage of most of the indicators that have been collected over the course of the preparation of this GCAP (especially pressure indicators) – see Figure 14. However, areas to improve on collection and processing of data include:

- **Data on soil quality:** Considering the known environmental impact of industries in Gaziantep, there is an urgent need to improve soil baseline for the province. No data on soil quality was available during the preparation of this GCAP.
- **Data on water quality:** While some data on water quality was obtained (mostly from academic and non-official sources) there is a need to improve data availability on water quality more generally.
- **Data on open / green space:** During the preparation of this GCAP, conflicting data on the open green space areas has been received from different sources. There is a need for consistency in how this data is collected and tracked to allow for proper monitoring of some of the actions that are relevant to that indicator.
- **Data on biodiversity:** The data on biodiversity (especially in urban districts) has been relatively poor. Additionally, it does not seem like that data is systematically collected in Gaziantep, so that is a distinct area for improvement.
- **Data on climate adaptation:** While Gaziantep has excellent data on its carbon emissions, limited quantitative data on adaptation (in terms of estimated damages from natural and climate-related disasters, percentage of public infrastructure and households at risk, etc) is collected at the moment, which is another important area for improvement.
- **Data on land use:** Some of the values for the indicators in this GCAP have been calculated using open-source GIS datasets, but there is a need to improve data collection and reporting on some of the indicators (e.g., vacancy rates of commercial and residential buildings).
- **Data on buildings:** Data on energy consumption for heating and cooling in both residential and commercial buildings has not been easy to access, so this is another area that could be improved.
- **Data on industries:** The data that was most difficult to obtain relates to the OIZs (both in terms of their environmental impact, energy performance, etc). As one of the actions in this GCAP is about establishing data monitoring centre for industries, it is expected that this action will help close some of those data gaps.

Table 16. Summary of Data Availability for Pressure-State-Response Indicators

	Core	Optional	Additional	Total
Overall	86%	57%	100%	74%
State	67%	47%	N/A	54%
Pressure	74%	61%	100%	66%
Response	100%	N/A	N/A	100%

Source: AECOM. 2022. GCAP Gaziantep Indicators Database. Excel File. London.

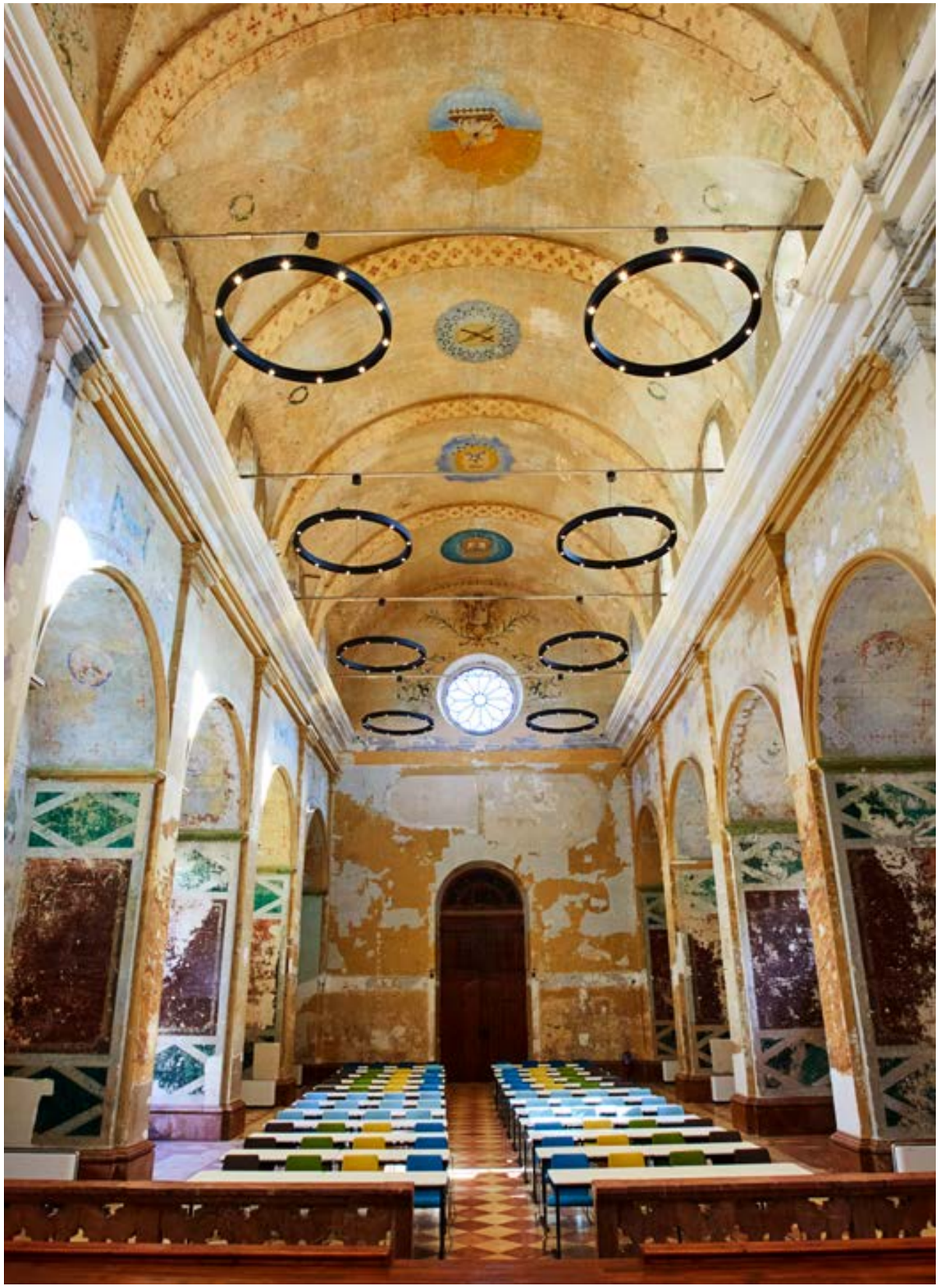


FIG 14. GCAP GAZIANTEP PROGRESS MONITORING PLAN (PMP) EXCEL TOOL

City	Country	Sector	GCAP Actions	Investment / Policy	GCAP Action Classification	Implementing Body	Source of Funding [Potential] (Municipal budget, national budget, PPP, Private sector, IFIs	Potential Support (EBRD Follow-on investment and/or TC/Policy) (Other IFIs support)	Status Implementation	CAPEX (€) estimate	OPEX (over 5 years) (€) esrimate	Devt & Advisor costs	Funding source
Gaziantep	Turkiye	Water	Develop an Integrated Plan for Water Resources Management	Policy	Strategies, plans and programmes	GASKI, DSI, Gaziantep OIZ	Own source, grant	IFIs	New	N/A	N/A	375,000	Not confirmed
Gaziantep	Turkiye	Water	Introduce Standard Processes for Data Collection and Monitoring of Ground and Surface Water	Policy	Monitoring, data collection, analysis and studies	DSI	Own source, grant, loan	IFIs	New	335,000	52500	335,000	Not confirmed
Gaziantep	Turkiye	Water	Transition to Net Zero Wastewater Treatment	Investment	Capital Investment	GASKI	Own source, grant, loan	IFIs	Ongoing	20000000	2,000,000	1,600,000	Not confirmed
Gaziantep	Turkiye	Water	Conduct a Study on Authorised Unbilled and Unauthorised Consumption and Develop a Phased Reduction Plan	Policy	Monitoring, data collection, analysis and studies	GASKI, DSI	Own source, grant, loan	IFIs	New	7,000,000	700,000	250,000	Not confirmed
Gaziantep	Turkiye	Energy	Identify Feasible Battery Energy Storage System (BESS) Opportunities	Policy	Soft Action (Investment related Feasibility Study)	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant	IFIs	New	N/A	N/A	150,000	Not confirmed
Gaziantep	Turkiye	Energy	Strengthening Existing Electricity Systems Against Natural Disasters and Developing an Alternative Energy Storage System To Be Used In Case of Disaster	Investment	Capital Investment	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant, loan	IFIs	New	5,200,000	780,000	614,000	Not confirmed
Gaziantep	Turkiye	Energy	Wind Power Plant Feasibility Study and Development	Investment	Capital Investment	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant, loan	IFIs	New	30,000,000	4,500,000	2,525,000	Not confirmed
Gaziantep	Turkiye	Solid Waste	Feasibility study for a 2-bin Waste Separation System for Households	Policy	Soft Action (Investment related Feasibility Study)	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant	IFIs	New	N/A	N/A	220,000	Not confirmed
Gaziantep	Turkiye	Solid Waste	Build a new Energy Plant Which Can Utilise RDF	Investment	Soft Action (Investment related Feasibility Study)	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant	IFIs	Planned	41,055,000	6,158,250	3,323,850	Not confirmed
Gaziantep	Turkiye	Solid Waste	Carry Out Feasibility Studies for Collection and Valorisation of Organic Waste	Policy	Soft Action (Investment related Feasibility Study)	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant, loan	IFIs	New	6,255,000	900,000	210,000	Not confirmed
Gaziantep	Turkiye	Solid Waste	Inventorise Sources of Hazardous Waste Production Within Gaziantep and Develop a Hazardous Waste Management Plan	Policy	Soft Action (Investment related Feasibility Study)	GMM Department of Environmental Protection, Climate Change and Zero Waste	Own source, grant	IFIs	New	N/A	N/A	500,000	Not confirmed

Source: AECOM. 2023. GCAP Gaziantep PMP IMP Tool. Excel File. London.

FIG 15. GCAP GAZIANTEP IMPACT MONITORING PLAN (IMP) EXCEL TOOL

City	Country	Indicators	Indicator Code	Sector	PSR	Trend	Colour code	Figure (In Indicator Database of GCAP)	Data Source / Contact Detail	Related Actions (Major Impact)	Related Actions (Medium Impact)	Related Actions (Minor Impact)	Figure (3 years after GCAP finalisation)	Colour code	Figure (5 years after GCAP finalisation)	Colour code
Gaziantep	Turkiye	Average annual concentration of PM2.5	1	Air quality	State	N/A		27.765 µg/m3 in 2021	https://sim.csb.gov.tr/STN/STN_Report/StationDataDownloadNew	Energy	Transport	Industry				
Gaziantep	Turkiye	Average annual concentration of PM10	1.1	Air quality	State	Downward		54.89 µg/m3 in 2021	https://sim.csb.gov.tr/STN/STN_Report/StationDataDownloadNew	Energy	Transport	Industry				
Gaziantep	Turkiye	Average daily concentration of SO2	1.2	Air quality	State	Downward		8.2 µg/m3 in 2021	https://sim.csb.gov.tr/STN/STN_Report/StationDataDownloadNew	Industry	Energy	Transport				
Gaziantep	Turkiye	Average annual concentration of Nox	1.3	Air quality	State	Downward		80.45 µg/m3 in 2021	https://sim.csb.gov.tr/STN/STN_Report/StationData	Industry	Energy	Transport				
Gaziantep	Turkiye	Biochemical Oxygen Demand (BOD) in rivers and lakes	2	Water bodies, drinking water	State	N/A		3.99 mg/L in 2022	Gaziantep Water and Sewerage Administration (GASKİ)	Water	Land Use	Industry				
Gaziantep	Turkiye	Ammonium (NH4) concentration in rivers and lakes	2.1	Water bodies, drinking water	State	N/A		9.99 mg/L in 2022	Gaziantep Water and Sewerage Administration (GASKİ)	Water	Land Use	Industry				
Gaziantep	Turkiye	Bathing waters meeting minimum standards	2.2	Water bodies, drinking water	State	N/A		100% in 2022	Gaziantep Water and Sewerage Administration (GASKİ)	Water	Land Use	Industry				
Gaziantep	Turkiye	Water samples complying with national potable water quality standards	3	Water bodies, drinking water	State	N/A		95% in 2022	Gaziantep Water and Sewerage Administration (GASKİ)	Water	Land Use	Industry				
Gaziantep	Turkiye	Contaminated sites	4	Soil	State	N/A		No data	N/A	Land Use	Industry	Water				
Gaziantep	Turkiye	Concentration of mercury in soil	4.1	Soil	State	N/A		No data	N/A	Land Use	Industry	Water				
Gaziantep	Turkiye	Concentration of cadmium in soil	4.2	Soil	State	N/A		No data	N/A	Land Use	Industry	Water				
Gaziantep	Turkiye	Concentration of zinc in soil	4.3	Soil	State	N/A		No data	N/A	Land Use	Industry	Water				
Gaziantep	Turkiye	Concentration of mineral oil in soil (using infrared spectroscopy)	4.4	Soil	State	N/A		No data	N/A	Land Use	Industry	Water				
Gaziantep	Turkiye	Water Exploitation Index	5	Water use	State	Upwards		7.7% in 2021	https://biruni.tuik.gov.tr/medas/?kn=121&locale=tr	Water	Industry	Land Use				
Gaziantep	Turkiye	Open green space area ratio per 100 000 inhabitant	6	Open space	State	N/A		8.66 in 2020	Arslanlas, F., Sahalan, K.C. and Cil, A (eds). 2020. Examples of Best Practices on Green Infrastructure and	Land Use	Buildings	Transport				

Source: AECOM. 2023. GCAP Gaziantep PMP IMP Tool. Excel File. London

EBRD GREEN CITIES