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GREEN ENGINEERING

Izmir Green City Action Plan

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European Bank for Reconstruction and Development

İZMİR BÜYÜKŞEHİR BELEDİYESİ

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List of Acronyms

Acronym	Meaning
AFAD	Disaster and Emergency Management Authority
BC	Before Christ
BEST	Boosting Effective and Sustainable Transformation for Energy
BESTMER	Ege University Application and Research Centre of Biomass Energy Systems and Technologies
ÇEVKO	Environmental Protection and Packaging Waste Recovery and Recycling Foundation
CH_4	Methane
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CO_2e	Carbon dioxide equivalent
CoM	Covenant of Mayors
DESOP	Outcome-Based Maritime Economy Program
EBSO	Aegean Region Chamber of Industry
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EEA	European Environment Agency
EMRA	Energy Market Regulatory Authority
ERL	Effects Range-Low
ERM	Effects Range-Median
ESCO	Energy Service Company
ESHOT	Electricity, Water, Coal, Gas, Bus and Trolley Bus Company, Public Transport Institution
EU	European Union
EUR	Euro
EYODER	Energy Efficiency and Management Association
FZ	Free Zone
GCAP	Green City Action Plan
GCoM	Global Covenant of Mayors for Climate & Energy
GDP	Gross Domestic Product
GDZ	Electric Distribution Company
GHG	Greenhouse gas
GIS	Geographical Information Systems
GNAT	Grand National Assembly of Turkey (Parliament)
GrCF	Green Cities Framework
IAOSB	Izmir Ataturk Organized Industrial Zone
IBA	Important Bird Area
IBB	Izmir Metropolitan Municipality
INA	Important Natural Areas
iNGOs	International non-governmental organization
IPCC	Intergovernmental Panel on Climate Change
IZBAN	Local railway company of IBB
IZBETON	Construction Company of IBB

IZDENIZ A.S.	Izmir Maritime Enterprises, Transportation and Tourism Company
IZKA	Izmir Development Agency
IZMIR METRO A.S.	IBB Subway Administration, Transportation and Construction Company
IZSU	Izmir Water and Sewage Administration
KBA	Key Biodiversity Area
km^2	Square kilometre
KWh	Kilowatt Hour
LOPI	Sustainable Urban Logistics Plan
LZC	Low and Zero Carbon
MCA	Multi-criteria analysis
MoAF	Ministry of Agriculture and Forestry
MoENR	Ministry of Energy and Natural Resources of Turkey
MoEnvU	Ministry of Environment and Urbanisation
MoH	Ministry of Health
MoI	Ministry of Interior
MoIT	Ministry Industry and Technology
MoTF	Ministry of Treasury and Finance
MW	Mega Watts
N_2O	Nitrous oxide
NBAP	National Biodiversity Action Plan
NBSAP	National Biological and Diversity Strategy Action Plan
NCCS	National Climate Change Strategy
NEEAP	National Energy Efficiency Action Plan
NGOs	Non-Governmental Organisations
NREAP	National Renewable Energy Action Plan
OIZ	Organised Industrial Zone
O&M	Operations & Maintenance
PAD	Landscape Research Society
PEC	Priority Environmental Challenges
PPP	Public Private Partnership
PSR	Pressure State Response Framework
SAD-AFAG	Underwater Research Association Mediterranean Monk Seal Research Group
SCADA	Supervisory Control and Data Acquisition
SEAP	Sustainable Energy Action Plan
SECAP	Sustainable Energy Climate Action Plan
SuDs	Sustainable Urban Drainage
SURE	Society for Urban Ecology
tCO_2e	Tonnes of Carbon Dioxide Equivalent
TEMA	The Turkish Foundation for Combating Erosion Reforestation and the Protection of Natural Habitats
TETSOP	Outcome-based Clean Energy and Clean Technologies Programme.
TÜRÇEK	Turkey Environment Protection and Greening Institution
UNFCCC	United Nations Framework Convention on Climate Change
USD	United Stated Dollar

WBG	World Bank Group
WSUD	Water Sensitive Urban Design
WWTP	Wastewater Treatment Plants
WWF	World Wildlife Fund
YABİS	Green Spaces Information System

0. Executive Summary

i. Introduction

The Green City Action Plan (GCAP) for Izmir aims to identify, prioritise and address the priority environmental challenges, and establish a vision and projects to enable a green future for the City. Izmir's GCAP has been developed over the last 12 months with input from over 100 stakeholders. It proposes 46 actions across 21 baskets that include infrastructure investments, policy measures, capacity development and advocacy, all of which are designed to help achieve our vision for a green Izmir.

Actions in the GCAP are proposals only – some may require additional detailed feasibility studies, funding or statutory approvals before implementation could commence. Each action in this GCAP, where applicable, sets out the initial steps that would be required for implementation.

ii. GCAP Process

The Green Cities process follows a consistent methodology used by all cities developing and implementing a GCAP. The methodology follows four main steps: (1) Green Cities Baseline; (2) Green City Action Plan; (3) Green City Implementation, and (4) Green City Reporting. Izmir commenced the GCAP process in May 2019, marked by a Kick-Off Meeting (KOM), also holding a Launch Event with IBB and key stakeholders in December 2019. The development of the GCAP was finished in July – August 2020. The next phases of the GCAP are 'Green City Implementation', which will run between 12 and 36 months, and 'Green City Reporting', which is anticipated to run for three months following implementation.

Stakeholder input has been a key feature of Izmir's GCAP process, with stakeholders identified and mapped at the start of the process in the development of a stakeholder engagement plan. Two governance bodies were also established; the Technical Committee and the Steering Committee.

Civil society and non-government organisations were also engaged throughout the GCAP process, including at the kick-off event and further consultation roundtables. IBB thanks these stakeholders for their valuable input on sustainability challenges and action prioritisation for Izmir.

iii. Priority Environmental Challenges

Following development of the GCAP Baseline, a suite of 'Priority Environmental Challenges' (PECs) were identified. These are the critical issues that undermine Izmir's ability to become more sustainable. These PECs were defined through an analysis of both the current state of the environment and the pressures that act upon the environment from key sectors, coupled with an understanding as to the level of agency that the city has to act on these challenges.

The Technical Committee undertook a preliminary prioritisation on the long list of Green City challenges, by allocated each challenge a score of 'high' 'moderate' or 'low' in relation to; 'the importance of the challenge to Izmir' and 'Ability of IBB and partners to positively influence this challenge'. This process identified high-priority challenges in relation to the following state indicator themes; GHG emissions, Climate Adaptation and Disaster Risk, Green Space and Biodiversity, Air Quality, Soil Quality, Water Quality and Marine Biology. As a result of this analysis, the state indicator themes identified as a priority are: Mitigation, Green Space & Biodiversity, Soil Quality and Air Quality. Based on the 'high priority' challenges determined across the state indicator themes, the following pressure and response sectors are recognised as the priorities: Land-use, Solid Waste and Buildings.

State Indicator	Challenges
GHG Emissions	• Separation of waste in collection and disposal • Non-revenue water loss (i.e. leakage rates in infrastructure). • Minimal but emerging diversity public transport options • Absence of control over building efficiency standards • Minimal uptake of renewable energy

	• Lack of green space (m^2).
Soil Quality	• The use of sustainable agricultural techniques and use of fertiliser / pesticides • Lack of solid waste separation and supporting compost production. • Minimal composting of solid waste • Dumping of soil waste outside waste treatment facilities • Minimal soil quality monitoring
Climate Adaptation and Disaster Risk	• No consideration of climate projections for new infrastructure and land use planning • Minimal use of native plants for green spaces • Insufficiency of separate collection infrastructure for stormwater and greywater • Minimal stormwater capture for irrigation • Sea level rise and coastal erosion.
Water Quality	• Low efficiency of water supply network (loss-leakage ratio) • Minimal sustainable urban drainage • No separation of wastewater and stormwater in collection infrastructure. • Insufficiency of treatment for wastewater for use in irrigation for agricultural. • Reuse of greywater • Agricultural water consumption
Green Space and Biodiversity	• Lack of high quality of urban green space • Insufficiency of green space connectivity • Lack of green space (m^2). • Competing land use priorities • Green space typology
Marine Biology	• Water quality of Izmir bay • Pressure on coastal development on marine habitats. • A high demand for seafood. • Inaccurate fishing and agricultural practices.

Air Quality	• Lack of green space (m^2). • Limited availability of public transport • Minimal landfill gas collection. • Small model share of biking • Limited cycling infrastructure • Management of traffic demand.

iv. Actions for a Green Izmir

The following actions have been developed in order to address the high-priority challenges identified through the GCAP process. These are in line with the strategic objectives outlined within IBB's Strategic Plan 2020 -2024 (see Appendix B for breakdown of objectives). A full summary of all GCAP actions by GCAP sectors can be found in Appendix A.

Each of the action I.D's are based on the GCAP sector that they address. This is as follows:

GCAP Sectors	Abbreviation for I.D
Buildings	**B**
Energy Supply	**ES**
Industries	**I**
Land use	**LU**
Solid Waste	**SW**
Transport	**T**
Water cycle management	**WCM**
Public Health	**PH**
Administrative Organisational Structure	**AOS**

Additionally, the actions included within the GCAP fall under the following categories:

- **Capital projects:** infrastructure investments that IBB will undertake either using municipal funds or with support from donor agencies.
- **Policy measures**: new legislation or policy enacted to drive more environmentally friendly activities.
- **Plans and strategies**: provide a more detailed roadmap for improving performance in a specific sector or area (e.g. a Climate Adaptation Plan).
- **Behavioural:** measures specifically seeking to shift behaviour of a cohort in a targeted direction (e.g. towards more public transport use). While policy measures may also have a behavioural component, actions in this category focus specifically on behaviour-change, such as awareness campaigns.
- **Training:** actions seeking are those that seek to increase capacity through knowledge exchange.
- **Enforcement:** measures seeking to improve compliance with policies and regulations, typically through monitoring and potential penalties.

There are **47** GCAP actions in total, covering **21** baskets and **9** different GCAP sectors. Of the 47 actions, **28** have a detailed business case request by IBB (highlighted by an **underlined** I.D). The I.D of actions that are found in both the SECAP and GCAP are highlighted in **green** and make-up: 44 of the 47 actions. The I.D of actions that are specific to GCAP have are highlighted in **blue** and total **3.**

I.D	Headline
Basket 1: Accelerate transition to low emission vehicles	
T1.1.3	Promote a step change in the uptake of privately and Municipality owned low emission vehicles.
T1.5	Municipal fleet and service vehicles: electric and low carbon vehicles.
Basket 2: Develop more sustainable mobility options	
T1.7	More sustainable urban mobility: mass transit and local mobility.
Basket 3: Develop a more sustainable logistics sector	
I: B	Develop more sustainable logistical practices
Basket 4: Commit to net zero energy and end the use of single use plastics in municipality buildings and encourage other organisations, business and institutions follow IBB's leadership	
B1.6	Municipality to commit to net zero energy in all new municipality-controlled buildings by 2030.
SW1.10	Municipality to commit to banning the use of single-use plastics within their buildings, encouraging local businesses to do the same.
Basket 5: Installation of low and zero carbon and energy efficient technologies in Municipality owned buildings and land	
ES1.5	Mass role out of solar energy on municipality owned assets and land e.g. municipality buildings, road reserves, bus stops.
ES1.7	Undertake a public lighting replacement scheme for all poles owned / run by municipality by installing LEDs.
Basket 6: Enhance evidence for action through studies / assessments	
B1.9	Undertake circular economy assessments on all municipality refurbishment and demolition projects, encouraging uptake in private projects.
ES1.1	Assess the feasibility of connecting public sector and / or industrial buildings to geothermal heat network(s)
ES1.11	Implement an environmental labelling scheme for companies within Izmir
ES1.4	Localised micro-grids renewable energy options study.
ES.A	Develop Izmir bioeconomy strategy and action plan
Basket 7: Facilitate more sustainable waste management	
SW1.16	Investigate potential to provide dedicated waste collection for restaurant / food industry traders in-line with management infrastructure and technology.
SW1.17	Undertake an assessment of waste collection infrastructure (collection service, coverage rate, bins / containers, vehicles), including smart collection systems and route optimisation software in collaboration with district municipalities.
Basket 8: Develop Municipality funded subsidy schemes, grant programmes and/or investments	
B1.11	Explore ways to support residential retrofits being undertaken to a higher and greener energy performance standard.
LU: B	Encourage urban transformation, acting on the Urban Transformation and development areas declared by the Council of Minister's decision for the creation of healthy, liveable urban spaces.

SW1.3	Make separate collection of key dry recyclable materials mandatory, formulating policy at the district municipality level.
SW1.4	Supplement and speed up investment in smart-waste separation facilities, (dry recyclables), a clean materials recovery infrastructure and composting facilities, building on the Integrated Solid Waste Management Strategy (2018).
Basket 9: Move toward network / infrastructure level water cycle management	
WCM1.10	Upgrade the existing water management infrastructure to incorporate the separation of wastewater and stormwater lines.
WCM1.6	Implementation of a maintenance program for the existing water supply network of Izmir city centre and its surroundings and construction of new additional water transmission lines.
WCM1.5	Integration of stormwater management techniques with urban greening e.g. sponge city principles.
Basket 10: Support building level water cycle management	
WCM1.11	Incorporate sustainable water practices and design within existing municipal-owned buildings and municipality controlled open spaces through refurbishment and retrofitting.
WCM1.9	Incorporate SuDs (Sustainable Urban Drainage) and WSUD (Water Sensitive Urban Design) principles into all planned green areas and publicly owned buildings within the scope of green infrastructure.
WCM1.4	Stormwater management storage systems for Municipality owned or operating Buildings and infrastructure at a building level, under-ground with links to green spaces.
Basket 11: Review and update of existing local policies, regulations and guidelines	
B1.3	Review and update the local-level policies, planning regulations and guidelines for future and new municipality development around energy efficiency.
LU1.16	Review and update local-level policies, planning regulations and guidelines for future and new infrastructure development to ensure they consider climate projections and urban resilience in design and construction.
B1.5	Revise planning regulations and guidelines to ensure efficient water fittings in all new IBB buildings.
WCM1.7	Review existing design and installation standards to increase efficiency of new water infrastructure networks.
Basket 12: Support collaboration and/or partnerships with Municipality-wide stakeholders	
ES1.12	Work with utility companies to understand capacity constraints and support a shift to smart-renewable electric systems.
LU: A	Identify and collaborate with stakeholders to lobby for the necessary amendments to regulations to enable the design and development of the 7 “Risk Areas” identified under Law 6306 (Transformation of Areas under Disaster Risk).
SW1.6	Partner and / or cooperate with relevant institutions and organisations that can act jointly in line with Zero Waste Regulation to develop and invest in the necessary smart-waste collection requirements (bins, trucks, routes etc.) and recycling infrastructure.
Basket 13: Address the urban heat island effect	
LU1.7	Identify and implement techniques to mitigate the Urban Heat Island Effect.
Basket 14: Implement strategies for urban greening	

LU1.18 & LU1.19	Further develop the green and blue infrastructure strategy.
Basket 15: Protection, restoration and regulation of the natural environment and ecosystems	
LU1.2	Maintain, protect and enhance existing biodiversity and ecological habitats through the restoration of wetlands, lagoons and afforestation (incorporating natural ecosystem creation).
I: A	Further regulate fishing operations in the gulf aiming to achieve sustainability of fish stocks and habitats.
WCM1.14	Conservation, protection and enhancement of marine biodiversity in Izmir Gulf, increasing the cleanliness of the Gulf
Basket 16: Reduce pollution	
I1.8	Address emissions and pollution within industrial areas.
Basket 17: Foster cross-sector collaboration	
AOS1.3	Develop an administrative organisational structure for the implementation and monitoring of GCAP and SECAP actions.
Basket 18: Enhance the Municipality's adaptation planning and implementation	
AOS1.1	Establishing the necessary tools, mechanisms and management structure for the effective implementation of climate change adaptation strategies.
WCM: A	Ensuring that it will be possible to access safe clean water in case of emergencies, such as disasters.
WCM1.18	Initiate a flood protection scheme for high-risk areas e.g. industrial, residential.
Basket 19: Understand the impacts of climate change on tourism	
I1.10	Commission a study to better understand both the direct and indirect impacts of climate change on tourism: both positive and negative and recommendations to improve the industry's resilience.
Basket 20: Raising public awareness across the municipality	
PH1.3	Carry out awareness raising activities on the effects of climate change on human health.
SW1.1	Establish a municipality-wide awareness campaign (schools etc) for waste reduction and separation at a household level.
Basket 21: Collaborate with the agricultural industry to become more sustainable	
I1.1 & I1.2	Support the implementation of low carbon farming techniques and climate-smart agriculture across the province.
I1.6	Increase farm biodiversity through appropriate techniques, such as increasing diversity in plant species and establishing nest blocks.

v. Monitoring and Implementation

IBB will put in place structures to ensure GCAP actions are implemented and their potential to make Izmir a greener city is understood and maximised. The key roles and responsibilities that will be put in place to implement the GCAP and track its progress (delivery and impact) will include the Green City Coordinator, the GCAP Coordination Board and Green Champions.

A transparent process has been established for monitoring, evaluating and reporting on implementation of the Izmir GCAP. Supported by two Microsoft Excel-based tools, the aims of this approach are to:

- Track implementation progress of GCAP actions (Progress Monitoring Plan (PMP))
- Identify whether each implemented action is having the desired results and impacts, linking back to state and pressure indicators (Impact Monitoring Plan (IMP))
- Facilitate learning about what is and what is not working, both in terms of the actions and the management and delivery structures in place within IBB
- Determine what adjustments need to be made during GCAP implementation to maximise the potential for positive impact.

The results of GCAP monitoring can be complementary to other planning agendas and activities within IBB. Therefore, the Green City Coordinator will aim to align the monitoring and evaluation process with other city processes, such the SECAP project also undertaken by IBB under the Global Covenant of Mayors on Climate and Energy. Aligning GCAP monitoring with other planned activities within IBB will help to streamline data collection with other stakeholder engagement initiatives, reducing duplication and improving efficiency.

1. Introduction

1.1 Overview and purpose of GCAP

Over the last decade, the City of Izmir has been taking significant action towards improving its environmental performance, particularly through strategy development and investment in green infrastructure, waste and water management infrastructure. Izmir Metropolitan Municipality (IBB) have expressed the desire to take a more synthetic approach to addressing its existing and emerging urban environmental challenges. To support this, IBB is participating in the European Bank for Reconstruction and Development (EBRD) Green Cities programme, undertaking a province-wide analysis. Launched to facilitate a better and more sustainable future for cities and their residents, the programme recognises the need for participating cities to:

1. Preserve the quality of their environmental assets and use natural resources sustainably
2. Mitigate and adapt to the risks of climate change
3. Ensure that environmental policies and developments contribute to the social and economic wellbeing of residents.

As part of EBRD Green Cities programme, IBB have received support to develop a Green City Action Plan (GCAP). The preparation of the GCAP provides an important opportunity for IBB and stakeholders to:

1. Establish an up to date evidence base for defining and prioritising the environmental challenges of Izmir ("Green City Baseline")
2. Identify the City's key environmental challenges and priority sectors ("Green City Challenges")
3. Identify and prioritise actions that IBB can take to improve its environmental sustainability ('Green City Policy Options and Actions')
4. Build local capacity to ensure successful implementation of the Plan
5. Monitor relevant indicators and report on progress and outcomes.

Izmir's GCAP has been developed over the last 16 months with input from over 100 individual stakeholders. It proposes 47 actions across 21 baskets that include infrastructure investments, policy measures, capacity development and advocacy, all of which are designed to help achieve our vision for a green Izmir.

1.2 Alignment with Izmir SECAP

The GCAP process has been carried out in alignment and in parallel with the preparation of the Izmir Sustainable Energy Climate Action Plan (SECAP), also supported by the EBRD, to avoid duplicated efforts and resources. The final action plan reports have been produced separately for the GCAP and SECAP, but are complementary to one another, aligned in messaging and actions where possible.

The SECAP, as outlined in Section 3.2.2, is an EU funded, EBRD supported project that has been undertaken as part of IBB's obligation in signing the Covenant of Mayors (CoM). It enables the collection and analysis of data around climate change mitigation and adaptation, outlining actions to help achieve a 40% emission reduction by 2030 against the 2018 baseline, and increase the cities resilience to climate change.

1.3 Spatial Coverage of the GCAP

The below map (Figure 1), demonstrates the geographical boundary of Izmir Province, outlining all of the districts that were considered within this GCAP. It also demonstrates various land-use types within the province, highlighting the mix and distribution of central urban, urban and rural areas.

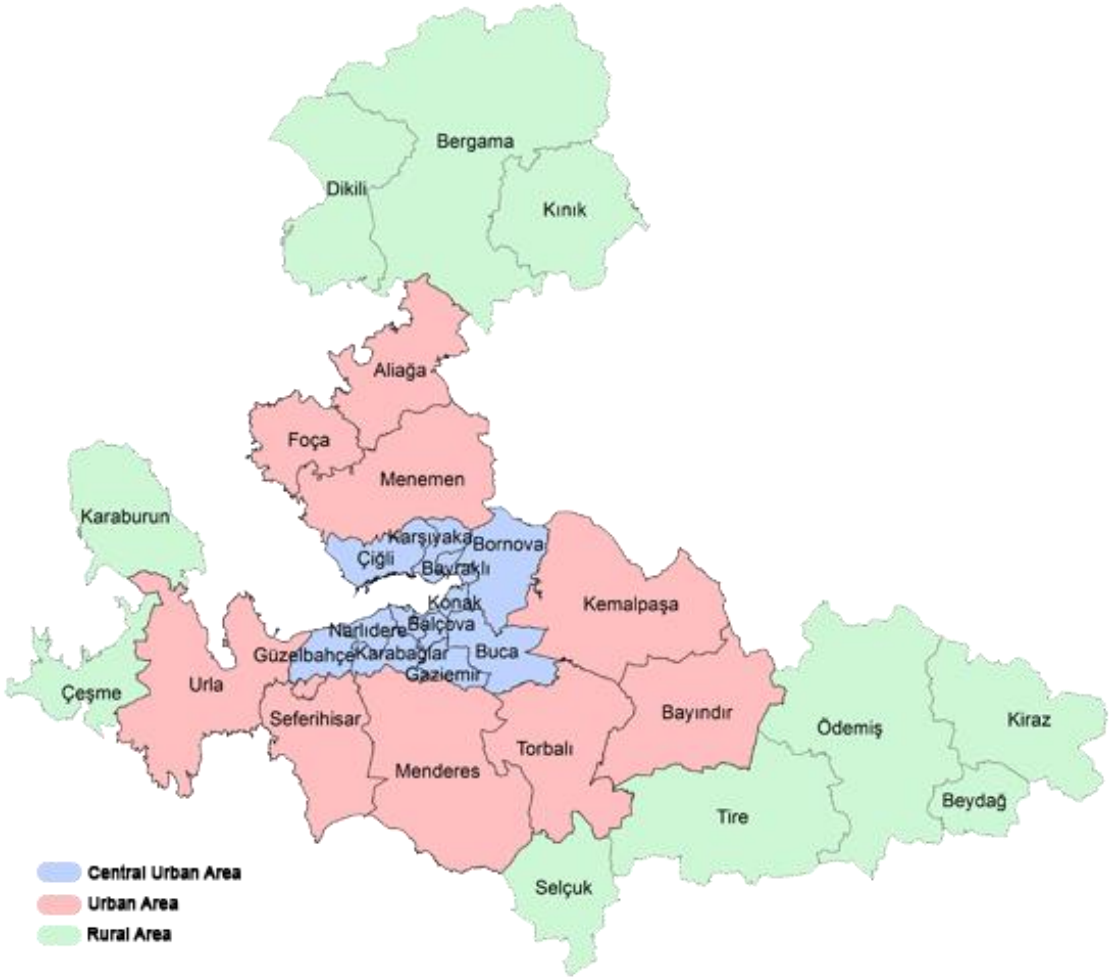


Figure 1: Map of Izmir Province, demonstrating urban and rural area locations.[1]

[1] *Adapted and edited from https://www.izmir.bel.tr/tr/IzmirUlasimPlani2009/431/77*

2. Izmir's GCAP

2.1 GCAP Governance

IBB developed the GCAP for Izmir with input and guidance from two governing bodies – the Technical Committee and the Steering Committee.

- The **Technical Committee** was designed to provide technical advice throughout the GCAP process. It comprises of 65 mid-level representatives (such as head/deputies of relevant structural units within IBB and IBB companies, professional chambers, Universities, governmental authorities, associations and utility companies) across the relevant sectors covered by the EBRD Green Cities Framework. The Technical Committee was involved in all GCAP milestone deliverables.
- The **Steering Committee** was established to provide guidance, oversight and ultimate City of Izmir approval of the GCAP. The Steering Committee comprises of 18 Senior IBB officials who hold decision-making power e.g. Deputy Secretary Generals, IZSU General Manager, Mayor Advisors and Senior Management of IBB. The steering committee held the role of providing overall strategic direction of the GCAP and alignment with other City priorities, private companies, utility providers and academic / research institutions.

2.2 Process followed

The Green Cities process follows a consistent methodology, which is used by all cities developing and implementing a GCAP. This methodology was developed by EBRD in conjunction with the Organisation for Economic Cooperation and Development (OECD) and the International Council of Local Environmental Initiatives (ICLEI). The methodology follows four main steps: (1) Green Cities Baseline; (2) Green City Action Plan; (3) Green City Implementation, and (4) Green City Reporting.

Figure 2 below illustrates the various steps undertaken throughout the GCAP Process.

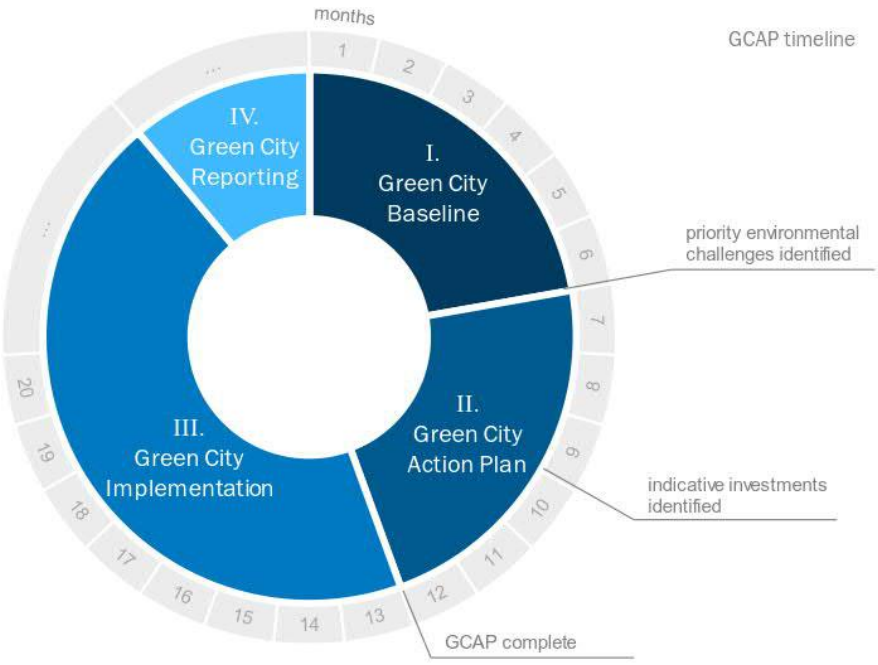


Figure 2: GCAP Process

i. Green City Baseline

The Green City Baseline establishes the underlying conditions in Izmir, understanding the state and pressures on environmental performance. This includes:

- A **Political framework** of supra-national, national, regional, and municipal legislative and regulatory frameworks that govern environmental management in Izmir, establishing the remit that IBB and other stakeholders have in order to address environmental challenges. This also includes a review of existing programme and projects focused on Izmir's environment.

- Collation of environmental **indicator data** using a 'Pressure-State-Response' (PSR) framework of 70 core and 114 optional indicators (see Appendix C). The PSR provides a structured approach to collecting trend data on the environmental condition (i.e. the State such as air quality) and the sectoral (transport, industrial etc.) drivers for change acting upon the environment (i.e. Pressures such as urban congestions or Responses such as environmental improvement projects).

- **Technical assessment** of the environmental data to identify the priority environmental challenges in the city and the context of the interdependencies within which they arise.

ii. Green City Action Development

Building on the Green City Baseline, IBB developed Izmir's GCAP by adhering to the following stages:

- The Technical Committee and key stakeholders prioritised the challenges identified in the technical assessment during the **Challenge Prioritisation Workshop**. This was undertaken in alignment with IBB's Strategic Plan 2020 – 2024 vision and objectives.

- A team of technical specialists from key stakeholders and IBB formulated a **set of 139 actions** across both the GCAP and SECAP projects that IBB could implement to address our prioritised challenges. This list incorporated a suite of indicators at the request of IBB, including reference too; IBB Strategic Plan 2020 – 2024 objectives, link to Green Infrastructure Strategy and alignment with 1/25,000 scaled IBB Environmental Plan.

- A multi-criteria analysis was applied to prioritise the actions into groups of 'high', 'medium' and 'low' priority against numerous environmental, social and economic criteria which were validated by IBB stakeholders. One of the social criteria that was considered here was gender equality.

- The Technical Committee and key stakeholders then validated the prioritised list of actions during the **GCAP Action Prioritisation Workshop**, which were then approved by the Steering Committee.

- The team of technical specialists further developed these actions to inform a **final round of consultations** with the Steering Committee, leading to the basketed actions included in this completed **Green City Action Plan.** Priority individual actions within the baskets were also then identified for detailed business case development.

iii. Green City Implementation

IBB will operationalise the GCAP during the Green City Implementation phase. Success at this stage requires the commitment of each action owner, as well as Municipal leadership, including allocation of necessary financial and human resources. Izmir is already highly active in a range of sectors (e.g. land-use) and hence some actions documented in this plan are already in progress.

iv. Green City Reporting

The GCAP is supported by a detailed Monitoring and Evaluation Plan, which documents activities that will be undertaken to track implementation progress of GCAP actions, as well as the impact these actions are having on the state of Izmir's environment. This document sets the requirements for periodic reporting and follow-up actions that will be taken in response to outcomes of monitoring and evaluation (e.g. the modification of actions that have proven less effective than expected).

v. Timeline of phases

The following diagram (Figure 3) portrays the delivery timeline for Izmir's GCAP. This was undertaken in co-ordination with the SECAP from the December 2019 launch event and prioritisation workshop.

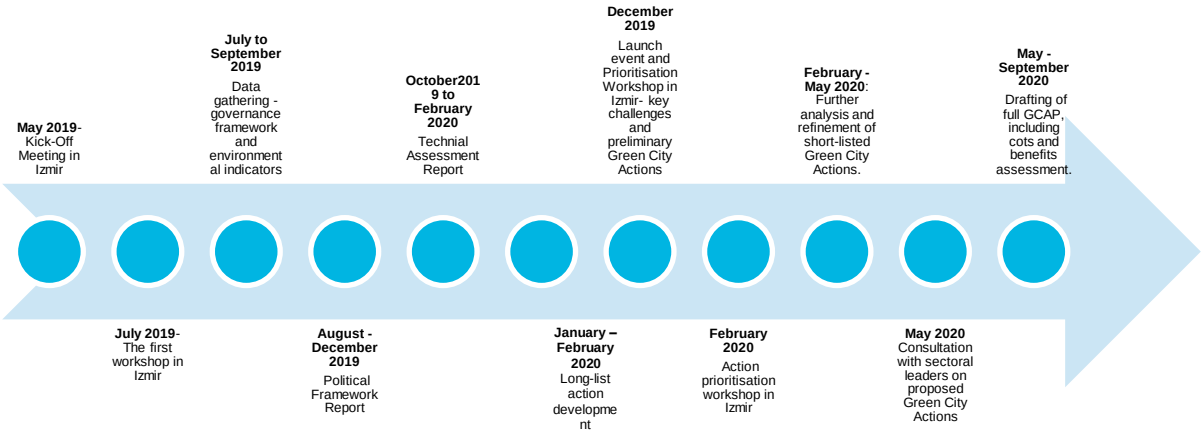


Figure 3: Timeline of delivery for Izmir's GCAP.

2.3 GCAP Governance

In order to develop the GCAP, IBB established two bodies for input and guidance:

- The **Steering Committee,** which reports to the Mayor of Izmir, is comprised of senior IBB officials including assistant secretary generals, general managers and directors, as well as mayoral advisors and other key decision-makers within the municipality. It was set up to provide strategic guidance, oversight and ultimately approval of the GCAP.
- The **Technical Committee,** comprised of technical officers from across IBB and key stakeholders, was established to support the collection, analysis and verification of evidence as well as contributions to developing GCAP actions.

2.4 Stakeholder Engagement

Stakeholder input has been a key feature of the Izmir GCAP process. Stakeholders were identified through a mapping workshop at the start of the GCAP process, the results of which were then compiled into the Stakeholder Engagement Plan. Alongside the GCAP governance groups, stakeholders include national and regional government agencies, civil society groups (NGO's and iNGOs) and financial institutions.

Stakeholders had the opportunity to input into several stages of the GCAP process including:

- Round table discussion with Technical Committee held on the 29th July 2019. It involved 23 participants from related departments of IBB and IZSU.
- A series of focus group meetings with key stakeholders held on the 30th July 2019. It involved 23 participants from 11 different organisations across Izmir, not including the IBB.

- The first capacity building session for the Technical Committee was held on the 1st August 2019. It involved 26 participants from related departments of IBB and IZSU.
- An official briefing to provide fundamental information about the GCAP progress and its importance for Izmir was held on the 11th December 2019. This was attended by Izmir's Mayor alongside 118 participants from 48 different organisations.
- The Technical Committee prioritised the challenges identified in the technical assessment during the Challenge Prioritisation Workshop, which was held on 11th December 2019. It involved 49 participants from 19 different organisations.
- The second capacity building session for the Technical Committee was held on the 18th February 2019. It involved 12 participants from related departments of IBB.
- The Steering Committee helped develop and guide the criteria used in the Multi Criteria Analysis applied in action prioritisation. The workshop was held on the 19th February 2020 and involved 20 participants from related departments of IBB.
- Prioritised actions were validated by Technical Committee during the GCAP Action Prioritisation Workshop held on the 20th February 2020. It involved 65 participants from 25 different organisations.
- A final round of consultations with the Steering Committee was held on the 12th March 2020, which finalised the basket of actions. This was attended by 10 participants from IBB.

Focused engagement with municipal staff also occurred from December 2019 through to the completion of the GCAP to validate the proposed actions and to assign responsibility for implementation Municipality-wide (inter-departmental). Inter-institutional focus group meetings were also held in February onwards to help inform the GCAP action process.

Figure 4: Stakeholder engagement activity held in Izmir in December 2019 (top picture) February 2020 (bottom picture).

2.5 Izmir's Vision & Strategic Plan

IBB has already developed several plans and strategies that aim to deliver a high quality of life for citizens, provide economic vitality and protect the environment. A description of these plans and strategies and their relation to the GCAP can be seen in Section 3.2.2. The city welcomed a new Mayor in 2019 who initiated the works to develop a new Vision and Strategic Plan for the Izmir. As such, in addressing the priority environmental challenges that Izmir faces, the GCAP must take into consideration and align with these wider aspirations.

Izmir's vision

Izmir was established as a port City around the 11th century BC, thus, the main strategies of the Izmir Province are founded upon the historical heritage of the city, striving to strengthen the connections between eastern and western communities, with justice and eco-friendly habits.

IBB's vision is to become a city that gains its strength from the harmony of diverse communities that both learns from, and becomes the source of inspiration for the world, and where prosperity, justice and eco-friendly habits are integrated in every moment of the life.
The municipality's mission is to provide innovative services by using the strength gained from the citizens for the common interests and sustainable development of the city.[2]

IBB Strategic Plan 2020 – 2024

IBB's Strategic Plan 2020-2024 is very critical for Izmir as it represents a road map for the next 5 years. The Strategic Plan 2020-2024 was prepared in collaboration with the metropolitan municipality teams, affiliated institutions; IZSU (Izmir Water and Sewage Administration), ESHOT (Electricity, Water, Coal, Gas, Bus and Trolley Bus Company, Public Transport Institution) and directors of related corporations, under the leadership of the Metropolitan Mayor and Directorate of Strategy Development and Coordination. It was developed in the light of the extensive preliminary studies and emerged from a strong core of vision and fundamental values. The vision of the plan is presented and developed in 7 strategic objectives: Infrastructure, Quality of Life, Economy, Democracy, Nature, Experimental Learning, Culture and Arts, which include a total of 26 targets.

Qualitative, social and intangible targets are of high importance for the actions in Izmir. Social progress in all areas as well as the protection of the environment is clearly visible both in the basic values and further in the objectives and targets of the plan. The basic values of Izmir Strategic Plan are listed below:

- Paying attention to priorities of the citizens
- Protecting the rights of humans and all living things
- Supporting gender mainstreaming
- Protecting historical heritage
- Being open for international partnerships
- Transparency and accountability
- Participatory decision-making
- Seeking for the best interest of children
- Generalizing social inclusion policies
- Preserving nature and earth
- Ensuring production-based local development
- Sustainability and accessibility

During the GCAP process, the objectives and goals within IBB's strategic plan were taken into consideration and linked to the high-priority GCAP actions, which include; infrastructure investments, policy measures, capacity development, and advocacy. This ensures that all actions developed help achieve the vision of IBB's Strategic Plan 2020-2024 alongside striving to make a greener Izmir.

A more detailed breakdown of the strategic plan can be found in Appendix B. This includes headings, sub-headings, goals and the associated objectives.

[2] *Izmir Metropolitan Municipality Website, https://www.izmir.bel.tr/tr/StratejikPlanlar/123/44*

3. Summary of City and Environmental Context

This section provides an overview of the regulatory and legal frameworks that will contribute to the success of the GCAP for Izmir. It also summarises the priority environmental challenges facing Izmir identified in the Technical Assessment. A full breakdown of the city's baseline can be found in Appendix C

3.1 City Context

Izmir lies in the western extremity of Anatolia. It is a Metropolitan Municipality, which is home to a total population of 4,320,519 as of 2018. Izmir is the third most populated province in Turkey, according to the Turkish Statistical Institute, and is the second largest metropolitan area located on the Aegean Sea, behind Athens, Greece.

The province of Izmir comprises of 30 districts in total. Historically, the central district of Konak was considered 'Izmir Municipality' proper. Subsequently, the boundaries of the metropolitan area expanded to include not only the surrounding urban districts, but also the surrounding provincial areas.

As of 2019, the 11 central districts of Izmir (Güzelbahçe, Narlıdere, Balçova, Karabağlar, Gaziemir, Buca, Konak, Bornova, Bayraklı, Karşıyaka and Çiğli) comprise the third largest City in Turkey after Istanbul and Ankara, with an urban population of 2,972,900. The 19 districts of Izmir are designated as rural / agricultural areas, which are; Aliağa, Bayındır, Bergama, Beydağ, Çeşme, Dikili, Foça, Karaburun, Kemalpaşa, Kınık, Kiraz, Menderes, Menemen, Ödemiş, Seferihisar, Selçuk, Tire, Torbalı and Urla. The toal population of rural areas in 2019 is 1,394,351.

As of 2019, 31.85% of the population was aged between 0-29 years old, 51.58% were 30-64 years old, and 16.57% were 65 or older. In total, 19.07% of the population are university or higher education graduates with 70.48% of the population leaving the education system after graduating from high school. The remaining 10.44% of the population either dropped out of school prior to graduating high school, have received no formal education or the condition is unknown.

As of 2018, Izmir has 8 universities, 138 University Research and Application Centres, 13 Organised Industrial Zones, 4 technology parks, 34 research and development centres, and 4 design centres. The trade volume of Izmir in 2018 was 17 billion US dollars, exporting goods to 191 countries and importing them from 160 countries. Izmir has the second highest number of foreign investment companies and foreign trade volume in Turkey, also ranking third in skilled labour force (25% of labour force has higher education), and production volume.[3] Izmir is also a growing attraction centre for foreign investors. As of 2018, there are 2,595 foreign capital enterprises in Izmir.[4]

In terms of overall employment, a higher share of people work in the services and industry sectors, with a lower share working in agriculture. Key industries within the province include; weaving and textiles, food and beverages, beer and tobacco products, iron-steel, petrochemicals, automotive, cement, olive oil, fertiliser, agricultural machinery, ceramics, and raw materials for construction.[5]

In 2017, the regional gross domestic product (GDP) of Izmir was 191.5 billion TL, ranking third in the country after Istanbul and Ankara. Within the province, the service industry is the highest contributor to GDP with 57.5%. It is followed by industry sector with 37.6% and agriculture with 4.9%. On a national level, as per 2017, Izmir had a share of 4.43% in agriculture (gross value added: 8.4 million TL), ranking second after Konya. In the industry sector, ranking third after Istanbul and Ankara, with a share of 7.05% (gross value added: 63.9 million TL). In the service industry, Izmir ranked third after Istanbul and Ankara, with a share of 5.88% (gross value added: 97.4 million TL). In 2015, Izmir had 38 enterprises among the top 500 highest-ranking industrial enterprises (these enterprises are registered to EBSO – Aegean Region Chamber of Industry), which is the second highest number

[3] *Aegean Young Business People Society (EGİAD), Economic and Demographic Indicators of Izmir,* https://www.egiad.org.tr/wp-content/uploads/arastirma-raporlari/ekonomik-demografik-gostergelerle-izmir.pdf
[4] Izmir Chamber of Commerce, Research and Development Bulletin, 2018, prepared by Erdem Alptekin, http://izto.org.tr/demo_betanix/uploads/cms/yonetim.ieu.edu.tr/6416_1536303920.pdf
[5] *Izmir Strategic Plan 2020 – 2024*

following Istanbul. Of the 38 enterprises in the rankings, 33 are in manufacturing sector. The highest of these 38 enterprises is PETKİM Petrochemical Company with a net sales value of 4.2 Million TL.

The city budget in the previous three years is shown in the table below.[6]

Table 1: IBB budgets

Budgets	2020 (TL)	2019 (TL)	2018 (TL)
IBB Expense Budget	7,950,000,000	5,995,000,000	5,450,000,000
IBB Revenue Budget	6,374,000,000	5,102,000,000	4,635,000,000

3.1.1 Legislative and Regulatory Context relevant to the GCAP

Although the main functions of the Turkish state are carried out by the central government, there are several tiers of local governmental authorities. Turkey is divided into 81 geographic provinces, which are further sub-divided into districts.

As of 2018, approximately 77% of the population of Turkey live within a Metropolitan Municipality. As noted in Section 2.1, Izmir is one of the largest of these. Metropolitan municipalities operate using a two-tier local government structure. The Metropolitan Municipality (in this case, IBB) forms the upper tier, overseeing macro-services, whereas District Municipalities operate micro-services. Since they operate in the same jurisdiction, their services are complementary in nature, Metropolitan, and District Municipalities need to work in close cooperation and coordination. The Metropolitan Municipality is tasked with ensuring coordination and resolving disputes among municipalities in the metropolitan area. This prevents gaps or overlaps in services. In addition, district mayors and some district councillors serve on the Metropolitan Council.

Izmir was designated as a Metropolitan Municipality in 1984. The establishment of IBB consolidated the central (urban) districts with those in the surrounding area. Over time, IBB's geographic boundary has grown; with the enactment of Law no. 6360 (2012) expanding IBB to comprise of 30 districts, covering a total area of 11,891 km^2.

IBB is organised around three key bodies; the Metropolitan Council, the Metropolitan Executive Committee, and the Mayor, which are described below:

- The Municipal Council is the decision-making body of the municipality. Members are directly elected by voters to serve five-year terms. The Izmir Metropolitan Council comprises 175 councillors plus the Mayor; the number of seats is determined by the number and size of districts within the Municipality.
- The Municipal Executive Committee is responsible for implementing the resolutions of the Municipal Council. The Mayor acts as the chairperson of the Municipal Executive Committee. Five of the members (i.e. half) are councillors elected by the Municipal Council, and the other five are municipal administrators selected by the Mayor.
- The Mayor of IBB is the head of the Metropolitan Municipality administration. They are directly elected for a five-year term by the citizen electorate within IBB and hold significant administrative power locally, as the speaker of the Council and Chairman of the Executive Committee. The Mayor has the mandate to set the agenda, to appoint and remove all municipal administrators and employees, and exercise control over the municipal budget.

The Metropolitan Municipality forms the upper tier, overseeing macro-services, whereas District Municipalities operate micro-services. The major functions of Metropolitan Municipalities are to:

- Prepare the higher scale (1/5,000 to 1/25,000) land development plans,
- Approve the implementation plans (1/1,000 scale) prepared by the District Municipalities,
- Supervise the compliance to planning guidelines regarding land development by district municipalities,

[6] *Izmir Metropolitan Municipality Website, http://www.izmir.bel.tr/tr/Dokumanlar/23/9*

- Produce land plots and housing to ensure orderly urbanisation, build infrastructure as required for industry and trade,
- Draw up the metropolitan transport master plan, plan and implement public transport,
- Build squares, boulevards, avenues and main roads,
- Protect and develop the environment, agricultural land and water basins,
- Recycle and store solid waste,
- Deliver water and sewer services,
- Build open and closed parking spaces,
- Build regional parks, zoos, museums, sporting, leisure and recreational facilities,
- Build cemeteries, wholesale food markets and slaughterhouses, and
- Provide fire-fighting and emergency services.

While the key responsibilities for implementation of the GCAP lie with departments within IBB, national government regulations and departments will have a part to play in ensuring the smooth roll out of the GCAP. Table 2 outlines key ministries within the National government that are relevant to the GCAP.

Table 2: Key National Ministries relevant to the GCAP.

National Ministry	Description of responsibilities
Ministry of Environment and Urbanization (MoEnvU)	The MoEnvU is responsible for issues related to the environment, urban planning, and public works. They are responsible for planning, regulating and coordinating all buildings and structures to be built on publicly owned land. The ministry is also responsible for commissioning transformation projects of buildings that are vulnerable to earthquakes, and structures that are in conflict with the zoning legislation. In addition, the MoEnvU develops standards and criteria, and determines the principles and policies for the prevention of environmental pollution through licensing, monitoring and inspection. Through the General Directorate of Environmental Management, the MoEnvU is responsible for regulation and monitoring of issues such as air quality, air pollution, noise, vibration, exhaust emissions, soil pollution, sea pollution and other aspects of environmental health. The Ministry also develops climate change plans and policies. Within the MoEnvU, the General Directorate of Local Administrations works to ensure that investments and services related to environmental and urban planning issues are coordinated on a national and local level. The Directorate also provides in-service training to local government personnel.
Ministry of Agriculture and Forestry (MoAF)	The MoAF is responsible for establishing the agricultural, livestock and aquaculture policy, as well as monitoring and supervising its implementation. The MoAF, through the General Directorate of Nature Conservation and Natural National Parks, conducts studies to inform policies for the protection of nature. In addition, the directorate is responsible for the designation, management, development and operation of national parks, wildlife parks, natural monuments, nature protection areas, wetlands, biodiversity. It also oversees hunting and wildlife protection. The MoAF, through the General Directorate of State Hydraulic Works (DSI), is also responsible for the planning, management, development and operation of all water resources in the country. The DSI attaches great importance to the protection of nature and wildlife, and conducts activities related to the development of sustainable water resources.
Ministry of Treasury and Finance (MoTF)	The MoTF is responsible for financing, budgeting and taxation across Turkey. The MoTF is relevant to the GCAP because it is responsible for procedures related to loans and grants from foreign countries and organizations.
Ministry of Energy and Natural Resources (MoENR)	The MoENR's duties are to assess Turkey's long- and short-term needs regarding energy and natural resources, and to inform on policies and legislation concerning the utilisation, management, development, protection and sustainability of those resources. The Ministry is also responsible for conducting renewable energy assessments and determining policies related to energy efficiency. The MoENR, through the General Directorate of Energy Affairs (EIGM), is responsible for meeting the energy needs of Turkey, which includes planning and keeping an inventory of power plants and energy sources.
Ministry of Industry and Technology (MoIT)	The MoIT informs technology and innovation policies in line with industrial strategies, in addition to key economic, social and national security objectives. The MoIT, through the General Directorate of Industry and Productivity, monitors developments related to environmental and climate change issues as part of its broader aim of enhancing productivity within industry.

Ministry of Transport and Infrastructure (MoTI)	The MoTI develops and implements policies, strategies and targets that relate to transport, maritime, communication and postal services. The MoTI, through the General Directorate of Highways, is responsible for traffic control, and collection and monitoring of statistics. It is also responsible for the development of road infrastructure for different regions, including the Izmir area (which falls within the jurisdiction of the 2nd Regional Directorate of Highways).
Ministry of Interior (MoI)	The MoI is primarily tasked with homeland security and public order. Through the Directorate of Traffic Services, the MoI ensures and controls traffic order on highways. Through the Disaster and Emergency Management Authority (AFAD), the MoI is responsible for preventing disasters and minimise disaster-related damages, planning and coordinating post-disaster response, and promoting cooperation among various government agencies.

As a Municipality, IBB owns and operates companies within various sectors throughout the province. These are listed below in Table 3.

Table 3: Municipal Companies of IBB[7]

Company Name	Area of Activity	Website
İZFAŞ – *Izmir Fair Organisations, Art and Culture Services Company*	Organisation of culture, fairs, educational, artistic, sportive and other activities and participating in related activities.	http://www.izfas.com.tr
EGE ŞEHİR PLANLAMA A.Ş. – *Aegean Urban Planning Company*	Urban planning, transportation master planning, collective housing and trade centre constructions, preparation of architectural and engineering projects, monitoring and consultancy services.	http://www.egesehirplanlama.com.tr
İZDENİZ A.Ş. – *Izmir Maritime Enterprises, Transportation and Tourism Company*	Maritime public transport services, preparation, organisation and management of maritime transportation potentials.	http://www.izdeniz.com.tr
İZMİR METRO A.Ş. – *IBB Subway Administration, Transportation and Construction Company*	Operation and management of every kind of railed underground and aboveground urban transport services.	http://www.izmirmetro.com.tr
İZDOĞA A.Ş. – *IBB Environmental Protection, Rehabilitation, Consultancy and Project Services Company*	Protection and rehabilitation of the environment, protection of land and natural resources in metropolitan and rural areas, protection of water, earth and air against pollution, services for health urbanization. Surveying, consultancy, project design, facility construction for urban potable water supply and for the reclamation of ground and surface water.	https://www.izdoga.com.tr/
ÜNİBEL A.Ş. – *Special Education and Information Technologies, Culture, Publicity and Publishing Company*	Data processing and related works for private and legal companies and public institutions.	http://www.unibel.com.tr
İZELMAN A.Ş. – *General Service Car Parks, Special Education, Fire Brigade and Health Services Company*	Recruitment, porterage, cleaning and maintenance and engineering staff recruitment services for companies, public institutions, banks, hotels, restaurants and tourism facilities. Organization of parks, gardens, recreational areas and their lighting, maintenance and repairing	http://www.izelman.com.tr

[7] *Izmir Metropolitan Municipality Website, Municipal Companies,* https://www.izmir.bel.tr/tr/Sirketler/169

	works, and consultancy services. Search and rescue services after disasters.	
İZULAŞ A.Ş. – *IBB Izmir Transport Services and Machinery Company*	Preparation, organization, management and tendering of the management works for public transport services in Izmir metropolitan area.	http://www.izulas.com.tr
İZBETON A.Ş. – *IBB Concrete, Asphalt, Energy Generation, Distribution Facilities, Water and Sewage Company*	Construction of new roads, boulevards and bridges, paving existing road, stormwater drainage systems and sewage systems. Alongside the production of road materials, construction and maintenance of parks, construction of sports fields, infrastructure, superstructure and engineering structures for settlement areas and related services for urban infrastructure.	http://www.izbeton.com.tr
GRAND PLAZA GIDA TURİZM A.Ş. – *IBB Grand Plaza Food, Hotel Management and Tourism Company*	Constructing and establishing tourism facilities throughout Turkey, investing in tourism facilities and operating them.	http://www.grandplaza.com.tr
İZENERJİ A.Ş. – *Human Resources Recruitment, Maintenance, Repair, Energy, Security Services and Disinfectation Company*	Extraction of thermal groundwater and geothermal energy resources, recruitment, cleaning and maintenance services for companies, public institutions, banks, hotels, restaurants and tourism facilities.	http://www.izenerji.com.tr
BAYSAN A.Ş. – *Izmir Bayındır Province Industrial Company*	Founded in the Bayındır district in collaboration with the government, NGO's and citizens. Olive oil and brick factories were established by the company. Currently, the aim is to establish research centers, educational institutions, and facilities for creating brands and markets, with the mission of sustainable agriculture and healthy food.	-

It is important to note that the scope of the GCAP includes the whole of Izmir Province. The GCAP identifies relevant action owners from IBB directorates and indicates where coordination with National Ministries or strategies is needed.

Legend

IBB Level of Jurisdiction over the Indicator	
High	Has significant autonomy to set policy and/or make investment decisions.
Medium	Has autonomy to set policy and/or make investment decisions around some aspects of the indicator only; or has the capacity to make investments but must comply with policy set by National Government actors.
Low	Has limited autonomy to set policy and/or make investment decisions. The City's main vector to influence policy and investments is advocacy.

Table 4: The level of jurisdiction of IBB over environmental and pressure sectors

Sector	Local governance arrangements
Air Quality	IBB involves the Department of Climate Change and Environmental Protection Control, which is authorized on air quality. IBB has air quality monitoring stations installed in Izmir and Izmir Governorship has developed the Izmir Clean Air Action Plan. Its primary stakeholders are Dokuz Eylul University, WB, EEA and local industry representatives.
Climate and Disaster Risk	IBB involves the Directorate of Search and Rescue and Disaster Affairs, as well as the Department of Urban Transformation and Department of Climate Change and Clean Energy. IBB has prepared the Izmir Climate Model, A Framework for Resilient Cities to Climate Change: Green Revision Guidebook in 2019, and has developed Izmir Earthquake Scenario and Izmir Earthquake Master Plan. Its primary stakeholders are AFAD (Disaster and Emergency Management Authority), Provincial Directorate of Health, MoEnvU, Tema Foundation, WWF and WBF alongside other NGOs and public agencies involved in both climate and disaster risk research and rescue activities.
Biodiversity	IBB involves the Department of Parks and Gardens and the Department of Agricultural Services. Numerous areas are protected in and around the province. The primary stakeholders are MoAF, Ege Forest Foundation, Nature Association (Doğa Derneği), TEMA, TURCEK, WWF, EBRD, Mediterranean Conservation Society and SAD-AFAG.
Greenhouse / Climate Change	IBB involves the Department of Climate Change and Environmental Protection Control, authorized on the issue. IBB has set 2020 targets for municipal assets regarding GHG emissions and climate change. Its primary stakeholders are MoEnvU, TEMA Foundation, TURCEK, UNDP, WWF, Greenpeace Akdeniz, GIZ, WB and EBRD, as well as related local industries.
Soil	IBB involves the Department of Agricultural Services. There are no local governance arrangements on the issue. The primary stakeholders are MoAF, MoEnvU, Dokuz Eylul University, TEMA Foundation, TURCEK and Nature Conservation Centre.
Water Supply, Sanitation and Drainage	IBB involves Projects Department. And IZSU General Directorate are also authorized on the issue. IZSU involves Water and Constructions Department, Water Treatment Department and Wastewater Treatment Department. Project Departments authorized on water supply, sanitation and drainage. Studies are conducted on the water quality improvement in Izmir Bay, IZSU has also prepared Potable Water Master Plan 2017. The previous strategic plan of IZSU (2015-2019) set out needs for Sewage and Storm Water Master Plan. The primary stakeholders are MoAF, MoEnvU, WWF and Dokuz Eylul University.
Buildings	IBB involves the Department of Construction Affairs, the Department of Urban Transformation and Department of Studies and Projects. Urban Transformation studies have been conducted in the City. The primary stakeholders are MoEnvU, MoENR Izmir Chamber of Commerce, the Chamber of Architects and Engineers, WBG, GIZ and Boğaziçi University.
Industries	No work is currently conducted on the issue. The primary stakeholders are MoIT, Aegean Region Chamber of Industry, UNDP, WBG, EBRD, Organized Industrial Zone and industry representatives.
Energy	IBB does not involve a department authorized to monitor various energy sectors such as electricity, fuel oil and natural gas in an integrated manner. Biogas and potential landfill gas projects have been conducted in the City, the primary stakeholders of which are MoENR, Greenpeace Akdeniz, GIZ, EBRD, EYODER, Izmir gaz A.S., Izmir Jeotermal A.S., WBG, GDZ Electricity and industry representatives.
Land Use	IBB involves Department of Reconstruction and Urbanisation, Department of Mapping and GIS, Department of Real Estate Management and Department of Agricultural services. Urban transformation plans have been prepared by IBB. The primary stakeholders are MoEnvU MoAF, TEMA Foundation, TURCEK and EEA.
Transport	IBB affiliated company ESHOT resides over Transport aspects, alongside the General Directorate Department of Transportation, Department of Rail System and the Department of Road Maintenance. Projects such as electric bus supply for the City, metro extensions, and ferry upgrades and transportation master plan have been conducted in the City, as well as national investments on port expansion projects. The primary stakeholders are MoTI, IZBETON, A.S., IZULAS A.S., Izmir Metro A.S IZDENIZ, WB and EBRD.
Solid Waste	IBB involves the Department of Waste Management. The primary stakeholders are MoEnvU, Dokuz Eylul University, CEVKO Foundation and EBRD.

3.2 Baseline environmental conditions

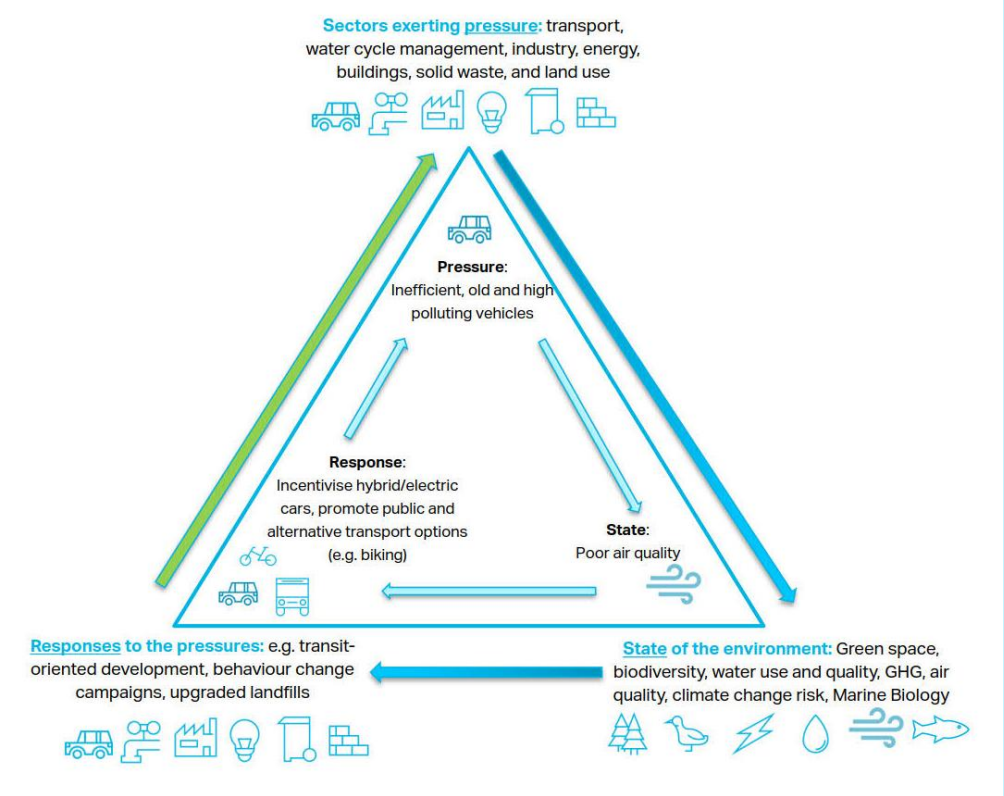
This section provides a summary of the state of Izmir's environment, the pressures affecting the environment, and the current responses that are being taken to address these pressures and improve the state of the environment.

The baseline conditions of key environmental indicators in Izmir were assessed as part of the Technical Assessment component of the Green City Baseline phase of the GCAP. The findings from the Technical Assessment are set out in Appendix C and summarised in section 3.2.1 below. The Technical Assessment followed an indicator database developed by the EBRD in partnership with ICLEI and is based on a Pressure-State-Response Framework, which is detailed in Box 1 below. This database consists of 70 core and 114 optional indicators which were collected and analysed to inform Izmir's environmental baseline. In addition to the standard indicators and due to Izmir's prominent coastal location, this GCAP has also examined the state of marine biology. All the state and pressure indicators have been benchmarked against international best practice and represent the most recently available data.

The data (as presented in Table 5), has been colour coded to reflect **good**, **moderate** or **poor** performance compared to the pre-defined international best practice. This key can also be applied the "Environmental Challenges" section of Appendix C.

Box 1. Explaining the PSR Framework

The PSR Framework conceptualises the interactions of different aspects of urban life on the environment. The schematic below demonstrates how state, pressure, and response indicators relate to one another. Eight **State indicators** relate to the quality of an environmental asset (e.g. air quality), the availability of an asset (water availability), or the state of risk (exposure to drought). Note that state indicators include indicators on climate and disaster risk **Pressure indicators** are based on eight sectors and aim to measure how urban activities may adversely impact the state of the environment (e.g. highly congested roads detrimentally impact air quality). **Response indicators** note existing approaches to addressing pressures that are being exerted on the environment.



3.2.1 Identifying Priority Environmental Challenges

Izmir has worked hard to achieve many successes in improving the quality of the environment. Benchmarking the state of the environment and analysing the pressures that are acting upon it has, however, helped to understand the root cause of environmental challenges that remain. Coupling this analysis with an appreciation of the political framework enables us to understand which levels of government and stakeholders have the agency to influence the environmental challenges. Through a stakeholder engagement workshop held in December 2019, the environmental challenges facing Izmir were prioritised, and became the focus on which actions in this GCAP to address them. Table 5 sets out the state of the environment indicators, along with key pressures and resulting priority environmental challenges.

Table 5: Environmental baseline and priority environmental challenges

State Indicators	State	Sector	Key Pressures	Priority Environmental Challenges*
Air Quality	Average annual concentration of PM_{10} is 40.61ppm with slight decline in concentration. Concentration of NO_x increasing. Average SO_2 levels benchmarked good. No $PM_{2.5}$ data available.	Transport	Emissions from road vehicles are a major source of air pollution in Izmir, exacerbated by relatively old age of vehicles (13yrs), the proportion of diesel vehicles (46%), growing population demand for cars and an increasing congestion.	• Lack of green space (m2). • Limited availability of public transport • Small model share of biking • Minimal availability of cycling infrastructure • Management of traffic demand • Proportion of diesel vehicles • Limited data availability and regulations on industrial air pollution
		Energy / Buildings	Fossil fuel dominates heat and electricity production. Many homes in informal areas and the rural areas still burn solid fuels for heat.	
		Industry	While there is limited data Industrial enterprises in Izmir have raised serious air pollution concerns, especially the Aliağa region, which includes of the biggest refineries in Turkey (SOCAR STAR Refinery, formally PETKIM). There are limited regulations for air pollution within the construction / demolition industry.	
Water Quality / Availability	Highly water constrained with Water Exploitation Index at 73. High level of ammonia and biochemical oxygen demand in G. Basin, K. Menderes and K. Ege.	Water	High water leakage loss at 33.15% in 2013, although this has been improving with better leak detection and line upgrades. Due to these efforts to reduce water leakage, this rate decreased to 28.86% in 2018, Limited reuse of treated wastewater.	• Low efficiency of water supply network (loss-leakage ratio) • Minimal sustainable urban drainage • No separation of wastewater and stormwater collection infrastructure • Lack of treatment for wastewater for use in irrigation for agriculture • Reuse of greywater • Agricultural water consumption
		Land use	IZSU's potable water masterplan highlights that rapid population growth and urban expansion, coupled with industrial demands, is projected to pass sustainable limits in the near future.	

			High levels of agricultural irrigation, potentially from illegal wells, risks ground water depletion. Agricultural run-off, including fertilizers, pesticides and sediment, is resulting in downstream pollution.	
		Buildings	Although 98% of buildings are connected to the potable water network, the age and condition of internal plumbing means water may be unsuitable for drinking and has led to high bottled water consumption. 100% of urban residential properties are connected to the wastewater network.	
Biodiversity and Greenspace	Relatively low levels of green space at 8.6m^2 per capita (2019). There is also a relatively high population density.	Land use / buildings	Rapid urban expansion has reduced areas of green cover and contributed to ecological fragmentation.	• Lack of high quality urban green space • Lack of green space connectivity • Lack of green space (m2). • Competing land use priorities • Green space typology • Regulation of land-use density
		Water	Reduced water availability for natural ecosystems.	
GHG Emissions	Izmir has a moderate 5.08 tCO_2e emissions per capita (2018), which includes industry, aviation and energy generation.	Transport	The transportation sector represents the second largest source of emissions for Izmir, at around 23.1% of the total inventory. Road vehicles and aviation account for 23.1% (5,780,293 tCO_2e) of GHG emissions, with private and other public vehicles forming the largest proportion of this, contributing to 19.9% of total emissions This is expected to increase unless infrastructure investments are made into public transport. The age of the private vehicle fleet is relatively high (13 years on average) and there is a high proportion of diesel vehicles.	• Separation of waste in collection and disposal • Non-revenue water loss (i.e. leakage rates in infrastructure) • Minimal but emerging diversity in public transport options • Absence of control over building efficiency standards • Minimal uptake of renewable energy • Lack of green space (m^2). • Municipal mitigation planning
		Industry	Industrial buildings and processes are a main contributor to GHG emissions in Izmir (31.4%), contributing to 7,860,219 tCO_2e.	
		Buildings	Izmir's buildings stock is relatively old (46% built before 1990). Electricity and heat use in residential buildings accounts for 14.3% of the municipalities total of CO_{2e} emissions.	
		Land use	Agriculture, through livestock and manure management accounts for 8.2% of total GHG emissions in Izmir. Conversion of land from green areas, such as forests or grassland, both emits CO_2 and reduces sequestration potential. Furthermore, the occurrence of forest fires emits large quantities of CO_2.	
		Waste	While most of the Izmir's waste is disposed of sanitarily, over 93% is directed to landfill with very limited reuse and recycling. Landfill gases are used for	

			energy generation, however, there remains high levels of embodied carbon and resources used inefficiently.	
		Energy	Energy generation capacity within Izmir remains largely focused on traditional fossil fuel energies with natural gas (2,412MW) imported coal (350MW), fuel oil (315MW), Geothermal heat is supplied to around 40,000 homes (12MW)	
Soil Quality	No data available	Water / Transport / Waste / Land use	Heavy rainfall picks up surface pollution and waste, such as transport particulates and chemicals, agricultural fertilizers, sediment and pesticides and general waste which can contaminate soils.	• The use of sustainable agricultural techniques and use of fertiliser / pesticides • Lack of solid waste separation • Minimal composting of solid waste • Illegal dumping of solid waste • Absence of the creation of environmental protection areas in plan decisions • Minimal soil quality monitoring
Marine Biology	The Water Quality Eutrophication TRIX Values (2018) for the Inner Bay are Medium to Bad quality, while the Outer Bay and Foça and SEPA are High quality.	Water / Land use	Izmir Bay is characterised as being heavily polluted from nutrients and organic material, with increased levels of chemicals and heavy metals in the water and sediments. The pollution in Izmir Bay, particularly of nutrients, has given rise to harmful algal blooms (HAB), or red tides, of toxic dinoflagellate species, which causes fish mortalities and human food poisoning.	• Poor water quality of Izmir Bay • Pressure of coastal development on marine habitats • Road planning in natural coastal areas • Lack of corporate equipment and personnel • Low management capacity • A high demand for Seafood
		Transport	Marine transport activities through freight, passenger and commercial vessels in-parts pressure on marine ecology due to pollution.	
		Industry	Overfishing in the bay (increasing demand due to population growth and tourism). There is also evidence of illegal fishing and responsible fishing codes are not being adhered too The activities of Alsancak Port located within the Gulf are poorly monitored.	
Climate Risk and Adaptation	The mean annual temperatures are likely to increase by 1.7º by 2050 and 4.6º by 2100 with solar radiation increasing by	Water	Current water shortages are likely to become exacerbated by longer, hotter and drier periods. Conversely, increased intensity of winter rainfall is likely to overwhelm combined storm and wastewater networks resulting in surface flooding and sewer overflows.	• No consideration of climate projections for new infrastructure • No consideration of climate projections in land use planning

	4w/^{2} by 2050 and 9w/m^2 by 2100. Precipitation is likely to increase by 2mm in the period to 2050 but by 65mm by 2100. [8]	Industry	Izmir's food industry accounts for 11% of Turkey's food and beverages exports. The food sector is likely to be severely impacted by climate change.	• Minimal use of native plants for green spaces • Insufficient infrastructure for the separate collection stormwater and greywater • Minimal stormwater capture for irrigation • Sea level rise and coastal erosion
		Land use / Buildings	The urban heat island effect will make built up areas feel even hotter, increasing demand for air conditioning and associated energy demands, as well as posing increased risk for vulnerable populations.	
		Land use	The risk of forest fires is likely to increase. Informal settlements are more at risk of earthquake and landslip damage as less buildings adhere to building codes in these areas. Limited areas of green space and other adaptive measures.	

**The top six priority environmental challenges for each sector were determined by comparing the final score produced by the prioritisation activity. If more than one challenge had the same final score, then their ranking within the 'top six' was determined by the total City Ranking score applied by the technical committee*.*

[8] *A framework for Resilient Cities to Climate Change: Green Revision Guidebook (2019), The Climate Data Factory (2018)*

3.2.2 Existing Plans and Projects

IBB and affiliated institutions have developed a diversified set of plans and strategies. These plans include agreements and partnerships with international institutions. The reasoning behind the group of plans and projects compiled below (Table 6) is to combat climate change, to establish and maintain sustainable growth standards for the City, and to integrate nature-oriented solutions for the resilience and sustainable development of Izmir.

Table 6: Key existing plans and projects to incorporate within Izmir's GCAP.

Plan or project	Timeframe	Description	Relation to GCAP
EBRD & IFC Pilot Climate Change Adaptation Market Study – Turkey	**2013**	The study was prepared with the aim of understanding the needs of the Turkish private sector in order to improve climate resilience. It was funded jointly by EBRD and IFC and undertaken in collaboration with the Union of Chambers and Commodity Exchanges of Turkey (TOBB) and MoEnvU.	Identifies specific, market-based tools and steps to improve water efficiency and climate-smart solutions for buildings.
IBB Integrated Solid Waste Management Plan	**2018**	This plan has been prepared with the objective to ensure sustainable waste management in middle and long term as well as to establish an integrated system with an affordable cost.	GCAP to support strategy recommendations related to solid waste e.g. management of the waste produced within each district in line with the most appropriate disposal method.
Izmir Green Infrastructure Strategy	**2017**	This strategy document is prepared to integrate with and foster the environmental investments, sustainable transport infrastructure, new generation park and recreation areas, sustainable energy action plan, and climate change mitigation and adaptation actions pursued by IBB.	Provides baseline for GCAP in water management and green infrastructure.
A framework for Resilient Cities to Climate Change: Green Revision Guidebook	**2019**	The aim of this project is to create a resilient urban area in the context of climate change by using, enhancing and supporting the potential of green infrastructure throughout Izmir Province.	GCAP measures to consider the problem area identified through the strategy and reflect key actions proposed.
Izmir Metropolitan Municipality COVID-19 Resilience Action Plan	**June 2020**	This report gives an account of the measures and activities that IBB introduced as a result of the new working model "crisis municipalism". It consists of three main sections; including the preventative services that IBB has carried out in crisis situation, the works carried out currently within the scope of combating the pandemic and the monitoring and adaptation activities to be performed within the scope of recovery efforts in the aftermath of the pandemic.	GCAP measures to consider the parallels that can be drawn and the lessons learned from the COVID-19 response. They would also take advantage of the opportunity presented for a green and more resilient recovery.
Izmir Strategic Plan 2020 – 2024.	**2020-2024**	Izmir Metropolitan strategies are founded upon the historical heritage of Izmir with the city striving to strengthen the connections between the eastern and western communities. The main target behind the strategies is to integrate Izmir among the cities of the world, in coherence with the natural qualities of the city.	Priorities have been set both for the management of the IBB and for the development of the City. Environmental problems have been identified and prioritised and actions have been addressed.

Izmir Sustainable Energy Action Plan (SEAP 2016)	**2016-2020**	Prepared as part of Covenant of Mayors (CoM) agreement within European Commission (EC). The aim is to mitigate GHG emissions in Izmir by at least 20% until 2020 with internationally adopted procedures and standards.	Identifies actions related to green sustainable city including protection and expansion of green areas, which is important against climate and disaster risks. GCAP measures to consider the problem area identified through the plan and reflect key actions proposed.
Izmir Sustainable Energy and Climate Action Plan (SECAP)	**2020**	It has been prepared as part of the cities obligation in joining the Covenant of Mayors (CoM) and is funded by EU and supported by EBRD. The SECAP enables the collection and analysis of data in a structured and systematic manner for both climate change mitigation and adaptation, developing actions to help hit the CoM targets of; 40% emission reduction by 2030 against 2018 baseline, increase the cities resilience.	It has been aligned with the development of GCAP, together with Izmir's Strategic Plan Vision, enabling a greener future for Izmir.
Izmir Transportation Master Plan (UPI 2030)	**2015 - 2030**	This plan is a collection of long-term planning decisions and principles produced for the solution of current and expected problems in the future, by complying with the construction plans and giving priority to public transportation.	GCAP transport actions will consider the direction and priorities identified in the plan, such as improving the public transport system, decreasing private vehicles use, increasing the number of electrically powered vehicles, increasing commuting role of cycling.
IZSU Potable Water Master Plan (2017)	**2050**	The purpose of this document is to provide a comprehensive review of Izmir's potable water supply and distribution system and develop a structured program to identify system improvements necessary to meet existing and future demand conditions. This report has been incorporated within IZSU Strategic Plan 2015 – 2019 and 2020 – 2024.	Provides the baseline for the GCAP in terms of potable water management, laying out the footprint for future water management intensions in Izmir.
IZSU Strategic Plan	**2020-2024**	The vision of IZSU is to become an institution that prioritizes the aquatic ecosystem under the light of science and latest technologies, makes sure that water returns to the nature without harming the environment, leaves behind a livable environment that can pass the wealth of tomorrow through generations, and finally to become a pioneer institution that is integrated with Izmir.	GCAP to develop priority actions to improve the sustainability of Izmir, aligned with IBB Strategic Plan 2020 – 2024.
Küçük Menderes Flood Basin Management Plan	**2019**	This plan has been prepared to determine and evaluate the flood risks of the Küçük Menderes Basin and to reduce the negative impacts of floods on human health, environment, cultural heritage and economic activities.	GCAP to consider in relation to water supply, sanitation and drainage.
UPI Bicycle and Pedestrian Action Plan	**2017-2030**	The vision of the plan is to transform Izmir into a pioneer city focused on non-motorized transport. It includes actions to improve the bicycle utilization in the city for citizens and tourists, to establish central and safe pedestrian areas, and to decrease transport related GHG emissions.	GCAP transport actions will consider the direction and priorities identified in the plan, such as increasing commuting role of cycling.

Plan or Project: Historical Centrum Sustainable Logistics Plan	**2030**	Prepared to ensure effective sustainability is incorporated within the planning of logistical operations within Izmir. It strives to do this by preserving the historical-cultural heritage of the Historical Centrum of Izmir and its market identity.	GCAP will benefit from this plan in terms of reduction of carbon emissions and increasing pedestrian traffic and ensuring safe and comfortable pedestrian traffic.
Plan or Project: Izmir Sustainable Urban Logistics Plan	**2030**	This plan outlines sustainable solutions to resolve challenges identified within Izmir's Urban Logistics, specifically I n regard to the demand and capacity of transportation systems within the jurisdiction of IBB, to ensure co-ordination and efficiency across relevant stakeholders.	Prepared for ensuring the planning and sustainability of logistics operations by preserving the historical-cultural heritage of the Historical Centrum of Izmir and its market identity.
Urban GREENUP	**2017**	An EU-funded project within EU Horizon 2020 Programme, which aims at developing, applying and validating a methodology for Renaturing Urban Plans to mitigate the effects of climate change, improve air quality and water management and increase the sustainability of cities through innovative nature-based solutions. It is currently established in three runner cities, which are Izmir, Liverpool and Valladolid.	Provides baseline for GCAP in climate change, air quality, water management and green infrastructure.

3.2.3 Existing EBRD Investments[9]

i. Izmir Metro Project II, F.Altay to Narlidere (GCAP trigger project)

Funding provided: EUR 80 million loan to IBB

Approval Date: June 2018

Progress to date: 45% of construction complete (as of 30th April 2020)

Origin: Sub-project under EBRD's Green Cities Framework (GrCF)

Figure 5: Graphic of Izmir Metro Project II.

Description:

The Fahrettin Altay-Narlidere-Kaymakamlik metro line covers a total length of 7.2km, including underground station and electromechanical works. The project has enabled the City to extent its existing metro network work and promote low-carbon sustainable urban mobility in one of Turkey's most congested cities. Once completed it will improve connections between the eastern and western areas of the city and better integrate various existing transport systems.

EBRD has also supported Izmir with the acquisition of five vehicle ferries currently being operated by Izdeniz (Izmir Ferry Company) in 2013 and with 85 light rail train vehicles in 2014[10].

ii. Izmir Metro Project III, Buca to Üçyol (GCAP follow-up project)

Funding to be provided: EBRD is mandated to provide a EUR 80 million loan to IBB

Approval date: December 2019

Origin: A follow-on investment under EBRD's Green Cities Framework

Figure 6: Route map of Izmir Metro Project III.

Description:

The Buca to Üçyol metro extension will form a part of the third phase of the investment into Izmir's metro.

The line will start at Bozyaka and there will be 11 stations namely Bozyaka, Üçyol, Zafertepe, General Asim Gündüz, Şirinye, Buca Municipality, Kasaplar, Hasanağa Bahçesi, Dokuz Eylül University, Buca Koop and Çamlıkule. The Buca line will meet with second stage line along F. Altay-Bornova at Üçyol Station, with IZBAN line at Sirinyer Station.

This project will result in safer and more reliable transport services for ~350,000 passengers per day. The Project is expected to significantly reduce high traffic congestion and noise pollution. The new line, together with its integration to the existing network, will replace high-carbon modes such as private cars and minibuses that use fossil fuels achieving transport modal shift thereby reducing GHG and air pollutant emission from transport in Izmir.

[9] *Information for the projects has been provided by EBRD.*
[10] https://www.ebrd.com/work-with-us/projects/psd/izmir-metro-project.html

4. Actions for a Green Izmir

This section comprises of 47 actions that span 21 different "baskets", covering 9 different sectors. Of the 47 actions displayed, 28 of these have been broken down into detailed business cases, the remaining 19 are described at a high-level with the opportunity for IBB to develop at a later stage. Each action has also been aligned with an appropriate IBB Strategic Plan Objective 2020 – 2024 that articulate the municipality's specific aims for the coming years.

While actions for the GCAP have been developed collaboratively with IBB, EBRD and a range of stakeholders, as well as being in coordination with the IBB Strategic Plan and Izmir SECAP, they remain to be proposals only at this stage. **Although some can be implemented quickly, most will require additional detailed feasibility studies, funding or statutory approvals before implementation could commence.**

i. Types of actions

The actions included within the GCAP fall under the following categories:

- **Capital projects:** infrastructure investments that IBB will undertake either using municipal funds or with support from donor agencies.
- **Policy measures**: new legislation or policy enacted to drive more environmentally friendly activities.
- **Plans and strategies**: provide a more detailed roadmap for improving performance in a specific sector or area (e.g. a Climate Adaptation Plan).
- **Behavioural:** measures specifically seeking to shift behaviour of a cohort in a targeted direction (e.g. towards more public transport use). While policy measures may also have a behavioural component, actions in this category focus specifically on behaviour-change, such as awareness campaigns.
- **Training:** actions seeking to increase capacity through knowledge exchange.
- **Enforcement:** measures seeking to improve compliance with policies and regulations, typically through monitoring and potential penalties.

ii. Action I.D / Sectors

Each action produced for the GCAP were allocated an I.D. based on the sector that they address. For the GCAP actions, this is as follows (Table 7).

Table 7: Action I.D per sector for GCAP and SECAP actions.

GCAP Sectors	Abbreviation for I.D
Buildings	**B**
Energy Supply	**ES**
Industries	**I**
Land-use	**LU**
Solid Waste	**SW**
Transport	**T**
Water Cycle Management	**WCM**
Public Health	**PH**
Administrative Organisational Structure	**AOS**

The sector(s) within which the actions fall, have been highlighted within an **orange** box at the beginning of each basket. A full summary of all actions presented within the GCAP by Sector can be found in Appendix A.

The action I.D's were assigned when the initial long list of actions was developed and were retained throughout the prioritisation, merging and stakeholder engagement process. As a result, the actions I.D's presented in this final report are not numbered consecutively and may have two presented for the same action, with I.D's not having been re-organised post prioritisation for administrative purposes and to enable the tracking of actions through the prioritisation process if required.

iii. Business Case Development

Of the 47 actions presented, 28 have been selected for a business case to be developed. A business case provides more detailed information around the action, including (but not limited too); action owner, key stakeholders, steps for implementation and economic costing.

Where a business case has not been selected, a less detailed summary box has been produced. This provides; an action description, a prescriptive impact, action owner, timeframe and financing options.

iv. Environmental Value Logos

Each business case developed for an action includes a symbol that depicts the environmental values that have been positively affected. These are portrayed in Table 8 below.

Table 8: Legend for "Environmental Values" used in action business case development.

State indicators	GCAP sectors
Air quality	Buildings
Biodiversity	Energy supply
Climate risk and adaptation	Industries
GHG Emissions	Land use
Green spaces	Solid waste
Soil quality	Transport
Water quality/availability	Water cycle management
Marine Biology	

v. Priority Environmental Challenges and Impact Level of the Action

In order to understand the main driver behind the action, the priority environmental challenges (as detailed in section 3.3.1.) that each action addresses have been outlined. In addition to this, a scale of impact has also been applied to each action, which demonstrates the assumed level of impact that the action will have in addressing the priority environmental challenges (Table 9).

Table 9: Legend demonstrating impact ratings of actions against the priority.

Impact Rating	Description
High	CAPEX Investment
Medium / High	Feasibility Study that will lead to CAPEX investment.
Medium / Low	Strategy and Policy Development
Low	Awarenes raising

vi. Benefits Assessment

In order to provide a greater level of detail around the potential benefits that could be achieved by the actions, criteria were developed which outlines descriptions for the following benefit categories:

- **Health & Wellbeing:** This covers public health improvement from more active lifestyles, reduced pollution and workplace safety.
- **Social Inclusion:** This covers access to basic services, skills development, social equity and social fabric.
- **Economic Development:** This addresses economic growth, employment creation, economic efficiency, revenue saving / generation and avoided damages.
- **Environmental:** Focusing on reduced air, water and ground pollution and a reduction in GHG emissions, alongside the prevention and enhancement of ecological value and biodiversity within Izmir.

Each business case developed across the suite of actions provides reference to the criteria that is has the ability to directly influence. The full matrix of criteria for the benefits assessment can be found in Appendix D.

vii. Economic Costing

Indicative economic costing has only been calculated for the 28 actions that have been selected for business case development by IBB. Calculated in Euros, the relevant assumptions made for the cost ranges calculated can be found in Appendix F. The costs estimated cover the following aspects where applicable to each action:

- **CAPEX**: Capital expenditure
- **OPEX:** Operation expenditure
- **Design / Development:** Other costs such as scoping / feasibility study.

viii. Learning from others

Where possible, at the beginning of each basket, a case study from another city or country across the globe has been developed and summarised within a **green** box. These case studies aim to provide inspiration about the benefits that can be achieved when a city makes a strong commitment to action around environmental sustainability.

ix. Other

In each detailed business case provided, “risk and / or vulnerabilities addressed” and “expected reduction in emissions” have been outlined where possible. Both of these elements refer to Izmir’s SECAP 2020, where more detail can be found in the following appendices of the SECAP report:

- ‘Appendix E Risk & Vulnerability Assessment”: A list of all climate change risks and vulnerabilities identified for the province of Izmir, across the twelve sectors identified.
- “Appendix H Summary of Mitigation Actions”: A list of all mitigation actions, and the calculated emission reductions (tCO_2e) anticipated during implementation.

Basket 1: Accelerate transition to low emission vehicles

Transport: T1.1.3, T1.5

There is a need to increase and generalise the use of environmentally friendly and low emission vehicles due to the impacts that are being experienced from fossil fuel vehicles regarding rising GHG emissions and poor air quality.

As of the Izmir GHG emissions baseline calculated for 2018 in Izmir's SECAP report[11], the municipalities transport sector contributes to 23.1% (5,780,293 tCO_2e) of its total emissions. The biggest contributor to the transport sector emissions in Izmir is private vehicles, at 19.9% (Private cars, minibus, bus, truck, pickup and motorcycle). Most of the vehicles are old (over 13 years) and nearly all fossil fuel powered. Approximately 46% of vehicles are diesel powered which also contributes high volumes of other harmful emissions that reduce air quality. The actions in this basket specifically focus on stimulating a transition away from fossil-fuel vehicles towards low-emission alternatives such as electric, covering both private use and municipality bus fleet and service vehicles.

What is already being done?

As the use of vehicles in cities increases drastically, local and central governments as well as international unions, have been searching for and implementing prudential solutions in order to decrease the harmful emissions and decrease the effects of global warming caused by them. IBB has put into practice and is implementing the following Action Plans and Strategic Plans in order to address this challenge:

- Turkey launched a scheme through the government-supported venture for the first domestically produced electric car. Production is expected to begin in 2022,
- The share of electric and hybrid vehicles is a proportion of the total number of vehicles in Izmir increased by nearly 90% between 2015 to 2018, rising from 772 to 1,884,
- There are currently a total of 46 electric vehicle charging stations in Izmir operated by 4 private companies; Zorlu Energy solutions[12], Voltrun[13], Sharz[14], Eşarj[15] and 1 Municipality affiliated company, Izelman A.Ş. [16],
- ESHOT, a public transport bus company affiliated with IBB, purchased 20 electric buses in April 2017. These were introduced in 2017 as part of a Zero Emission Community Transportation Project, an award-winning scheme which is reported to be the first of its kind in Turkey. Charged in part using solar power, they demonstrate the first step towards electrifying the bus network for the province, with a commitment to purchase a further 380 e-buses by 2024,
- Izmir Clean Air Action Plan sets out a range of measures for the City to take to address the issues of high levels of fossil fuel transport and involves projects to generalize public transport, railway, subway and marine transport, encourage citizens to use public transport and increase vehicle emission inspection[17],
- Izmir Transportation Master Plan (UPI 2030) has set targets to increase the use of public transportation and non-motorized vehicles, while decreasing the use of private vehicles and shuttles. The transportation modal shares for 2030 is expected be 25.5% of private cars, 42% of public transportation (bus, tramline, metro, commuter rail and service cars), 31% of by foot and 1.5% of bicycle[18],

[11] *Izmir Sustainable Energy Climate Action Plan, Final Report 2020.*
[12] https://zes.net/sarj-noktalari.html
[13] https://www.voltrun.com/?gclid=EAIaIQobChMI5pGama2x6gIVht4YCh3GrgU9EAAYAiAAEgJarfD_BwE
[14] https://www.sharz.net/elektrikli-arac-sarj-sistemleri/?gclid=EAIaIQobChMI5pGama2x6gIVht4YCh3GrgU9EAAYASAAEgJEr_D_BwE
[15] https://esarj.com/harita
[16] https://www.izelman.com.tr/17/elektrikli-arac-sarj-istasyonlari
[17] *Izmir Clean Air Action Plan, 2016 -* https://webdosya.csb.gov.tr/db/izmir/editordosya/THEP(1).pdf
[18] *Izmir Transportation Master Plan (UPI 2030) Executive Summary* https://www.izmir.bel.tr/CKYuklenen/dokumanlar_2018/upi_sonuc_ozeti.pdf

- Izmir Sustainable Energy Action Plan (SEAP) has been prepared which includes significant actions towards energy efficiency measures on transport:

  - Purchasing 400 electrical buses for ESHOT bus fleet,
  - Replacing 25% of ESHOT bus fleet with new, fuel-efficient vehicles,
  - Making 25% of the municipal car fleet, electrical and hybrid cars.

Specific Strategic Plan Objectives of IBB

The following strategic objectives and goals have been selected from the IBB Strategic Plan 2020-2024 as the actions developed around low emission vehicles[19]. Strategic goal 2.4 includes "Installation of EV Charge stations" as one of the proposed activities and projects.

Table 10: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Quality of Life – Urban Transportation	**2.** Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options
Quality of Life – Accessible and Clean Energy	**2**. Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need to transition to low emission vehicles:

Table 11: Priority Environmental Challenges.

State Indicator	Priority Environmental Challenges
GHG Emissions	Reducing the Municipalities emissions as part of the city's commitment to a 40% reduction in emissions against the 2018 baseline by 2030.
Air Quality	Diesel vehicles constitute 46% of all cars within Izmir, with an increasing trend. The particulate emissions originating from diesel vehicles are transferred by either wind or water and are spread, polluting the soil. Electric and hybrid vehicles represent only 0.04% of total vehicles in Izmir

Actions

The Green City actions around transition to low-emission vehicles across the municipality are summarised below (Table 12). Detailed descriptions of each actions are presented where they were identified to be detailed by the municipality.

[19] *IBB Strategic Plan 2020-2024*

Table 12: Actions within basket 1.

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
T1.1.3	Promote a Step Change in the Uptake of Privately and Municipality Owned Low Emission Vehicles	Capital project	Proportion of diesel vehicles	Medium-high	**CAPEX:** A total of 50 rapid charging points = €17,000 A total of 50 slow charging points = €11,000
T1.5	Municipal Fleet and Service Vehicles: Electric Vehicle Purchase	Capital project	Municipal mitigation planning	High	**CAPEX:** €400,000,000 - €600,000,000 **OPEX:** €78,000 - €96,000 **Design / Development:** €64,000 - €80,000

Case Study, learning from other cities[20]

Clean Vehicles in Rotterdam

In 2012, Rotterdam embarked on a 12-month project to test the overall feasibility of electric vehicles, during which it monitored 75 electric vehicles and 129 charging points. This project assessed the performance of fully electric and plug-in hybrid vehicles, but it also focused on the efficiency of the whole chain of electric vehicle technological components, from distribution transformers to charging points. The tank-to-wheel results showed that the electric vehicles reduced direct CO_2 emissions by 67% and particulate emissions by up to 20%. In addition, Rotterdam, along with its different public and private partners, tested the feasibility of electric garbage trucks, buses, delivery vans and an electric car-sharing program

- **The expansion of its electric charging infrastructure***:* Municipality provides electrical charging infrastructure according to consumer demand. If an electric vehicle owner cannot have a charging station on their property, the city will install a public charging station within 250 meters of their home or business. Rotterdam Municipality also provides charging infrastructure in its public carparking facilities.
- **Revision of its municipal fleet, favoring electric vehicles***:* In 2014, the municipal fleet had 25% electric vehicles. The new challenge is to increase the whole municipal fleet to 50% clean vehicles by 2018.
- **Funding innovative projects to attract business/private sector interest in electro mobility and new charging technology***:* Rotterdam's current pilot projects include projects on smart charging, inductive charging, battery improvement, infrastructure improvement to increase the business case for charging facilities, and pilot projects on the feasibility of electrical buses and garbage trucks.
- **Creating Green Deals with urban logistics companies to encourage zero emission deliveries***:* Together with big frontrunner freight companies such as TNT and DHL, the city aims at zero emission goods delivery in the city by 2020.

IBB are striving to replace and expand their existing fleet with low-emission alternative, whilst encouraging a private uptake of EV's. This case study demonstrates successful approaches taken to both funding opportunities, pilot studies, infrastructure development and fleet technologies that are available

[20] *Compiled from: Paris Process on Mobility and Climate (PPMC) Article: http://www.ppmc-transport.org/rotterdams-commitment-to-electric-mobility/, Success Stories: Rotterdam City: https://evbox.com/en/success-stories/rotterdam-city, Clean Vehicle Procurement in Rotterdam Presentation by Rotterdam Climate Initiative: https://civitas.eu/sites/default/files/3b_national_framework_nl_messemaker.pdf*

T1.1.3: Promote a Step Change in the Uptake of Privately and Municipality Owned Low Emission Vehicles	
Strategic Plan Objectives	**2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options **2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Description	This action will help Izmir take advantage from being at the forefront of the transition to electrified mobility through measures to that support electric vehicle use including: • priority parking for electric vehicles; • the provision of new and smart electric vehicle (EV) charging infrastructure; • To promote and encourage commercial buildings to have EV charging stations, with business licences granted by IBB • Install EV charging stations for all municipal buildings and municipal parking area • Introduction of an all-electric / hybrid car club pool
Rationale	Emissions from fossil fuel degrade Izmir's air quality, which is significantly poorer in the city centre, and contribute to climate change. EV have several advantages, including lower emissions, noise and vibration levels. The environmental impact of fossil fuel vehicles is leading to stricter EU emissions standards leading to several major automotive producers have announcing they will stop working on diesel engines and concentrate on hybrid and electrical vehicle engines in the first half of the next decade. A local brand of e-vehicle is under development. Mass production will start in the next 3-5 years. Furthermore, EVs typically have lower the operating costs of the municipal fleet over time, with generally lower maintenance costs, and EVs will not be dependent on the volatile prices of oil Promoting hybrid and electric vehicles in the city is also one of the actions planned in Izmir Transportation Master Plan (2019). Supporting the uptake of EVs will help improve Izmir's environment and benefit from being at the forefront of the transition.
Steps for Implementation	**Priority parking and EV charging infrastructure:** 1. Undertake mapping of dedicated parking areas and street parking 2. Develop provision standards for EV charging sites (including catchment / distribution density, charging capacity (speed), type of charging connections. 3. Identify spaces within municipal buildings, municipal parking areas and streets which have beneficial positioning / access that can be reserved for EVs. 4. Re-paint parking spaces and add install new signage. 5. Work with GDZ Electricity for a feasibility study to evaluate grid capacity for installation of charging infrastructure. 6. Monitor and enforce correct use of parking spaces. 7. Work with EV charging operators to fund, install and operate charge points. These could be connected to other municipal infrastructure such as lighting columns. 8. Work with private parking operators to encourage their support of priority parking for EVs and installation of charging infrastructure. 9. Develop policies for EV parking and charging within new development 10. Stakeholder engagement consultations and public awareness campaigns for the use of EV's and Road Safety. 11. To promote and encourage commercial buildings to have EV charging stations through business licences granted by IBB. **Introduce EV / Hybrid vehicle car club :** 1. In conjunction with identifying EV priority parking, identify locations for positioning EVs to be used as part of a shared pool 'car club'. These could be specific locations on residential streets, or within development areas. 2. Set up carpool club sharing company or working with existing car club operators to provide EVs. 3. Promote benefits of scheme
Type of action	Capital projects
Environmental values positively affected	
Climate Change risks and / or	N/A

vulnerabilities addressed.		
Potential Emission Savings	It is assumed that 30 % of private cars will be switched to electric vehicles by 2030 335.686 tCO_2e in 2030	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Izelman A.Ş. Ministry of Transportation and Infrastructure GDZ Electricity NGOs District Municipalities Citizens Entrepreneurs, start-ups, EV retailors, car club operators Developers
	Financing options	Municipal budget, IFIs, private finance (charging companies, car companies etc), PPP, Ilbank,
	Revenue/savings opportunities	Electric vehicles will lower OPEX of the municipal fleet over time as EVs will not be dependent on the volatile prices of oil and generally have fewer associated maintenance costs. Air quality benefits may also lead to avoided healthcare costs.
	Timeline	2021 – 2030
Impact measures	• All air quality indicators • Concentration of heavy metals in soils (zinc, cadmium) • Annual CO_2 equivalent emissions per capita • Annual CO_2 emissions per unit of GDP • Average age of car fleet total and by type • Share of total passenger car fleet run by electric hybrid fuel cell Liquefied Petroleum Gas LPG and Compressed Natural Gas CNG energy total and by type • Number of private EVs • Number of charge points delivered	
Estimated cost	**CAPEX:** €17,000 for 50 rapid charging points. €11,000 for 50 slow charging points. **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** Public health – reduced pollution **Economic Development:** Increased economic efficiency; economic growth; employment creation, Revenue/savings generating activities **Social Inclusion:** Access to basic services **Environment:** reduced pollution, mitigation of GHG emissions. .	
Existing Work Leveraged:	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City	

T1.5: Municipal Fleet and Service Vehicles: Electric and Low-carbon Vehicles	
Strategic Plan Objectives	**2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options **2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Description	This action can be split into two parts, renewal of IBB's bus fleet by purchasing e-buses and the procurement of low carbon service vehicles. **a) E-Buses purchase:**

<table>
<tr><td></td><td colspan="2">IBB will continue and expand its efforts to replace old municipal buses and expand its existing capacity with e-buses. This action builds upon the ESHOT Strategic Plan, which has an expectation of approximately 400 e-buses to be purchased by 2024. Currently, 20 e buses have already been purchased from a local producer in 2017 at a cost of 400,000 EUR per bus, with a further 380 to be procured. After operating e-buses for 3 years, it has been observed by ESHOT that despite e-buses having a greater upfront cost of 250,000 EUR compared to diesel buses, they are 78% cheaper to fuel and 40% cheaper to maintain over the life cycle of the vehicle.
Taking into consideration the renewal of older vehicles and projections for future capacity needed, ESHOT have planned the need to replace 871 buses in 2020-2025 and 530 buses between 2025 – 2030, totalling a need for 1,401 new buses to be purchased by 2030. As the first step of this renewal process, ESHOT will purchase 304 diesel buses in 2021. The remaining 1097 buses will be purchased as e-buses between 2021 to 2030.
b) Service Vehicle procurement:
IBB currently tender the provision of service vehicles, which are predominantly made up of fossil-fuel based vehicles: petrol & diesel. According to IBB's Activity Report of 2018, IBB owns 120 passenger cars, 197 caryall trucks and cargo carrier vehicles, 9 land vehicles and 553 special purpose vehicles. In addition, IBB rented 235 vehicles (Passenger and van), 1.801 minibuses and buses, 12 construction vehicles and 12 water tankers. This action aims to revise IBB's current procurement policy to encourage the provision of electric or low-carbon alternative vehicle types.</td></tr>
<tr><td>Rationale</td><td colspan="2">53% of public transport is delivered through buses. Most of these are diesel fuelled, with relatively high operating cost, risks of oil price volatility and environmental concerns[21]. The EU has set ambitious targets to reduce the number of fossil fuel vehicles should be reduced by 50% by 2030, and by 2050 all fossil fuel vehicles should be eliminated.

The City has already purchased 20 electric buses. However, most of IBB's fleet is old, inefficient and comfort for passengers can be improved. A comprehensive upgrade programme will be a key driver of modal shift, resulting in improved air quality, reduced noise levels and improved comfort.</td></tr>
<tr><td>Steps for Implementation</td><td colspan="2">E-Bus purchase:
1. Establish annual targets for fleet replacement.
2. Engage with funders to determine finance options.
3. Identify new sites for charging buses and service vehicles, taking into consideration the space requirements, charging rates and grid capacity. This could include dedicated charging sites for many buses or en-route charging.
4. Prepare feasibility studies for PV for clean energy production to reduce emissions further.
Service Vehicles procurement:
1. Establish the timeframe for service vehicle renewal / replacement.
2. Revise existing service vehicle procurement policy to reflect the desire for electric or low-carbon vehicles.
3. Prepare the procurement documents and release the invitation for tender.</td></tr>
<tr><td>Type of action</td><td colspan="2">Capital project</td></tr>
<tr><td>Environmental values positively affected</td><td colspan="2">  </td></tr>
<tr><td>Climate Change risks and / or vulnerabilities addressed</td><td colspan="2">N/A</td></tr>
<tr><td>Potential Emission Savings</td><td colspan="2">55% of emission reduction targeted in 80% of all vehicle fleet
127.494 CO_{2e} savings in 2030</td></tr>
<tr><td rowspan="2">Plan for delivery</td><td>Action owner</td><td>ESHOT</td></tr>
<tr><td>Stakeholders</td><td>IBB</td></tr>
</table>

[21] *Transportation Plan of Izmir 2030, page 166*

	Financing options	Municipal budget, IFIs, Ilbank, PPP, private operators
	Revenue/savings opportunities	After initial outlay, the operating costs of electric vehicles will be lower than for the existing fleet. It will be possible to save EUR 14,500 from fuel cost and EUR 3,900 from maintenance cost for one bus per year. Increased revenue may also be generated through higher public transport patronage. Air quality benefits may also lead to avoided healthcare costs.
	Timeline	2021 – 2030
Impact measures	• Proportion of fleet that is electrified • Public transport CO_2 emissions • Number of EV passengers • Total number of EVs in fleet	
Estimated cost	**CAPEX:** €400,000,000 - €600,000,000 **OPEX:** €78,000 - €98,000 **Design/development costs:** €64,000 - €80,000	
Estimated benefits	**Health impacts:** Public health – reduced pollution **Economic Development:** Increased economic efficiency; economic growth; employment creation, Revenue/savings generating activities **Social Inclusion:** Access to basic services **Environment:** reduced pollution, mitigation of GHG emissions.	
Existing Work Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	Not Spatially Dependent	

Basket 2: Develop more sustainable mobility options

Transport: T1.7

The transportation sector represents the second largest source of emissions for Izmir, at around 23% of the total inventory. Public transport and walking are the primary modes of travel in Izmir, representing 38.8% and 35% of total journeys, respectively. However, the modal share of private cars (currently accounting for around 28% of trips) is expected to increase unless necessary policy interventions and infrastructure investments are made.

There is also a high level of congestions during peak travel hours in Izmir, as evidenced by slow travel speeds at peak times throughout the province. This means that cars are idling on the road for longer periods of time and emitting GHG emissions as a result. Emissions associated with private vehicle uses are also exacerbated by the average age of vehicles, which in Izmir is relatively high at 13 years old. This is because older vehicles tend to be less efficient and emit more CO_2 than newer models[22].

This basket aims to increase the mix sustainable, environmentally friendly mobility options, whether they be mass transit or local mobility.

What is already being done?

Transportation is considered a high priority sector for Turkey. At a national level, Development Plans, Strategy Documents, Action Plans, National Laws and Regulations have set the guidelines and future projections for transport as a whole and further specifically on energy efficient transport systems. On the municipal level, IBB has also prepared following plans and taken actions that set the framework on a sustainable, affordable and an energy efficient public transport system, as well as increasing the awareness and contribution of the citizens to it. The related actions and documents are as follows:

- Izmir Transport Master Plan for 2030 (UPI 2030) has been prepared by the IBB Transportation Department and was published in 2017. It sets out many actions to help improve the transport infrastructure including the extension of the Izmir Metro system supported by EBRD,
- IBB and Turkish State Railway (TCDD) have constructed 177km public transport rail systems (metro line, tramline and suburban line-IZBAN) as of 2019. Currently, 7.2km long of metro line between Fahrettin Altay and Narlıdere is under construction and planned to be completed in 2021. According to the UPI 2030, 664km of railway systems are planned to be in operation by 2030,
- A car park network and steps for integration with the current transportation network have been suggested within UPI 2030 for park-and-ride systems,
- As of 2020, Izmir was home to 67km of cycle roads, helping facilitate sustainable inner-city transportation. A further 40km of segregated cycle roads was developed in 2020, in accordance with the 2019 Regulation on Cycle Roads, bringing the total up to 107km within the province. The UPI 2030 set out to increase this to 402km by 2030,
- The UPI 2030 sets targets that 145 km length of street pedestrianization will be implemented in some of the districts such as Narlıdere, Balçova, Konak, Bornova, Buca, Karşıyaka, Çiğli,
- As of 2020, IZELMAN Directorate of Izmir Metropolitan Municipality started providing shared car services with 200 vehicles.[23] Shared electric scooter service “Martı” has been established in Izmir, along with 8

[22] *Xiao, C, Chang, M, Guo, P, Chen Q, Tian X. (2019). Comparison of the cost-effectiveness of eliminating high-polluting old vehicles and imposing driving restrictions to reduce vehicles emission in Beijing. Transportation Research Part D: Transport and Environment. Volume 67. Pg. 291-302.* https://doi.org/10.1016/j.trd.2018.10.006

[23] *News, Izmir Metropolitan Municipality,* https://www.izmir.bel.tr/tr/Haberler/izmir-de-paylasimli-arac-kullanimi-icin-ilk-adim-atildi/41339/156

other cities in Turkey. There are also two different Bike Sharing Programs in Izmir namely BİSİM and KARBİS with over 500 bicycles,[24 & 25]

- Izmir Clean Air Action Plan sets out a range of measures for the City to take to address the issues of high levels of fossil fuel transport and significant industrial processes,
- Izmir Clean Air Action Plan has been prepared by the Provincial Directorate of Environment and Urbanization of the MoEnvU in order to improve air quality through projects, awareness, advocacy and providing locally specific guidance in coordination with IBB. It proposes to improve the availability of public transport, railway and subway networks, put emphasis on maritime transportation and increase its use, encourage the use of public transport,[26]
- Izmir Sustainable Energy Action Plan (SEAP) has been prepared which includes significant actions towards energy efficiency measures on transport:
  - Improving total efficiency of the public transport through integration of rail system and other systems,
  - Rapid train connection and integration with public transport,
  - Increasing rate of cycling by 2% in commuting,
  - Increasing pedestrian travels by 5% in commuting,
- EBRD has a played an important role in delivering the UPI 2030 to date, by co-financing the modernisation of the commuter ferries and improving the traffic control systems in 2013 and procuring 85 metro vehicles in 2014. The EBRD is now supporting the extension of the metro by a further 7.2 km through an EUR80m loan agreement with the City.

Specific Strategic Plan Objectives of IBB

The following strategic objectives and goals have been selected from the IBB Strategic Plan 2020-2024 for the actions developed around sustainable urban mobility options:[27]

Table 13: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Quality of Life – Public Transport	**2**. Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.1** Public Transport Will Be Affordable, Energy Efficient, Fair, Comfortable, Available to and Accessible for all residents
Quality of Life – Urban Transportation	**2.**Making Izmir a Smart City with A high Level of Quality of Life and A Well-Developed Transport Network	**2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges have been identified as exacerbating the need to promote more sustainable modes of mobility in Izmir:

[24] *Conference Paper, "Türkiye'de Bisiklet Paylaşım Programları"* https://www.researchgate.net/publication/329143871 *Turkiye'deki_Bisiklet_Paylasim_Programlari*
[25] https://www.bisikletizm.com/bike-sharing-bisiklet-paylasim-sistemleri/
[26] *Izmir Clean Air Action Plan 2016*: https://webdosya.csb.gov.tr/db/izmir/editordosya/THEP(1).pdf
[27] *IBB Strategic Plan 2020-2024*

Table 14: Priority Environmental Challenges.

State Indicator	Priority Environmental Challenges
GHG Emission	There is a growing trajectory of private vehicle ownership of 6% per year, increasing the modal share of private cars (which is currently at 28% of trips).
GHG Emissions	The use of low-carbon mobility options such as bicycles is very low. Anecdotal evidence indicates that, although there are several cycle routes suitable for sightseeing, it is not easy to commute by bicycle.
GHG Emissions	There is a high level of congestion during peak travel hours, as evidenced by the slow travel speeds at peak times. This means cars are idling on the road for longer periods and emitting GHG as a result. The issue is likely to be exacerbated by the increasing use of private vehicles.

Actions

The Green City action around more sustainable mobility options across the municipality is summarised below (Table 15). A detailed description of this action is also presented.

Table 15: Action within basket 2.

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
T1.7	More sustainable urban mobility: mass transit and local mobility.	Capital project	Minimal but emerging diversity in public transport options.	High	**CAPEX:** - Pedestrianisation €172,405,000 for 145km - Cycling: €69,498,000 for 351km

Case Study, learning from other cities[28]

The City of Copenhagen's Bicycle Strategy

Copenhagen has set itself the goal of becoming 'the world's best bicycle city by 2025'. Achieving this goal is also viewed as integral to the city's health plan, to the environmental goal of making the city CO_2 neutral by 2025, and to enhancing the liveability of the city. Copenhagen's plan for achieving a greater modal share for bicycles includes increasing the capacity of the cycle tracks to the city centre, in order to accommodate an additional 60,000 cyclists by 2025. From 2010 to 2014, the City of Copenhagen allocated a total 80 million euros to the implementation of its bicycle strategies and infrastructure. The major spend came in both 2012, with €25 million, and in 2014, with €30 million.

Planning and Infrastructure:

There have been two main dimensions of implementation for Copenhagen's Bicycle Strategy: planning and infrastructure. Planning is now an integrated feature of urban development and urban governance in Copenhagen. Between 2002 and current day, the city has developed 4 separate cycle-based policies, plans and strategies. The Copenhagen Bicycle Strategy (2011-2025) is one of these. Of the key goals of this strategy is to increase the number of daily bicycle trips in Copenhagen to 240,000 by 2025, from a baseline of 110,000 in 1970 and 150,000 in 2015. Others include the Priority Plan, which addresses implementation; and the Transport and Environment Plan which deals with questions of funding for bicycle infrastructure.

In terms of infrastructure implementation, this includes:

- The construction of a network of dedicated bike paths that are segregated from both pedestrians and vehicle traffic,
- Dedicated bicycle traffic lights that allow for cyclists to leave intersections before cars,
- Separately coloured bike paths where cars and bikes share road space.

Currently, cycling forms a minor proportion of Izmir's total transportation modal share, in-part this is due to a lack of dedicated cycling infrastructure. This case study demonstrates a best practice example of the planning, strategy, policy and investment in order to develop cycling infrastructure that helps promote greater modal share of bicycles.

T1.7: More sustainable urban mobility: mass transit and local mobility.	
Strategic Plan Objectives	**2.1** Public Transport Will Be Affordable, Energy Efficient, Fair, Comfortable, Available to and Accessible for all residents **2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options
Description	Develop and enhance the Municipalities urban mobility to enable the implementation of more diverse modes of low carbon transportation alternatives whilst reducing traffic congestions, by: <u>Mass transit schemes</u> By 2030, the rail system network will total 664.1km including tramway, metro and IZBAN line • It is targeted to complete 312.1km rail system network. The line between F. Altay and Narlıdere will be finalized in 2021. Buca metro line has been planned and will be finalized by 2025. The tram line to Çigli is planned to be finalized in 2021. • Expanding the existing metro lines with Buca metro project which includes the construction of 13.3km metro line and 11 underground stations • Introduce more park-and-ride systems in-line with the transportation master plan. Park-and-ride systems are located in 8 main transportation hubs, 21 transportation hubs and 23 transfer points totalling 52 points. • Additional 8 ferry and passenger ships will be purchased. • Implementation of park-and-ride systems to integrate private car using with public transportation system <u>Local mobility schemes</u> • Assess feasibility of scaling up existing local mobility options E.g. scooter schemes and share-bike incentives.

[28] *Urban Sustainability Exchange, The City of Copenhagen's Bicycle Strategy Case Study,* https://use.metropolis.org/case-studies/cycling-in-copenhagen

	• Pedestrianisation of central city streets. 145 km length of street pedestrianization will be implemented in some of the districts such as Narlıdere, Balçova, Konak, Bornova, Buca, Karşıyaka, Çiğli until 2030 • Improve and expand the cycling infrastructure e.g. cycle lanes. The length of cycling route will be increased from 67km to 402km until 2030.	
Rationale	As Izmir has grown, so has the number of private vehicles on the roads from 477,773 in 2008 to 765,657 in 2018. This has led to reduced air quality and congestions. This action will help reduce dependence of fossil fuel private vehicles by offering a range of local and longer distance, low carbon, mobility options. Damage and disruption to transport infrastructure is also a key factor in amplifying the impact of a climate related event, especially in densely populated cities such as Izmir. By diversifying and improving the transport infrastructure within the City it will create an overarching transport infrastructure that can provide more effective protection and support recovery	
Steps for Implementation	<u>Mass-transit schemes</u> In line with the Transportation Master Plan of Izmir 2030, this action is already being progressed including: 1. Procurement of construction works of Buca metro 2. Construction of metro line including civil and E&M works 3. Procurement of metro vehicles 4. Handing over to Izmir Metro AŞ for operation 5. Development plans to be updated considering planned main transportations hubs, transportation hubs, transfer points and P&R locations 6. Metro station designs to take into account planned P&R areas 7. Construction and operation of park-and-ride systems <u>Local mobility schemes</u> 1. Feasibility studies to be prepared for scaling up existing scooter schemes and share-bike incentives. 2. Development plans to be updated considering planned pedestrianization projects 3. Preparation of hardscaping and landscaping design of pedestrianization projects 4. Construction of pedestrianization projects 5. Development plans to be updated considering planned cycling routes 6. Preparation of cycling infrastructure design 7. Construction of cycling infrastructure 8. Undertake and implement awareness raising campaigns on road safety.	
Type of action	Capital project	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM4	
Potential Emission Savings	**Mass transit schemes**: 805.216 tCO_2e reduction in 2030. 12% reduction targeted of all transportation except logistic emissions and additional 5% for intercity speed train investments. **Local mobility schemes:** 410.473 tCO_2e reduction in 2030. 5% reduction targeted for cycling and 5% for pedestrian of all transportation except logistic emissions	
Plan for delivery	**Action owner**	• IBB:
	Stakeholders	• ESHOT • IZBAN • Izmir Metro AŞ • TCDD • 2nd Regional Directorate of Highways. • Professional chambers • District municipalities • Headman's and Citizens
	Financing options	Municipal budget, IFIs, Ilbank, PPP, private operators
	Revenue/savings opportunities	Greater uptake of public transportation will result in higher revenues for the city.

	Timeline	2021 - 2030
Impact measures	• All air quality indicators • Concentration of heavy metals in soils (zinc, cadmium) • Annual CO_2 equivalent emissions per capita • Annual CO_2 emissions per unit of GDP • Transport modal share in total trips (Public Transport) • Transport modal share in total trips (Walking) • Transport modal share in total trips (Bicycle) • Kilometres of road dedicated exclusively to public transit per 100,000 population • Kilometres bicycle path per 100,000 population • Share of population having access to public transport within 15 min by foot • Interruption of public transport systems in case of disaster • Efficiency of transport emergency systems in case of disaster	
Estimated cost	**CAPEX: -** Pedestrianisation: €172,405,000 for 145km of 15m width pavement. - Cycling Infrastructure: €69,498,000 for 351km 5m wide infrastructure. **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** Public health – more active lifestyles and reduced pollution. Public safety - particularly for more vulnerable people such as children and elderly **Economic Development:** Increased economic efficiency; economic growth; employment creation; avoided damages **Social Inclusion:** Access to basic services; social equity **Environment:** reduced pollution, mitigation of GHG emissions.	
Existing Work Leveraged:	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

Basket 3: Develop a more sustainable logistics sector

Industries: I.B

Izmir is an important logistical centre for Turkey, with a strong network of airways, motorways, railways and marine routes. The Port of Izmir is particularly important as it has a central location between Western Europe and North Africa. Logistics can, however, have sever impacts on the environment, both directly from creating routes and dredging deep sea channels to more indirect greenhouse gas emissions. Izmir Bay is characterised as being heavily polluted from nutrients and organic material, with increased levels of chemicals and heavy metals in the water and sediments. Marine transport activities through freight, passenger and commercial vessels in-parts pressure on marine biology due to pollution while the activities of Alsancak Port located within the Gulf are poorly monitored. This basket of actions seeks to reduce the environmental impact of logistics while protecting it as a key economic sector for the city.

What is already being done?

Logistics practices in Izmir are continuously improving. The city is increasing the capacity of its piers and docks, which result in increased imports and exports. This active and strong status of logistics in Izmir has resulting in multiple projects that have been undertaken or are currently underway, alongside the development of strategies to be adopted. Existing actions and strategies are as follows:

- The Green Port / Eco Port project in Turkey fulfils Green port implementation programmes. Any sea port that meets the following certification requirements can voluntarily apply to the Ministry of Transport, Maritime Affairs and Communications in order to be certified as a Green Port[29] The certification requirements include: TS EN ISO 9001 “Quality Management System”, TS EN ISO 14001 “Environmental Management System” and OHSAS 18001 “Occupational Health and Safety Management System”,
- IBB has prepared the Sustainable Urban Logistics Plan of Izmir (LOPI) that covers 30 districts and 1,285 neighbourhoods through the municipality[30], with the aim of ensuring that passenger and freight transport in the city to be carried out with respect to European standards and scientific criteria,
- Plans have been prepared to increase the container capacity of Izmir Port and dredge the channel in order to allow larger ships to berth. Furthermore, work to increase the capacity of the passenger port to accommodate more ships will make Izmir Port the largest cruise port in the Mediterranean,
- As part of “the Gulf and Port of Izmir Rehabilitation Project”, monitoring studies and meteo-oceanographic observations are regularly carried out around estuaries and inland, along with other efforts to improve the water quality,
- İZKA has prepared the Izmir Regional Plan 2014-2023. One of the objectives is to protect the sensitive ecosystems and biodiversity in Karaburun Peninsula and implement an integrated sea and coastal strip management,
- İZKA has developed the Peninsula Sustainable Development Strategy, in which the “Clean Coast – Clean Sea” objective is defined, further encouraging the constitution of coastal logistics centres and coastal fishing in appropriate locations. Another objective is to protect the Mediterranean monk seal and Audouin’s gull living in their natural habitat in the peninsula, which are under risk due to high human action in the region[31],

[29] *Akgul, B 2017, Green Port / Eco Port Project, Applications and Procedures in Turkey*
[30] https://www.izmirlojistikplan.com/
[31] *İzmir Development Agency (İZKA) Peninsula Sustainable Development Strategy, http://www.izka.org.tr/sites/default/files/2019-12/14_yarimada_kalkinma_stratejisi.pdf*

- İZKA has established a work program in two prospective development themes. These are Blue and Green Growth. Blue Growth actions aim to promote Izmir as the Mediterranean centre of attraction with the sustainable growth of the city based coastal activities. It focuses on the coastal economy, development and sustainable growth in the port sector and related sectors. The Outcome-Based Maritime Economy Program (DESOP)[32] has been developed in line with Blue Growth, with the following objectives:
    - Enhancing the marine and coastal economy focusing on Blue Growth principles, and;
    - Improving the maritime transportation and port services in Izmir

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from the IBB Strategic Plan 2020-2024 as the actions developed around sustainable logistical practices:[33]

Table 16: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Nature – Sea and Coasts	**5**. Making İzmir one of the Model Cities of the World in terms of living with Nature	**5.3** Izmir Bay and All Coasts and Seas will be Protected and will be Used Sustainably
Quality of Life	**2.** Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. This Priority Environmental Challenge has been identified as exacerbating the need to further address the development of more sustainable logistical practices within Izmir:

Table 17: Priority Environmental Challenges.

State Indicator	Priority Environmental Challenge
Green Space, Biodiversity	There is a growing pressure of coastal developments which impart unintended environmental consequences on marine biology, with the construction of ports facilities.

Action

The Green City action around more sustainable logistical practices across the municipality is summarised below (Table 18). A detailed description of this action is also presented.

[32] *Izmir Development Agency (İZKA) – DESOP 2020, http://www.izka.org.tr/sites/default/files/2020-02/2020_calisma_programi_mavi_buyume.pdf*
[33] *IBB Strategic Plan 2020-2024*

Table 18: Action within basket 3.

Action I.D	Action Headline	Action Type	Priority Challenge	Level of Impact of the Action	Indicative Cost
I.B	Develop more sustainable logistical practices	Plan / Strategy	Pressure of coastal development on marine habitats	Medium - Low	**Design / Development:** €8,000 - €20,000

Case Study, learning from other cities[34]

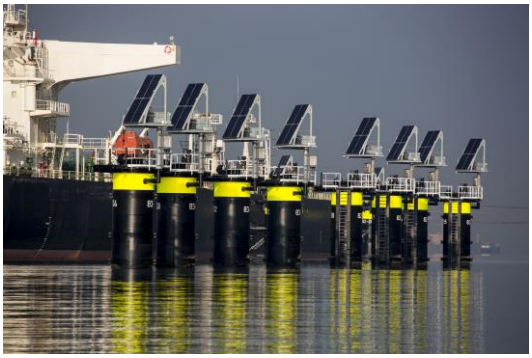
Port of Rotterdam (PoR)

The Port of Rotterdam is the busiest seaport in Europe with annual throughput of more than 421 million tonnes of goods. Rotterdam is recognized as a European leader for cleaner technologies and efficient port practices. PoR is guided by its *Port Vision 2030* prepared along with clients, government departments, knowledge institutes and societal organisations. From a sustainability perspective, Port Vision 2030 envisages that by 2030 POR will have the smallest ecological footprint in the world, achieved by sustainable transportation modes, clean fuels and efficient logistics chains. PoR has addressed environmental management through its corporate social responsibility program that is an integral component of its Business Plan 2006-2010, which was refined further in 2007 making sustainability a priority goal. PoR believes that a healthy environment offers competitive advantages.

With growing trade volumes, PoR is expanding the port area by a land reclamation project called *Maasvlakte 2*, which increases port size by 20%. *Maasvlakte 2* will promote sustainability by clustering businesses, whereby companies that can benefit from each other's residual products and residual heat are all within easy reach, making technologies such as district heating economically feasible. Secondly, wind turbines will be installed on all the solid sea defences to generate renewable energy.

Port Vision 2020 and *2030* have endorsed numerous strategies to reduce air pollution. PoR is contemplating using natural gas for barges between port and inland destinations. It is also developing a sustainability-shipping index to create financial incentives, such as lower fees for clean ships that comply with the index. PoR installed shore-based electricity facilities for inland shipping in 2007.

With Izmir being one of the most important logistical hubs in Turkey with extensive port operations that are having unintended environmental consequences, this case study can be seen as a best practice example for minimising Izmir's logistical footprint, whilst also providing opportunity to the surrounding communities.



I.B: Develop more sustainable logistical practices	
Strategic Plan Objectives	**5.3** Izmir Bay and All The Coastal and Marine Areas Will Be Protected and Used Sustainably **2.2** A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options
Description	A baseline study will be undertaken with a view of informing policy development around the uptake of more sustainable practices and the adoption of environmental and cultural factors in port operations (international and national logistics) and the development of coastal structures. The basic aims of this these studies will focus on: • An understanding of current port infrastructure, assets and management structure / protocols.

[34] *Excerpt taken from article: Sustainable Development in the Maritime Industry: A Multi-Case Study of Seaports, Hiranandani, 2014. (Inline citations were omitted) source: https://www.rrojasdatabank.info/Hiranandani.pdf.*

	• Identify operation and smart-infrastructure improvements that can be made that improve the emissions and reduce the environmental impacts associated with port operations, enhancing their sustainability practices. Opportunities to leverage the knowledge and best practice in regard to efficient/green operations will be sought through operational and management PPP options.	
Rationale	Izmir's geographical position caused the development of sea transportation and the city is a big hub for industry. Alsancak port located at centre, Çeşme, Dikili, Seferihisar ports providing international connections via shipping, Aliağa port which is an industrial area with petrol transport and Alaybey shipyard where the military facilities are located. These ports play an integral role in city's transportation links, by helping create more sustainable logistical operations in the port, it will positively influence both national and international transportation from these facilities in regard to their environmental impacts, use of natural resources and greenhouse gas emissions produced.	
Steps for Implementation	For the baseline studies: • Develop the scope and specification of the study, working with appropriate stakeholders. • Identify and secure the necessary funding • Procure a contractor to carry out the study.	
Type of action	Plan / Strategy	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	Emissions of ports are not calculated separately from the city emissions; savings are not foreseen for port operations	
Plan for delivery	**Action owner**	IBB
	Stakeholders	MoTI MoEnvU General Directorate of Maritime Affairs Professional Chambers District Municipalities Marine and Heavy Vehicle Logistic Sector Representatives International Ship Companies IZDENIZ
	Financing options	Municipal budget, Ilbank, O&M PPP, private sector
	Revenue/savings opportunities	Savings opportunities will come from reduced energy costs, decreased pressure on energy networks and public health benefits
	Timeline	2021 – 2030.
Impact measures	• All air quality indicators • Concentration of heavy metals in soils (zinc, cadmium) • Annual CO_2 equivalent emissions per capita • Annual CO_2 emissions per unit of GDP • Water Quality: Eutrophication • Sediment Quality • WFD Assessment: Seagrass	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €8,000 - €20,000	

Estimated benefits	**Health impacts:** Public health – reduced pollution. **Economic Development:** Increased economic efficiency; economic growth; employment creation **Social Inclusion:** Access to basic services **Environment:** reduced pollution, mitigation of GHG emissions.
Existing Work Leveraged:	N/A
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay

Basket 4: Commit to net zero energy and end the use of single use plastics in municipality buildings and encourage other organisations, business and institutions and follow IBB's leadership

Buildings: B1.6
Solid Waste: SW1.10

It is important that despite an increasing population and strong economy we decouple growth from natural resource consumption. Through this basket of actions, IBB will encourage our community of businesses and institutions to commit to joining us in reducing their environmental footprint.

The 2018 baseline emissions inventory outlined in Izmir's SECAP, demonstrates that Municipality Buildings / Sites produce a total of 181,289 tCO_2e from consuming a total of 403,894 MWh of energy, contributing 0.7% of the province's total emissions. When adding this to the emissions associated to province's tertiary and residential buildings, this contributes to 23.5% of total emissions.

This action recognises that as the Municipality, IBB have a limited remit over the emission reduction targets as well as actions taken to combat these emissions within certain sectors throughout the province, such a tertiary, residential and industrial buildings. The purpose of this action is therefore not to just reduce the emissions of IBB's property portfolio, but also to take a leadership role in helping business and industry leaders, alongside Izmir residents, to reduce the remaining 22.8% of emissions from buildings.

What is already being done?

- Turkey has adopted a strategy, which promotes a zero-waste management approach, efficient use of natural resources, landfill reduction, and increased recycling. Legislation introducing a ban on the free distribution of lightweight plastic bags came into force in January 2019 and attracted substantial public interest,

- In 2015 IBB became a party to the CoM, established under the European Commission, whose main objective is to promote and support the use of renewable and clean energy resources for a world that is fighting carbon dioxide gas and fighting global warming,

- IBB has prepared a SECAP in coordination with this GCAP, updating the current SEAP emissions inventory undertaken in 2016, to sets a target of achieving a 40% reduction of greenhouse gas emission by 2030 against the 2018 baseline. The SECAP 2030 sets out actions including, but not limited to:
    - Creating an inventory of high energy use buildings or sectors and promoting energy efficiency measures in these areas,
    - Conducting studies on energy consumption and providing information about reducing greenhouse gas emissions to local and neighbourhood organisations,
    - Ensuring that public institutions, especially municipalities, develop relevant databases and adopt greenhouse gas reduction measures,
    - Energy efficient renovations in existing municipal buildings (heat isolation + lightening),

- IBB signed a protocol in October 2019 to join the "Plastic Waste-Free Cities Network" of the Worldwide Fund for Nature (WWF) within the scope of plastic pollution prevention works[35],

- According to the Zero Waste Regulation, District Municipalities of Izmir are required to start implementing a Zero Waste management System by 31 December 2020.

[35] https://www.izmir.bel.tr/tr/Haberler/izmir-plastik-atiklari-azaltmak-icin-ilk-adimi-atti/40950/156

Specific Strategic Plan Objectives of IBB

IBB's new Strategic Plan includes targets to increase clean energy uptake and raise municipal and public awareness on the importance of clean energy. The plan also outlines objectives to establish a region where low emission measurements will be designed every year between 2020 – 2024.

The following strategic objectives have been selected from the IBB Strategic Plan 2020-2024 as the actions developed around increasing the inclusive approach of the municipality towards climate change and encouraging its stakeholders to mitigate the effects of climate change and implement sustainable practices:[36]

Table 19: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Nature – Climate Action	**5.** Making İzmir one of the Model Cities of the World in terms of living with Nature	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Learning by Experiencing – Institutional Capacity – Enterprise Resource Management	**6**. Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges that drive the need for further commitments by IBB are:

Table 20: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
GHG Emissions	The IBB has limited control of the building sector, with building licences and building occupancy permits given by district municipalities.
GHG emissions	The age and current state of the building stock is an important reference point in developing targets for emission reduction, however there is limited data on this subject.
Soil Quality	There is no separate collection and appropriate recycling of waste prior to disposal in landfills in Izmir. In order to comply with EU requirements, all the MSW (municipal solid waste) should be treated or recycled instead of going directly to landfill, and only the waste that cannot be recycled should go to landfill.

Actions

The Green City actions around IBB making commitments are summarised below (

[36] *IBB Strategic Plan 2020-2024*

Table 21) Detailed descriptions of each actions are presented where they were identified to be detailed by the municipality.

Table 21: Action within basket 4

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
B1.6	Municipality to commit to net zero energy in all new municipality-controlled buildings by 2030.	Plan / Strategy	Absence of control over building efficiency standards.	Medium - High	**Design / Development** €21, 000 to €31, 000
SW1.10	Municipality to commit to banning the use of single-use plastics within their buildings and operations, encouraging local businesses to do the same.	Plan/Strategy leading to Capital Investment	Lack of solid waste separation.	Medium - High	**OPEX:** €600 - €800 **Design / Development** €15,000 - €20,000

B1.6: Municipality to commit to net zero energy in all new municipality-controlled buildings by 2030.	
Strategic Plan Objectives	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Description	In order to adapt to climate change and its impacts, IBB will commit to net zero in all new municipality-controlled buildings and encourage other organisations, businesses and institutions to do the same.
Rationale	Rising national energy dependency on foreign fuels and market prices volatiles are a big challenge facing the world. IBB would like to showcase some of the projects within the urban transformation programme by delivering net zero buildings and thus also developing financial and technical feasibilities for similar projects to copy and to study the possibilities and feasibility of delivering net zero buildings in the city of Izmir. The EU Energy Performance of Buildings Directive (consolidated version) requires all new buildings to be nearly zero-energy by the end of 2020. Considering that Turkey is a candidate country, Izmir would be a template for the rest of the country. Note: There are 8 buildings planned within the 2020-2024 Strategic Plan of IBB. IBB is encouraged to adopt this target for all future buildings, including those in the 2020-2024 Strategic Plan where feasible.
Steps for Implementation	1. Establish a working group to study the design, implementation and additional cost for net zero buildings which particularly emphasis on water efficiency which has high carbon impacts. 2. Review municipality construction and refurbishment programme 3. Conduct feasibility studies for priority buildings 4. Set programme for committing to zero carbon 5. Develop and implement projects 6. Target to be met by implementing projects in stages. With sustainable low energy to be achieved between 2020-2025; nearly zero buildings between 2025-2030 and then net zero energy buildings from 2030 onwards.
Type of action	Plan / strategy, plus capital investment for future building investment
Environmental values positively affected	
Climate Change risks and / or vulnerabilities addressed	N/A
Potential Emission Savings	By committing to net zero in all new municipality buildings, this will not reduce the current baseline of emissions, but will help avoid potential future emissions that these buildings would have been produced if built to existing standards. Because there is currently no information about the proposed future buildings it is not possible to calculate emissions savings at this time.

Plan for delivery	**Action owner**	IBB
	Stakeholders	Academics Consultancy companies for Green Buildings Finance institutions
	Financing options	Municipal budget, IFIs, Ilbank, private banks, Green Bonds,
	Revenue/savings opportunities	Savings opportunities will come from reduced energy costs, decreased pressure on energy networks and public health benefits
	Timeline	2021-2030
Impact measures	Annual emissions associated with new public sector buildings	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €21,000 - €31,000	
Estimated benefits	**Health impacts:** Public health – reduced pollution **Economic Development:** Increased economic efficiency, revenue/savings generating activities **Social Inclusion:** Skills development **Environment:** Mitigation of GHG Emissions	
Existing Work Leveraged	Izmir SEAP 2016 EBRD Turkey Adaptation Study Izmir Green Infrastructure Strategy	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent	

SW1.10: Municipality to commit to banning the use of single-use plastics within their buildings and operations, encouraging local businesses to do the same.

Strategic Plan Objectives	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Description	In order to reduce the amount of non-recyclable waste and GHG emissions, Municipality will commit to banning the use of single-use plastics within their buildings and operations, while encouraging other organisations, businesses and institutions to do the same.
Rationale	According to the United Nations Environment Programme report "Single-Use Plastics - A Roadmap for Sustainability", the impacts of single-use plastics include: • Impacts on wildlife from direct ingestion/entanglement or from ingestion of micro plastics following plastic degradation; • Blockage of watercourses and sewage systems; • Visual impacts and disamenity from litter; • Economic costs of beach and sea clean-up and economic impacts on fisheries, tourism and shipping industries. • Plastic production and disposal generate GHG emissions, and the majority of plastics are not recycled[37]. IBB has direct control over municipal buildings. Banning the use of single-use plastics is a simple step to reduce İzmir's total amount of non-recyclable waste and GHG emissions
Steps for Implementation	**Municipality to commit to banning the use of single-use plastics:** 1. Stakeholder mapping and confirmation of policy scope. 2. Inventory of single-use plastics 3. Identify potential alternatives and any essential/non-substitutable items. 4. Carry out impact assessment of costs and risks. 5. Develop and implementation plan, including allocating roles and responsibilities, communication strategy and timeframe. 6. Implementation and monitoring.

[37] *Zheng, J., Suh, S. Strategies to reduce the global carbon footprint of plastics. Nat. Clim. Chang. 9, 374–378 (2019). https://doi.org/10.1038/s41558-019-0459-z*

<table>
<tr><td></td><td colspan="2">Encouraging local businesses to do the same:
1. Voluntary reduction strategies for local businesses and agreements
2. Stakeholder mapping
3. Develop case studies and “how to” guides (including mode policies).
Public campaign to encourage uptake.
4. Monitoring of uptake.</td></tr>
<tr><td>Type of action</td><td colspan="2">Plan / Strategy</td></tr>
<tr><td>Environmental values positively affected</td><td colspan="2">   </td></tr>
<tr><td>Climate Change risks and / or vulnerabilities addressed</td><td colspan="2">N/A</td></tr>
<tr><td>Potential Emission Savings</td><td colspan="2">The emissions savings cannot be quantified at this stage since the amount of single-use plastic is not known. A ban has the potential to:
• Reduce overall waste generation
• Reduce GHG emissions.</td></tr>
<tr><td rowspan="5">Plan for delivery</td><td>Action owner</td><td>IBB</td></tr>
<tr><td>Stakeholders</td><td>Local Businesses
NGOs
Citizens</td></tr>
<tr><td>Financing options</td><td>Municipal budget</td></tr>
<tr><td>Revenue/savings opportunities</td><td>Savings opportunities will come from public health benefits</td></tr>
<tr><td>Timeline</td><td>2020-2030</td></tr>
<tr><td>Impact measures</td><td colspan="2">• Annual CO_2 equivalent emissions per capita
• Annual CO_2 emissions per unit of GDP
• Total solid waste generation per capita
• GDP per domestic material consumption
• Proportion of municipal solid waste that is sorted and recycled total and by type of waste e.g. paper glass batteries PVC bottles metals</td></tr>
<tr><td>Estimated cost</td><td colspan="2">CAPEX: N/A
OPEX: €600 - 800
Design/development costs: €15,000 - €20,000</td></tr>
<tr><td>Estimated benefits</td><td colspan="2">Health impacts: Public health – reduced pollution
Economic Development: Increased economic efficiency, Revenue/savings generating activities
Social Inclusion: Strengthens social fabric
Environment: reduced pollution</td></tr>
<tr><td>Existing Work Leveraged</td><td colspan="2">Izmir Integrated Solid Waste Management Plan 2018</td></tr>
<tr><td>1/25,000 scaled IBB Environmental Plan Alignment</td><td colspan="2">Not spatially dependent</td></tr>
</table>

Basket 5: Installation of low and zero carbon and energy efficient technologies in Municipality owned buildings and land

Energy Supply: ES1.5 ES1.7.

The installation of low and zero carbon (LZC), energy efficient technologies will not only help to reduce the city's greenhouse gas emissions but will also help to reduce our own operational costs while demonstrating our commitment to environmental improvement. This basket of actions sets out how we will reduce the emissions from our own building stock and land holding and will be undertaken in response to commitment made by the Municipality in basket 4 to net zero in all owned and operated buildings.

The 2018 baseline emissions inventory outlined in Izmir's SECAP, demonstrates that Municipality Buildings / Sites produce a total of 181,289 tCO_2e, contributing 0.7% of the province's total emissions. When adding this to the emissions associated to province's tertiary and residential buildings, this contributes to 23.5% of total emissions.

Public realm lighting in Izmir also accounts for 4% of IBB's organisational emissions and is equivalent to 0.13% of total emissions for the province, estimated to consume 230,000 MWh of energy in 2018. When incorporating street lighting that is the responsibility of GDZ (Electric distribution company) and KGM (General Directorate of Highways), this rises to 0.8% of total emissions.

What is already being done?

Although IBB's influence over the private sector is relatively limited, the municipality can take a leadership role when it comes to raising awareness of LZC and energy efficiency technologies and demonstrating best practice. This is acknowledged within the 2015 Sustainable Energy Action Plan, which included a commitment to adopt greenhouse gas reduction measures. In addition, the IBB Strategic Plan 2020-2024 includes targets to raise awareness of clean energy both inside the municipal administration and with the public, preliminary studies for renewable energy technology, and increase the municipality's own uptake of clean energy.

These commitments are supported by nation-wide policies and strategies such as the National Climate Change Strategy, the Energy Efficiency Strategy, the 11th National Development Plan and the Strategic Plan of the Ministry of Energy and Natural Resources. The Turkish government has set a target to increase the share of renewable energy supply to at least 30% by 2023. This is supported by several national strategic plans and regulations, including the National Renewable Energy Action Plan (2011 – 2023).

We are also updating the SEAP with a new SECAP being developed alongside this GCAP. As part of IBB's commitment to emission reduction under the CoM of 40% by 2030 against the 2018 baseline, the SECAP sets out a target of 15MW of LZC energy capacity is to be introduced in IBB premises by 2030, alongside 745 MW of LZC energy capacity city-wide. IBB also has a target to prepare pre-feasibility studies for different types of renewable energy (solar, biogas, etc.) in the next five years. These studies will be useful guides for potential investors.

Additionally, Izmir Metropolitan Municipality has installed solar panels on the roofs of Bergama Slaughterhouse, Aliağa Fire Station, Uzundere Multi-Purpose Hall and Çiğli Family Consulting Centre[38]. As a result of this installation, CO_2 emissions will be reduced by 140 tonnes per year, generating 280,000 kW/hour of electricity annually. There are also installations in various facilities privately owned / operated facilities within the province, including Ekrem Akurgal Life Park, a dog shelter and a solid waste transfer station, including at the ESHOT facility in Buca, which is uses PV to charge their electric buses.

[38] *Energy and City, News, http://enerjivesehir.com/index.php/2020/06/18/izmirde-4-tesisin-catisina-gunes-paneli-kuruldu/*

Specific Strategic Plan Objectives of IBB

This basket of actions addresses two key Strategic Plan objectives, as outlined below.

Table 22: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
1: Infrastructure – Urban Infrastructure	**1**. Building a Sustainable Infrastructure Available to Everyone	**1.1.** Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy
2: Quality of Life – Accessible and Clean Energy	**2.** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted	**2.4.** Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges that drive the need for further mitigation planning by IBB are:

Table 23: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
GHG Emissions	There is currently a minimal uptake of renewable energy by both the municipality and private sectors.
GHG Emissions	Reducing the Municipalities emissions as part of the city's commitment to a 40% reduction in emissions against the 2018 baseline by 2030.

Actions

The Green City actions around low-zero carbon technologies across the municipality are summarised below (Table 24)

Business cases were not developed for these actions, in-line with IBB's selection of actions to prioritise. However, when considering the development and implementation of these actions in the appropriate timeframe, public-private partnership would be an appropriate pathway.

Table 24: Action within basket 5

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
ES1.5	Mass role out of solar energy on municipality owned assets and land e.g. municipality buildings, road reserves, bus stops.	Capital project	Minimal uptake of renewable energy.	High	N/A
ES1.7	Undertake a public lighting replacement scheme for all poles owned / run by municipality by installing LEDs.	Capital project	Municipal mitigation planning	High	N/A

Case Study: Learning from other cities[39]

Solar City – Halifax Regional Municipality, Nova Scotia, Canada.

Halifax regional municipality set up the Solar City Program, which offers property owners (residential, non-profit, places of worship, charities and co-operatives) within their jurisdiction access to innovative solar energy options, which can be financed through a solar collector account within the municipality. The homeowner has the option of; solar electric, hot air or hot water.

The Solar City program has an annual budget of CAD4 million with an annual target of 450 installations a year. It offers an online voluntary financing application where property owners enter into an agreement with the municipality to access funds that offset the capital costs of installing solar energy systems on their property. The municipality then places a voluntary Local Improvement Charge[1] on the property after the solar contract is paid. This is an annual charge for the property owner, separate to their annual tax bill, paid over 10 years at a fixed interest rate (4.75%) with the option to pay the balance in full.The benefits of this programme are that it makes solar power accessible to multiple buildings and organisations throughout the Municipality, on an affordable, 10-year programme. The solar hot water aspect of the programme alone is believed to have reduced greenhouse gas emissions by 16 million kgs and will save upwards of 320 million litres of water over the 23-year life span of the installations.

ES1.5: Mass role out of solar energy on municipality owned assets and land e.g. municipality buildings, road reserves, bus stops.	
Action Description	This action would involve an investment in 15MW of solar energy to be installed upon buildings owned by municipalities and their subsidiaries by 2030. Within the strategic plan of IBB there are 10 solar energy plants planned until the end of 2024. We can easily assume that IBB will develop more projects after the year 2024. By increasing the municipalities renewable energy generation capacity, it diversifies the energy supply, reducing the exposure of the municipality buildings and key infrastructure to the risk of power shortages and blackouts as a result of a climate hazard.
Potential Impact	A 15MW installation of photovoltaic would result in a saving of 12,168 tCO_2e in 2030. Financial benefits could also be achieved if there is excess energy generation by exporting the electricity to the Cities utility grid.
Action Owner	IBB
Timeframe	2020 - 2030
Financing Options	Municipal Funding, PPP, commercial financing from banks and private investment, IFI's

[39] *https://www.halifax.ca/home-property/solar-projects/about-solar-city-halifax#:~:text=The%20Solar%20City%20program%20offers,with%20the%20Halifax%20Regional%20Municipality.&text=offer%20the%20option%20to%20install%20three%20unique%20solar%20energy%20systems*

ES1.7: Undertake a public lighting replacement scheme for all poles owned / run by municipality by installing LEDs.	
Action Description	This action would involve an analysis of energy use by lighting zones across the province for LED replacement. This should prioritize zones throughout the province where energy use is the highest and also be aligned with the replacement of existing lighting poles when either broken or their life cycle has come to an end.
Potential Impact	Potential emission savings for IBB would be 10,980 tCO_2e in 2030 if all public lighting is replaced with LEDs. If the lighting managed by organisations other than IBB were also replaced, a further 111,102 tCO_2e could be saved by 2030.
Action Owner	IBB District Municipalities The Ministry of Transportation Directorate of Highways
Timeframe	2020- 2030
Financing Options	Municipal Budget, PPP, IFIs, IIBank.

Basket 6: Enhance evidence for action through studies / assessments

Buildings: B1.9
Energy Supply: ES1.1, ES1.4, ES1.11, ES.A

To understand the potential for increasing the uptake of low and zero-carbon (LZC) energy options will require studies to be undertaken. This will ensure that efforts are focused on the uptake of LZC technologies that play the greatest cost-effective role in minimising GHG emissions, and also helps to ensure a secure, reliable and affordable supply of energy to everyone. It is also crucial for achieving Izmir's goals for sustainable transport, which will rely on the availability of LZC electricity.

What is already being done?

At present, there are a number of LZC installations across the province, including solar PV, wind turbines, geothermal energy installations and heat networks – but multiple sources, including the Izmir Sustainable Energy Action Plan (SEAP, 2016) indicate that there is significant additional potential within Izmir. The Izmir Strategic Plan includes a target of undertaking preliminary studies for renewable energy technologies. Some key projects around this include solar energy plant in Municipal buildings and carparks (2016-present); installation of solar panels in water depots for chlorination in villages (IZSU); and the establishing a smart energy and management system in the Municipality.

These commitments are supported by nation-wide policies and strategies such as the National Climate Change Strategy, the Energy Efficiency Strategy, and the 11th National Development Plan and the Strategic Plan of the Ministry of Environment and Natural Resources, which sets a nation-wide target of at least 30% of electricity to come from renewable sources by 2023.

Specific Strategic Plan Objectives of IBB

This basket of actions addresses key Strategic Plan objectives, as outlined below.

Table 25: A summary of IBB Strategic Plan 2020-2024 Objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
1: Infrastructure – Urban Infrastructure	**1.**Building a Sustainable Infrastructure Available to Everyone	**1.1** A Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy
2: Quality of Life – Accessible and Clean Energy	**2**. Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
5: Nature – Climate Action	**5.** Making Izmir a Global Model City for Its Harmony With Nature	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need for low-carbon energy and heat studies.

Table 26: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
GHG Emissions	There is currently a minimal uptake of renewable energy by both the municipality and private sectors.
GHG Emissions	Reducing the Municipalities emissions as part of the city's commitment to a 40% reduction in emissions against the 2018 baseline by 2030.

Actions

The Green City actions around LZC energy and heat studies within the municipality are summarised below (Table 27). Detailed descriptions are presented where these have been requested by IBB.

Table 27: Actions for basket 6

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
B1.9	Undertake circular economy assessments on Municipality refurbishment and demolition projects, encouraging uptake in private projects	Plan / Strategy	Municipal mitigation planning	Medium - Low	**Design / Development**: €40,000 - €50,000
ES1.1	Assess the feasibility of connecting public sector and / or industrial buildings to geothermal heat network(s)	Plan / Strategy	Municipal mitigation planning	Medium - Low	**Design / Development** €20,000 - €33,000
ES1.11	Implement an environmental labelling scheme for companies within Izmir.	Plan / Strategy	Minimal uptake of renewable energy	Medium - Low	**Design / Development:** €10,000 - €13,000 **OPEX**: €500 - €700
ES1.4	Local renewable energy options study	Plan / Strategy leading to Capital Project	Minimal uptake of renewable energy	Medium - High	**CAPEX:** €105,000,000
ES.A	Develop Izmir bioeconomy strategy and action plan	Plan / Strategy	Municipality mitigation planning	Medium – High	**OPEX:** € 60,000

B1.9: Undertake circular economy assessments on Municipality refurbishment and demolition projects and encourage their uptake in private projects		
Strategic Plan Objectives	**1.1** A Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy	
Description	IBB will commit to undertaking circular economy (CE) Assessments on all IBB buildings, refurbishment and demolition projects, and (where practicable) ensuring that the findings or recommendations are implemented. The aims of a CE assessment will be to identify opportunities to retain and reuse materials of buildings and develop a design and management strategy for ensuring that the building is easy to maintain, adapt and deconstruct in future. IBB should determine the content and scope of such studies, but key outputs are likely to include: • A pre-demolition audit (if applicable) highlighting reuse opportunities • An estimate of construction, demolition and excavation waste arisings, with specific commitments (e.g. design strategies) for how these will be minimised and monitored • Specific design measures aimed at facilitating deconstruction and reuse IBB will also develop a PR strategy (e.g. press releases and guidance) to promote CE assessments as a best practice measure that should be adopted by private businesses.	
Rationale	Building construction, retrofit and demolition creates significant volumes of waste and in addition results in significant emissions from the manufacturing and construction process. Undertaking CE assessments will help to identify opportunities for reusing and recycling building materials, reducing the volume of waste to landfill and the need for virgin materials with associated extraction and processing impacts. IBB has greatest control over their own building stock, and the IBB's 2020-2024 Strategic Plan identifies several new buildings and retrofit plan. With significant private sector development, particularly within the allocated 'Urban Transformation Areas', this action will also encourage the private sector to also undertake CE assessments.	
Steps for Implementation	1. IBB must define the scope and process for carrying out CE assessments. This will include defining standards and design evidence requirements for pre-demolition audits, the method for estimating and monitoring waste arising, and the level of detail required for any design for deconstruction strategy. 2. Based on the outputs of (1), develop and disseminate guidance on how to carry out a CE assessment, both internally within IBB and externally so that private companies can develop their own targets as appropriate. 3. Allocate the individual(s) or department(s) responsible for ensuring they are carried out on IBB projects, e.g. ensuring that design teams have engaged with contractors to identify CE measures and ensure these are written into specifications or contracts in collaboration with IBB project decision makers 4. Publicise positive outcomes (e.g. waste reduction and cost savings) through press releases and social media to promote uptake by private businesses	
Type of action	Plan / Strategy	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	This action should result in a reduction in emissions associated with material efficiency, less demand for raw materials (higher use of recycled materials) and therefore less demand for manufacturing and transport of those materials. The emissions figures have not been calculated at this time.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	District Municipalities Design teams, engineers, contractors Waste and recycling facilities Industries / organisations that can use the waste
	Financing options	Municipal budget.
	Revenue/savings opportunities	Circular Economy Assessments aim to maximise overall resource efficiency, helping to avoid costs of construction, demolition and refurbishment. Although some 'circular' solutions may cost more in the short term, these costs can often be recouped because of the ease of deconstruction, higher resale value, etc.
	Timeline	2021-2030

Impact measures	(de)construction waste diverted from landfill
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €40,000 - €50,000
Estimated benefits	**Health impacts:** Reduced waste to landfill, reduced air pollution and less dust due to lower rates of demolition, more efficient logistics during construction, and lower levels of waste production **Economic development:** Opportunities to develop new industries related to (de)construction, innovative design and construction techniques, and greater need to reclaim, reuse and recycle materials **Social Inclusion:** Wider, global positive impacts result from lowering the demand for raw materials which have a high social, economic and environmental cost due to the extraction and processing involved
Existing Work Leveraged	N/A
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent

ES1.1: Assess the feasibility of connecting public sector and / or industrial buildings to geothermal heat network(s)

Strategic Plan Objectives	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Description	Undertake mapping and associated baseline analysis to understand the number, distribution and fuel consumption of public sector and industrial buildings that currently use fossil fuel-based heating and understand the feasibility and potential benefits of connecting these to the geothermal heat network. Heat networks operate most efficiently when there is a high anchor load and therefore it is expected that the focus will initially be on large public sector or industrial buildings (or zones).
Rationale	Heat generation can result in high carbon emissions. Connecting high heat users to the existing geothermal heat network and/or delivering new heat network(s) could result in the provision of more efficient, lower carbon heat. As with other forms of decentralised energy systems, it also offers benefits in terms of resilience and security of energy supply. At present there is very limited data available regarding the prevalence of different fuels and heating systems in Izmir, due in part to the number of informal settlements. In order to realise the potential benefits of heat networks, it is first necessary to undertake feasibility work to understand the scale and spatial distribution of opportunities along with their potential benefits.
Steps for Implementation	1. Create a project team from different departments and establish rules for investment decisions 2. Undertake area-wide fuel consumption and heating demand analysis of existing buildings (in particular large public sector or industrial buildings) to identify heat network opportunity areas followed by more detailed feasibility work for opportunities with the greatest potential in terms of energy / CO_2 savings, cost effectiveness and deliverability 3. Analysis of the geothermal network for capacity, sizing and investment needs 4. IBB and stakeholders to agree on capital project opportunities that can be taken forward following results of the feasibility studies Although it is out of the scope of this report to identify opportunity areas, we note that some of the existing buildings in the geothermal region include: Dokuz Eylül University Hospital Campus, Izmir Economics University, Balçova Municipality Sports Facilities, Narlıdere Municipality
Type of action	Plan / Strategy
Environmental values positively affected	
Climate Change risks and / or vulnerabilities addressed.	N/A
Potential Emission Savings	Savings not calculated for the action, although it would be anticipated that substantial emission savings could be achieved as a result of diverting buildings away from a reliance on fossil fuel heating and towards a geothermal.

Plan for delivery	**Action owner**	IBB
	Stakeholders	Izmir Jeotermal A.S. Public buildings Geothermal energy companies Finance institutions Technical experts, consultants, and academics
	Financing options	Municipal Budget
	Revenue/savings opportunities	Potential cost savings if the new source of heat is cheaper than existing fuels.
	Timeline	2021 – 2025
Impact measures	• Fossil fuel consumption in buildings • Total geothermal energy consumption by year • Share of industrial energy consumption from renewable energy • Proportion of total energy demand derived from RES as a share of total city energy consumption • Average carbon factor of heat generated / used	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €20,000 - €33,000	
Estimated benefits	**Health impacts:** Improved air quality through use of local renewable energy sources, potential reductions in fuel poverty. **Economic development:** Potential to create jobs during roll-out of the heat network **Environment:** reduced pollution, mitigation of GHG emissions.	
Existing Work Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

ES1.11: Implement an environmental labelling for companies within Izmir.	
Strategic Plan Objectives	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Description	This action involves implementing a company-level environmental labelling scheme (and associated marketing strategy) to raise consumer awareness of sustainability issues and promote environmentally responsible production and purchasing decisions. The aim would be to encourage industrial businesses to participate in clean energy and green infrastructure efforts.
Rationale	'Green' labelling schemes include, for example, organic certification and fair-trade products, sustainable timber, or energy efficiency ratings for appliances. The aim is to help customers understand the environmental and social sustainability impacts of their decision-making and by extension promote responsible purchases. Some research suggests that green labelling schemes can directly increase the value of a product, which offers potential economic benefits to participating organisations, along with sustainability benefits.[40].
Steps for Implementation	1. Form a project team to assess opportunities to deploy labelling schemes, considering topics such as appropriate sectors, market trends and relevant legislation 2. Once a suitable initiative is identified, develop a marketing campaign to (a) encourage businesses to participate in these efforts and (b) raise consumer awareness 3. Monitor uptake and the success of the scheme
Type of action	Plan / Strategy
Environmental values positively affected	

[40] *Ulf J. J. Hahnel et al, 'The power of putting a label on it' (2015). DOI: 10.3389/fpsyg.2015.01392*

Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	There would be positive mitigation effects if, for instance, energy labelling of appliances resulted in significant increases in efficiency and a net decrease in fuel consumption.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	District Municipalities within the Metropolitan Area Private Sector companies, cooperatives, and NGOs Finance institutions
	Financing options	Municipal budget,
	Revenue/savings opportunities	Potential increase in product value (for more environmentally friendly products).
	Timeline	2021 onwards
Impact measures	Qualitative market research survey to understand any shift in customer decisions making around responsible purchasing.	
Estimated cost	**CAPEX:** N/A **OPEX:** €500, - €700 **Design/development costs:** €10,000 - €13,000	
Estimated benefits	**Health impacts:** Depends on the sectors or businesses targeted for labelling **Economic development:** The innovation needed to develop lower-impact products can create new jobs **Environment:** reduced pollution, mitigation of GHG emissions. **Social Inclusion:** Skills development.	
Existing Work Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

ES1.4: Local renewable energy options study

Strategic Plan Objectives	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Description	Undertake an options study to understand the feasibility of deploying local renewable energy technologies and expanding the use of renewable electricity. This should be done across Izmir but particular opportunities may exist in areas in the city that are close to high energy users (for example, heat networks near universities, hospitals or industrial zones and / or cooling networks for offices) and in informal settlement areas where there is limited access to grid electricity.
Rationale	This action is a first step to rolling out renewable electricity technologies across the province, which would improve the security and reliability of Izmir's energy supply and reduce the carbon intensity of electricity use.
Steps for Implementation	1. Appoint a project team to conduct the analysis (e.g. consultants and/or different IBB departments) 2. Project team to investigate feasibility of technologies such as wind, solar PV / solar hot water, heat pumps, batteries, district heating, micro CHPs and fuel cells, identifying suitable polot projects 3. Search for financing options for different actions (ESCOs or similar financing mechanisms can also be considered as an option) 4. IBB to review and sign off on suitable locations for pilot project(s), if any 5. Conduct pilot projects, monitor and publicise results, and assess whether to pursue additional projects
Type of action	Plan / Strategy leading to Capital project
Environmental values positively affected	

Climate Change risks and / or vulnerabilities addressed.	**Risks:** IM5, IM6 **Opportunity:** IM7	
Potential Emission Savings	In cooperation with SECAP action ES1.14, greenhouse gas reduction will be achieved by installing 850 MW solar PV in buildings and using 45 MW solar energy in agricultural irrigation.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	District Municipalities and MoENR Academics, consultancy firms and other knowledge institutions that can inform or conduct the study
	Financing options	IBB would likely need to provide funding for the initial study but there may be potential to collaborate with an industrial or academic partner organisation. ESCOs or similar financing mechanisms can also be considered as an option for project delivery.
	Revenue/savings opportunities	If a micro grid is implemented, this could offer reduced exposure to energy price hikes, reduced exposure to damage from blackouts, etc. along with potential revenue from the sale of surplus power.
	Timeline	2022 – 2030
Impact measures	• Proportion of total energy demand derived from RES as a share of total city energy consumption • Share of population with an authorised connection to electricity • Average share of population undergoing prolonged power outage in case of climatic extremes over the past 5 years	
Estimated cost	**CAPEX:** €105,000,000 **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** Improved air quality through use of local renewable energy sources, potential reductions in fuel poverty. **Economic development:** This action can create jobs if projects are implemented. **Environment:** reduced pollution, mitigation of GHG emissions. **Other:** Improved resilience of the energy system.	
Existing Work Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

ES.A: Develop Izmir bioeconomy strategy and action plan	
Strategic Plan Objectives	**3.1.** The Right Ecosystem Will be Created to Make İzmir an Attraction Center for New Investments, Technological Innovations, and Creative Industries.
Description	Covers all kinds of industries and economic sectors producing, managing and distributing biological resources (e.g. Agriculture, Food, Forestry, Fishery and other bio-based industries).
Rationale	It has become mandatory to make a transition from a structure based on unsustainable fossil resources to a bio-based economic system aiming to produce innovative and reliable products through the use of bio-based resources. Efforts should be spent on the provision of biomass supply for bio-based products and services, diversification of biomass resources, fostering their production and ensuring sustainable provision in the fields of agriculture and forestry. Izmir has the potential to take important steps particularly towards transition to sustainable and nature-based agricultural practices, blue bioeconomy and forest bioeconomy in mountain ecosystems.
Steps for Implementation	1. A meeting should be organized with the relevant public institutions, private sector institutions, universities, chambers, cooperatives and associations in order to identify the areas of Izmir offering a bioeconomy potential, which will constitute the basis for the strategic plan of IBB.

	2. IBB should appoint individual(s) or department(s) in charge who will ensure the conduct of the relevant strategy on the part of the administration. 3. The relevant bioeconomy strategy and action plan should be prepared, and services should be procured on the issue. 4. Strategy should be created, and the results obtained should be ensured to be shared widely through the strategy website, press releases and social media. 5. The action plan should be created via a dialogue conference in order to determine the internal officers of IBB and the relevant external institutions who are in charge of the implementation processes. 6. The structure founded at IBB for monitoring the relevant strategy and action plan (Item 2) should be authorized to perform the monitoring activities and be ensured to be competent in the relevant job.	
Action Type	Plan / Strategy	
Environmental values positively effected		
Climate Change risks and/or vulnerabilities addressed	N/A	
Expected reduction in emissions	This action will result in reduced emissions through the recycling of bio-based waste materials, reduced use of raw materials (conversion of recycled materials into biomass and biogas) and thus a reduced transportation requirement for the disposal of these materials (e.g. designing bioreactors for the fast production of compost fertilizers in market places and where segregation is not required). Emission figures have not been calculated yet.	
Implementation plan	**Action Owner**	IBB
	Stakeholders	District Municipalities Industries / industrial organizations which may use the wastes Cooperatives Technical experts, consultants and academicians
	Financing Options	Municipality Budget
	Revenue/savings opportunities	Bioeconomy is a key component of circular economy, and hence will maximize total resource efficiency by means of conversion of wastes into resources. Some "circular" solutions will become suitable and cost-efficient once they are disseminated to residential areas, which are responsible for the large building stocks of the city (e.g. garden wastes produced by districts where garden houses are common and, on a smaller scale, by large housing complexes can be used in pyrolysis facilities for biocoal production).
	Timeframe	2021 – 2025
Impact measures	To be determined as a result of the strategy and action plan produced as part of this action.	
Estimated cost	**CAPEX:** - **OPEX: -** **Design/Development Costs:**-€60,000	
Estimated benefits	**Health impacts:** Production of food supplement and nutraceuticals (e.g. extraction of bioactive substances from agricultural production wastes and agricultural industries' waste). In addition, production of disinfectants under pandemic conditions (e.g. food businesses employing fermentation of sugar products whose shelf life has expired and producing industrial ethyl alcohol to be used in cologne making). **Economic development**: Will increase industrial symbiosis potential among industrial businesses. In addition, contribution will be made to the production of food with added value and clean energy thanks to reduced dependency on fossil fuels. **Environmental:** Bioeconomy practices will result in reduced carbon emissions. They will support smarter use of natural resources and prevent wastage.	
Existing Actions Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

Basket 7: Facilitate more sustainable waste management

Solid Waste: SW1.16, SW1.17

At present nearly all (over 90%) of Izmir's waste goes to landfill. While the landfill meets EU sanitary standards, it has limited capacity. Disposal of waste in landfill ranks low on the hierarchy of waste management and IBB is keen to see an increase in waste reuse and recycling to make better use of natural resources, increase the lifespan of the landfill for non-recyclable materials and stimulate a more suitable waste management sector. There are also a wide range of environmental and public health issues associated with waste management. This basket of actions focuses on reducing these impacts by developing more advanced waste collection systems, including smart collection and route optimisation.

What is already being done?

The following projects and activities have / are currently underway within the municipality in regard to waste collection systems. It is necessary to build on and leverage this work when implementing the GCAP actions proposed:

- Izmir's Solid Waste is managed in line with the requirements of the MoEnvU's 'National Waste Management and Action Plan 2016-2023' and IBB 'Integrated Solid Waste Management Plan' (2018), which both cover policy reducing waste generation, classification and collection,
- The MoEnvU is conducting a Zero Waste Project covering actions such as the implementation of zero waste projects in areas of the Ministry, segregated collection of wastes, sending surplus food to animal shelters and installation of compost units,
- District municipalities handle the day-to-day management of 'micro-services' such domestic waste collection,
- Waste collection in Izmir province is carried out by district municipalities or its contractor companies. Waste collection efficiency has been determined as 100% throughout Izmir. Municipal waste is collected by a total of 569 compaction vehicles with capacities ranging from 7 to 20 m^3. Medical wastes produced in Izmir, however, are transported by 12 licensed medical waste collection-transportation vehicles[41],
- IBB has proposed the following strategies through Integrated Solid Waste Management Plan developed in 2018: [42]
    - Ensure that waste is separated, or that mechanical / biological treatment has been carried out, before waste is accepted to landfill;
    - The use of sufficient number of containers and vehicles of the same standards throughout Izmir province with appropriate consideration given to the potential increase in waste generated over time
    - Establishing new waste collection systems to facilitate the separation and processing of recyclable and biodegradable waste and raising public awareness on this issue.
    - Establishment of additional waste collection centres by district municipalities and efficient collection of waste.
    - Collecting municipal waste directly and transferring it to newly planned integrated recovery and disposal facilities through transfer stations
    - At least 12% of packaging waste to be collected separately at source by 2023.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around waste collection.

[41] *Izmir Integrated Solid Waste Management Plan, IBB, 2018*
[42] *Izmir Province Integrated Solid Waste Management Plan, 2018, p.104-105.*

Table 28: A summary of IBB Strategic Plan 2020-2024 Objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Nature - Recycling	**5**. Making İzmir A Global Model City for Its Harmony With Nature	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Learning by Experiencing - Institutional Capacity	**6**. Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.1** Innovative, Equal and High-Quality Experimental Learning Opportunities as well as Life-Long Learning Opportunities Will Be Provided for All

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need for feasibility studies on waste collection.

Table 29: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Soil Quality	Waste management in Izmir currently do not separate waste streams (except for packaging waste), with waste currently sent directly to landfill without recycling or composting.
Soil Quality	Food waste is currently disposed of at landfills and not composted.

Actions

The Green City actions around feasibility studies for waste collection are summarised below. (Table 30). Business cases were not developed for these actions, in-line with IBB's selection of actions to prioritise.

Table 30: Actions for basket 7

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
SW1.16	Investigate potential to provide dedicated waste collection for restaurant / food industry traders in-line with management infrastructure and technology.	Plan / Strategy	Minimal composting of solid waste.	Medium – Low	N/A
SW1.17	Undertake an assessment of waste collection infrastructure (collection service, coverage rate, bins / containers, vehicles), including smart collection systems and route optimisation software in collaboration with district municipalities.	Plan / Strategy	Lack of solid waste separation.	Medium - Low	N/A

Case Study, learning from other cities[43]

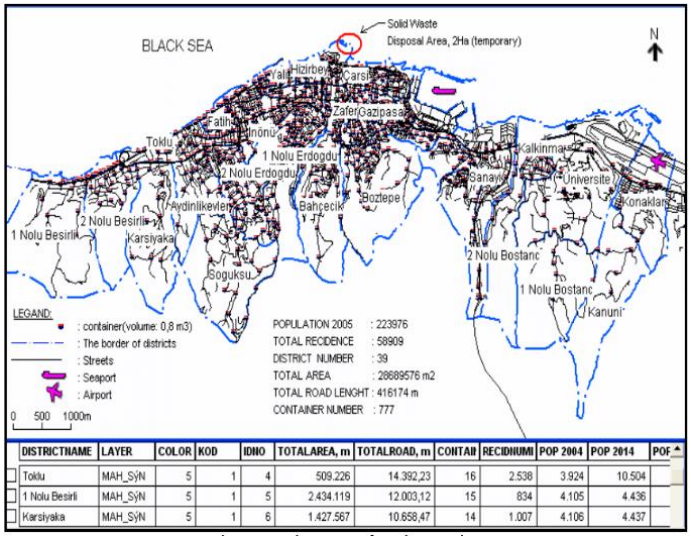
Feasibility and options study on waste collection by route optimization for solid waste collection: Trabzon (Turkey) case study

In a municipal solid waste management system, decreasing collection/hauling costs, which consist of 85% of total disposal expenditure, can be carried out by a route optimization. The objectives of this study were to optimize the route of collection/hauling in Trabzon City by taking into consideration data around road net, demographics and solid waste production.

In order to analyse the solid waste collection/hauling process in the city, the processes were recorded by a video camera on individual collection vehicles. Data related to present spending, truck type and capacity, solid waste production, number of inhabitants and Global Positioning System (GPS) were collected for each route and analysed simultaneously.

The present and newly mapped, optimized routes were modelled in the software in order to compare their efficiencies. This modelling showed that the optimized routes were 4-59 % more efficient for distance and 14-65 % more efficient for time. Ultimately, this corresponds to a 24% reduction in cost for the optimized route as opposed to the original route taken by a container collection system.

This case study demonstrates an approach that could be built on by IBB in optimizing solid was collection practices, in order to both maximise cost efficiency and reduce emissions associated with collection.



DISTRICTNAME	LAYER	COLOR	KOD	IDNO	TOTALAREA, m	TOTALROAD, m	CONTAII	RECIDNUMI	POP 2004	POP 2014	POF
Toklu	MAH_SYN	5	1	4	509.226	14.392,23	16	2.538	3.924	10.504	
1 Nolu Besirli	MAH_SYN	5	1	5	2.434.119	12.003,12	15	834	4.105	4.436	
Karsiyaka	MAH_SYN	5	1	6	1.427.567	10.658,47	14	1.007	4.106	4.437	

SW1.16: Investigate potential to provide dedicated waste collection for restaurant / food industry traders in-line with management infrastructure and technology.

Action Description	This action should be developed in-line with action SW1.4 and SW1.3. It would be focused on those areas within the province that food businesses are more concentrated, such as Alsancak, and involve a feasibility study to identify where collected waste can be composted and the facilities that would be required to deal with the assumed volumes of waste. This would require cooperation with the district municipalities and the private management companies that are involved in the waste management process.
Potential Impact	In combination with action SECAP action SW1.8 and GCAP action SW1.6, SW1.16 and SW1.17, this action would contribute to emissions savings seen as a result of diverting waste from landfill, the total of which could be as much as ~667,279 tCO_2e by 2030.
Action Owner	IBB
Timeframe	2021 - 2025

43 https://www.researchgate.net/publication/229004015_Route_optimization_for_solid_waste_collection_Trabzon_Turkey_case_study

Financing Options	Municipal Budget, PPP

SW1.17: Undertake an assessment of existing waste collection infrastructure (collection service, coverage rate, bins / containers, vehicles), including smart collection systems and route optimisation software in collaboration with district municipalities	
Action Description	This action would involve better understanding existing waste collection infrastructure and management practices in order to undertake modelling the impact that smart collection systems and route optimisation would have on operation cost and efficiency. This action would help inform the necessary investments required across the waste management structure and be a pre-curser to action SW1.3.
Potential Impact	In general terms, waste management obtains two-thirds of its revenue from collection services[44]. With this in mind, improving the efficiency in operating the collection fleet improves the bottom line for the district municipality / private company who operated collection. By improving the efficiency of the waste collection system, it has the potential to reduce operating costs, provide better collection frequencies and therefore customer service, alongside reducing GHG emissions associated with collection.
Action Owner	IBB
Timeframe	2021 - 2025
Financing Options	Municipal Budget, PPP

[44] https://www.researchgate.net/publication/220249887_Routing_Optimization_for_Waste_Management

Basket 8: Develop Municipality funded subsidy schemes, grant programmes and/or investments

Buildings: B1.11
Land-use: LU.B
Solid Waste: SW1.3, SW1.4

While many environmental measures reduce operational costs or can stimulate revenue generating businesses, raising capital finance to initiate and accelerate uptake can be difficult to find. This basket of measures focuses on approaches IBB can take to help subsidise, grant fund or invest in environmentally friendly measures, as well as providing fast tracked approval and permitting where environmental benefits are clearly demonstrable. We will also look to ways in which we can offer added benefits to development partners that commit to higher levels of environmental performance, such as increased gross floor areas.

As many of Izmir's residential buildings are relatively old, 46% pre 1990, and have poor thermal standards, part of this basket will seek to identify funds that can be used to stimulate the home retrofit market as has been done elsewhere in the world. As the city is also growing fast, the actions also seek to incentivise new development in urban transformation areas to deliver high quality, environmentally sensitive schemes. In addition, moving towards smarter waste management will require private enterprise. This basket will seek to support the establishment of a business that can help reduce the amount of waste going to landfill.

What is already being done?

The following projects and activities have / are currently underway within the municipality in regard to grant programmes/investments and waste separation projects. It is necessary to build on and leverage this work when implementing the GCAP actions proposed around healthy and liveable urban spaces and waste management.

- Izmir is one of three frontrunner cities for the EU funded Urban GREENUP project which renatures urban plans. Some other projects that have been granted by IBB under this project include; CITyFIED[45] (based on energy efficiency retrofitting), A framework for Resilient Cities to Climate Change: Green Revision Guidebook and RURITAGE (a Systematic Approach to Heritage-Based Rural Regeneration)[46],

- A comprehensive 'Building Inventory Study' was carried out in 2003 which covers all buildings within IBB boundaries[47],

- IBB has benefited from the Grant Program of IZKA Agriculture and Rural Development Financial Support Program (Organic Waste Utilization Model Grant Program in Small Family Businesses[48]),

- In 2018, IBB prepared an Integrated Solid Waste Management Plan, which sets out waste management practices and infrastructure enhancements for Izmir,

- IBB has proposed to reduce the amount of waste to send to the Harmandalı Solid Waste Landfill Facility, by establishing a separation facility that will ensure the separation of waste by physical processes. A feasibility study and Environmental Impact Assessment have been completed for the Separation Facility to be installed at Harmandalı, which is planned for 2025 with 5,400 tonne/day capacity[49],

- A new Northern Region Solid Waste Reuse and Disposal Facility is being planned for the northern region of Izmir. The Mechanical Biological Processing Plant would provide a high level of waste processing with an integrated approach [50].

[45] http://www.cityfied.eu/
[46] *IBB Activity Report, 2018*
[47] *http://www.izmir.bel.tr/izmirdeprem/index.html, 2003*
[48] https://www.izmir.bel.tr/tr/TamamlananProjeler/135/68
[49] *IBB, Integrated Solid Waste Management Plan, 2018*
[50] *News from IBB's website,* https://www.izmir.bel.tr/tr/Projeler/yeni-kati-atik-degerlendirme-ve-bertaraf-tesisleri-kuruluyor/1317/4

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around sustainable infrastructure and waste management.

Table 31: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Infrastructure-Sustainable Living Areas	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.2**. Planned, Safe and Sound Settlement Areas Will Be Developed or Regenerated
Nature - Recycling	**5**. Making İzmir A Global Model City for Its Harmony With Nature	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Learning by Experiencing - Institutional Capacity	**6**. Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.1** Innovative, Equal and High-Quality Experimental Learning Opportunities as well as Life-Long Learning Opportunities Will Be Provided for All

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges that drive the need for further commitments by IBB are:

Table 32: Priority Environmental Challenges

State	Priority Environmental Challenges
GHG Emissions	The IBB has limited control of the building sector, with building licences and building occupancy permits given by district municipalities.
Green Space, Biodiversity	A rising population within the city has led to a rapid urban expansion due to a rising demand for housing and infrastructure, increasing the competition for land-uses with industry, agricultural and the natural environment, alongside encouraging the construction of poor quality, informal settlements.
Soil Quality, GHG Emissions,	There is no separate collection and appropriate recycling of waste (except for packaging waste) prior to disposal in landfills in Izmir. In order to comply with EU requirements, all the MSW (municipal solid waste) should be treated or recycled instead of going directly to landfill, and only the waste that cannot be recycled should go to landfill.

Actions

The Green City actions around subsidy schemes / grant programmes / subsidies across the municipality are summarised below (Table 33). Detailed descriptions of each of the actions (with the exception of LU.B) are presented where they were identified to be detailed by the municipality.

Table 33: Actions within basket 8

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
B1.11	Explore ways to support residential retrofits being undertaken to a higher and greener energy performance standard.	Capital project	Absence of control over building efficiency standards.	Medium / High	**OPEX:** €2,081,250 **Design / Development:** €312,188.
LU.B	Encourage urban transformation, acting on the Urban Transformation and development areas declared by the Council of Minister's decision for the creation of healthy, liveable urban spaces	Policy	Rapid Urban Expansion	Low	**N/A**
SW1.3	Make separate collection of key dry recyclable materials mandatory, formulating policy at the district municipality level.	Enforce ment	Lack of solid waste separation	Low	**CAPEX:** Collection asset set-up cost: €980,000 - €1,230,000 **OPEX:** Public info Campaign - €1,300 - €1,600 Collection asset cost per year: €1,600,000 - €2,400,000. **Design / Development:** €23,000 - €29,000
SW1.4	Supplement and speed up investment in smart-waste separation facilities, (dry recyclables), a clean materials recovery infrastructure and composting facilities, building on the Integrated Solid Waste Management Plan (2018).	Capital project	Lack of solid waste separation	High	**CAPEX:** - €8 / tonne for a clean materials facility - €18 / tonne for a composting facility.

Case Study: Learning from other cities[51]

London – RE:New Programme.

The aim of London's RE:NEW programme is to reduce carbon emissions and energy bills in London's homes, as they currently account for around 36% of the capital's total carbon footprint.

London has 3.4m households (in 2014), 78% of are in the private sector, with 1.7m owner-occupiers and 1m renters. There are also around 800,000 social housing household. More than half of homes (59%) were built pre-1965 and a third (32%) were built before 1919. This age profile contributes to the UK's housing stock being amongst the least efficient in Europe.

RE;NEW helps organisations such as London Boroughs, housing associations and universities to implement retrofit projects and alleviate fuel poverty. It does this through:

- A RE:NEW Support Team, with sector experts team providing the end to end support needed to get projects up and running and successfully implemented.
- A RE:NEW framework of suppliers, which saves time and resources for organisations and individuals that are procuring retrofit services and works.

Typical measures implemented include; loft and cavity insultation internal and external solid wall insulation, heating upgrades, water efficiency measures, double glazing and drought proofing and communal heating systems.

Established in 2009, the RE'NEW programme helped improve over 127,500 of London's homes by 2017, saving an approximated 46,000 tCO_2e per year.

B1.11: Explore ways to support residential retrofits being undertaken to a higher and greener energy performance standard.

Strategic Plan Objectives	**1.2** Planned, Safe and Sound Settlement Areas Will Be Developed or Regenerated
Description	Explore the options that are available to support retrofitting of existing privately-owned residential properties so that they become more sustainable. Retrofitting practices could include, but are not limited to. • upgrading the building fabric (e.g. wall and roof insulation, windows, airtightness, etc.) • services (e.g. heating systems and water/sanitary fittings), • green roofs • Water efficiency, rainwater/greywater collection for reuse and rehabilitation. Options to support retrofitting could include: • Adjusting permitting requirements for buildings that meet high standards of energy and water efficiency (e.g. fast-tracking permits, allowing greater floor area, etc.) • Developing public awareness campaigns and information schemes to promote uptake in residential retrofitting. This action should be coordinated with Action B1.3, which includes research and surveys aimed at assessing the existing energy performance of the building stock, in order to target areas currently exhibiting poor performance. It should be aligned with SECAP B4, B5 and ES1.5.
Rationale	Due to the age of the building stock of Izmir (46% having been built prior to 1990 and therefore prior to the introduction of thermal standards) there is likely to be poor building performance across the City, although there is currently no reliable data about the existing building stock in regards to age, household composition, heating systems, energy performance, etc. The energy efficiency and quality of housing stock not only dictates the emissions and cost associated with space heating and cooling, but if poor, it can expose the residents to a higher level of risk to extreme temperatures due to its heightened sensitivity to overheating. Furthermore, opportunities for improving the efficiency of water fixtures and fittings will help to reduce water demands and help remove dated plumbing (often cited as a reason for residents not drinking from the potable water network with dependency on bottled water).

[51] https://www.london.gov.uk/sites/default/files/re_new_funding_guide.pdf

	By retrofitting residential building, operational energy costs can be reduced, decreasing the resident's vulnerability to overheating, improve water efficiency and quality to reduce water stress and help to reduce GHG emissions.	
Steps for Implementation	1. Undertake analysis of housing stock to identify those areas that are poor performing, not set for urban transformation and where improvement would reduce energy poverty. 2. Create a suite of home energy retrofit options that target the most cost-effective carbon reduction and water efficiency opportunities. 3. Conduct Life Cycle analysis for green energy standards proposed to further investigate how buildings should be designed, constructed/retrofitted and operated. 4. Establish guidelines that addresses the definitions, technical standards, economic analysis, building envelope recommendations, and building mechanical and electrical systems. 5. Developing public awareness campaigns or incentive methods to contribute to household budgets, through tax reductions such as Energy Performance Regulation in Buildings (05.12.2008) on energy gains to be achieved and environmental protection	
Type of action	Policy / Behavioural / Training	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM1, IM11, IM24 **Vulnerabilities:** PE-D	
Potential Emission Savings	The emissions savings depend on the nature of the incentive that is established. For context, if this was delivered for 50% of residential buildings in Izmir, achieving a 10% reduction in electricity demand and a 40% reduction in heat demand.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	MoEnvU, MoENR, IFI's, Izmir citizens, Businesses such as architects and designers, contractors / construction companies, manufacturers e.g. as insulation, heating systems, etc. Vulnerable groups: infirm, elderly.
	Financing options	Municipal budget, IFIs, Ilbank, Private banks
	Revenue/savings opportunities	Savings opportunities will come from reduced energy costs, decreased pressure on energy networks, and public health benefits from more comfortable homes.
	Timeline	2020-2030
Impact measures	• Electricity consumption in residential buildings. • Heating / cooling consumption in residential buildings	
Estimated cost	**CAPEX:** **OPEX:** €2,081,250 **Design/development costs:** €312,188	
Estimated benefits	**Health impacts:** Public health – more active lifestyles **Economic Development:** increased economic efficiency; economic growth **Environment:** Mitigation of GHG Emissions	
Existing Work Leveraged	Izmir SEAP 2016	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent.	

LU.B: Encourage urban transformation, acting on the Urban Transformation and development areas declared by the Council of Minister's decision for the creation of healthy, liveable urban spaces.	
Action Description	This action would involve the regeneration of the urban areas by improving existing buildings stocks and the creation of new living areas. This action can be broken down into the following aspects, covering the consensus-based area of 305.47ha in the scope of the Municipality law 5359; • Issue urban transformation regulations. • Facilitating and provide guidance on grant programmes, setting up a services framework. • Incentivise developers • Allocate funding.
Potential Impact	By encouraging and facilitating urban transformation across 305.47 ha of land within the province, this can achieve multiple benefits, including; local job creation through development, increasing the living standards and health and wellbeing of the residents within the identified areas, reducing urban pollution and reducing current and preventing future building related emissions.
Action Owner	IBB
Timeframe	2021 – 2023
Financing Options	PPPs, IFI's, IIBank, Private Developers, Private banks.

SW1.3: Make separate collection of key dry recyclable materials mandatory, formulating policy at the district municipality level.	
Strategic Plan Objectives	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Description	In line with the National Zero Waste Regulation[52] and in collaboration with SW1.8, IBB will establish mandatory requirements for the separate collection of dry recyclable materials at the district municipality level and will by raise public awareness on this issue. In addition, according to the Regulation, District Municipalities of IBB are required to start implementation of Zero Waste Management System by 31 December 2020.
Rationale	According to the waste characterisation study of Izmir Province conducted in 2018, the samples identified that recyclable packaging waste was the most prominent element (with an average of 18.97% by weight). Therefore, mandatory separate collection of dry recyclable materials will; • reduce the amount of waste sent to landfill (the reduction rate of waste sent to disposal should be at least 15% according to the National Zero Waste Regulation) and therefore, decrease the land needed for landfilling • be beneficial for the economy • help to achieve one of the goals of the Integrated Solid Waste Management Plan of IBB developed in 2018, which is to collect at least 12% of packaging waste separately at source by 2023.
Steps for Implementation	1. Explore the regulatory and fiscal measures available to the municipality to set enforceable policies for dry recycle separation 2. Baseline assessment of current markets and infrastructure for recyclable collection, separation, processing and export. 3. Evaluate and determine practical infrastructure requirements needed for District Municipalities to undertake effective separate waste collection (i.e. bin, storage, collection and processing requirements) 4. Engage with District Municipalities 5. Formulate and approve policy and enforcement measures 6. Develop implementation plan to include infrastructure investment and revisions to building codes required.
Type of action	Enforcement with potential capital investment
Environmental values positively affected	
Climate Change risks and / or	N/A

[52] *MoEnvU, "Zero Waste Regulation" numbered 30829, 12 July 2019*

vulnerabilities addressed		
Potential Emission Savings	In combination with action SECAP action SW1.8, and GCAP action SW1.6, SW1.16 an SW1.17.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	MoEnvU, Provincial Directorate of Environment and Urbanisation, CEVKO Foundation, Izmir citizens.
	Financing options	Municipal budget
	Revenue/savings opportunities	Revenue could be generated from the key dry recycled materials
	Timeline	2020-2025
Impact measures	• Share of the population with weekly municipal solid waste (MSW) collection • Proportion of MSW that is sorted and recycled total and by type of waste e.g. paper glass batteries PVC bottles metals	
Estimated cost	**CAPEX:** Collection asset set-up cost: €980,000 - €1,230,000 **OPEX:** Public Information Campaign: €1,300 – 1,600, Collection asset cost per year: €1,600,000 - €2,400,000. **Design/development costs:** Studies and Information Campaign: €23,000 - €29,000	
Estimated benefits	**Economic Development:** economic growth; employment creation; revenue generating activities **Social Inclusion:** skills development (behavioural) **Environment:** Mitigation of GHG Emissions	
Existing Work Leveraged	Izmir Integrated Solid Waste Management Plan 2018.	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent.	

SW1.4 Supplement and speed up investment in smart-waste separation facilities, (dry recyclables), a clean materials recovery infrastructure and composting facilities, building on the Integrated Solid Waste Management Plan (2018).

Strategic Plan Objectives	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Description	In accordance with the targets of the Integrated Solid Waste Management Plan of IBB developed in 2018; waste have to be separated in source, or that mechanical / biological treatment has to be carried out, before waste is accepted to landfill. To ensure that, undertake an assessment study with a view to investing in waste separation facilities (such as Harmandalı Physical Separation Facility), a clean materials recovery facility and composting facility and complete the waste collection systems.
Rationale	• Segregating recyclable waste will reduce the amount of waste sent to landfill, and thus, the land needed for landfilling will decrease • Recycled materials will be introduced to the economy. • Biodegradable wastes are evaluated in compost production before disposal.
Steps for Implementation	1. Assess expected quantities of different waste streams 2. Assess current infrastructure and expected infrastructure / area needs, for waste separation, recovery and composting 3. Identify requirements for separate collection, recovery and composting, including any funding or financial support, technology assessment 4. Complete the investment of waste collection systems to facilitate the separation and processing of recyclable and biodegradable waste
Type of action	Capital project

Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	The specific reduction associated with this action has not been calculated at this time, however emissions can be reduced as: • Waste separation, minimisation, reuse and recycling reduce GHG emissions by conserving raw materials and fossil fuel use during the products life cycle. • Waste offers a significant source of renewable energy. Incineration and other thermal processes for waste-to-energy, landfill gas recovery and utilisation, and use of anaerobic digester biogas can play important roles in reducing fossil fuel consumption and GHG emission. • Increasing the material recovery rate and compost production reduces GHG emissions that are currently associated with their disposal in landfill.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Provincial Directorate of Environment and Urbanisation, District Municipalities, Investors
	Financing options	Municipal budget, IFIs, Ilbank, PPP, private banks
	Revenue/savings opportunities	Revenue could be generated from reuse of dry recyclables
	Timeline	2020 – 2025
Impact measures	• Share of the population with weekly MSW collection • Proportion of MSW that is sorted and recycled total and by type of waste e.g. paper glass batteries PVC bottles metals	
Estimated cost	**CAPEX:** €8 / tonne for a clean materials facility and €18 / tonne for a composting facility. **OPEX:** **Design/development costs:**	
Estimated benefits	**Health impacts:** public health – reduced pollution **Economic Development:** economic growth; employment creation; revenue generating activities **Social Inclusion:** skills development (behavioural) **Environment:** Mitigation of GHG Emissions, reduced pollution	
Existing Work Leveraged	Izmir SEAP 2016, Izmir's Integrated Solid Waste Management Plan 2018.	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent.	

Basket 9: Move toward network / infrastructure level water cycle management

Water Cycle Management: WCM1.5, WCM1.6, WCM1.10

Like many cities, Izmir's water management infrastructure is based on a linear water abstraction, treatment to potable water standards, conveyed to where it is to be used, becomes grey or black water before being conveyed to treatment facilities and discharged into the environment. Furthermore, most of the wastewater network of sewers is combined with the storm water network. It is increasingly becoming recognised that this linear approach to water management wastes considerable amounts of water through leakage (around 29% in Izmir for 2018), can cause environmental degradation through over abstraction at source and pollution risks in discharge. With combined storm and wastewater sewers, all water goes for treatment placing the volume increasing pressure on constrained networks and infrastructure as well as more energy to pump and treat.

There is increasingly a move towards more circular approaches to water management through more decentralised collection and reuse of water. For example, rainwater harvesting, or grey water recycling can help reduce run-off to the sewer network and increase capacity for wastewater and reduce the need for abstraction. This non-potable water can be used to purpose that do not require high drinking quality water, such as toilet flushing and irrigation, reducing treatment demands.

With Izmir facing water scarcity and primarily located in and around coastal, low-lying deltaic plains surrounded by steep sides mountain ranges, continued action to improve potable, waste and storm water management infrastructure will play a key role in delivering a more sustainable water cycle in Izmir. Actions in this basket focus specifically on upgrade of the existing water management infrastructure, construction of the new additional water transmission lines and the separation of wastewater and stormwater lines.

What is already being done?

The following projects and activities have / are currently underway within the municipality in regard to network / infrastructure level water cycle management. It is necessary to build on and leverage this work when implementing the GCAP actions proposed around sustainable water cycle and urban drainage.

- In order to prepare the City against global climate change and to create a new road map against possible water shortages, IZSU prepared a 'Potable Water Master Plan' (2017) which plans as far as 2050:
    - As part of the works carried out within the scope of IZSU's Master Plan Report, 18 new surface water resources (15 dams and 3 regulators) have been developed to meet the 2050 water demand for surface water resources across Izmir province. This is in addition to the 6 existing surface water resources operated under the Master Plan and the 7 existing surface water resources which are planned to be constructed in 2020, as well as 6 resources planned by İZSU-DSİ,
    - In order to balance resource availability and demand, a gradual reduction in the share of total water consumption sourced from groundwater has been adopted as a planning decision. In addition, sea water treatment is planned to be used during the years in which surface water and underground water capacities fall short in meeting the potable water demand for Izmir. A sea water treatment facility was suggested for Foça and Çeşme Peninsulas,
- In 2013 the estimated proportion of water lost through leakage was 33.15%. As a result, a project for water leakage and control was conducted for controlled distribution and consumption of existing water via isolated meter zones. Due to these efforts to reduce water leakage, this rate decreased by 4.89% to 28.86% in 2018,
- IZSUs target is to decrease this rate to 25% by 2045. In order to reduce the water loss-leakage ratio to the target value, new isolated meter zones have to be rolled out by IZSU across Izmir,
- In order to improve the efficiency of water supply networks following investments continue in the City:
    - Water network renewal projects (upgrading about 217km of existing 3,437km sewer lines, 597km of existing 7,860 km potable water network in 2018[53]),
    - Automation systems between wells and warehouse,

[53] *İZSU Activity Report, 2018*

- Dissemination of the SCADA system (Supervisory Control and Data Acquisition),
- Separation of storm water from the sewage system.642km storm water network and collector lines was completed in 2019, with a target of up 1,122 km in 2024 (this leaves 480km left between 2020-2024) [54],

- The IZSU Wastewater Master Plan, which is expected to be prepared in 2020, will include opportunities for reuse of grey water, storm water collection and reuse, water sensitive urban design, feasibility studies of stormwater capture tanks in public spaces such as parks and school gardens. It is envisioned that the water retained in the tanks could be used for irrigation.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around sustainable water cycle and urban drainage.

Table 34: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Infrastructure- Urban Infrastructure	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.1** A Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy
Nature - Climate Action	**5**. Making İzmir A Global Model City for Its Harmony With Nature	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Learning by Experiencing - Institutional Capacity	**6.** Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient

Priority Environmental Challenges Addressed:

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need to promote more actions around water cycle management:

Table 35: Priority Environmental Challenges Addressed.

State Indicator	Priority Environmental Challenges
Water Quality	The water loss-leakage ratio for 2018 was calculated as 28.86%. IZSU is aiming to reduce this to 25% in 2045 but given water scarcity issues it is worth considering that this ratio should be decreased even further.
Water Quality	Wastewater and stormwater are collected together in Izmir and transferred to Çiğli and Southwest WWTPs. Stormwater can be separately collected to reduce the burden on the drainage network and WWTPs.
Water Quality	No buildings or infrastructure in Izmir are connected to facilities that reuse domestic wastewater.

[54] *İZSU Strategical Plan, 2020-2024*

Actions

The Green City actions around more sustainable water cycle management within the municipality are summarised below (Table 36). Detailed descriptions of each actions are presented (with the exception of WCM1.6) for those that were identified to be detailed by the municipality.

Table 36: Actions for basket 9.

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
WCM1.10	Upgrade the existing water management infrastructure to incorporate the separation of wastewater and stormwater lines	Capital project	No separation of wastewater and stormwater collection infrastructure	High	**CAPEX:** - **Storm Water Network:** €100,000 / km - **Wastewater Network:** €50,000 / km
WCM1.6	Implementation of a maintenance program for the existing water supply network of Izmir city centre and its surroundings and construction of new additional water transmission lines	Capital project	Low efficiency of water supply network (loss-leakage ratio)	High	N/A
WCM1.5	Integration of stormwater management techniques with urban greening e.g. sponge city principles	Plan /Strategy	Minimal sustainable urban drainage	Low	**CAPEX:** - **Stormwater deposition tanks:** €88 / m^3 - **Green roofs:** €80 / m^2 - **Permeable spaces:** €79 / m^2 - **Green spaces to absorb rainwater:** €11 / m^2

Case Study, learning from other cities[55]

Network/infrastructure level water cycle management of heavy rains and stormwater in Copenhagen — The Cloudburst Management Plan, Denmark

Copenhagen experienced four major rainfall events in the period 2011-2016, resulting in severe damage that was expensive to repair. The city has drawn out a Cloudburst Management Plan in 2013 consisting of expanding the sewer network and surface projects focusing on water retention and drainage and including the following solutions:

- Stormwater roads and pipes that transport water towards lakes and the harbour, e.g. in the built-up area of central Copenhagen;
- retention roads for storing waters;
- retention areas to store very large water volumes, e.g. parks that could turn into lakes during flood events;
- green roads to detain and hold back water in smaller side streets.

Lessons learned from this project include the ensuring that cross-sectoral impacts are considered in the planning stage of the infrastructure improvements. Primarily this was around the city's conservation goals, with an analysis required on the environmental impact of the plan in certain areas. This was prioritised for the projects larger-scale renovations, which also required cooperation between municipalities and private landowners. Ultimately, water treatment control measures were required on stormwater to ensure no pollutants were present.

With Izmir in the process of extensively upgrading their water cycle management, this case study demonstrates considerations that are required during the renovations, striving to ensure that no maladaptive consequences occur as a result of the upgrade.

WCM1.10: Upgrade the existing water management infrastructure to incorporate the separation of wastewater and stormwater lines	
Strategic Plan Objectives	**5.2.** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Description	IBB and IZSUs 2020 Izmir Province Metropolitan Area Wastewater, Stormwater and Streams Master plan, alongside existing IZSU projects, are aiming to collect wastewater and rainwater through separate channels, which will reduce the hydraulic load of the wastewater system and increase the usability of water within the stormwater lines and storage areas. The aim of this action is to analyse the findings of these projects by making the use of the existing feasibility studies, to improve and develop the infrastructure facilities and to further develop the construction techniques during the construction stages. (i.e. the transition from the combined sewer system where wastewater and storm water are collected together through the same channel to a separate system). 480 km storm water network and collector lines are planned to be constructed between 2020-2024 according to IZSU Strategic Plan.
Rationale	Heavy rainfall can cause the combined foul and stormwater sewer system to overflow, causing surface water flooding and increasing the risk of organic pollution entering waterways, water bodies and the Bay. Separate collection of stormwaters can reduce the burden on the drainage network and WWTPs to reduce flood risk and safeguard water quality.
Steps for Implementation	1. Work with IZSU to understand wastewater capacity constraints 2. Identify areas most at risk from sewer flooding 3. Scope and map required interventions including disconnection of stormwater drainage into combined sewers through Sustainable Drainage Systems. This could be combined with opportunities to reuse stormwater and reduce water stress. 4. Tender projects for development. 5. Allocate budget and/or operating requirements for ongoing maintenance (this could be through IZSU or third-party adoption and management). 6. Develop policies for new development to identify opportunities for reducing runoff into combined sewer network to greenfield rates.
Type of action	Capital project
Environmental values positively affected	

[55] *https://climate-adapt.eea.europa.eu/metadata/case-studies/the-economics-of-managing-heavy-rains-and-stormwater-in-copenhagen-2013-the-cloudburst-management-plan*

Climate Change risks and / or vulnerabilities addressed	**Risks:** IM2, IM8, IM9, IM13 **Vulnerabilities:** PE-D, PE-E	
Potential Emission Savings	Reduction in water reaching wastewater treatment plants because stormwater has been removed and treated indirectly will reduce emissions associated with the energy required to run the plant.	
Plan for delivery	**Action owner**	IZSU
	Stakeholders	IBB.
	Financing options	Municipal budget, IZSU, IFIs, Ilbank
	Revenue/savings opportunities	Savings opportunities will occur from the reduction in flooding and runoff-related damage.
	Timeline	2020-2025
Impact measures	• Annual number of storm water or sewerage overflows per 100km of network length • Buildings access to wastewater collection and treatment systems is improved through plans and investment • Area of permeable surfacing	
Estimated cost	**CAPEX:** Storm Water Network: €100,000 / km, Wastewater Network: €50,000 / km **OPEX:** **Design/development costs:**	
Estimated benefits	**Health impacts:** Public health - safety **Economic Development:** Revenue generating activities, avoided damage costs **Social Inclusion:** Access to basic services	
Existing Work Leveraged	IZSU Strategic Plan (2020 – 2024) Wastewater, Stormwater and Streams Master Plan for Izmir Metropolitan area (2020).	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent but should target areas with greatest challenges on capacity.	

WCM1.6: Implementation of a maintenance program for the existing water supply network of Izmir city centre and its surroundings and construction of new additional water transmission lines

Action Description	To implement and fund projects identified in the IZSU Potable Water Master Plan (2017); a maintenance programme across the existing water supply network to reduce leakage rates and additional water transmission lines from alternative water resources developed to create a more resilient system.
Potential Impact	This would help reduce the financial cost of water loss, both in regard to treatment but also the lost revenue. It will also help reduce water use, mitigate against the risk of water scarcity and drought, as well as reducing carbon emissions associated with potable water management and distribution.
Action Owner	IZSU
Timeframe	2021 – 2030
Financing Options	IZSU budget, IFIs, PPP, Ilbank.

WCM1.5: Integration of stormwater management techniques with urban greening e.g. sponge city principles

Strategic Plan Objectives	**6.2.** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient

Description	This action would involve the integration of Izmir's Green Infrastructure Strategy, Urban Green UP programme and IZSU Strategic Plan and action WCM1.18, in order to identify opportunities within proposed GI and GreenUP projects that can be enhanced to incorporate 'sponge city principles. This would be in accordance with the following storm water management techniques: • construction of stormwater deposition tanks in suitable areas such as parks and school gardens • green rooftops that allow for large amounts of water to be absorbed into the soil and plants that sit atop numerous buildings, • permeable spaces that are between surfaces such as sidewalks and roads that help absorb some of the water that comes from rain, • green spaces such as parks and gardens which can absorb the rainwater.	
Rationale	Impermeable surfaces increase stormwater runoff rates, picking up diffuse urban pollution which can impact the quality of water bodies including the bay and rivers. Furthermore, the speed at which stormwater that does reach the combined storm and foul water sewer system arrives can overwhelm capacity resulting in overflows and contamination with sewerage. Sponge city principles priorities green infrastructure approaches to increasing surface permeability to control and cleans stormwater runoff.	
Steps for Implementation	1. Identify areas of stormwater flooding and combined sewer overflow risk 2. Identify potential stormwater absorber areas upstream of the areas at risk. 3. Design stormwater absorbers according to the type of the absorber areas 4. Implement projects 5. Monitor their efficiency	
Type of action	Plan/Strategy and associated capital projects	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM2, IM8, IM9, IM13 **Vulnerabilities:** PE-D, PE-E	
Potential Emission Savings	Reduction in water reaching wastewater treatment plants because stormwater has been removed and treated indirectly will reduce emissions associated with the energy required to run the plant.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	IZSU MoEnvU MOAF
	Financing options	Municipal budget, Ilbank
	Revenue/savings opportunities	Savings opportunities will occur from the reduction in flooding and runoff-related damage and saving the energy needed to water numerous places throughout a city
	Timeline	2020-2030
Impact measures	• Drainage facilities are developed through plans and investment • Areas at risk of stormwater flooding • Annual number of sewerage overflows per 100km of network length • Area of permeable surfacing within the city	
Estimated cost	**APEX:** Stormwater deposition tanks: €88 / m^3 Green roofs: €80 / m^2 Permeable spaces: €79 / m^2 Green spaces to absorb rainwater: €11 / m^2 **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** public health – safety **Economic Development:** Revenue generating activities, Avoided damage costs **Social Inclusion:** Access to basic services	
Existing Work Leveraged	A framework for Resilient Cities to Climate Change: Green Revision Guidebook	

1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery

Basket 10: Support building level water cycle management

Water Cycle Management: WCM1.4, WCM1.9, WCM1.11

While basket 9 focuses on developing the strategic infrastructure to support more sustainability water management, there are many things that can be done at a building scale. IBB wish to lead by example. This action focuses on the 6,630 buildings within the real estate portfolio of the municipality, which we have the greater level of influence and control over. The actions in this basket target sustainable urban drainage, refurbishment and retrofitting methods and stormwater management for all existing and planned publicly owned and managed buildings and open spaces, with a preference for green infrastructure where possible.

What is already being done?

The following projects and activities have / are currently underway within the municipality in regard to building level and public realm water cycle management. It is necessary to build on and leverage this work when implementing the GCAP actions, which include:

- The criteria for using treated wastewater as irrigation water in Turkey is given in Wastewater Treatment Plant Technical Procedures Communiqué.[56] To date, treated wastewater has not been used for irrigation in Izmir,
- The IZSU Wastewater Master Plan, which is expected to be published in 2020, will include opportunities for reuse of grey water, storm water collection and reuse and feasibility studies for stormwater capture tanks in public spaces such as parks,
- A framework for Resilient Cities to Climate Change: Green Revision Guidebook was conducted by IBB and the Landscape Research Society (PAD) in 2019 to make the city of Izmir more resilient to climate change. The project also includes recommendations for storm water management such as; increase pervious surface ratio in urban areas, increasing water infiltration capacity of urban green areas and reducing the amount of impervious surfaces in the areas managed by municipalities, such as urban parks and sport fields,
- Izmir is one of three frontrunner cities for the EU funded Urban GREENUP project, which aims to achieve a suite of positive cascading impacts in relation to both the environmental and socio-economic aspects of green infrastructure. This focuses on the implementation of very technical nature-based solutions including water interventions such as sustainable drainage systems that store and recycle greywater for us in irrigation[57],
- The IBB Action Report (2018), lists municipal-owned buildings and municipality controlled open spaces, as of 2018. These assets can be retrofitted / refurbished with sustainable water practice design considerations and technologies.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around sustainable water cycle management.

Table 37: A summary of IBB Strategic Plan 2020-2024 Objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Experimental Learning - Institutional Capacity-	**6.** Making İzmir a Leading City in the World in Experiential Learning, and	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient

[56] *Official Gazette No. 27527 (2010) Appendix 7, Table E7.1 and E7.2.*
[57] https://www.urbangreenup.eu/cities/front-runners/izmir.kl

Enterprise Resource Management	Creating an Urban Environment, Where Innovative Ideas Flourish

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need for more sustainable water management in IBB owned and managed buildings and open spaces

Table 38: Priority Environmental Challenges.

State Indicator	Priority Environmental Challenges
Water Quality	Wastewater and stormwater are collected together in Izmir and transferred to Cigli and Southwest WWTPs. Stormwater can be separately collected to reduce the burden on the drainage network and WWTPs.
Water Quality	No buildings or infrastructure in Izmir are connected to facilities that reuse domestic wastewater.

Actions

The Green City actions around more sustainable water cycle management within municipality owned and operated buildings and open spaces are summarised below (Table 39). Detailed descriptions of each actions are presented where they were identified to be detailed by the municipality.

Table 39: Actions for basket 10.

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
WCM1.11	Incorporate sustainable water practices and design within existing municipal-owned buildings and municipality controlled open spaces through refurbishment and retrofitting.	Capital project	No separation of wastewater and stormwater	High	**CAPEX:** offices: €14 / m^2 Irrigation to open spaces: €1 / m^2.
WCM1.9	Incorporate SuDs (Sustainable Urban Drainage) and WSUD (Water Sensitive Urban Design) principles into all planned green areas and publicly owned buildings within the scope of green infrastructure.	Policy / Strategy	Minimal sustainable urban drainage	Medium - Low	**CAPEX:** Rainwater harvesting for publicly owned buildings: €4 / m^2
WCM1.4	Stormwater management storage systems for Municipality owned or operating Building and infrastructure at a building level, under-ground, linked to green spaces.	Capital project	No separation of wastewater and stormwater	High	**CAPEX:** Collection tanks for buildings: €88 /m^2 Attenuation basins for open space: €22 / m^2

Case Study, learning from other cities[58]

Building level water cycle management with an Innovative Stormwater, Rain Harvesting Management

With California in an on-going struggle with water scarcity and drought, there is a critical need to use every drop of water sustainably A recent project for the Santa Monica Exposition Metro Line Construction Authority (METRO) epitomised this.

The aim of the new Expo Rail Operations and Maintenance Facility is to meet the regions increased demand for mass transit. By doing so, the project creates impermeable surfaces that require assertive stormwater management approaches.

The new operations and management facility requires an estimated 5,500 gallons of water per day for landscape irrigation, vehicle washing and other aspects. To help meet this demand sustainaby, the METRO officials opted for a Low Impat Development Design, with an innovativ rainwater harvesting and stormwater management system. This include a 400,000 gallons StormCapture cister, upstream pre-treating and a stormwater harvesting system that allows water to be collected, stored and re-used for multiple applications throughout the facility.

This benefits of this system say across-the board efficiencies in water use by reducing the demand on the municpal water supply, land footprint of the deveopment, system maintenance time and budgetary concerns.

WCM1.11: Incorporate sustainable water practices and design within existing municipal-owned buildings and municipality controlled open spaces through refurbishment and retrofitting.	
Strategic Plan Objectives	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Description	Sustainable water cycle management within the 6,630 buildings within the Municipalities real estate and open spaces will be delivered to reduce potable water demand and wastewater to the combined sewer. The development and use of support tools aimed at the building water cycle are as follows: • Rainwater harvesting • Greywater and black water recycling. • Water efficient irrigation methods. • Upgrade to water efficient fixtures and fittings
Rationale	To reduce potable water demand through smart measures such as water efficient fittings and appliances and alternative non-potable sources such as rainwater harvesting and wastewater re-use.
Steps for Implementation	1. Calculate potable water demand from municipal buildings and open spaces to fill the current data gap. 2. Targeting the highest users, undertake cost benefit analysis of potable water demand reduction options. 3. Target building retrofit through planned refurbishment schedules. 4. Develop projects. 5. Allocate budget for and undertake ongoing maintenance.
Type of action	Capital project
Environmental values positively affected	
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM9, IM8 **Vulnerabilities:** PE-H, PE-D.

[58] https://www.buildingsolutions.com/projects/innovative-stormwater-rain-harvesting-management-for-high-drought-area

Potential Emission Savings	While there might be a short-term increase in emissions associated with energy for managing alternative water sources and embodied carbon from the need to have duel pipe networks (potable water and non-potable water), the long-term carbon impact related to managing water stress is likely to be significantly higher.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	IZSU
	Financing options	Municipal budget, Ilbank, private banks
	Revenue/savings opportunities	Savings opportunities will occur from the reduction in water cost
	Timeline	2020-2030
Impact measures	Reduction in potable water use per person	
Estimated cost	**CAPEX:** offices: €14 / m^2, Irrigation to open spaces: €1 / m^2 **OPEX:** N/A **Design/development costs**: N/A	
Estimated benefits	**Health impacts:** Public health – more active lifestyles **Economic Development:** Revenue generating activities, Increased economic efficiency	
Existing Work Leveraged	EBRD Pilot Climate Change Adaptation Market Study: Turkey Urban Green Up	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent.	

WCM1.9: Incorporate SuDS (Sustainable Urban Drainage System) and WSUD (Water Sensitive Urban Design) principles into all planned green areas and publicly owned buildings within the scope of green infrastructure.	
Strategic Plan Objectives	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Description	IBB will integrate WSUD and SuDS principles into all planned publicly owned development, prioritising a green infrastructure solution. This would include the collection of rain and stormwater from rooftops of buildings and through natural attenuation areas for us in toilet flushing, laundry, garden watering and car washing. This will be designed with the aim of conserving potable water and partially meeting domestic water demands using rainwater. IBB's Strategic Plan highlights 8 new municipal buildings and 7 new fire station buildings are planned to be constructed between 2020-2024. In addition, Green Infrastructure strategy of the City has been developed for environmentally-friendly green areas.
Rationale	WSUD and SuDS principals integrate the water cycle more effectively into the urban fabric to reduce flood risk, improve water quality and limit water stress. SuDS will become an integral method to manage the water cycle, by adopting a fit-for-purpose approach to the use of potential alternative sources of water such as rainwater; incorporating the use of water efficient appliances and fittings; minimising wastewater generation. Climate-friendly park arrangements and plant pattern selections will be made.
Steps for Implementation	1. Ensure WSUD and SuDS solutions considered in the design and tendering of new municipal buildings, 2. Undertake whole life-cycle benefit analysis to determine preferred approaches 3. Ensure principles are followed through to constriction and maintenance. 4. Choose climate change-resistant plants that require minimal irrigation for green areas. 5. Set up and implement nature compatible green infrastructure systems, and establish drought-resistant green corridors and multi-functional parks within this context.
Type of action	Design / Capital project

Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM9, IM8 **Vulnerabilities:** PE-H, PE-D.	
Potential Emission Savings	While there might be a short-term increase in emissions associated with energy for managing alternative water sources and embodied carbon from the need to have duel pipe networks (potable water and non-potable water), the long-term carbon impact related to managing water stress is likely to be significantly higher.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	IZSU
	Financing options	Municipal budget, Ilbank, IZSU
	Revenue/savings opportunities	Savings opportunities will occur from the reduction in water cost
	Timeline	2020--2025
Impact measures	• Potable water demand • Area of permeable surfacing • Flood risk • Annual number of storm water or sewerage overflows per 100km of network length	
Estimated cost	**CAPEX:** Rainwater harvesting for publicly owned buildings: €4 / m^2 **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Economic Development:** Increased economic efficiency	
Existing Work Leveraged	A framework for Resilient Cities to Climate Change: Green Revision Guidebook, Küçük Menderes Basin Flood Management Plan, Gediz Basin Flood Management Plan, Kuzey Ege Basin Flood Management Plan	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

WCM1.4 Stormwater management storage systems for Municipality owned or operating Building and infrastructure at a building level, under-ground, linked to green spaces.

Strategic Plan Objectives	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Description	To set up smart- storage water systems, including collection tanks, cisterns, or attenuation basins in and around Municipality owned or operating buildings and sites
Rationale	The collection of storm water will help reduce flow rates to the combine sewer, in turn reducing flood and overflow risks. The stored water could also be used to help reduce potable water demand by providing an alternative non-potable water source for irrigation and toilet flushing. Green attenuation solutions will also support biodiversity, reduce the urban heat island and improve the attractiveness of the city.
Steps for Implementation	1. Identify suitable sites for attenuation, with priority for surface level green solutions. Underground solutions may be more space efficient but can be more costly to deliver and have less additional benefits. Sites should ideally be upstream of flooding issues. 2. Undertake whole life cycle cost benefit of utilising stored water for non-potable reuse either in nearby buildings of for irrigation. 3. Develop project specification and tender the project for development. 4. Allocate budget and implement ongoing maintenance.
Type of action	Capital project

Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM9, IM8 **Vulnerabilities:** PE-H	
Potential Emission Savings	While there might be a short-term increase in emissions associated with energy for managing alternative water sources and embodied carbon from the need to have duel pipe networks (potable water and non-potable water), the long-term carbon impact related to managing water stress is likely to be significantly higher.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	IZSU
	Financing options	Municipal budget
	Revenue/savings opportunities	The savings opportunities will occur through the irrigation of green spaces
	Timeline	2020-2030
Impact measures	• Potable water demand • Area of permeable surfacing • Flood risk • Annual number of storm water or sewerage overflows per 100km of network length	
Estimated cost	**CAPEX:** Collection tanks for buildings: €88 /m^2 Attenuation basins for open space: €22 / m^2 **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** Public health – more active lifestyles **Economic Development:** Increased economic efficiency **Social Inclusion:** Access to essential services **Environment:** increasing the flexibility of energy system.	
Existing Work Leveraged	A framework for Resilient Cities to Climate Change: Green Revision Guidebook, Urban Green UP Küçük Menderes Basin Flood Management Plan Gediz Basin Flood Management Plan Kuzey Ege Basin Flood Management Plan	
1/25,000 scaled IBB Environmental Plan Alignment	Not spatially dependent.	

Basket 11: Review and update of existing local policies, regulations and guidelines

Buildings: B1.3, B1.5
Land-use: LU1.16
Water Cycle Management: WCM1.7.

It is important that all policies are aligned. As such Green City actions to review and update of existing local level policies, regulations and guidelines play a key role in developing and planning, safe and sustainable buildings, infrastructure and urban spaces. Actions in this basket focus specifically on reviewing and update the local-level policies, planning regulations and guidelines for future municipality development around energy efficiency, urban resilience in design and construction and efficiency of new water infrastructure networks.

What is already being done?

The following projects and activities have / are currently underway within Izmir in regard to enhance sustainable infrastructure. It is necessary to build on and leverage this work when implementing the GCAP actions propose.

- In accordance with the 'Spatial Plans Construction Regulation (No. 13.06.2014 – 29020)', in 2012, IBB produced a 1:25,000 scale Izmir Metropolitan Landscaping Plan (updated in 2017), which classifies districts within different geographic areas in relation to the City centre,
- IBB is a signatory to the Covenant of Mayors and therefore has made an independent commitment to achieving specific GHG reductions – something that can only be achieved through significant uptake of renewable technologies and more efficient design and development,
- IBB has prepared a Sustainable Energy Action Plan (SEAP) 2016, which sets out actions including:
  - Creating an inventory of buildings or sectors with high power consumption rates in order to promote energy efficiency measures in these areas,
  - Conducting studies on energy consumption and providing information about reducing greenhouse gas emissions to local organisations,
  - Ensuring that public institutions, especially municipalities, develop relevant databases and adopt greenhouse gas reduction measures,
  - Developing public awareness campaigns or incentive methods to contribute to household budgets through tax reductions such as environmental taxes on energy gains to be achieved,
  - Taking measures to save energy in buildings and increasing the amount of green areas in urban transformation areas,
- IBB has developed a local climate change model and developed the 'A framework for Resilient Cities to Climate Change: Green Revision Guidebook' (2019),
- IBB's new Strategic Plan 2020 – 2024, includes targets to raise awareness of clean energy both inside the municipal administration and with the public, preliminary studies for renewable energy technology, and increase the municipality's own uptake of clean energy. The plan recognises climate risks (such as heat and forest fires) and sets out targets to mitigate them, including increasing the m^2 of climate friendly green areas (parks, recreational areas, medians between roads, squares, intersections) and planting drought- and fire-resistant trees.,
- Pilot Climate Change Adaptation Market Study: Turkey funded jointly by EBRD and IFC and undertaken in collaboration with the Union of Chambers and Commodity Exchanges of Turkey (TOBB) and MoEnvU between 2012 -2013, aimed to develop new approaches to help businesses understand and manage the risks, and identify technological and investment needs and opportunities caused by a changing climate. The study identified and prioritised specific, market-based tools and steps to improve water efficiency and climate-smart solutions for buildings[59],

  In accordance with the National Regulation on the Control of Water Losses within Potable Water Supply and Distribution Systems (No. 08.05.2014 – 28994) which has been in force since May 2014, traceable and controllable isolated meter zones are established to reduce water loss in Izmir,
- Küçük Menderes Basin and Gediz Basin Flood Management Plan prepared by MoAF-General Directorate of Water Management (2019) includes an assessment, flood management actions and measures to be taken that takes into account the possible effects of climate change. [60]

[59] https://www.ebrd.com/downloads/sector/sei/turkey-adaptation-study.pdf
[60] http://taskinyonetimi.tarimorman.gov.tr/_engine//_engine/file.axd?file=/Dokumanlar/Havzalar/kmenderes/kucuk_menderes_havzasi_taskin_yonetim_plani.pdf

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around sustainable infrastructure.

Table 40: A summary of IBB Strategic Plan 2020 – 2024 Objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Infrastructure - Urban Infrastructure	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.1** A Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy
Infrastructure- Sustainable Living Areas	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.2**. Planned, Safe and Sound Settlement Areas Will Be Developed or Regenerated
Experimental Learning - Institutional Capacity	**6**. Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient

Priority Environmental Challenges Addressed:

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need to review and update existing local policies, regulations and guidelines.

Table 41: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Climate Risk and Adaptation	There is currently a lack of consideration of climate change projections in new infrastructure and buildings, as well as regulations around urban density and urban sprawl and energy efficiency regulations in buildings.
Water Quality	The water loss-leakage ratio for 2018 was calculated as 28.86%. IZSU is aiming to reduce this to 25% in 2045 but given water scarcity issues it is worth considering that this target should be higher.
Water Quality	There is currently limited consideration of water efficient fixtures and fittings in current planning policy and regulations within Izmir.

Actions

The Green City actions around more local policy, regulation and guidelines are summarised below (Table 42). No business cases were developed for the actions in this basket, in-line with IBB's selection of actions to prioritise.

Table 42: Actions for basket 11

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
B1.3	Review and update the local-level policies, planning regulations and guidelines for future municipality development around energy efficiency	Policy	No consideration of climate projections for new infrastructure	Medium - Low	N/A

LU1.16	Review and update local-level policies, planning regulations and guidelines for future and new infrastructure development to ensure they consider climate projections and urban resilience in design and construction.	Policy	No consideration of climate projections for new infrastructure	Medium - Low	N/A
B1.5	Revise planning regulations and guidelines to ensure efficient water fittings in all new IBB buildings.	Policy	Planned new Developments	Medium - Low	N/A
WCM1.7	Review existing design and installation standards to increase efficiency of new water infrastructure networks.	Policy	Low efficiency of water supply network (loss-leakage ratio)	Medium - Low	N/A

Case Study, learning from other cities[61]

Review and update of existing local level policies, regulations and guidelines in order to secure future water supply on regional and local level in the River Lavant Valley, Carinthia (2017)

The densely populated River Lavant valley region in the eastern part of Carinthia in the southern Austrian Alps is characterised by a low level of precipitation, geological conditions unfavourable to groundwater storage and a limited number of springs that can be used for water supply. In the past decades, annual precipitation amounts have declined significantly, and the region has been affected by water shortages during hot summers several times. Despite uncertainties in projections of future changes of regional precipitation patterns, the variability of groundwater levels and discharges of springs are expected to increase further in the future, raising the risk of water scarcity and temporal bottlenecks in water supply during drought periods.

The region has responded to these challenges by adaptation measures to secure future water supply on the regional and local level, in particular by establishing a regional water association network interconnecting the supply networks of four municipalities, developing new water sources and investing in extension of the supply infrastructure. The municipalities are encouraging their citizens to use water sparingly and efficiently by providing information about water stress levels and raising awareness about water-saving measures.

The adaptation measures taken on a regional level have, to date, been successful in safeguarding the water supply to ~42,000 consumers connected to the public water supply system. The measures taken by the municipal bodies responsible for local water management in Wolfsberg have secured water suupy for more than 7,000 households over the long-term.

Izmir is currently and will continue to experience high levels of water scarcity. This case study demonstrates examples of approaches that could be adopted in helping to reduce water demand and secure future supply, which IBB and IZSU's existing projects can help build upon.

[61] *https://climate-adapt.eea.europa.eu/metadata/case-studies/securing-future-water-supply-on-regional-and-local-level-in-the-river-lavant-valley-carinthia*

B1.3: Review and update the local-level policies, planning regulations and guidelines for future and new municipality development around energy efficiency.	
Action Description	This aim of this action is to set ambitious energy efficiency standards within the appropriate policy and planning regulations for new Municipality owned buildings. Recognising that building regulations are set at a national level in Turkey, this action targets the area where IBB can influence and take up a leading role. The standards of operational energy performance to be achieved by new Municipality buildings should be aligned with international best practice benchmarks, such as; - CIBSE TM54: Evaluation Operational Energy Performance of Buildings. - ASHRAE
Potential Impact	This has cross-cutting impacts on health and quality of life for the building's occupants, alongside having the potential to reduce the operating costs of the development, as well as preventing / reducing future GHG emission from new Municipality buildings,
Action Owner	IBB
Timeframe	2022 - 2030
Financing Options	Municipal Budget

LU1.16: Review and update local-level policies, planning regulations and guidelines for future and new infrastructure development to ensure they consider climate projections and urban resilience in design and construction.	
Action Description	This action would involve collaboration with relevant bodies to review and update policies, planning regulation and guidelines for new infrastructure development for; buildings transport, water management energy. This would consider the latest climate projections for the province, as outlined in the Cities. "A framework for Resilient Cities to Climate Change: Green Revision Guidebook"[62], applying RCP4.5 and RCP8.5 scenarios for 2050 – 2100. The consideration of urban resilience should incorporate both direct and indirect impacts. Direct impacts include resilience to shocks (e.g. disaster resilience) and to slow-onset impacts (e.g. climate change). Indirect impacts include the effects of depleting or degrading the natural environment, such as through deforestation or pollution, otherwise phrased as a reduction of 'ecosystem services that enable the natural environment to increase our resilience. Infrastructure systems are an important factor to consider, meaning the resilience considered is not just related to an individual infrastructure element but how these elements work together as a network. A resilient infrastructure system should be sufficiently robust, have sufficient redundancy and allow for sufficient resourcefulness to resolve issues with sufficient rapidity to continue operating a normal or near normal performance levels.
Potential Impact	Developing resilient infrastructure make it's sustainable, with increased resource use efficiency and greater adoption of clean and environmental sound technologies and industrial processes. It will help support long-term economic development and also human well-being, alongside reducing the long-term impacts, such as disruption and maintenance / repair costs as a result of a climatic event.
Action Owner	IBB
Timeframe	2021 - 2025
Financing Options	Municipal Budget

[62] https://direnclikent2019.izmir.bel.tr/YuklenenDosyalar/Dokumanlar/AFRAMEWORKFORRESILIENTCITIESTOCLIMATECHANGEGREENREVISIONGUIDEBOOK.pdf

B1.5: Revise planning regulations and guidelines to ensure efficient water fittings in all new IBB buildings	
Action Description	AS per LU1.16 this action would involve collaboration with relevant bodies to review and update the appropriate planning regulation and guidelines to ensure that water efficient fixtures and fittings are considered in all new public buildings. This would involve considering the following water-consuming components: WC's, Urinals, Taps (wash-hand basins and, where specified kitchen taps and waste disposal unit), showers, baths, dishwashers and washing machines.
Potential Impact	The value of this action in that it would reduce potable water consumption and costs related to water consumption and water heating, alongside promoting innovation in design, manufacturing and specification of more water efficient equipment.
Action Owner	IBB
Timeframe	2020 - 2030
Financing Options	Municipal Budget

WCM1.7: Review existing design and installation standards to increase efficiency of new water infrastructure networks.	
Action Description	This action would involve undertaking a review of existing IZSU design and installation standards for water infrastructure networks, with a view of increase the efficiency of new pipeline networks to reduce loss-leakage ratio. This would be building on the potable water network and transmission line projects conducted by İZSU's Water and Construction Works Department, which are prepared in line with the principles set forth in the Regulation on Water Losses in Potable Water Supply and Distribution Systems published in the Official Gazette dated 8 May 2014. It is numbered 28994, and uses Ductile Iron Pipes and HDPE100 pipes in order to minimize the water loss-leakage ratios.
Potential Impact	Ensuring that the design and installation standards of new water infrastructure networks is as efficient as possible, will reduce the loss-leakage ratio for potable water distribution and therefore reduce the systems vulnerability to the impact of droughts and water scarcity, alongside the cost of maintaining and operating the network.
Action Owner	IZSU
Timeframe	2021 – 2025
Financing Options	IZSU Budget.

Basket 12: Support collaboration and/or partnerships with Municipality-wide stakeholders

Energy Supply: ES1.12
Land-use: LU:A
Solid Waste: SW1.6

IBB cannot deliver the changes necessary to meeting our environmental challenges alone. There is also significant talent and expertise in and around our Province. As such, the actions in this basket pursue the goal of delivering more resilient and sustainable urban infrastructure in Izmir through strategic partnerships with influential stakeholders.

We currently have limited recycling infrastructure, and although we have developed some renewable energy sources, this needs to be scaled up to reduce our reliance of fossil fuels. Opportunities will be taken to share and understand technical knowledge, with a focus on delivering renewable energy and waste infrastructure as well as implementing risk reduction strategies, in order to provide syngeneic benefits for all parties.

What is already being done?

Given the climatic, geographical and industrial characteristics of Izmir, the province has huge potential and capacity for the enhancement and development of low carbon and renewable energy types. Izmir's potential to generate renewable energy, especially wind and solar power, is extremely high. Renewable energy investments will be supported to increase capacity of production of electricity from solar and wind power.

There are also opportunities for geothermal district heating. For the province as a whole, 60% of energy in Izmir is generated by natural gas power plants, while wind power plants generate only 19%[63]. Additionally, being one of the leading provinces in terms of agriculture and livestock, Izmir also has considerable potential for biomass and biogas. There is currently a biogas plant located in the Izmir landfill Harmandalı site, and the potential for generating electricity from biogas is around 45 MW depending on the availability of agricultural land suitable for use in Izmir and the amount of animal and plant waste .

Izmir has and is currently undertaking multiple projects that show both the cooperation between the municipality and its stakeholders, with a focus on taking action that has helped improve the resilient and sustainable infrastructure in Izmir.

- Under the leadership of the IBB Directorate of Climate Change, Environmental Protection Control, and the Directorate of Climate Change and Clean Energy, and in coordination with local stakeholders, IBB have recently updated the SEAP with the new SECAP, which includes actions on renewable energy such as solar energy, geothermal heating, power generation from solid waste landfill and biomass usage. The target set by the Municipality is to increase the capacity for solar power to 10 GW and wind power to 16 GW until 2030[64], which helps contribute towards meeting the Municipalities target of a 40% reduction on 2018 baselines emissions by 2030,

- IZKA has prepared the Outcome-Based Clean Energy and Clean Technologies Program (TETSOP) for renewable energy in Izmir,

- The Harmandalı Solid Waste Landfill Facility, commissioned in 2019, is a facility that generates electricity from the landfill gas with a min. capacity of 15 MWe,

- Together with the Aegean Forest Foundation, IBB organizes trainings for students on nature, environment, waste and recycling,

- A ‘Recovery Specialization Organized Industrial Zone’ is planned to be constructed by the Aegean Region Chamber of Industry (EBSO), in collaboration with IBB. This industrial zone is planned as part of “Zero

[63] *Izmir SECAP Report, 2020*
[64] *Izmir SECAP Report, 2020*

Waste" project, the aim of which is to collect and recycle solid waste in the economically viable, modern and eco-friendly facilities[65],

- İZSU General Directorate has constructed a Solar Sludge Drying Facility as part of the İZKA Renewable Energy and Environment Technologies Financial Support Programme. The aim of the project has been to recycle the sludge formed during the wastewater treatment process using only renewable solar energy, in a financially efficient manner,

- İZKA has implemented the Boosting Effective and Sustainable Transformation for Energy (BEST) project which is supported by the Ministry of Industry and Technology. The aim is to assist the firms in the clean energy sector that develop equipment and environmental technologies. It has been undertaken in partnership with the Energy Industrialists and Businesspeople Society[66],

- İZKA has supported the Solar Energy Institute of Ege University Centre's project on Biomass Energy Systems and Technologies (BESTMER). The project consists of working with local manufacturers on research and development projects and with consultancy services to better understand and develop biomass energy technologies. As part of the project the Solar Energy Institute also maintains a GIS system in Izmir province, inspects installed biomass systems and provides certification programs to educate qualified workers for the renewable energy sector[67],

- Izmir signed up to the Plastic Smart Cities programme[68] on the 25th of September 2019, making a commitment to prevent the release of plastic pollution into the marine environment, through the reduction in the use of disposable plastics and increase in plastic recycling,

- A Solid waste Inventory was undertaken for Domestic Waste across the districts within Izmir for 2017, obtaining information for 24 of the 30 districts as found in Table 43. This shows that infrastructure for solid waste vastly outweighs that for separation of waste i.e. recyclable materials such as cardboards, plastics and glass.

- In addition to IBB's facilities using electricity produced from renewable energy sources in Izmir, solar panels were installed on the roofs of four more facilities. A total of 280 thousand KwH of electricity will be generated annually from the solar panels of these four facilities, and 140 tons of carbon dioxide emission will be prevented annually[69],

Having commissioned the first solar power plant two and a half years ago, ESHOT is building three more solar power plants (SPP). With the commissioning of these three SPPs, ESHOT will reach a total installed power capacity of 4.5 megawatts (4500 kilowatts) and will meet all electricity needs from the solar panels[70].

Table 43: Data showing the number of bins and collection trucks for different waste types across 24 districts in Izmir in 2017.

Waste Type	Number of Collection Trucks	Number of Bins
Solid Waste	415	114,472
Separation of Waste	143	30,305

[65] *IBB News,* https://www.izmir.bel.tr/tr/Haberler/hedef-sifir-atik/39290/156
[66] *Izmir Development Agency (İZKA) Interim Activity Report 2019,* http://www.izka.org.tr/sites/default/files/2020-03/2019_ara_faaliyet_raporu.pdf
[67] *Izmir Development Agency (İZKA), BESTMER Directed Project,* http://www.izka.org.tr/tr/biyokutle
[68] *Plastic Smart Cities:* https://plasticsmartcities.org/pages/plastic-smart-cities
[69] https://www.izmir.bel.tr/tr/Haberler/43727/156
[70] https://www.izmir.bel.tr/tr/Haberler/eshot-tum-elektrik-ihtiyacini-gunesten-saglayacak-/41268/156

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from the IBB Strategic Plan 2020-2024 as the actions developed around clean energy resources and a sustainable living environment:[71]

Table 44: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Infrastructure – Sustainable Living Areas	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.2** Planned, Safe and Sound Settlement Areas Will Be Developed or Regenerated
Quality of Life – Accessible and Clean Energy	**2.** Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.4** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Nature- Recycling	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. The Priority Environmental Challenges that drive the need for more collaborative, partnership working are:

Table 45: Priority Environmental Challenges.

State Indicator	Priority Environmental Challenges
Soil Quality	Food waste is currently disposed of at landfills and not composted.
Soil Quality	There is no separate collection and appropriate recycling of waste prior to disposal in landfills in Izmir. In order to comply with EU requirements, all the MSW (municipal solid waste) should be treated or recycled instead of going directly to landfill, and only the waste that cannot be recycled should go to landfill.
Green Space, Biodiversity	A rising population within the city has led to a rapid urban expansion due to a rising demand for housing and infrastructure, increasing the competition for land-uses with industry, agricultural and the natural environment, alongside encouraging the construction of poor quality, informal settlements.
GHG Emissions	There is currently a minimal uptake of renewable energy by both the municipality and private sectors.

Actions

The Green City actions around collaboration and partnership with stakeholders the municipality are summarised below (Table 46). Business cases were not developed for these actions, in-line with IBB's selection of actions to prioritise.

[71] *IBB Strategic Plan 2020-2024*

Table 46: Actions within basket 12.

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
ES1.12	Work with the local utility companies to understand capacity constraints and help facilitate a shift towards smart-renewable electric systems.	Capacity-building	Minimal uptake of renewable energy	Low	N/A
LU.A	Identify and collaborate with stakeholders to lobby for the necessary amendments to regulations to enable the design and development of the 7 “Risk Areas” identified under Law 6306 (Transformation of Areas under Disaster Risk).	Plan / Strategy	Rapid urban expansion	Medium - Low	N/A
SW1.6	Partner and / or cooperate with relevant institutions and organisations that can act jointly in line with Zero Waste Regulation to develop and invest in the necessary smart-waste collection requirements (bins, trucks, routes etc) and recycling infrastructure.	Plan / Strategy	Lack of solid waste separation.	Low	N/A

Case Study, learning from other cities[72]

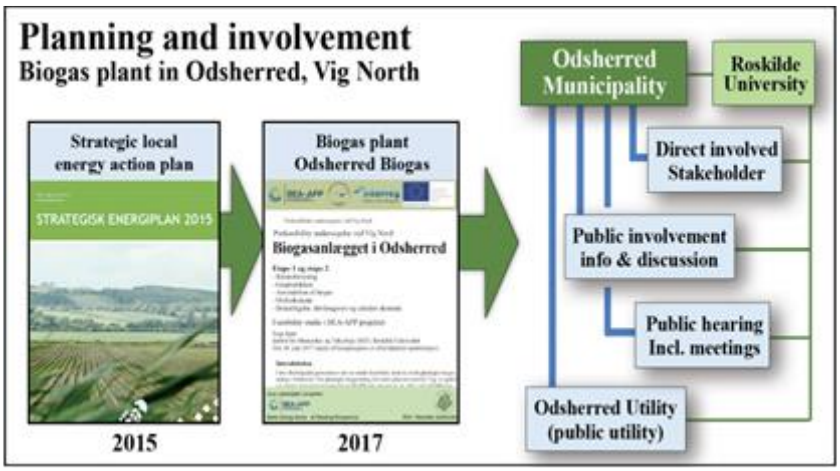
Cooperation with stakeholders in the pilot project on the planning process for establishment of biogas plant in Odsherred Municipality, Denmark (2018)

The pilot project aims to contribute to the development of a biogas plant, based on the philosophy of circular economy in qualifying and using local resources. The planning process is focused on establishment of biogas plant (capacity of 160,000 tonnes) based on residues from agriculture and local industry. The process comprised of meetings and discussions with mayor and top officials, municipal councillors, involvement of direct stakeholders in the facility, public meetings on plans of location, function and size of facilities, and public consultation meetings proposals.

Key stakeholders addressed were farmers who own the land and / or supplied some of the biomass for the plant, a group of suppliers to the plant (pig farmers, local feed factory, pharmaceutical company, the farmers' association), energy utilities, the municipality and researchers (Roskilde University). Stakeholder communication and their continuous involvement in the project occurred through meetings of various sizes which were organized throughout the process.

Since the project was completed, a lessons learned exercise was undertaken to provide recommendations for stakeholder engagement in future spatial planning development, this includes

- Early involvement of stakeholders is a prerequisite for successful planning and implementation.
- Stakeholders request should be provided comprehensive communications on technologies, costs and benefits, given in an easy to understand and attractive manner.
- It was deemed that interactive communication methods were the most suitable when promoting cooperation in planning.
- Stakeholder engagement needs to bring a confidence to the participating parties that their contribution to the project is not a waste of time and their opinions have been considered.



ES1.12: Work with the local utility companies to understand capacity constraints and help facilitate a shift towards smart-renewable electric systems.	
Action Description	The municipality aims to pursue a collaborative approach with local utility providers in order to help facilitate: - effective clean energy procurement and integration, - decarbonization of the grid, - A review of utility resource plans, and a stronger relationship between the local utility companies and their Izmir based customers that can lead to future innovation. Collaboration through resource planning, specifically including public demand in integrated resource planning processes, allows municipalities and utility companies to better anticipate the associated additional renewable energy capacity within the city's energy generation portfolios. It gives the utility companies the opportunity to site these

[72] https://www.balticenergyareas.eu/images/achievements/BEA-APP_Deliverable-3.3.pdf

	resources where they are most efficient and to work to reduce grid issues that arise from variable renewable sources. Aligned planning also supports faster decarbonization for the utility territory with increasing customer purchasing options[73].
Potential Impact	By investing in the expansion and upgrading of Izmir's solid waste collection and recycling infrastructure, it will provide multiple benefits across the province. These includes; a reduction in GHG emissions currently associated with collection and disposal through landfill, a reduction in the demand on virgin materials and a decrease in both air and soil pollution associated with existing waste management practices. The potential magnitude of emission savings is not possible to quantify without further detailed feasibility studies.
Action Owner	IBB
Timeframe	2021 - 2030
Financing Options	Municipal Budget

LU.A: Identify and collaborate with stakeholders to lobby for the necessary amendments to regulations to enable the design and development of the 7 "Risk Areas" identified under Law 6306 (Transformation of Areas under Disaster Risk).	
Action Description	Within the framework of Law No. 6306 (Transformation of Areas under Disaster Risk), the MoEU is carrying out urban transformation projects on a consensus-based 918.16 ha area in İzmir. IBB will identify and collaborate with the necessary stakeholders in order to make the required amendments to current regulations to enable the transformation of 918.16 ha area (defined as Risk Areas) and creation of sustainable, healthy, and liveable urban spaces throughout the Municipality.
Potential Impact	By help transform the "risk areas" within Izmir will have impacts across multiple sectors. This would include reducing the vulnerability of those who reside in these areas to climate events, increasing energy efficiency and reducing associated GHG emissions, as well as improving the quality of life and health and wellbeing of the residents.
Action Owner	IBB
Timeframe	2021 - 2025
Financing Options	Municipal Budget

SW1.6: Partner and / or cooperate with relevant institutions and organisations that can act jointly in line with Zero Waste Regulation to develop and invest in the necessary smart-waste collection requirements (bins, trucks, routes etc) and recycling infrastructure.	
Action Description	This action would focus on investing in and developing the necessary smart waste collection infrastructure and assets that IBB requires to help advance Izmir Integrated Solid Waste Management Plan 2018. It would be developed in-line with actions SW1.3 and SW1.8. The amount of solid waste per capita in Izmir has increased in recent years, rising from 390.55 kg per capita in 2008, 469.09 kg per capita in 2018 – a 20% increase. According to the (Izmir Province Integrated Waste Management Plan, the amount of waste per capita is expected to continue to rise in the next decade.

[73] *Pathways To Integrating Customer Clean Energy Demand In Utility Planning - Heidi Bishop Ratz And Lori Bird*

	In 2018, 4800 tons of waste was accepted per day in Harmandalı Solid Waste Storage Area. The amount of urban solid waste is expected to be 5,413 tons in 2025. This action is therefore necessary to minimise the increase in waste, and associated GHG emissions. There should be a focus on both expanding capacities to ensure that 100% of areas within the province receive a weekly collection, whilst also upgrading to a smart waste management system. The first stage of this action would involve filling the current data gaps regarding the current number of waste collection trucks and the district through Izmir that would require more extensive collection coverage. Developed in-line with the timeframes for the construction of disposal and recycling facilities, outlined in the Izmir Integrated Solid Waste Management Plan 2018
Potential Impact	By investing in the expansion and upgrading of Izmir's solid waste collection and recycling infrastructure, it will provide multiple benefits across the province. These includes; a reduction in GHG emissions currently associated with collection and disposal through landfill, a reduction in the demand on virgin materials and a decrease in both air and soil pollution associated with existing waste management practices. The potential magnitude of emission savings is not possible to quantify without further detailed feasibility studies.
Action Owner	IBB
Timeframe	2020 - 2030
Financing Options	PPP, IFI's, State Investment, Municipal Budget, Municipality Issued Green Bonds

Basket 13: Address the urban heat island effect

Land-use: LU1.7

The materials used to develop urban centres tend to absorb more solar radiation that surrounding rural areas. This stored heat is released as air temperatures drop, effectively making denser urban areas warmer by up to 8ºC. This is known as the urban heat island effect and exacerbates temperature rises due to climate change. Long, hot periods, especially nights, can result in many health problems and cause damage to urban infrastructure. Izmir is a relatively dense city with limited areas of greenspace and facing an increase in temperatures of 4.6ºC and increase in solar ration to by 9w/m^2 by 2100[74]. Actions in this basket focus specifically on techniques to mitigate the Urban Heat Island Effect.

What is already being done?

The following projects and activities have / are currently underway within Izmir in regard to helping reduce the urban heat island effect. These actions have focused on the importance of green spaces and green infrastructure with an urban environment. It is necessary to build on and leverage this work when implementing the GCAP actions proposed around addressing the urban heat island effect.

- Green Spaces Information System (YABİS) was developed under the protocol signed among IBB's Parks and Gardens Department, Maps and GIS Department, and Izmir High Technology Institute in July 2017. In this study, all green spaces in Izmir were uploaded to GIS, using satellite images obtained from the Ministry in 2018. The green space map was integrated with GIS, and then transferred to the IBB Spatial Database, and stored as smart data, allowing any kind of inquiry and analysis. This study provided the following:
  - Green space information collected from 30 districts of IBB, was assessed to obtain park concentration maps on a district basis. In addition to this assessment, population and age ratios of the districts were calculated and in total 1295 neighbourhoods were assessed to determine their need for parks.
  - This study helped to determine the neighbourhoods that needed green spaces the most, and to identify those who have priority due to age distribution of the residents,

- There is a Project for Developing Green OIZ (Organised Industrial Zones) in Turkey, which is conducted jointly by the Ministry of Industry and Technology and the World Bank, and under this project, action plans for resource efficiency and green infrastructure are prepared for four OIZs including IAOSB,

- IBB Green Infrastructure Strategy (2018) sets out recommendations to promote green infrastructure, such as a green belt around the city, and an ecological corridor to the south,

- IBB are currently implementing programmes such as Urban GREENUP and have issued strategies such as A framework for Resilient Cities to Climate Change: Green Revision Guidebook (2019), which recognise and provide actions for increasing the permeable surface area and green space across the municipality.

Specific Strategic Plan Objectives of IBB

IBB Strategic Plan 2020-2024 includes targets to further increase the m^2 of green space per capita, increasing the number of trees planted, and better connect and integrate green space.

The following strategic objective has been selected from IBBs Strategic Plan for 2020-2024 for the actions developed around green infrastructure.

[74] *A framework for Resilient Cities to Climate Change: Green Revision Guidebook*

Table 47: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objectives
Infrastructure - Green Infrastructure	**1.** Building a Sustainable Infrastructure Available to Everyone	**1.3.** Climate Friendly Urban Green Areas Network Will Be Created in the Province

Priority Environmental Challenges Addressed

The following key finding from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges have been identified as exacerbating the need to address the urban heat island effect:

Table 48: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Greenspace, biodiversity	Izmir's green and natural spaces are competing with residential, commercial and industrial constructions as well as all transport and utilities infrastructure.

Action

The Green City action around implementation techniques to mitigate the Urban Heat Island Effect across the municipality is summarised below (Table 49). A detailed description of this action is also presented.

Table 49: Action within basket 13

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
LU1.7	Identify and implement techniques to mitigate the Urban Heat Island Effect.	Policy / Strategy and Capital Project	Lack of Green Space (m^2)	High	**Capex:** **Tree cover:** €21 / m^2 • **Green roof:** €80 / m2 • **Cool roofs:** €83 / m^2 • **Cool pavements:** €81 / m2 • **Shading in public spaces:** €286 / m^2

Case Study, learning from other cities[75]

Addressing the urban heat island effect in Stuttgart: combating the heat island effect and poor air quality with green ventilation corridors (2014)

Stuttgart's location in a valley basin, its mild climate, low wind speeds, industrial activity and high volume of traffic has made it susceptible to poor air quality. Development on the valley slopes has prevented air from moving through the city, which worsens the air quality and contributes to the urban heat island effect.

Funded by the City of Stuttgart and the Verband Region Stuttgart, climatic data was generated in order to develop a Climate Atlas. This atlas, presented the distribution of temperature and cold air flows according to the city's topography and land use for 179 towns and municipalities within the region. The aim of the atlas is to inform urban planners on what to do for urban climatic optimisation in new projects. To do this, the atlas comprised of maps showing regional wind patterns, flows of cold air and air pollution concentrations.

A key element of the atlas was also the role of topography, development density and character, as well as the provision of green space plays on the exchange and flow of cool air. Based on this, the following design principles were therefore outlined:

- Valleys and hillsides should not be developed as they serve as air delivery corridors and enhance intensive and fresh-air transport
- Urban sprawl is to be avoided.
- All tree growing in the urban core with a trunk circumference of more than 80cm at height of 1m are protected.
- Green space should be connected, and vegetation should be placed to surround developments.

As a result of the atlas, over 39% of Stuttgart's surface areas has been put under the protection of nature conservation orders. Greenery no covers more than 60% of the city, with the region containing 5,000 hectares of forest, 65,000 trees in parks and 35,000 street trees. Additionally, 300,000 m^2 of rooftops have been greened and 40 our of 250 km of tram tracks have been grassed, Alongside this, 60ha of greenfield land previously earmarked for development was cut from the 2010 land development plan to protect existing green space.

The urban areas within Izmir are known to be experiencing the impacts of the urban heat island effect. This case study demonstrates the outcomes that can be achieved producing a data and policy driven atlas and set of recommendations to be implemented on new project

LU1.7 Identify and implement techniques to mitigate the Urban Heat Island Effect	
Strategic Plan Objectives	**1.3.** Climate Friendly Urban Green Areas Network Will Be Created in the Province
Description	Actions will be taken to reduce urban heat island effect such as promoting micro-climate cooling through increasing tree and vegetative cover, installing green roofs, installing cool—mainly reflective—roofs, using cool pavements (either reflective or permeable), developing a shading strategy for urban areas and including highly efficient water features in open public spaces.
Rationale	Urban materials have a tendency to absorb and trap solar radiation (heat), reradiating this heat once surrounding temperatures drop. These elevated temperatures are known as urban heat islands. They can be particularly detrimental during the summer nights affective the environment and quality of life, such as increase energy demand for cooling, increase in air pollutant and greenhouse gas emissions, affect human health by contributing to general discomfort, respiratory difficulties, heat cramps and exhaustion, non-fatal heat stroke, and heat-related mortality and raise in water temperatures due to heated storm water. Choice of urban material finishes and particularly green infrastructure, can help reduce the urban heat island effect by reflecting and or reducing the absorption of heat. Green spaces have the added potential to reduce temperatures through evapotranspiration. This action will also help improve on the currently low provision of greenspace across the city which is currently only 8m^2 per person.
Steps for Implementation	This action can be broken down into two aspects in order to reduce the urban heat island effect in Izmir: **Identify:** 1. Undertake urban heat island modelling. This can be done through near earth infrared observations or using proxy data from urban density, permeability of surfacing, tree canopy cover, green space cover and wind modelling. 2. Identify priority areas for urban heat island management 3. Explore range of urban heat management solutions 4. There are likely to be range of delivery options, as such it is important to understand opportunities for implementation including alignment with urban renewable priorities (i.e. urban transformation areas, pavement renewal, public / institutional building retrofit) **Implementation:**

[75] https://climate-adapt.eea.europa.eu/metadata/case-studies/securing-future-water-supply-on-regionalstuttgart-combating-the-heat-island-effect-and-local-level-in-the-river-lavant-valley-carinthiapoor-air-quality-with-green-ventilation-corridors

	1. Work with public / institutional buildings to install green / reflective roofs 2. Deliver urban greening projects in public open spaces 3. Work with highways management to improve the albedo and permeability of road and pavement surfacing	
Type of action	Policy / Strategy and Capital Project	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM1, IM5, IM6, IM11, IM24, IM25, IM27, IM30, IM32, **Vulnerabilities:** SE-E, PE-D, PE-E	
Potential Emission Savings	Tackling the urban heat island effect has the potential to reduce emissions through the reduced need and therefore use of mechanical cooling such as air conditioning.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	MoEnvU, 4th Regional Directorate of Nature Conservation and Natural Parks, NGO, Vulnerable groups e.g. elderly, infirm, women.
	Financing options	Municipal budget, IFIs, Ilbank, private banks, private developers
	Revenue/savings opportunities	Savings opportunities will come from reduced energy costs and improved health outcomes from Izmir's citizens
	Timeline	2020 -2030
Impact measures	• Peak temperatures (particularly at night) • Green canopy cover • Reflective / green roofs installed • Open green space area ratio per 100,000 inhabitants • Share of green space areas within urban limits • Average annual growth rate of built-up areas • Area of permeable, reflective surfacing	
Estimated cost	**CAPEX:** Tree Cover: €21 / m^2, Green Cover: €80 / m^2 Cool roof: €81 / m^2, Cool pavements: €81 / m^2, Shading in public spaces: €286 / m^2. **OPEX:** N/A **Design/development costs:** N/A	
Estimated benefits	**Health impacts:** Public health – reduced pollution, more active lifestyles **Economic Development:** Avoided damage costs **Social Inclusion:** Social equity **Environment:** mitigation of GHG Emissions.	
Existing Work Leveraged	Urban Green Up Izmir Green Infrastructure Strategy A framework for Resilient Cities to Climate Change: Green Revision Guidebook	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City	

Basket 14: Implement strategies for urban greening

Land-use: LU1.18 & LU1.19.

Urban greening has many benefits for both residents and biodiversity. It is well documented that high quality green urban environments help improve physical health and mental wellbeing as well as improve air quality and decrease presence to climate change. In Izmir, there is an average of 8.6m^2 of greenspace per person in the city[76] which is relatively low, against the internal benchmark of 10m^2 within the urban limits of a city. This basket of actions will seek to create a more connected of greenspaces that connect citizens to parks and open spaces and green corridors that ultimately connect to rural areas. It will also allow the representation of biodiversity components within the city and provide the city with various ecosystem services such as climate regulation. This will provide a network of recreation spaces that will also help improve ecological connectivity throughout the city.

What is already being done?

In order to improve the urban greening of Izmir, several strategies and projects have already been developed:

- Izmir is one of three lead runner cities for the EU funded Urban GREENUP project, which aims to mitigate the effects of climate change, improve air quality and water management, and increase sustainability in cities through nature-based solutions. The current status of Izmir has been monitored and greening implementations have been designed for Izmir.

- Arboreal areas around car parks, installation of parklets, smart soil (biochar) structures, green permeable pavements, green covering shelters for car parks and carbon sequestration areas in the city, Smart soil production for urban farming, natural pollinator modules, grassed swales and water retention ponds around bio-boulevard and climate-smart greenhouses[77],

- IBB Green Infrastructure Strategy (2018) sets out recommendations to promote green infrastructure. This includes; a green belt around the city, an ecological corridor to the south and establishment of corridors that will connect green and blue infrastructure. The Strategy is a project under the Horizon 2020 Framework,

- The Izmir Strategic Plan 2020 – 2024, aims to create 500,000m^2 of additional new green space each year, totalling 2,500,000m^2, increasing the greenspace ratio by 0.53m^2 per capita across the province,

- IBB has collaborated with Landscape Research Society (PAD) and Austrian Society for Urban Ecology (SURE) for the Green Re-Vision project (A framework for Resilient Cities to Climate Change: Green Revision Guidebook) with the theme of constituting a framework for resilient cities. The aim of this project is to help Izmir to become a resilient city against the effects of climate change,

- Green Spaces Information System (YABİS) was developed under the protocol signed among Parks and Gardens Department, Maps and GIS Department, and İzmir High Technology Institute (İYTE) in 2017. In this study, all green spaces in İzmir were uploaded to GIS and the green space map was integrated with GIS and then transferred to the IBB Spatial Database and stored as smart data. The collected data was assessed to display the park concentration and the need for parks in 1295 neighbourhoods, both spatially and by the age distribution.

Specific Strategic Plan Objectives of IBB

IBB Strategic Plan 2020 – 2024 sets targets to increase the m^2 of green space per capita, number of trees planted, and better integration of green space.

[76] *IBB Annual Report 2019.*
[77] *Urban GREENUP Programme 2019.*

The following strategic objective has been selected from the IBB Strategic Plan 2020-2024 as the action developed around nature and urban greening:[78]

Table 50: A summary of IBB Strategic Plan 2020-2024 Objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Infrastructure- Green Infrastructure	**1**. Building a Sustainable Infrastructure Available to Everyone	**1.3** Climate Friendly Urban Green Areas Network Will Be Created in the Province

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. The priority environmental challenge that has been identified as exacerbating the need for further work on urban greening is as follows:

Table 51: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Green space, biodiversity	There is currently a lack of interconnecting green space within Izmir, with the city dominated by hard landscaping and the built environment. This is due to the benefits of interconnected green space and habitat bridges being relatively unknown when large swathes of the city was designed and built.

Actions

The Green City action around LZC energy and heat studies within the municipality is summarised below (Table 52). A business case was not developed for these actions, in-line with IBB's selection of actions to prioritise.

Table 52: Actions for basket 14

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
LU1.18 & LU1.19	Further develop the green and blue infrastructure strategy.	Plan / Strategy	Lack of high quality urban green space.	Medium - low	N/A

[78] *IBB Strategic Plan 2020-2024*

Case Study, learning from other cities[79]

MetroGreen – Linking Lands for Nature and People in Kansas City

MetroGreen is a proposed 1,144-mile (1841 km) interconnected system of public and private open spaces, greenways, and trails designed to link seven counties in the Kansas City metropolitan area. MetroGreen builds on the area's tradition of valuing green space by identifying 85 separate green corridors that have the potential to form a regional network of greenways that would link the area's most valuable natural assets. By the end of 2008 MetroGreen had succeeded in creating 252 miles (405.5 km) of greenway trails and protecting about 91,000 acres (36,826 hectares) of stream corridors.

The MetroGreen Plan was implemented through a mix of acquisition, education, outreach, incentives, voluntary initiatives, ordinances, and other conservation and policy tools. Since it's inception, it has relied on numerous funding sources, such as Family Foundations, the U.S E.P.A, state funding such as from the Missouri Department of Natural Resources as well as grants from various environmental protection programmes.

As of December 2007, the region had successfully protected, through public ownership, 9,700 acres (3,925 hectares) of the priority regional greenways. Stream setback ordinances protect an additional 8,000 acres (3,237 hectares), ensuring these areas will remain undeveloped, allowing opportunities for connections and possible restoration.

Izmir is city that is growing and experiencing an ever-increasing competition for land-use. This has ultimately been seen to have a detrimental impact on the city's open, green spaces. This case study demonstrates an approach that could be built upon in order to help secure and enhance the Izmir's green spaces, with the aim of ultimately developing interconnected, priority greenways.

LU1.18 & LU1.19: Further develop the green and blue infrastructure strategy	
Action Description	The aim of this action to building on and utilising the existing work undertaken by the Urban GreenUP programme and the IBB Green Infrastructure Strategy (2018) in order to support: • Cohesive and inter-connected green spaces within the urban areas. • Blue infrastructure for microclimate cooling (in line with action LU1.7). • Sequestration potential for urban greening and the incorporation of Natural Capital.
Potential Impact	Further developing the green and blue infrastructure can have multiple benefits, including; enhancing urban biodiversity, improving stormwater quality, retaining runoff in landscaped areas and enhancing flow management, develop an urban cooling effect and reducing the energy demand for cooling in buildings, improve air quality, encourage a more healthy, outdoor and active lifestyle, increase property values and marketability of neighbourhoods
Action Owner	IBB
Timeframe	2021 - 2025
Financing Options	Municipal budget, IFIs, Ilbank, private banks, private developers

[79] *Kansas City Green Infrastructure Case Study,* https://www.conservationfund.org/images/programs/files/Kansas_City_Green_Infrastructure_Case_Study.pdf

Basket 15: Protection, restoration and regulation of the natural environment and ecosystems

Land-use: LU1.2
Industries: I.A
Water Cycle Management: WCM1.14.

Izmir is fortunate to have a wide variety of habitats and is home to sites that are internationally important for wildlife, of which there are around 300 different species recorded within the province. It is vital that we protect these areas, their ability to support biodiversity and the wider ecosystem services that provide economic and social benefit to wider society.

Elsewhere in the Province, however, urban agricultural expansion and agricultural intensification, along with agricultural and industrial discharge has led to environmental degradation. Furthermore, there is limited greenspace within the urban areas where the built environment and supporting transport infrastructure fragments habitats and functional ecosystem. These habitats are not only important for wildlife, but are vital for human health and well-being, providing places for recreation, improving air quality and helping mitigate the impacts of climate change. With 8.6m^2 of green space per person on average across the city[80], it is important that we increase the area of greenspace and green cover.

This basket of actions focuses on protecting and enhancing the existing terrestrial and marine biodiversity and creating new ecologically diverse habitats. This will help strengthen the ecology and associated provision of ecosystem services while improving resilience to climate change.

What is already being done?

The following projects and activities have / are currently underway within Izmir relating to enhancing biodiversity and ecosystem. It is necessary to build on and leverage this work when implementing the GCAP actions proposed around natural environment and ecosystems.

- Turkey was a signatory to the 1992 Convention on Biological Diversity, ratified into law in 1996. In 2006/2007 the MoAF developed a National Biological and Diversity Strategy Action Plan (NBSAP) for 2007-2017, recently updated in the National Biodiversity Action Plan (NBAP) 2018-2028. These plans adopt five strategic goals aimed at reducing biodiversity loss, reducing pressures and promoting sustainability,

- Designated sites within Izmir that reflect the importance of some of this diversity are; the Foça Special Environmental Protection Area (SEPA), Karaburun - Ildır Bay SEPA, Çakalburnu Lagoon, Meles Delta and the Gediz Delta Ramsar site. Gediz Delta is also located within Izmir Gulf and is an area designated by Doğa Derneği (Birdlife International's Partner in Turkey) as an Important Bird Area (IBA) as well as a Key Biodiversity Area (KBA),

- Within the province there are several ongoing projects and studies relating to biodiversity and ecosystem enhancement, including:
  - Gediz Basin Management Plan of the MoEnvU - General Directorate of Environmental Management 2018, TUBITAK MAM,
  - A Review on Urbanisation, Pollution and Biodiversity in Izmir, 2019, International Journal of Environmental Trends,
  - Key Biodiversity Areas of Turkey, 2018[81],
  - Wind Energy: Possible Threats to an Endangered Natural Habitat in Izmir, 2016, Convention on the Conservation of European Wildlife and Natural Habitats,

- A Inventory Study was undertaken in 2016, 2017 and 2018 for the whole of province. Carried out by the technical staff of the Izmir Branch Directorate of the Ministry of Agriculture and Forestry and the Reptile and Amphibian experts, the aim of this inventory has been to better understand and therefore protect the existing biological richness of Izmir and to identify new species,

[80] *IBB Annual Report 2019.*
[81] *https://keybiodiversityareasturkey.org/*

- Since 2011, marine monitoring studies have been carried out by MoEnvU. These studies are centred around an ecosystem-based management approach under an Integrated Marine Pollution Monitoring Programme, coordinated by TUBITAK Marmara Research Centre,

- The Izmir Regional Plan of IZKA was published in 2014. An aim of which is to include a commitment to reduce threats to coastal and marine biological diversity,

- The IBB Strategic Plan 2020 – 2024 plans to plant 738,000 trees across 3 forestry areas within the province in 2020.

Specific Strategic Plan Objectives of IBB

IBB Strategic Plan 2020-2024 includes targets to further increase the m^2 of green space per capita, increasing the number of trees planted, and better connect and integrate green space. Plan also aims to initiate one project every year to protect the flamingo population, as well as better protection of Izmir's biodiversity more broadly.

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around natural environment and ecosystems.

Table 53: A summary of IBB Strategic Plan 2020-2024 Objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Nature - Ecosystem Integrity	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.4.** Agricultural Areas Will Be Developed to Protect the Ecosystem; Loss of Natural Areas and Biodiversity Will Be Stopped
Experimental Learning - Institutional Capacity	**6.** Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Nature - Recycling	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.3**. Izmir Bay and All The Coastal and Marine Areas Will Be Protected and Used Sustainably

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. The Priority Environmental Challenges that drive the need to further the conservation of existing biodiversity, ecological habitats and marine biodiversity are:

Table 54: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Greenspace, biodiversity	Izmir's green and natural spaces are competing with residential, commercial and industrial constructions as well as all transport and utilities infrastructure.
Biodiversity	Marine habitats in the Gulf of Izmir, such as lagoons and seagrass meadows, are already under threat from direct habitat loss and the indirect effects from industrial and domestic activity. There is a lack of management capacity, reward and incentive schemes and incomplete legislation for marine issues, specifically around conservation areas
Biodiversity	Population growth and increased tourism all increase the demand for seafood in an already heavily exploited fishing grounds both by artisanal, industrial and recreational fishers.

Actions

The Green City actions around protection, restoration and regulation of the natural environment and ecosystems across the municipality are summarised below (Table 55). Detailed descriptions of each actions are presented where they were identified to be detailed by the municipality.

Table 55: Actions within basket 15

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
LU1.2	Maintain, protect and enhance existing biodiversity and ecological habitats through the restoration of wetlands, lagoons and afforestation (incorporating natural ecosystem creation)	Capital project	Lack of green space (m^2)	High	**CAPEX:** €129,000 / 1000m^2 of wetland, lagoon and forest.
I.A	Further regulate fishing operations in the gulf aiming to achieve sustainability of fish stocks and habitats.	Policy	A high demand for sea food.	Medium - Low	**Design / Development:** €10,000 - €15,000
WCM1.14	Conservation, protection and enhancement of marine biodiversity in Izmir Gulf, increasing the cleanliness of the Gulf.	Behavioural	Low Management Capacity.	Low	**Design / Development**: €29,000 - €37,000

Case Study, learning from other cities[82]

Protection, restoration and regulation of the natural environment and ecosystems ex: Habitat restoration and management in the Ebro delta coastal lagoons (2014)

The Alfacada and Tancada coastal lagoons are located in the Delta del Ebro Natural Park. The lagoons are vulnerable to the effects of climate change, particularly sea level rise, in combination with sediment deficit due to river regulation, leading to exacerbated coastal erosion and subsidence. Local management practices (e.g. intensive rice farming) have also affected the natural habitats and species, causing wetland loss and changes in salinity and water quality.

Having identified this habitat degradation and loss, a restoration project was initiated for 62ha between 2011 – 2014, at a total implementation cost of €3,054,703 (€1,490,084 of which was EU Life+ funding). The main measures implemented were:

- To improve the hydrological network of the lagoons by cleaning out canals that bypass the lagoon and build a new canal that connects the lagoon direct to a nearby river.
- Improve hydrological connection of the salt marshes that were previously isolated from one-another.
- Naturalise agricultural land-use back to the original lagoon habitat.
- Create small islands as nesting areas for sea birds.
- Limit land access to some areas in order to mitigate the impacts of predators and human activity.

The observed outcomes of this project were both environmental and economic. the recovery of some of the protected species was observed, alongside the lagoons and marshes become more resilient to sea level rise. Additionally, this project created jobs during its execution and eventual operation, with a new visitor centre built in one of the lagoons.

Izmir is home to coastal lagoons which are also experiencing the impact of human activity and climate change. This case study demonstrates that restoration is possible, with cross-organisational collaboration and stakeholder engagement. It also demonstrates that the root cause of the issue needs to be addressed alongside physical restoration – namely local land-use management practice.

LU1.2: Maintain, protect and enhance existing biodiversity and ecological habitats through the restoration of wetlands, lagoons and afforestation (incorporating natural ecosystem creation)		
Strategic Plan Objectives	**5.4.** Agricultural Areas Will Be Developed to Protect the Ecosystem; Loss of Natural Areas and Biodiversity Will Be Stopped	
Description	In line with the National Biodiversity Strategy and Action Plan (2007-2017) and the National Biodiversity Action Plan (2018-2028), this action will implement the restoration and enhancement / conservation management programme for wetlands in Izmir. This would focus and prioritise Important Natural Areas (INA), as author by the Municipality, alongside afforestation schemes of native species in cooperation with relevant stakeholders and community volunteers. Improved sequestration could be achieved by increasing the size of carbon sinks through afforestation, with native species, reforestation and restoration of other natural habitats, alongside the maintenance of existing carbon stores through avoiding deforestation or protecting wetlands	
Rationale	Climate change is recognised as a threat to the survival of ecosystems such a wetlands and lagoons, which are vulnerable to changes in the quantity and quality of their water supply and changes in hydrological regimes. Afforestation schemes will be beneficial due to carbon sequestration, also helping mitigate impacts such as soil erosion and degradation, landslides and surface water flooding. Enhanced, protection and improved management of natural ecosystems clearly can contribute to survival of ecosystems.	
Steps for Implementation	1. Undertake a study of the quality and connectivity of natural habitats, focusing on INAs. 2. Work with relevant stakeholders (including landowners) and community volunteers to prioritise areas of habitat for restoration, afforestation base on biodiversity priorities and maximisation of ecosystem service benefits. 3. Develop appropriate habitat restoration or afforestation projects 4. Scope funding and delivery options 5. Work with stakeholders to deliver projects 6. Prioritise Important Natural Areas (INA) that fall under the jurisdiction of IBB	
Type of action	Capital project	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	**Risks:** Im16, IM17, IM18, IM19, IM20, IM21, IM22, IM23 **Vulnerabilities:** PE-C, PE-G	
Potential Emission Savings	This would promote carbon sequestration and increase the Municipalities offsetting capability.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	4th Regional Directorate of Nature Conservation and Natural Parks, MoEnvU, Ministry of Agriculture and Forestry, Ege Forest Foundation, Doğa Derneği – (Nature Association), TEMA, WWF, Mediterranean Conservation Association, SAD-AFAG
	Financing options	Municipal budget, IFIs, Ilbank, forestry NGOs
	Revenue/savings opportunities	Savings opportunities will come from decreased pressure on natural ecosystem
	Timeline	2021 – 2025
Impact measures	• Area of rehabilitate habitat or afforestation	

	• Open green space area ratio per 100,000 inhabitants • Share of green space areas within urban limits • Abundance of bird species all species, Abundance of other species • Green space connectivity • Water Quality: Eutrophication • WFD Assessment: Seagrass (*Posidonia oceanica*)
Estimated cost	**CAPEX:** €120,000 per 1000m^2 of wetlands, 1000m^2 of lagoon and 1000m^2 of forest. **OPEX:** N/A **Design/development costs:** N/A
Estimated benefits	**Health impacts:** Public health – reduced pollution **Economic Development:** Avoided damage costs **Environment:** enhanced ecological value, prevention of biodiversity loss.
Existing Work Leveraged	A framework for Resilient Cities to Climate Change: Green Revision Guidebook, Urban Green UP Izmir Green Infrastructure Strategy
1/25,000 scaled IBB Environmental Plan Alignment	4. Agricultural Basins 5. Green Belt

I.A: Further regulate fishing operations in the gulf aiming to achieve sustainability of fish stocks and habitats.

Strategic Plan Objectives	**6.2** Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient	
Description	• To ensure the implementation of reducing pressure on fish biodiversity through the conservation and sustainable management of fish stocks with further compulsive regulations of IBB • To tighten the control of the regulations such as illegal fishing, minimum landing sizes, closed seasons and areas, and restrictions on fishing methods and species caught within landing ports • To undertake clearly planned and properly managed fish farming development • To prepare a broader framework of integrated coastal zone management	
Rationale	Fisheries are regulated and managed by the Ministry of Agriculture and Forestry in Izmir and Turkey as a whole. However, fish stocks in Izmir Bay are current threatened due to overfishing. Therefore, IBB should act on its limited authority in this space to further regulate fishing operations where possible, enabling the sustainable management and preservation of fish stocks in Izmir Bay.	
Steps for Implementation	1. Establish a working group to review local and national level policies 2. Identify and define the issues that necessitates the development of a regulation 3. Establish the regulation development process 4. Consult with appropriate stakeholders 5. Implement and monitor	
Type of action	Policy	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	This action does not result in emission savings.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Ministry of Agriculture and Forestry, Ege Forest Foundation, Doga Dernegi – (Nature Association), TEMA, WWF,

		Mediterranean Conservation Society, SAD-AFAG
	Financing options	Municipal budget
	Revenue/savings opportunities	Savings opportunities will come from decreased pressure on natural ecosystem
	Timeline	2020-2023
Impact measures	Abundance of fish species within the gulf.	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs**: €10,000 - €15,000	
Estimated benefits	**Economic Development:** Avoided damage costs **Social Inclusion:** Skills development (behavioural) **Environment:** enhanced ecological value, prevention of biodiversity loss.	
Existing Work Leveraged	N/A	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay	

WCM1.14: Conservation, protection and enhancement of marine biodiversity in Izmir Gulf, increasing the cleanliness of the Gulf

Strategic Plan Objectives	**5.3** Izmir Bay and All The Coastal and Marine Areas Will Be Protected and Used Sustainably
Description	Izmir Bay contributes significant marine biodiversity value. Designated sites that reflect the importance of some of this diversity and require further protection are; the Foça Special Environmental Protection Area (SEPA), Karaburun - Ildır Bay SEPA, Çakalburnu Lagoon, Meles Delta and the Gediz Delta Ramsar site. Analysing and allocating the spatial and temporal distribution of human activities in these marine areas will be carried out to achieve ecological, economic and social objectives by marine spatial planning. Marine spatial planning is a strategic tool for regulating, managing and protecting the marine environment. Developing a marine spatial plan will help identify measures to be taken to help reduce pollution into the bay, this is likely to include actions for both the public and private sectors in managing land cover, surface run-off and drainage into the bay. As such, there will need to be both public and private investment and behavioural change.
Rationale	The Gulf of Izmir support a variety of habitats including seagrass beds and coastal lagoons, which are critical for fauna and flora. The Bay supports rare and endangered marine mammals, turtles and a high diversity of bird species. These habits are threatened by heavy pollution from nutrient run-off and domestic and industrial materials resulting in high concentrations of heavy metals. There is also evidence of eutrophication. Climate change is anticipated to exacerbate this, with periods of drought reducing discharge rates in freshwater bodies, which will reduce the natural environments capacity to manage the pollution. This is coupled with more extreme precipitation events, which will increase nutrient run-off during more intense, higher magnitude events. Furthermore, demand for marine goods and services, such as food, energy, and habitats, usually exceed the capacity of marine areas.
Steps for Implementation	1. Identify the management actions required to achieve the protection goals of the marine diversity 2. Identify possible alternative financing mechanisms for plan tasks 3. Engage key stakeholders 4. Prepare an implementation plan, including a timetable for the management actions 5. Measure indicators of the performance of marine spatial management actions and modify if required 6. Monitor and increase the water quality of Izmir Gulf, and clean the Gulf 7. Strengthen the wastewater system by separating the stormwater and sewage systems, thus reducing the pollution of the Gulf 8. Prevent stream-related pollution of the Gulf by ensuring effective cleaning of the streams reaching to the Gulf 9. Undertake activities that maintain and promote the biodiversity of the Gulf
Type of action	Policy / Strategy / Behavioural / Capital & Implementation projects
Environmental values positively affected	

Climate Change risks and / or vulnerabilities addressed	**Risks:** IM21, IM22, IM23 **Vulnerabilities:** PE-G	
Potential Emission Savings	Carbon sequestration potential of restoring marine habitats has not been calculated.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Ministry of Agriculture and Forestry, Ege Forest Foundation, Doğa Derneği – (Nature Association), TEMA, WWF, Mediterranean Conservation Society, SAD-AFAG, Universities, funding bodies.
	Financing options	Municipal budget, landowners/private finance
	Revenue/savings opportunities	Savings opportunities will come from decreased pressure on natural ecosystem
	Timeline	2021 – 2025
Impact measures	- Marine water quality - Marine and coastal biodiversity values and abundance of marine species.	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs**: €29,000 - €37,000	
Estimated benefits	**Economic Development:** Avoided damage costs **Social Inclusion:** Skills development (behavioural) **Environment:** Enhanced ecological value, prevention of biodiversity loss.	
Existing Work Leveraged	Izmir Green Infrastructure Strategy	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay	

Basket 16: Reduce pollution

Industries: I1.8

Air quality has severe implications for the health of our residents. Actions in this basket focus specifically on mitigation measures to reduce air pollution within industrial areas.

What is already being done?

The following projects and activities have / are currently underway within the municipality in regard to protect the air quality. It is necessary to build on and leverage this work when implementing the GCAP actions proposed.

- Air protection in Turkey is mainly regulated through the Law of Environment No. 2872/1983. Air quality targets were established in the Regulation of Air Quality Assessment and Management, which is based on Article 6 of Environmental Law No. 2872.
- Continuous air quality monitoring is carried out by MoEnvU country-wide and there are twenty-three monitoring stations in Izmir province. IBB controls seven of them and one mobile monitoring station which measure concentrations of PM10, SO_2, CO, NO, NO_2 and NO_X data from all stations is automatically monitored to check whether the results comply with national limit values. Seven fixed Air Quality Measurement Stations have been established by the Municipality and are operated on a continuous basis, with the measurement results posted on the Ministry website (www.havaizleme.gov.tr) or the Municipality website (www.izmir.bel.tr),
- MoEnvU is responsible for the industrial air quality in Izmir Province. Industrial areas are mainly in Aliağa, Bornova, Torbalı and Kemalpasa districts. MoEnvU established the Aegean Region Clean Air Regional Directorate at the end of 2017. Currently, there are fixed air quality monitoring stations in the industrial areas of Aliağa and Bornova districts,
- In the Izmir Province, there are 13 industrial plants with a capacity bigger than 10 MW, which are legally obliged to monitor air quality and have a continuous emission monitoring system. The system is monitored on-line by the MoEnvU and the Provincial Directorate,
- The Izmir Clean Air Action Plan has already identified several actions designed to support the improvement of air quality across the City,
- CityAir is a project funded by the EU that is running country wide across 31 cities including Izmir. The project aims to improve the capacity of the air emissions inventory system, including tools used for Air Quality management, together with modelling and GIS,
- UPİ-2030 outline investment plans to increase public transport availability, as well as cycling infrastructure that strives to reduce air pollution. In terms of industrial air pollution, the plan states the need to raise awareness on the importance of the impact of pollutant emissions caused by industrial activities on climate change and also includes a target of the establishment of a low emission measurement area to be projected.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around air pollution reduction.

Table 56: A summary of IBB strategic Plan 2020-2024 objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Nature - Ecosystem Integrity	**5**. Making İzmir A Global Model City for Its Harmony With Nature	**5.4.** Agricultural Areas Will Be Developed to Protect the Ecosystem;

		Loss of Natural Areas and Biodiversity Will Be Stopped
Nature- Climate Action	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.2**. In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Quality of Life- Accessible and Clean Energy	**2**. Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.4.** Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted

Priority Environmental Challenges Addressed

The following key findings of this study which were also presented at the Challenge Prioritisation Workshop, at which the Technical Committee was consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need for further action on pollution reduction:

Table 57: Priority Environmental Changes

State Indicator	Priority Environmental Challenges
Air Quality	Data provided by the monitoring stations in Izmir does not necessarily give a good indication of overall air quality distributed across the city, and data from certain monitoring stations is unavailable. This is especially the case for heavily industrialised areas, there is limited data available on the impact of the industries on air quality. Industrial enterprises are one of the main sources of air pollution in Izmir and have caused serious air pollution concerns, especially Aliağa region, which includes of the biggest refineries in Turkey (SOCAR STAR Refinery, formally PETKIM).

Action

The Green City action around air pollution is summarised below. (Table 58). A detailed description is presented below.

Table 58: Action for basket 16

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
I1.8	Address emissions and pollution within industrial	Capital project	Limited data availability and regulations on industrial air pollution.	High	**Design / Development :** €60,000 - €110,000

Case Study, learning from other cities[83]

Pollution Reduction in BEIJING: Aggressive Policies Aimed at Tackling Some of the Worst Urban Air Pollution in the World

The problem of air pollution is widespread throughout Chinese cities but is particularly severe in and around Beijing. For years, the exact scope of the air quality problems was difficult to assess because there was not sufficient publicly available monitoring data. Beginning around the time of the Beijing Olympics in 2008, the U.S. Embassy in Beijing began publicizing daily measurements of local air quality. After initially resisting the publication of this information, in 2012 the Chinese government began putting in place a system of air quality monitoring throughout the country.

The monitoring has highlighted the poor air quality in Chinese cities. The average PM2.5 levels in China's urban areas are often 6 times higher than WHO standards. This level of air pollution is estimated to contribute to approximately 1.2 – 1.641 million deaths per year in China. Around 50% of this air pollution burden is attributable to coal. Air pollution in the Beijing area highlights the need for regional coordination. Approximately 40% of Beijing's PM2.5 pollution comes from outside of Beijing, primarily from Tianjin and Hebei areas.

The Beijing-Tianjin-Hebei region has been identified as one of the priority areas in which China is seeking to make the most substantial improvements. The specific action plan for the Beijing-Tianjin-Hebei region includes decommissioning the highest emitting vehicles, prohibiting construction of any new heavy polluting industries, and replacing coal with renewables and natural gas.

I1.8: Address emissions and pollution within industrial areas	
Strategic Plan Objectives	**5.4.** Areas Will Be Developed to Protect the Ecosystem; Loss of Natural Areas and Biodiversity Will Be Stopped
Description	Industrial areas are mainly in Aliağa, Bornova, Torbalı and Kemalpasa districts of Izmir, and currently, there are monitoring stations of MoEnvU in Aliağa and Bornova. In order to address emissions and pollution within industrial areas following actions will be applied: • Undertaking air quality assessments specific to the industrial areas in Izmir to determine if the mitigation measures are implemented sufficiently to reduce pollution and if new air quality monitoring stations or new mitigation measures are required. • Understand the best ways to remediate and 'clean-up' existing contaminated sites, focusing on soils. • Encourage the voluntary adoption of sustainable measures by industrial stakeholders (i.e. reducing pollution at its source; such as using less toxic raw materials or fuels, using a less-polluting industrial process, improving the efficiency of the process)
Rationale	Industrial enterprises in Izmir have caused serious air and soil pollution concerns, especially Aliağa region. Thus, pollution reduction is important for Izmir and protects the human health and the environment by conserving and protecting natural resources

Steps for Implementation	1. Determine priority pollutants within industrial areas
	2. Undertake an air quality assessment specific to the industrial areas
	3. Develop a control, management and remediation strategy.
	  • Identify measures to control sources of pollution.
	  • Identify management processes to help clean-up contaminated areas, with a focus on soils.
	4. Involve the stakeholders
	5. Have the voluntary industrial company give a signed commitment letter with a science-based emission reduction target and announce the target
	6. Include compliance and enforcement programs.

Type of action	Capital Project

[83] *https://www.igu.org/sites/default/files/IGU_Urban%20Air%20Quality%20FINAL%20for%20web%20etc.pdf*

Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N/A	
Potential Emission Savings	A reduction in emissions associated with industrial areas will have a significant impact on greenhouse gas emissions. Industry sector is excluded from the scope of the Izmir SECAP and therefore the potential savings has not been calculated.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	MoEnvU Provincial Directorate of Environment and Urbanisation, Environmental Management and Inspection Branch Office, Local industrial representatives, Dokuz Eylul University.
	Financing options	Municipal budget, private sector
	Revenue/savings opportunities	Savings opportunities will come from public health
	Timeline	2020-2030
Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Average daily concentration of SO2 • Average daily concentration of NOx • Average annual concentration of TSP • Number of contaminated sites • Concentration of mercury, cadmium, zinc and mineral oil in soil.	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs: :** €60,000 - €110,000	
Estimated benefits	**Health impacts:** Public health – reduced pollution **Economic Development:** Avoided damage costs **Environment:** Reduced pollution, mitigation of GHG emissions, reduction in contaminated sites.	
Existing Work Leveraged	Izmir Clean Air Action Plan	
1/25,000 scaled IBB Environmental Plan Alignment	1. Izmir Bay 2. Central City 3. Urban / Rural Periphery	

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Basket 17: Foster cross-sector collaboration

Administrative Organisational Structure: AOS1.3

The implementation and monitoring of the actions outlined within both this GCAP document and Izmir's SECAP, form an integral aspect of the two processes. IBB are the central body responsible for delivering both this GCAP and the associated SECAP and will remain in charge of overseeing its implementation as the plans progress

The implementation of the GCAP and SECAP strategies will involve operationalizing the monitoring and implementation plan laid out within section 5 of this report at various levels and across various departments within the Municipality. In order to undertake this successfully, IBB intend to create an organic organizational structure that enables team working across various departmental hierarchies within the organisation, with each playing a supportive role of the other, whilst also allowing for flexibility or agility in its operations to order to adjust to any changes that may occur during the strategy implementation process.

What is already being done?

At a municipal level, IBB have developed multiple strategies in order to address challenges identified across the sectors that have been identified in the GCAP / SECAP, including but not exclusive of the Green Infrastructure Strategy (2018), A framework for Resilient Cities to Climate Change: Green Revision Guidebook (2019), Izmir SEAP 2016, Izmir Transport Mater Plan for 203. The publication of IBB's Strategic Plans for 2015 – 2019 and 2020 – 2024, align these documents under a common goal, however the co-ordination of their implementation remains limited.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB's new Strategic Plan (2019) for the actions developed around cross-sector collaboration.

Table 59: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Experimental Learning, Institutional Capacity – Enterprise Resource Management	**6.** Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2**. Institutional Capacity and Functioning Will be Made More Effective, Economic and Efficient.

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need to develop cross-sector strategies within the municipality:

Table 60: Priority Environmental Challenges

State Indicators	Priority Environmental Challenges
GHG Emissions	Reducing the Municipalities emissions as part of the city's commitment to a 40% reduction in emissions against the 2018 baseline by 2030.
Climate Risk and Adaptation	There is currently no city-wide plan that take an integrated approach to drive climate adaptation.

Action

The Green City action around awareness raising across the municipality is summarised below (Table 61). A business case was not developed for this action, in-line with IBB's selection of actions to prioritise.

Table 61: Actions for basket 17

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
AOS1.3	Develop an administrative organisational structure for the implementation and monitoring of GCAP and SECAP actions.	Plan / Strategy	Municipal Mitigation Planning	Medium - Low	N/A

AOS1.3: Develop an administrative organisational structure for the implementation and monitoring of GCAP and SECAP actions.	
Action Description	This action would be aligned with section 5 of this report "Implementation and Monitoring of the GCAP" and include the following: • Nomination of a Green City coordinator • Transition the governance body – steering committee, into the role of a GCAP coordination board. • identify a Green Champion for each department within the Municipality involved in the implementation of GCAP actions. • Appoint an internal Auditor to independently evaluate GCAP action process. • Monitor evaluate and report on the implementation of the GCAP.
Potential Impact	This action will help provide more effective implementation, monitoring of the actions developed within the GCAP and SECAP projects.
Action Owner	IBB
Timeframe	2020 - 2021
Financing Options	Municipal Budget

Basket 18: Enhance the Municipality's adaptation planning and implementation

Administrative Organisation Structure: AOS1.1
Water Cycle Management: WCM1.18, WCM,A.

Climate change is likely to exacerbate the natural hazards that Izmir is currently exposed too; namely; flooding, landslides, wildfire, extreme heat and drought. Through our land use planning responsibilities and capital investment plans, the Municipality will play a leading role in helping to help mitigate the impacts of future climatic events, reducing the social and economic vulnerabilities within Izmir.

What is already being done?

It is acknowledged that the official responsibility for climate adaptation planning resides at a national government level and the associated ministries provincial directorates, with IBB currently having no official obligation to develop climate adaptation action plans in current situation. The Ministry continues legislative works for the Local Climate Change Action Plan (YİDEP) to be prepared by local governments. Turkey has developed and adopted a National Climate Change Strategy (2011) and the National Adaptation Strategy Plan (2012), both of which currently lack clear prioritised objectives and verifiable targets.

On a municipality level, IBB have taken the initiative within various sectoral plans and strategies, which contain elements of adaptation measures, including; the Green Infrastructure Strategy, Urban Green UP programme, IBB Integrated Solid Waste Management Plan and A framework for Resilient Cities to Climate Change: Green Revision Guidebook. Despite this, there is currently no citywide, cross-sectoral adaptation plan that adopts an integrated approach to drive climate adaptation planning

In light of the recent COVID-19 pandemic, IBB have also taken action in the form of their COVID-19 Resilience Plan, which was published in June 2020. This report recognising that monitoring and adaptation are amongst the most important activities when it comes to their pandemic response, with a continuous effort required until a vaccine is found and there is no risk of the virus.

The COVID-19 resilience plan highlights that monitoring and adaptation are amongst the most important activities when reacting to the pandemic. As a result, IBB have created a monitoring protocol that consists of three crisis management boards, established to continuously monitor all developments regarding the pandemic. Additionally, a number of support mechanisms has or is intended to be implemented by IBB to help adapt to the pandemic, this included but is not exclusive of:

- To coordinate all kinds of social support and assistance for adults, the elderly, the disabled, women, youth and children in crisis circumstances.
- To prepare a detailed crisis expenditure financing program by going beyond the principles determined in the strategic plan and annual program.

It is important that this GCAP and other IBB activities around adaptation planning build on the opportunities that COVID-19 has presented. Although parallels can't be drawn regarding the rapid and sudden catastrophic economic and social impact that COVID-19 has produced, with climate change expected to demonstrate a systematic change, a comparison can be made in terms of preparedness and the benefits of listening to the scientific evidence. By doing so, this will help ensure that we are more prepared for what climate change may bring rather than be ill-prepared, as was the case for COVID-19.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB's new Strategic Plan (2019) for the actions developed around awareness raising activities.

Table 62: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket.

Strategic Heading	Strategic Goal	Strategic Objective
Nature - Recycling	**5.** Making Izmir one of the Model Cities of the World in Terms of Living with Nature	**5.2.** In order In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Experimental Learning, Institutional Capacity – Enterprise Resource Management	**6.** Making Izmir a Leading City in the World in Experimental Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish.	**6.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges that drive the need for further adaptation planning by IBB are:

Table 63: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Climate Risk and Adaptation	Water scarcity is Identified to be a key risk to Izmir in current day, being exacerbated in the future due to the anticipated climate change that the region will experience, warmer, drier summers with longer periods of more intense drought.
Climate Risk and Adaptation	Fluvial, surface and coastal flooding is a key climate risk for Izmir, with the city having experienced multiple, high-impacting events in the last few decades. With climate change, these high-impacting flood events are anticipated to occur more frequently and with greater intensity
Climate Risk and Adaptation	There is currently no city-wide plan that take an integrated approach to drive climate adaptation.

Actions

The Green City actions around awareness raising across the municipality are summarised below (Table 64). A detailed description was produced for action WCM1.18, but not actions AOS1.1 and WCM.A, in-line with IBB's selection of actions to prioritise.

Table 64 Actions within basket 18

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
AOS1.1	Establishing the necessary tools, mechanisms and management structure for the effective implementation of climate change adaptation strategies.	Plan / Strategy	Municipal Climate adaptation planning	Medium – Low	N/A

WCM. A	Ensuring that it will be possible to access safe clean water in case of emergencies, such as disasters.	Plan / Strategy	Water Scarcity	Medium - Low	N/A
WCM1.18	Initiate a flood protection scheme for high risk areas e.g. industrial, residential	Capital Project	Flooding	Medium - High	**Design / Development** : €207,000

A Cases Study: Learning from other initiatives[84]

Get Ready Campaign – New Zealand

A civil defence programme, Get Ready is a national-wide initiative to inform households, businesses and schools of how to prepare for the various climate and natural hazards that New Zealand is exposed to.

On a household level, this involves information on storing supplies (e.g. water), how to develop individual disaster response plans, understand potential impacts, how to stay informed during an event and how to make your home more resilient. It also acts as a platform to enable volunteers to get involved in emergency preparedness planning for their local communities or neighbourhoods, with the aim of building a robust and sustainable volunteer capability and capacity for emergency management.

Izmir intends to develop its disaster response and emergency management capacity and this case study acts as a benchmark for best practice in order to plan for an prepare the community on both earthquakes and climate related hazards.

AOS1.1: Establishing the necessary tools, mechanisms and management structure for the effective implementation of climate change adaptation strategies.	
Action Description	This action would require the following: - Development of an inter-institutional management strategy e.g. establish and adaptation "Coordination Board". - Development of monitoring methods and tools for key risks and vulnerabilities. - Collection, evaluation and management of adaptation impact indicator data. - Setting up a Climate Adaptation Green Dashboard that allows access and navigation of this data by all necessary stakeholders.
Potential Impact	This action would help create a more successful and comprehensive implementation and execution of adaptation strategies, reducing the risk of maladaptive practice and allowing the action taken by the Municipality to evolve and adapt the future scenarios that may occur through climate change or other risks, such as recently experienced by COVID-19.
Action Owner	IBB
Timeframe	2021 – 2025

[84] https://getready.govt.nz/

Financing Options	PPPs, IFI's, IIBank, Private Developers, Private banks.

WCM. A: Ensuring that it will be possible to access safe, clean water in case of emergencies, such as disasters.	
Action Description	Building on the IZSU Potable Water Master Plan (2017) up to 2050, undertake and develop a disaster preparedness plan with a specific focus on ensuring citizens have access to safe and clean drinking water in the event of an emergency. This would incorporate both climate related hazards as well as earthquakes, looking at infrastructure resilience and also personal preparedness.
Potential Impact:	Water is a critical resource. Access to safe and clean potable water during emergencies and disasters can significantly influence the residual impact on the health and wellbeing of the population, as it helps improve the populations ability to respond and recover effectively
Action Owner	IZSU AFAD – Disaster and Emergency Management Authority.
Timeframe	2021 – 2025
Financing Options	Municipal Budget, State funding, Charity Organisations, IFIs.

WCM1.18: Initiate a flood protection scheme for high risk areas (e.g. industrial, residential	
Strategic Plan Objectives	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Description	IBB will take steps to initiate a flood protection scheme for high risk areas across Izmir, building on existing work such as the Küçük Menderes Basin Flood Management Plan, Gediz Basin Flood Management Plan, Kuzey Ege Basin Flood Management Plan and the Izmir Green Infrastructure Strategy, this would include: A. Determine flood hazard and risk level at all gradual scales and produce appropriate maps across Izmir province B. Implement an early warning and control system of high-risk areas. Increase the number of stream flow monitoring stations, which is currently 4. C. Determine appropriate flood defences which incorporate climate change projections D. Implement and develop flood resilient design into existing and future building and infrastructure.
Rationale	Climate change will result in an increase in surface water, fluvial and coastal flooding within Izmir, so the initiation of a flood protection scheme will become an integral part of managing the water cycle in coordination, alongside reducing exposure and vulnerability to the anticipated impacts.
Steps for Implementation	*Letters correspond to the description.* **(a) Flood Mapping:** 1. Develop the scope and specification of the study. 2. Identify and secure necessary funding 3. Procure a contractor to carry out the study **(b) Early Warning System** 1. Liaise with AFAD at a national and provincial level and with the Turkish State Meteorological Service to understand existing strategies and capability for monitoring required indicators. 2. Build on the SECAP risk and vulnerability assessment to better identify the physical, social and economic vulnerabilities to flooding throughout the province. Based on this information, undertake a feasibility study to determine the best EWS approach for Izmir, in-line with the Sendai Framework for Disaster Risk Reduction (2015-30)[85]: Top down and hazard-centred, or bottom-up, people centred. **(c) Flood Defences**. 1. Carry out a feasibility study, based on the flood mapping to: A. Assess current infrastructure vulnerability B. Identify key locations for future defence development C. Identify suitable partners for investment in the defences.

[85] https://www.undrr.org/implementing-sendai-framework/what-sf

<table>
<tr><td></td><td colspan="2">D. Consider hard and soft engineering options, alongside WSUD and SuDs and stormwater management techniques in-line with other actions.
(d) Flood Resilient Design
1. Liaise with National government to identify any existing building standard for flood resilient design.
2. If present translate national law into applicable municipal policy
3. If absent, develop new, applicable municipal policy.
4. Ensure the Municipality is appropriate structures and resourced to implement new design standards.</td></tr>
<tr><td>Type of action</td><td colspan="2">Strategy and policy leading to capital investment</td></tr>
<tr><td>Environmental values positively affected</td><td colspan="2">  </td></tr>
<tr><td>Climate Change risks and / or vulnerabilities addressed</td><td colspan="2">Risks: IM2, IM4, IM6, IM9, IM10, IM13, IM25, IM27, IM28, IM31, IM21
Vulnerabilities: SE-A, PE-A, PE-B, PE-D, PE-E, PE-G</td></tr>
<tr><td>Potential Emission Savings</td><td colspan="2">This action does not result in emission savings.</td></tr>
<tr><td rowspan="5">Plan for delivery</td><td>Action owner</td><td>İZSU</td></tr>
<tr><td>Stakeholders</td><td>• MoAF
• MoEnvU
• AFAD
• IBB
• Vulnerable groups; infirm, elderly, disabled etc.</td></tr>
<tr><td>Financing options</td><td>Municipal budget, IFIs, Ilbank, EU Solidarity Fund, land value capture.</td></tr>
<tr><td>Revenue/savings opportunities</td><td>Saving opportunities will occur from the reduction in flooding and run-off related damage.</td></tr>
<tr><td>Timeline</td><td>2021-2030</td></tr>
<tr><td>Impact Measures</td><td colspan="2">Adaptation resilience to natural disaster risk:
• Percentage of public infrastructure at risk to flooding
• Percentage of households at risk to flooding
• Estimated economic damage from flooding.</td></tr>
<tr><td>Estimated cost</td><td colspan="2">CAPEX: N/A
OPEX: N/A
Design/development costs: €207,000</td></tr>
<tr><td>Estimated benefits</td><td colspan="2">Health impacts: Reduction in injuries, deaths and flood related disease
Economic Development: Economic creation, avoided damages.
Social Inclusion: Strengthens social fabric
Other: Increased community resilience.</td></tr>
<tr><td>Existing Work Leveraged</td><td colspan="2">Küçük Menderes Basin Flood Management Plan, Gediz Basin Flood Management Plan, Kuzey Ege Basin Flood Management Plan and the Izmir GI strategy.</td></tr>
<tr><td>1/25,000 scaled IBB Environmental Plan Alignment</td><td colspan="2">This action would cover all aspects of IBB spatial alignment where they are exposed to flooding: surface, fluvial or coastal.
1. Izmir Bay
2. Central City
3. Urban / Rural Periphery
4. Agricultural Basin
5. Green Belt</td></tr>
</table>

Basket 19: Understand the impacts of climate change on tourism

Industries: I1.10

Tourism in an important industry for Izmir and influences multiple sectors across the province. Izmir presents tourists with numerous cultural and environmental experiences. In addition to its markets and thriving hospitality scene, the city is home to the Izmir Agora and the Pergamon Acropolis, as well as being within striking distance of the ancient Roman City of Ephesus and the Greek-Roman spa town of Hierapolis-Pamukkale. Izmir also has numerous opportunities for Eco Tourism, with the province home to mountains, plains, lakes, rivers, caves, marshlands, swamps and the bay peninsula. Izmir has rich natural beauty, flora and fauna and both land and sea, which promotes trekking, water sports, cave diving, fishing, amongst others, covering a broad range of tourism activity.

With such as thriving industry, comes a number of unintended environmental impacts, and in turn, the sector and its assets are potentially at risk from a changing climate. This basket of actions looks at options for reducing risk and taking advantage of opportunities for developing sustainable tourism.

What is already being done?

This cross-sector influence is reflected in the local and national strategies and policies that act in support of the industry as part of a wider plan, alongside striving to protect the natural environment and resources from the associated pressures Tourisms brings. This includes consideration in land-use strategies such as Izmir's Urban GreenUP programme, broader industry documentation such as The Aegean Region Chamber of Industry Strategic Plan (2017-2021) and national level strategies such as the National Transport Master Plan 2019.

When developing and implementing these actions it is also important to recognise the positive and negative cross-sector, influences that the Tourism industry can both impart and be affected by. In taking action to better understanding the implications that climate change will have on the tourism-recreation sector, more informed, effective and integrated action can be adopted.

Additionally, lessons can be learnt from the experiences of the COVID-19 Pandemic. According to the COVID-19 Resilience Action Plan report produced by IBB in June 2020, Tourism has been the worst affected sector by the worldwide outbreak. The pandemic is expected to reduce global tourist mobility by 20 to 30% in 2020 compared to the same period last year. Although the challenges identified as part of this GCAP report would not be expected to have such a significant shock on the industry, having more of a systematic impact as opposed to rapid, it demonstrates that preparedness is key and that listening to scientific evidence is necessary.

In response to the impact of COVID-19, Izmir took important steps to minimise the effects of the outbreak on tourisms and increase urban resilience, through supporting and establishing a Tourism Coordination Board under the Department of Foreign Relations and Tourisms. This board consists of all the tourism stakeholders and meets regularly to make decisions. Additionally, the Izmir Tourism Promotion Strategy and Action Plan has been updated with the emergency of the outbreak to be in line with the requirements of the new process, with activities to be carried out to help mitigate these impacts prioritised.

Specific Strategic Plan Objectives of IBB

The following strategic objectives have been selected from IBB's new Strategic Plan (2019) for the actions developed around awareness raising activities.

Table 65: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Economy – World City Izmir	**3.** Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.5**. Tourism will be supported and Izmir Will Be Promoted To Make it a Global Meeting Point.

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These priority environmental challenges have been identified as exacerbating the need for a better understanding around the impact of climate change on tourism.

Table 66: Priority Environmental Challenges

State Indicator	Priority Environmental Challenges
Climate Risk and Adaptation	A large proportion of the tourisms industries infrastructure and operations within Izmir is located on the coast. Sea level rise and coastal erosion has been identified as a core hazard to the coastal regions of the province, the main driver of which is climate change.

Action

The Green City action around understanding the impact of climate change on tourism within the municipality is summarised below (Table 67). A detailed description of this action is presented where they were identified to be detailed by the municipality.

Table 67: Action for basket 19

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
I1.10	Commission a study to better understand both the direct and indirect impacts of climate change on tourism: both positive and negative and recommendations to improve the industry's resilience.	Plan / Strategy	Water demand of the tourism sector	Medium - Low	**Design / Development**: €6,000 - €8,000

I1.10: Commission a study to better understand both the direct and indirect impacts of climate change on tourism: both positive and negative and recommendations to improve the industry's resilience.	
Strategic Plan Objectives	**3.5** Tourism Will be Supported and İzmir Will Be Promoted To Make it a Global Meeting Point
Description	Establish funding to commission a study which will derive and analyse both positive and negative cascading impacts (direct and indirect) on tourism, in line with the most recent projections. This will consider the move to a low carbon and resilient economy and be in-line with the Paris Agreement and a 1.5ºC to 2.0ºC warming. It would also incorporate an element of how tourisms can both mitigate and exacerbate the impacts of climate change alongside building the resilience of the industry. This study would focus on both chronic and acute hazards, as outlined in Izmir's SECAP report, including sea level rise and coastal erosion. Key actions could focus on: - Integrating disaster management principles into Tourism management plans to help enhance destination and organisational resilience. - Provide central steering of collaborative action between stakeholders of the tourism supply chain by developing a governance structure which supports resilient actions. This could include; preparing for gradual changes by fostering social learning and innovation and reacting to short-term shocks by demanding the quick distribution of information and a centralized governance of the collective action taken by the industry. - Understanding the characteristics of individual destinations in order to determine the appropriateness and effectiveness of the adaptive action required. Whether it be the protection and rejuvenation of a

	natural asset (e.g Gediz Delta Wetlands), the protection of long-term benefits for short-term loss of Tourism through natural adaptive strategies, or managed coastal realignment whether through facilitating a natural process or building flood defences to protect coastal resorts.	
Rationale	By fully understanding the complex and inter-connected nature of the impacts that could face Tourisms as a result of climate change, it will lay the groundwork for a more informed and comprehensive action to help the Tourism industry in Izmir adapt to changing circumstances.	
Steps for Implementation	1. Develop the scope and specification of the study, including the destinations and organisational structures that are considered. 2. Identify and secure necessary funding	
Type of action	Plan / Strategy	
Environmental values positively affected	 	
Climate Change risks and / or vulnerabilities addressed	**Risks:** IM31 **Vulnerabilities:** SE-B	
Potential Emission Savings	No emission savings will occur as a direct result of this action.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	• MoIT • Aegean Region Chamber of Industry • Industry representatives such as Visit Turkey • Funding bodies
	Financing options	Municipal budgets, grant funding, research projects
	Revenue/savings opportunities	This study will better inform the sector around the future impacts they could potentially face, informing action around adaptation and increasing resilience, which could lead to future savings in relation to reduced cost of impacts from climate events.
	Timeline	2021 - 2025
Impact measures	Indicators in relation to climate risk and vulnerabilities.	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €6,000 - €8,000	
Estimated benefits	**Economic Development:** increased economic efficiency, avoided damages, economic growth and creation. **Social Inclusion:** Skills training	
Existing Work Leveraged	N/A	
1/25,000 scaled IBB Environmental Plan Alignment	This action would cover all the spatial areas within Izmir that house elements of the tourism industry: 1. Izmir Bay 2. Central City 3. Urban / Rural Periphery 4. Agricultural Basin 5. Green Belt:	

Basket 20: Raising public awareness across the Municipality

Public Health: PH1.3
Solid Waste: SW1.1

Creating a green Izmir will require action from multiple stakeholders throughout the province, but more specifically, it requires the creation of a green city to be high on the public agenda. This basket of actions is specifically focused on raising public awareness of two of the most priority environmental challenges that the city faces; climate change and more sustainable resource/waste management (set out in section 3 above), providing information on the actions we can all take to help make the city more sustainable and resilient.

While CO_2 emissions per capita are average for a city like Izmir, they are steadily rising. It is important that clear messages reach citizens as to their part to play in reducing greenhouse gasses. Furthermore, Izmir is already feeling the effects of a changing climate. It is our responsibility to highlight these changing risks to our communities and provide the information that can help them become more resilient to changes.

All Izmir's waste goes to increasingly constraint landfill. It is important that we become better at reusing and recycling materials to reduce the demand for resources and limit waste going to landfill. One prime example is that despite potable water being delivered to 98% of the population, we still have a very high consumption of disposable water bottles. This awareness raising will be coupled with Basket 8, which seeks to increase recycling infrastructure.

What is already being done?

The following projects and activities are about to be initiated or are currently underway within the municipality to raise awareness and instigate behavioural change activities. It is necessary to build this work when implementing the GCAP actions proposed for improving awareness and collective responsibility around climate change, waste management and public health.

- IBB has conducted a social project, called "Once Upon a Time", which strives to raise the awareness of students to the environment through organized training in schools[86],
- In line with the National Zero Waste Regulation, awareness meetings have been organized with the representatives of 30 District Municipalities, public and private hospitals, all public institutions and organizations, universities, District Governorships and Organized Industrial Zones in 2018 about Zero Waste Management applications,
- 'Izmir Sustainable Energy Action Plan' (SEAP) has been prepared by IBB in 2016 to reduce the emissions in Izmir and outlines potential actions including awareness raising opportunities:
  - Campaigns for raising awareness in relation to energy efficiency,
  - Raising awareness in relation to using PV on the roofs of urban building environment,
- The SEAP has been updated to form Izmir's SECAP, which has been developed alongside this GCAP,
- The ongoing Izmir 'Water Saving Campaign' aims to spread awareness of water efficiency measures and behavioural change, has been initiated by IZSU. IZSU implements gradual tariffs and reflects them on invoices to encourage savings to less water users,
- In 2019 the Ege Forest foundation trained 6,400 students in 60 schools across Izmir around to raising awareness for Climate Change, Global Warming, Energy Efficiency and Renewable Energies. Since 2015, this has totalled 30,000 students in 301 school.
- The Provincial Directorate of Environment and Urbanisation of the MoEnvU works to improve air quality through projects, awareness, advocacy and providing locally specific guidance in coordination with IBB.

[86] *IBB Activity Report, 2018*

The Provincial Directorate has produced the 'Izmir Clean Air Action Plan'[87] which lists the following key actions to carry out awareness raising activities on the effects of climate change on human health in Izmir:

- Creating a public spot and raising the actions to be taken to the citizens in order to increase environmental awareness,
- Organizing conferences and seminars in schools to develop environmental awareness for children,

- On a country level, the Ministry of Health published a National Programme and Action Plan on Reducing the Adverse Impacts of Climate Change on Public Health (2015), which is currently being implemented, though no follow up or monitoring is published. Actions include raising public awareness and strengthening institutional capacity to monitor diseases,

- IBB's Strategic Plan for 2020-2024 highlights that training has been provided to raise awareness on global warming, usage of renewable energy sources and energy efficiency.

Specific Strategic Plan Objectives of IBB

IBB's Strategic Plan for 2020-2024 also highlighted the need for new trainings to be targeted from 2020. Research, coordination and awareness raising activities on biodiversity and ecology will be carried out within the scope of this program. Raising awareness on the impact of pollutant emissions created by industrial activities on climate change is also determined under the Climate Action Strategy Area of the Strategic Plan.

The following strategic objectives have been selected from IBB Strategic Plan 2020-2024 for the actions developed around awareness raising activities.

Table 68: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Nature - Recycling	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.1** Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Nature - Ecosystem Integrity	**5.** Making İzmir A Global Model City for Its Harmony With Nature	**5.4.** Agricultural Areas Will Be Developed to Protect the Ecosystem; Loss of Natural Areas and Biodiversity Will Be Stopped
Experimental Learning - Institutional Capacity	**6.** Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.1**. Innovative, Equal and High-Quality Experimental Learning Opportunities as well as Life-Long Learning Opportunities Will Be Provided for All

Priority Environmental Challenges Addressed

The following key findings from this study were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges for raising awareness include:

Table 69: Priority Environmental Challenges

State Indicator	Priority Environmental Challenge
Soil Quality	Segregating waste streams is another challenge with implications for the GCAP as all waste is currently directly sent to landfill with no recycling or composting.
GHG emissions, Soil Quality, Air Quality	Izmir's population growth has caused a rise in the number of private motorised vehicles, which directly affects the quality of air. Air pollutants are responsible

[87] https://webdosya.csb.gov.tr/db/izmir/editordosya/THEP(1).pdf

	for several adverse effects on human health especially respiratory and heart problems and they can harm both the natural and the semi-natural environment

Actions

The Green City actions around awareness raising across the municipality are summarised below (Table 70). Business cases were not developed for these actions, in-line with IBB's selection of actions to prioritise.

Table 70: Actions within basket 20

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost	Timeframe
PH1.3	Carry out awareness raising activities on the effects of climate change on human health	Capacity-building	Minimal knowledge on the effects of climate change on public health	Low	N/A	2020 – 2024
SW1.1	Establish a municipality-wide awareness campaign (schools etc) for waste reduction and separation at a household level.	Policy	Lack of solid waste separation.	Low	N/A	2020 - 2024

Case Study, learning from other cities[88]

Using awareness raising in the implementation of the Heat-Health Action Plan for the former Yugoslav Republic, now Northern Macedonia.

In the summer heatwave of 2007, high temperatures contributed to over 1,000 premature deaths in North Macedonia, Climate change is expected to increase these periods of very hot weather in North Macedonia, as a result the government made plans to ensure that the country is more prepared in the future.

This resulted in the development of The National Heat-Health Action Plan, within the National Strategy for Adaptation for the health sector, which was designed to implement adaptation measures that helped prevent the consequences associated with extreme heat due to climate change. Its goals are to decrease morbidity connected with heatwaves by issuing heat and health warnings; encourage planning in the relevant sectors; and raise awareness among the public and health sector workers.

One of the key solutions proposed by the plan was the implementation of an alert system for timely announcements of heatwaves, especially between May and September, being the most common for heatwaves. An application for Android mobile phones was also developed; it provides heat and health warnings and related recommendations to users.

The observed impact of this initiative is an observable increase in the resilience of the community to heat-related stresses. Additionally, the annual costs of implementing the heat-health adaptation measures is estimated at 12 million local currency units (LCU) , compared with costs of responding to and dealing with the health impacts related to heat (disease and deaths) which is estimated at 170 million LCU per year .

[88] *Climate Adapt Website:* https://climate-adapt.eea.europa.eu/about/climate-adapt-10-case-studies-online.pdf

PH1.3: Carry out awareness raising activities on the effects of climate change on human health.	
Action Description	This action would held raise the understanding around potential impacts of climate change on human health. The awareness raising activities should target the most vulnerable population groups within Izmir, as they are less likely to be able to prepare for, respond to and recover from the impacts of climate change. This would include but not be exclusive of; the elderly, infirm, those living in poor quality housing stock and low-income families. It should focus on impacts that could and are already occurring from both acute and chronic hazards, including but not exclusive of; overheating, water scarcity due to drought, reduced air quality and flooding from surface water, coastal and riverine sources. The awareness raising activities could also consider incorporating information on preparedness, response plans and mechanisms that residents could undertake or utilise to help enhance their own personal resilience to the events.
Potential Impact	Increasing the awareness of the potential impacts of human health, particularly in vulnerable population groups, will help improve the social resilience of Izmir's population and reduce the resilience gap that is currently present in society. This would in-turn, potentially reduce the impacts experienced by vulnerable population groups when the risks occur, therefore reducing the pressure on emergency response and healthcare systems in the future.
Action Owner	IBB
Timeframe	2020 - 2024
Financing Options	Municipal Budget.

SW1.1: Establish a municipality-wide awareness campaign (schools etc) for waste reduction and separation at a household level.	
Action Description	This action should focus on undertaking province-wide awareness raising campaign's and the provision of guidance and / instructions on how citizens can embark on home or community composting (the recycling of organic wastes such as food and kitchen waste from households, restaurants, caterers), or other means of recyclable waste. This will help reach the objective of sustainable waste management and effective recycling within the Strategic Plan 2020 – 2024, with a view of encouraging and informing behaviour change.
Potential Impact	By helping inform a shift in current behaviour, this action could divert recyclable and food waste from landfill, reducing the emissions associated with solid waste disposal, as well as reducing the use of virgin material throughout the province. Other benefits include the reduction of soil and environment pollution from solid waste such as plastics.
Action Owner	IBB
Timeframe	2021 – 2025.
Financing Options	Municipal Budget

Basket 21: Collaborate with the agricultural industry to become more sustainable

Industries: I1.1 & I1.2, I1.6.

While this GCAP focuses actions on the urban areas of Izmir, it is recognised that the way in which land in the wider Izmir Province has direct and indirect impacts on the environment of the city. For example, nutrient runoff from agriculture can impact water quality in the bay, with high abstraction rates for irrigation imparting great pressure on the demand for water for other activities such as industry and drinking water.

Izmir is one of the most important agricultural regions in Turkey with 9,9bn TL (€2.58bn), in which vegetal production value is 8,43bn TL (€1.1bn), animal products production value is 9,28bn TL (€1.2bn) and aquaculture production value is 2,19bn TL (€0.3bn). The relatively stable climate and fertile soils enabling production of a wide variety of produce including fig, tobacco, citrus fruit, dairy farming and animal husbandry, olive oil, cereals, medical and aromatic plants, winemaking and apicultural products. Around 28.4% of the Province is given over to horticulture, of which 41.8% is arable and 28.4% olive production[89]. Izmir is a centre for dairy production with 780k cattle, 671k sheep and 242k goats in the Province in 2019. Farms are range from small holdings to larger corporate land holdings. Izmir is also leading the development of organic farming with production increasing nearly 140% between 2004 and 2019, however this still only accounts for around 24ha out of the 343,000ha of productive land.

Agricultural is subject to the negative impacts of climate change through drought and flooding but is also a major contributor to climate change through the greenhouse-gas (GHGs) emission it produces. This is portrayed within the 2018 baseline emissions inventory for Izmir, showing that Livestock and Manure Management accounts for 8.2% (195,069 tCO_2e)[90] of the total emissions within the province. For this reason, agriculture plays a key role in defining successful climate adaptation and mitigation measures. Furthermore, land use changes and the use of fertilisers and pesticides as a result of agricultural practices is often cited for being a catalyst in the reduction and loss of biodiversity and related ecosystem services. This basket of actions therefore focusses specifically on supporting the sector to transition to more climate-smart agriculture and increase farm biodiversity.

What is already being done?

In order to allow GCAP actions to be as effect as possible, it is necessary to build on and leverage the work that has either already been undertaken or is currently underway when within the province. The projects undertaken in relation to agriculture are as follows:

- IBB has developed a local climate change model set out in A framework for Resilient Cities to Climate Change: Green Revision Guidebook (2019). This document sets outs several recommendations on suitability for agriculture areas according to land cover, slope, distance to agriculture, distance to road,

- IBB has delivered local development strategies for three fertile areas within the Izmir Province (Karaburun Peninsula, Gediz-Bakırçay and Küçük Menderes), which consider both agriculture and water resources,

- To avoid excessive and incorrect application of fertilisers and to protect soil and water resources of Izmir Province, IBB initiated the Soil and Leaf Analysis Laboratory which was established in the Buca district in 2012. Using this laboratory, producers are able to analyse soil samples taken from their own production areas to better understand; soil composition, pH of the soil, lime ratios, amount of organic matter and the levels of phosphorus, potassium, calcium and magnesium within the soil. This information enables a better understanding of the structure of the soil, helping inform the suitability of soil and crop management practices [91],

- In 2016, IZSU started a pilot a Recycled Wastewater Project at Çiğli WWTP that treats wastewater and reuses it for agricultural irrigation to help alleviate pressures on water extraction,

[89] *Data from the Izmir Chamber of Commerce 2019*
[90] *Izmir Sustainable Energy and Climate Action Plan, 2020.*
[91] https://www.izmir.bel.tr/tr/Projeler/toprak-ve-yaprak-analiz-laboratuvari/1428/4

- Over the last 20 years, educational activities relating to soil and water protection / conservation and improvement have developed, with training programmes comprising of modules including organic agriculture, good agricultural practices and soil conservation. Developed by MoAF and its provincial organisation, the process to date has involved consulting with farmers and inspecting and certifying staff and training farms,

- IBB has supported regional food producers by providing technical consultancy services in the scope of good agricultural practices and hosting seminars on organic agriculture. As a result of these efforts, Izmir's agriculture production saw a growth rate that was 2.5 times faster than the average for Turkey.

Specific Strategic Plan Objectives of IBB

IBB Strategic Plan 2020-2024 includes targets to increase the use of organic agricultural fertilisers, increase the uptake of sustainable agricultural practices, and carry out soil analysis.

The actions in this basket help support the following strategic objectives from the IBB Strategic Plan 2020-2024 towards sustainable, climate-smart agricultural industry and biodiverse farming.

Table 71: A summary of IBB Strategic Plan 2020-2024 objectives addressed by this basket

Strategic Heading	Strategic Goal	Strategic Objective
Economy - Access to Food	**3**. Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.4**. Food Safety Will Be Provided, Nutrition Will Be Improved, and Sustainable Agriculture Will Be Supported.
Nature - Climate Action	**5**. Making İzmir A Global Model City for Its Harmony With Nature	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy

Priority Environmental Challenges Addressed

The following key findings from the Izmir GCAP Technical Assessment Report were presented at the Challenge Prioritisation Workshop, at which the Technical Committee and stakeholders were consulted to verify the findings and prioritise the challenges. These Priority Environmental Challenges for transitioning to sustainable, climate-smart agricultural industry and biodiverse farming are:

Table 72: Priority Environmental Challenges

State Indicator	Priority Environmental Challenge
GHG Emissions - air quality, soil quality	Industrial agriculture negatively affects soil health and the atmosphere, by reducing organic matter, releasing carbon and through the overuse of fertilizer and pesticides. Sustainable agricultural techniques can be explored to help to improve soil quality, avoiding the need for synthetic fertiliser and pesticide use.
Biodiversity, Greenspace	Competing land-use priorities
Water Quality, Soil Quality	High rates of water consumption for agriculture and the lack of treatment for wastewater for in in irrigation.
Soil quality, GHG Emissions	A lack of sol quality monitoring occurring meaning there is no baseline data to accurately understand the impact current land-use practices is having on the soil.

Actions

The Green City actions around more sustainable agriculture across the municipality are summarised below (Table 73). Detailed descriptions of each actions are presented where they were identified to be detailed by the municipality.

Table 73: Actions within basket 21

Action I.D	Action Headline	Action Type	Priority Challenges	Level of Impact of the Action	Indicative Cost
I1.1 & I1.2	Support the implementation of low carbon farming techniques and climate-smart agriculture across the province.	Capacity-building	The use of sustainable agricultural techniques and use of fertiliser / pesticides	Low	**Design / Development :** €19,000 - €25,000
I1.6	Increase farm biodiversity through appropriate techniques, such as increasing diversity in plant species and establishing nest blocks.	Capacity-building	Competing land use priorities	Medium - Low	**Design / Development** : €19,000 - €25,000

Case Study, learning from other cities[92]

To Collaborate and work with the agricultural industry, crop diversification and improved soil management in Segovia (Spain) (2019)

A 110ha farm in Spain was experiencing a yield reduction of rainfed crops which was endangering the viability of the farm, caused by more frequent droughts, extreme temperatures and soil degradation with the anticipation that this will be exacerbated due to climate change.

In order to improve resilience and adaptation of the rainfed arable crops to climate change, whilst also striving to provide cross-cutting environmental benefits, a €5,000 action plan was commissioned. It was financed by the AgriAdapt Project and funded by the European Commission through the LIFE Program. This action plan outlined adaptation measures which were implemented between 2017 and 2019, the aim of which was to enhance resilience whilst not increasing the cost of crop production for the farmer. In-fact, savings were anticipated.

The solutions implemented include were:
Crop rotation: The farmer performs five different crop rotations, which ensures higher yield, better resistance to climate change and increases the nutrient content of the soil whilst also reducing emissions.
Crop cultivation and sowing: Cultivation of crops such as legumes and cereals as forage crops improves yields. Additionally, early sowing helps to reduce hydric and thermal stress at the end of the growth cycle.
Soil Management: avoiding bare soil by leaving the stubble standing, applying organic fertilizer at least every two years and feeding of livestock on fallow lands.
Multifunctional field margins: These were created or requalified to reduce soil erosion and enhance local biodiversity, particularly for pollinators and other beneficial insects.

A new climate change risk assessment is currently underway with the aim to help understand if the measures applied have reduced the exposure of vulnerability of the farm to the impacts of climate change.

[92] *https://climate-adapt.eea.europa.eu/metadata/case-studies/crop-diversification-and-improved-soil-management-for-adaptation-to-climate-change-in-segovia-spain*

I1.1 & I1.2: Support the implementation of low carbon farming techniques and climate-smart agriculture across the province.	
Strategic Plan Objectives	**3.4** Food Safety Will Be Provided, Nutrition Will Be Improved, and Sustainable Agriculture Will Be Supported. **5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Description	Development of resources and training scheme for farmers to support the transition to more sustainable agriculture that is more resilient to climate change, reduces greenhouse gas emissions and increase carbon sequestration rates. This would include the consideration of techniques that help address the "four pillars" of carbon farming. These are: - **Nutrient Management**: which looks at ways to improve storage and application of fertilisers and manures, which would increase efficiency and decrease emissions. - **Livestock Management:** A focus on animal health and welfare to reduce fatalities and stimulate healthy gut activity, exploring different grass types and supplements. - **Soil and Grassland Management:** Looking at soil biology including micro-organisms and Earthworks. Avoiding soil disturbance as much as possible and adopted practices such as injection fertilisers, and extended leys. - **Renewable Energy:** opportunity to diversify and consider using solar power and other renewable energies to generate electricity and sell the surplus back to the grid. - **Ancient Production Basins:** Agricultural production basins where low-carbon and rain-based production takes place, biodiversity is rich, and production is mostly based on pure (ancestry) seed crops.
Rationale	In order to improve food security while also reducing food waste globally and to mitigate against negative climate change impacts. CO_2e emissions from livestock is one of the highest emissions of the city. According to the 2018 baseline emissions inventory undertaken by Izmir's SECAP, there are nearly 750 thousand livestock within the city of Izmir accounting for 90% of the CH4 emissions from enteric fermentation. 937 thousand sheep and goats account for 7% of the enteric fermentation. The use of chemical fertilisers are 8% of the total agriculture related emissions (2.06 million tCO_2e), which equates to 1.2% of all emissions within the province.
Steps for Implementation	1. Undertaken more in-depth analysis of agricultural sector and product pattern, including an examination of the key biophysical, economic, and social components of the agricultural system to understand the characteristics of the sector. 2. Draw on analysis to determine possible practices that are most at risk and/or contribute the greatest CO_2e, and eliminate them gradually. 3. Engage with farming community and cooperatives to understand most effective training formats and support required for transition to more sustainable practices. 4. Supporting more sustainable agricultural practices at the basin scale, which could include, but are not limited a. Giving purchase guarantee to low carbon strategic products, b. Supporting rain-based agricultural and ancient production basin products, c. Supporting the production of goats and sheep grazing in natural pastures, preparing and implementing pasture plans for small cattle, establishing a private dairy network for small cattle, d. Organic farming practices, e. Energy efficient and low carbon irrigation system, f. Low-cost monitoring, g. Supporting the development of water-meadows and buffalo breeding, h. Promoting pasture instead of forage plants that consumes a lot of water, i. Farming practices with high biodiversity, changing the agricultural crop pattern, j. Providing water management suitable for climate change in agricultural production, and reducing agricultural irrigation, k. Supporting heirloom and native breeds, l. Providing active support for the branding, patenting, packaging and export of climate-friendly products. 5. Undertake appropriate training workshops across the agricultural basins. 6. Establishment of the agriculture high school. 7. Track progress of implementation and evaluate impact
Type of action	Capacity-building, Capital and implementation projects
Environmental values positively affected	

Climate Change risks and / or vulnerabilities addressed	**Risks:** IM2, IM8, IM9, IM16, IM17, IM18 **Vulnerabilities:** SE-A, PE-A, PE-B, PE-C, PE-G, PE-H	
Potential Emission Savings	Savings from irrigation (20% Efficiency): 49,479 tCO_2e by 2030 Savings from chemical fertilizers 55,609 tCO_2e by 2030 (20% decrease) Savings from manure management 173,260 tCO_2e by 2030 Savings from transforming the animal stock 438,456 tCO_2e by 2030 *It is estimated there will be an addition of 10 sheep for each cow removed from the herd	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Izmir International Agricultural Research and Training Centre, Izmir Provincial Directorate of Agriculture and Forestry, District Municipalities (especially rural Districts), Farmers and cooperatives
	Financing options	Municipal budget, private banks, funding sources as identified by the Climate Smart Agriculture guide[93]
	Revenue/savings opportunities	Savings opportunities will come from public health benefits from food safety and reduced GHG emissions.
	Timeline	2020-2030
Impact measures	• Quality of Environmental assets – water bodies and soil. • Emissions associated with agriculture. • Economic cost of climate event impacts	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €19,000 - €25,000	
Estimated benefits	**Economic Development:** increased economic efficiency; economic growth **Environment:** Mitigation of GHG emissions, enhanced ecological value.	
Existing Work Leveraged	EBRD Turkey Adaptation Study	
1/25,000 scaled IBB Environmental Plan Alignment	4. Agricultural Basins	

I1.6: Increase farm biodiversity through appropriate techniques, such as increasing diversity in plant species and establishing nest blocks.

Strategic Plan Objectives	**5.2** In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Description	This action will help educate and inform agricultural practitioners in the techniques they can implement in order to enhance biodiversity throughout areas of agricultural land use. Techniques could include, but are not limited to: maximising crop diversity, crop rotations, intercropping, cover cropping, conservation tillage and incorporation of organic matter.
Rationale	Biodiversity within Izmir province in being slowly degraded, with agriculture contributing to this degradation. By educating and informing practitioners of techniques, it will encourage the and produce more on-farm biodiversity. A list of appropriate techniques and their potential impact is seen below: • crop rotations improve soil, increase farm biodiversity and boost crop yields. • Diverse plantings often decrease insect pest populations, breaks disease and weed cycles. • Planting crops that support natural enemies or directly inhibit insect attack helps to stabilize insect communities. • Adding new crops that fit the climate, geography and management requirements can increase profits by providing the opportunity to expand marketing opportunities and offset commodity price swings.

[93] https://csa.guide/csa/funding-opportunities

Steps for Implementation[94]	1. Conduct a situation analysis including an examination of existing farm biodiversity to better understand the existing characteristics of the sector. 2. Targeting and prioritizing to narrow the extensive list of possible practices, services, and policies down to a range of best-bet options that can be scaled out, and which may serve to attract investment and funding (Plan crop mixtures and multiple crop varieties, provide nesting areas of pollinators, incorporating cover crops, reducing tillage, increase organic matter). 3. Engage with farming community and cooperatives to understand most effective training formats and support required for increasing farm biodiversity. 4. Develop targeted training material and polices for increasing farm biodiversity. 5. Undertake appropriate training workshops across the agricultural basins. 6. Track progress of implementation and evaluate impact	
Type of action	Capacity-building	
Environmental values positively affected		
Climate Change risks and / or vulnerabilities addressed	N.A	
Potential Emission Savings	Sustainable agricultural practices could influence carbons sequestration rates in influence soil carbon, as well as reducing emisisons associated with operational aspects of agriculture. The savings associated with this have not been calculated at this time.	
Plan for delivery	**Action owner**	IBB
	Stakeholders	Izmir International Agricultural Research and Training Centre, Izmir Provincial Directorate of Agriculture and Forestry
	Financing options	Municipal budget
	Revenue/savings opportunities	Increasing farm diversity offers the opportunity to increase profits while decreasing production costs.
	Timeline	2020-2030
Impact measures	Biodiversity and ecosystem: Abundance of species – both birds and other species.	
Estimated cost	**CAPEX:** N/A **OPEX:** N/A **Design/development costs:** €19,000 - €25,000	
Estimated benefits	**Environment:** Mitigation of GHG emissions, enhanced ecological value,	
Existing Work Leveraged	EBRD Turkey Adaptation Study	
1/25,000 scaled IBB Environmental Plan Alignment	4. Agricultural Basins	

[94] https://extension.tennessee.edu/publications/Documents/W235-D.pdf

5. Implementation and Monitoring the GCAP

This section describes the structure that IBB will put in place to ensure GCAP Actions are implemented and their potential to make Izmir a greener city is understood and maximised.

5.1 Implementing Roles and Responsibilities

5.1.1 Green City Coordinator

The Directorate of Climate Change and Clean Energy within IBB are the central body responsible for delivering this GCAP and will remain in charge of overseeing its implementation. The Directorate of Climate Change and Clean Energy will nominate a Green City Coordinator with the following role:

- Oversee the implementation of all GCAP actions, liaising with implementation leads in relevant departments, directorates and stakeholders.
- Help identify and establish Green Champions (see below) who will advocate for green city outcomes in each IBB department
- Collaborate with action leads to ensure the proper progress monitoring of actions, including opportunities to integrate monitoring and evaluation activities with existing IBB processes
- Set standards for data collection and storage
- Collaborate with the GCAP Coordination Board, seeking high-level technical input from the Board as and when required
- Champion green city actions and initiatives within IBB.

The EBRD's GCAP Methodology sets out key competencies, which a Green City Coordinator should have:

- A change agent that can organise resources, support, and buy-in for innovative work
- Capable to bridge between policy and implementation, and able to build partnerships and alliances between diverse stakeholder groups
- Excellent managerial and coordination skills including organising 'green' events
- An excellent communicator and inspirational champion of 'green' measures and initiatives.

5.1.2 GCAP Coordination Board

The GCAP crosses many departmental interests and therefore the Steering Committee was established to provide timely cross-departmental input into GCAP development. This group will transition to the role of the **GCAP Coordination Board**. Comprising senior representatives across IBB departments, the GCAP Coordination Board will meet at least twice annually to:

- Provide technical advice to Green Champions and the Green City Coordinator to assist tracking and monitoring progress of action implementation
- Provide insight into departmental priorities and opportunities for new Green City Actions.

5.1.3 Green Champions

Each department involved in implementing GCAP actions will identify a **Green Champion** who will be responsible for monitoring the progress of the relevant actions within their department. They will also be assigned a set of indicators, linked to the department's actions, that they will also be responsible for monitoring.

Departmental Green Champions will determine appropriate stakeholders for data collection and will be responsible for completing relevant sections of the Monitoring and Evaluation Tool. Green Champions across departments will work collaboratively, especially on crosscutting actions, which will help to ensure that efforts to make Izmir more sustainable are not 'siloed' within one functional area only.

5.1.4 Internal Auditor

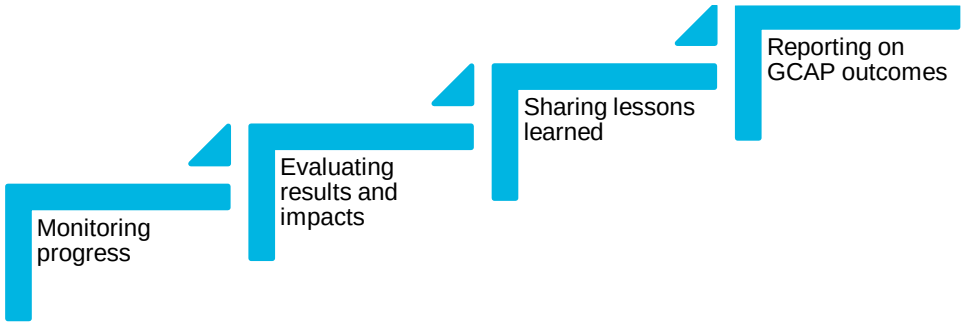
The GCAP Coordinator will appoint an Internal Auditor who will independently evaluate the GCAP management process and achievements at two-year intervals. The Internal Auditor may be an IBB staff member or an external consultant but must be removed from the process of GCAP development and implementation.

5.2 Monitoring our progress and Impact

A transparent process has been established for monitoring, evaluating and reporting on implementation of the Izmir GCAP. Supported by two Excel-based tools, the aims of this approach are to:

- Track implementation progress of GCAP actions (Progress Monitoring Plan (PMP)
- Identify whether each implemented action is having the desired results and impacts, linking back to state and pressure indicators (Impact Monitoring Plan (IMP)
- Facilitate learning about what is and what is not working, both in terms of the actions and the management and delivery structures in place within IBB
- Determine what adjustments need to be made during GCAP implementation to maximise the potential for positive impact.
- The results of GCAP monitoring can be complementary to other planning agendas and activities in IBB. Therefore, the Green City Coordinator will aim to align the monitoring and evaluation process with other city processes, such as Izmir's SECAP completed under the Global Covenant of Mayors on Climate and Energy. Aligning GCAP monitoring with other planned activities within IBB will help to streamline data collection with other stakeholder engagement initiatives, reducing duplication and improving efficiency.

Figure 7. Key monitoring and evaluation steps during GCAP implementation



5.2.1 Monitoring progress

The PMP sets out all the GCAP actions broken down by strategic objective and target, the body responsible for implementation and key milestones. The PMP also provides a timeline and sequence for each milestone over the short to medium-term.

Izmir Progress Monitoring Plan

Action I.D	Sector	Actions	Strategic Objective	Type of action	Action Owner	Relevant GCAP Targets	Timeframe 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2050
Basket 2: Raising public awareness across the Municipality																	
PH1.3	Public Health	Carry out awareness raising activities on the effects of climate change on human health	N/A	Capacity-building	N/A												
SW1.1	Solid Waste	Establish a municipality-wide awareness campaign (schools etc) for waste reduction and separation at a household level.	N/A	Policy	N/A												
Basket 3: Promote Circular Food Management																	
SW1.18	Solid Waste	Encourage and promote communal and/or home composting	N/A	Capacity-building	N/A												

Figure 8: A screenshot of Izmir's Progress Monitoring Plan

The Green City Coordinator will be ultimately responsible for overseeing the PMP, while the Departmental Green Champions will be responsible for updating the PMP for their respective actions and feeding this back to the Green City Coordinator on a quarterly basis. The results of the monitoring will inform the planning of subsequent stages of each action as well as any required amendments to timeframes, resources and budget.

5.2.2 Evaluation results and impacts

It is also critical to measure the extent to which GCAP actions are having the desired impact on Izmir's sustainability, along with any possible unintended impacts. The IMP is based on the Indicator Database, which established the quantitative baseline for Izmir's GCAP across state indicators measuring the quality and availability of environmental assets, as well as sectors and the pressure they exert on Izmir's environment. The IMP lists out the baseline condition for each indicator against which annual monitoring will be undertaken to measure the impact various actions will have on the indicators in the short to medium-term. The aim is to identify whether each implemented action is having the desired results and impacts.

Izmir Impact Monitoring Plan

Legend – colour in column H to BB denotes physical scale on which the action can have an environmental impact
National or Regional Impact
City-scale impact
Localised impact

Indicator Code	Indicators	Colour code	Figure (In Indicator Database of GCAP) for the laest year available	Units	Data Source / Contact Detail
State Indicators					
Air Quality					
1	Average annual concentration of PM2.5	N/A	No data	µg/m3	N/A – PM2.5 not measured in Turkey
1.1	Average annual concentration of PM10 (Izmir average)	YELLOW	40.610	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Karşıyaka)	YELLOW	28.600	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Şirinyer)	YELLOW	41.920	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Bornova)	YELLOW	48.460	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Torbalı)	N/A	No data	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Alsancak)	YELLOW	36.020	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Çiğli)	YELLOW	36.960	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Gaziemir)	YELLOW	45.250	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Bayraklı)	RED	51.730	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.1	Average annual concentration of PM10 (Güzelyalı)	YELLOW	35.940	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Izmir average)	GREEN	11.261	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Karşıyaka)	GREEN	14.520	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Şirinyer)	GREEN	11.580	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Bornova)	GREEN	7.900	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Alsancak)	GREEN	8.790	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Çiğli)	GREEN	16.620	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Gaziemir)	GREEN	10.040	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Bayraklı)	GREEN	6.230	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.2	Average daily concentration of SO2 (Güzelyalı)	GREEN	14.410	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.3	Average daily concentration of Nox (average)	YELLOW	42.395	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.3	Average daily concentration of Nox (Karşıyaka)	GREEN	4.600	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.3	Average daily concentration of Nox (Şirinyer)	RED	81.860	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].
1.3	Average daily concentration of Nox (Bornova)	GREEN	25.420	µg/m3	Havaizleme.gov.tr. [2015]. Continuous Monitoring Center. [online] Available at: http://www.havaizleme.gov.tr/ [Accessed Jul 2020].

Figure 9: A screenshot of Izmir's Impact Monitoring Plan

Like the PMP, the Green City Coordinator will be responsible for overseeing the IMP, while each Departmental Green Champion will be responsible for monitoring a set of indicators that are linked to that department's actions.

The Departmental Green Champions will update the IMP for their respective indicators on an annual basis and feed this back to the Green City Coordinator. As many actions will be impacting indicators across the board, it is suggested that Green Champions across departments working collaboratively to monitor annual impacts. Subsequently, the Green City Coordinator will provide an update to the Green City Coordination Board. This feedback can be provided through an annual Action Impact Meeting.

5.2.3 Sharing lessons learned

The Green City Coordinator will provide concise bi-annual updates to the GCAP Coordination Board on the PMP and IMP. A more detailed Annual Progress Report will be produced and presented, including a summary of:

- Action implementation status and any issues encountered
- Recommendations for revisions to any GCAP actions
- Change in a 'dashboard' of key state indicators
- Potential new GCAP actions for consideration.
- A public fact sheet on implementation progress will also be published on the IBB website. Press releases and case studies may also be produced to highlight specific success stories.

5.2.4 Improving baseline data

A successful monitoring and evaluation process are grounded in good quality data. While completing the Indicators Database several limitations were encountered, including:

- There was little data available on contaminated sites and the concentration of heavy metals in soil.
- Few details were found on the growth rate of built up areas and the percentage of urban developments that occur on brownfield rather than greenfield land.
- There was limited information available on impact related indicators for adaptation and disaster risk.

It is important to ensure that whilst improving baseline data, this process is aligned with Izmir's SECAP.

Appendix A GCAP Actions by Sector

The below table provides an outline of all the GCAP related actions by Sector. A reference to the basket each action is located within is also presented.

I.D	Headline
Buildings	
B1.6 (Basket 4)	Municipality to develop policy that commits to net zero in all new municipality-controlled buildings by 2030.
B1.11 (Basket 8).	Explore ways to support residential retrofits being undertaken to a higher and greener energy performance standard.
B1.3 (Basket 11)	Review and update the local-level policies, planning regulations and guidelines for future municipality development around energy efficiency, giving consideration to changing climate conditions and the need for flexibility and adaptability in future use. (following the identification of "high-risk buildings" under Law No. 6306).
B1.5 (Basket 11)	Revise planning regulations and guidelines to ensure efficient water fittings in all new IBB buildings.
B1.9 (Basket 6)	Undertake circular economy assessments on all Municipality refurbishment and demolition projects, encouraging uptake in private projects.
Energy Supply	
ES1.12 (Basket 12)	Work with the local utility companies to understand capacity constraints and help facilitate a shift towards smart-renewable electric systems.
ES1.5 (Basket 5)	Mass role out of solar energy on municipality owned assets and land e.g. municipality buildings, road reserves, bus stops.
ES1.7 (Basket 5)	Undertake a public lighting replacement scheme for all poles owned / run by municipality by installing LEDs.
ES1.4 (Basket 6)	Local renewable energy options study.
ES1.11 (Basket 6)	Implement an environmental labelling scheme for companies within Izmir to help improve and develop product value, with an aim of encouraging industrial businesses to participate in clean energy and green infrastructure efforts.
ES1.1 (Basket 6)	Undertake mapping and associated baseline analysis to understand the number and consumption of public sector (municipality) and industry buildings where possible that currently use fossil fuel-based heating with an aim of expanding and connecting them to the geothermal heat network, without compromising pressure levels.
ES.A	Develop Izmir bioeconomy strategy and action plan
Industries	
I1.1 & I1.2 (Basket 22)	Support the implementation of low carbon farming techniques and climate-smart agriculture across the province
I1.6 (Basket 22)	Increase farm biodiversity through appropriate techniques, such as increasing diversity in plant species and establishing nest blocks.
I: A (Basket 15**)**	Further regulate fishing operations in the gulf aiming to achieve sustainability of fish stocks and habitats.
I: B (Basket 3)	Undertake baseline studies with a view of developing policy to ensure that sustainable practices, environmental and cultural factors are adopted in port operations (international and national logistics) and the development of coastal structures.
I1.10 (Basket 19)	Commission a study to better understand both the direct and indirect impacts of climate change on tourism: both positive and negative and recommendations to improve the industry's resilience.
I1.8 (Basket 16)	Address emissions and pollution within industrial areas through: - Undertaking Air Quality Assessments with the aim of implemented mitigation measures to reduce pollution and encourage the voluntary adoption of sustainable measures by industrial stakeholders e.g. science-based targets - Strengthen the existing air quality monitoring through installation of appropriate monitoring stations (PM2.5).
Land-Use	
LU: A (Basket 12**)**	Identify and collaborate with stakeholders to lobby for the necessary amendments to regulations to enable the design and development of the 7 "Risk Areas" identified under

	Law 6306 (Transformation of Areas under Disaster Risk), covering 918 hectares. This is for the purpose of creating sustainable, healthy, and liveable urban spaces, throughout the Municipality.
LU.B (Basket 8)	Encourage urban transformation, acting on the Urban Transformation and development areas declared by the Council of Minister's decision for the creation of healthy, liveable urban spaces.
LU1.2 (Basket 15)	Maintain, protect and enhance existing biodiversity and ecological habitats through the restoration of wetlands, lagoons and afforestation (incorporating natural ecosystem creation).
LU1.7 (Basket 13)	Identify and implement techniques to mitigate the Urban Heat Island Effect.
LU1.16 (Basket 11)	Review and update local-level policies, planning regulations and guidelines for future and new infrastructure development to ensure they consider climate projections and urban resilience in design and construction.
LU1.18 & LU1.19 (Basket 14)	Further develop the green and blue infrastructure strategy in order to: - create cohesiveness and interconnection of green spaces. - identifying areas for potential sequestration through the Urban GreenUP programme.
Solid-Waste	
SW1.1 (Basket 20)	Establish a municipality-wide awareness campaign (schools etc) for waste reduction and separation at a household level.
SW1.10 (Basket 4)	Municipality to commit to banning the use of single-use plastics within their buildings, encouraging local businesses to do the same.
SW1.6 (Basket 12)	Partner and / or cooperate with relevant institutions and organisations that can act jointly in line with Zero Waste Regulation to develop and invest in the necessary smart-waste collection requirements (bins, trucks, routes etc) and recycling infrastructure.
SW1.4 (Basket 8)	Supplement and speed up investment in smart-waste separation facilities, (dry recyclables), a clean materials recovery infrastructure and composting facilities, building on the Integrated Solid Waste Management Strategy (2018).
SW1.3 (Basket 8)	Make separate collection of key dry recyclable materials mandatory, formulating policy at the district municipality level.
SW1.17 (Basket 7)	Undertake an assessment of waste collection infrastructure (collection service, coverage rate, bins / containers, vehicles), including smart collection systems and route optimisation software in collaboration with district municipalities.
SW1.16 (Basket 21)	Investigate potential to provide dedicated waste collection for restaurant / food industry traders in-line with management infrastructure and technology.
Transport	
T1.1.3 (Basket 1)	Promote a step change in the uptake of privately / Municipality owned low emission vehicles.
T1.5 (Basket 1)	Municipal fleet and service vehicles: electric and low carbon vehicles.
T1.7 (Basket 2)	More sustainable urban mobility: mass transit and local mobility.
Water Cycle Management	
WCM: A (Basket 18)	Ensuring that it will be possible to access safe clean water in case of emergencies, such as disasters.
WCM1.18 (Basket 18)	Initiate a flood protection scheme for high risk areas e.g. industrial, residential.
WCM1.14 (Basket 15)	Conservation, protection and enhancement of marine biodiversity in Izmir Gulf, increasing the cleanliness of the Gulf.
WCM1.10 (Basket 9)	Upgrade the existing water management infrastructure to incorporate the separation of wastewater and stormwater lines.
WCM1.5 (Basket 9)	Integration of stormwater management techniques with urban greening e.g. sponge city principles.
WCM1.6 (Basket 9)	Implementation of a maintenance program for the existing water supply network of Izmir city centre and its surroundings and construction of new additional water transmission lines
WCM1.4 (Basket 10)	Stormwater management storage systems for Municipality owned or operating Buildings and infrastructure at a building level, under-ground with links to green spaces.
WCM1.9 (Basket 10**)**	Incorporate SuDs (Sustainable Urban Drainage) and WSUD (Water Sensitive Urban Design) principles into all planned green areas and publicly owned buildings within the scope of green infrastructure.
WCM1.11 (Basket 10)	Incorporate sustainable water practices and design within existing municipal-owned buildings and municipality controlled open spaces through refurbishment and retrofitting.
WCM1.7 (Basket 11)	Review existing design and installation standards to increase efficiency of new water infrastructure networks.

Public Health	
PH1.3 (Basket 20)	Carry out awareness raising activities on the effects of climate change on human health.
Administrative Organisation Structure	
AOS1.1 (Basket 18)	Establishing the necessary tools, mechanisms and management structure for the effective implementation of climate change adaptation strategies.
AOS1.3 (Basket 17)	Develop an administrative organisational structure for the implementation and monitoring of GCAP and SECAP actions.

Appendix B IBB Strategic Plan 2020-2024

A summary of IBB's 2020 – 2024 strategic plan, utilised and referred to in business case development.

Heading	Sub-heading	No	Goal	No	Objective
Infrastructure	Urban Infrastructure	**1**	Building a Sustainable Infrastructure Available to Everyone	**1.1**	A Sustainable Urban Infrastructure Will Be Built to Contribute to the Urban Economy
Infrastructure	Sustainable Living Areas	**1**	Building a Sustainable Infrastructure Available to Everyone	**1.2**	Planned, Safe and Sound Settlement Areas Will Be Developed or Regenerated
Infrastructure	Green Infrastructure	**1**	Building a Sustainable Infrastructure Available to Everyone	**1.3**	Climate Friendly Urban Green Areas Network Will Be Created in the Province
Quality of Life	Public Transport	**2**	Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.1**	Public Transport Will Be Affordable, Energy Efficient, Fair, Comfortable, Available to and Accessible for all residents
Quality of Life	Urban Transportation	**2**	Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.2**	A Sustainable Transport System Will Be Created With a Harmonious Interaction Between Different Modes of Transport, Offering Different Options
Quality of Life	Health and Sports	**2**	Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.3**	Health of Human and All Creatures will be Promoted
Quality of Life	Accessible and Clean Energy	**2**	Making Izmir a Smart City with a High Level of Quality of Life and A Well-Developed Transport Network	**2.4**	Access to Reliable, Sustainable and Affordable Energy by Everyone Will be Promoted
Economy	Sustainable Economic Growth	**3**	Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.1**	The Right Ecosystem Will be Created to Make İzmir an Attraction Center for New Investments, Technological Innovations, and Creative Industries.
Economy	Partnerships for Sustainable Development	**3**	Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.2**	Local, National and Global Partnerships and Harmony Among Different Sectors Will Be Encouraged.
Economy	Poverty Reduction	**3**	Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.3**	Full Time, Productive and Innovative Business Environment Will Be Created for Everyone and All Kinds of Poverty Will Be Reduced in İzmir

Economy	Access to Food	**3**	Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.4**	Food Safety Will Be Provided, Nutrition Will Be Improved, and Sustainable Agriculture Will Be Supported.
Economy	World City İzmir	**3**	Creating an Innovative and Entrepreneurial Local Ecosystem Capitalizing on Geographical Characteristics of the City.	**3.5**	Tourism Will be Supported and İzmir Will Be Promoted To Make it a Global Meeting Point
Democracy	Peace and Justice	**4**	Including Izmir Residents in Decision Making, Making Decisions Transparent and Auditable, and Urban Rights and Identity An Integral Part of the City Culture	**4.1**	Peaceful and Inclusive Social Consensus Will be Encouraged, Justice Will be Accessible To All, Human Rights and Rights of All Living Things Will be Advocated
Democracy	Gender Equality, Children, Youth and Disadvantaged Communities	**4**	Including Izmir Residents in Decision Making, Making Decisions Transparent and Auditable, and Making Urban Rights and Identity An Integral Part of the City Culture	**4.2**	Gender Equality in Urban Life Will be Promoted, Women Will Be Empowered In The Society; Equal Opportunities Will Be Provided for Children, Young People and Disadvantaged Communities
Democracy	Reducing Inequalities	**4**	Including Izmir Residents in Decision Making, Making Decisions Transparent and Auditable, and Making Urban Rights and Identity An Integral Part of the City Culture	**4.3**	The Value and Welfare Generated in İzmir Will be Distributed Fairly To All Districts and Villages
Democracy	Urban Rights and Identity	**4**	Including Izmir Residents in Decision Making, Making Decisions Transparent and Auditable, and Making Urban Rights and Identity An Integral Part of the City Culture	**4.4**	A Social Environment, Where Security, Peace and Urban Rights Are Protected, Will Be Created
Democracy	Digital Transformation	**4**	Including Izmir Residents in Decision Making, Making Decisions Transparent and Auditable, and Making Urban Rights and Identity An Integral Part of the City Culture	**4.5**	Participatory Digital Change Will Lead to a Sustainable an Efficient Urban Ecosystem Management
Nature	Recycling	**5**	Making İzmir A Global Model City for Its Harmony With Nature	**5.1**	Sustainable Waste Management and Recycling Mechanisms Will Be Developed
Nature	Climate Action	**5**	Making İzmir A Global Model City for Its Harmony With Nature	**5.2**	In Order to Adapt to Climate Change and its Impacts, Actions Will Be Taken in All Areas, Primarily in Agriculture and Energy
Nature	Marine and Coastal Areas	**5**	Making İzmir A Global Model City for Its Harmony With Nature	**5.3**	Izmir Bay and All The Coastal and Marine Areas Will Be Protected and Used Sustainably
Nature	Ecosystem Integrity	**5**	Making İzmir A Global Model City for Its Harmony With Nature	**5.4**	Agricultural Areas Will Be Developed to Protect the Ecosystem; Loss of Natural Areas and Biodiversity Will Be Stopped

Experimental Learning - Institutional Capacity	Experimental Learning	**6**	Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.1**	Innovative, Equal and High-Quality Experimental Learning Opportunities as well as Life-Long Learning Opportunities Will Be Provided for All
Experimental Learning - Institutional Capacity	Enterprise Resource Management	**6**	Making İzmir a Leading City in the World in Experiential Learning, and Creating an Urban Environment, Where Innovative Ideas Flourish	**6.2**	Institutional Capacity and Functioning Will Be Made More Effective, Economic and Efficient
Culture and Arts	Cultural activities	**7**	Making İzmir a Cultural Hub for the Aegean and Mediterranean Regions, and the World once again	**7.1**	Culture and Arts Will Be Made A Part of All Areas of Life
Culture and Arts	Keeping the Culture Alive	**7**	Making İzmir a Cultural Hub for the Aegean and Mediterranean Regions, and the World once again	**7.2**	Ancient Cultural Assets of İzmir Will be Preserved and Made A Part Of Life Again
Culture and Arts	World Arts	**7**	Making İzmir a Cultural Hub for the Aegean and Mediterranean Regions, and the World once again	**7.3**	İzmir Will Become the Meeting Point For World Culture and Arts

Appendix C Baseline Conditions in Izmir

In this appendix, the social, environmental and economic context of Izmir has been explained in detail. It is followed by the governance context, which involves the explanation of the top-down legislative framework in Turkey and the governance structure of the Metropolitan Municipalities in Turkey. The legal and regulatory framework is further disclosed, which consists of the regulatory documents on the key environmental issues relevant to GCAP. Finally, the environmental challenges are explained in detail.

Social Context

As of 2018, the 11 central districts of Izmir (Güzelbahçe, Narlıdere, Balçova, Karabağlar, Gaziemir, Buca, Konak, Bornova, Bayraklı, Karşıyaka and Çiğli) comprise the third largest City in Turkey after Istanbul and Ankara, with an urban population of 2,947,000 (2017). Like much of Turkey, Izmir experienced a rapid population increase during the second half of the 20th century. Although the trend has slowed over the past two decades, Izmir continues to experience higher rates of population growth compared with the national average. This increase is due to both natural growth and immigration; as of 2017, the net immigration rate was 5.8%. The trend is partly associated with rural populations moving to urban areas, a pattern that can be seen nationwide, as well as the refugee crisis due to unrest in the Middle East. Turkey as a whole host the largest refugee population in the world.

Population growth has given rise to a variety of challenges, including social issues (e.g. lack of access to services, areas of economic deprivation) and environmental concerns (e.g. industrial zones located too close to residential areas, and encroachment on the natural surroundings).

On the other hand, as noted in the IBB's Strategic Plan 2020-2024, Izmir offers a wide range of health and educational services, including nine universities. The City benefits from a newly operational metro system and bicycle networks that provide local transportation links.

Environmental Context

Izmir is strategically located on the Aegean Coast, sheltered within the Gulf of Izmir, and its geography has shaped the City's cultural and historic significance. As noted in the IBB's Strategic Plan 2020-2024, the topography around the City allows for transportation and logistical links between the coast and inland. Therefore, it acts as a metaphorical 'gateway' for commerce and culture.

Izmir has a Mediterranean climate, which includes long, hot, dry summers; winters tend to be rainy and mild, with prevailing westerly winds. July and August are the hottest months, with a daily mean temperature of around 27-28 °C, compared to 8.7 °C in January, the coolest month. High temperatures in summer are mediated, to an extent, by a coastal breeze.

Because of Izmir's coastal location, climate and geological conditions, there is significant potential for low and zero carbon (LZC) energy generation, including wind, wave, geothermal and solar power. For instance, Izmir receives a high level of sunshine, which is above the Turkish national average. These natural resources present opportunities for future sustainable development projects.

However, there are also a variety of natural hazards present, including flooding, landslides, rockslides, and earthquakes. These risks are exacerbated by Izmir's relatively old building stock, and previous periods of rapid urban expansion, both of which create challenges for ensuring safety standards for buildings and neighbourhoods.

Economic Context

During much of its 3,000-year recorded history, Izmir has consistently been one of the Mediterranean Sea's principle mercantile cities. Today, it is still a regional commercial hub and one of Turkey's primary ports. Izmir accounts for approximately $9.3bn or 6% of the country's exports (Turkish Exporters Association TI, 2018) This is set to increase with central government investment to the port to increase capacity.

According to the Strategic Plan, compared with national averages, Izmir has a higher GDP. In terms of overall employment, a higher share of people working services and industry, and a lower share work in agriculture. Key industries within the province include:

- Weaving and textiles
- Food and beverages
- Beer and tobacco products
- Iron-steel
- Petrochemicals
- Automotive
- Cement
- Olive oil
- Fertiliser
- Agricultural machinery
- Ceramics
- Raw materials for construction

In addition, tourism plays an important role in the economy of Izmir, reflecting its rich history, culture and environment. The first human settlements in Izmir are thought to have formed up to 8,500 years ago, during the Neolithic period, and since then the City has been subject to rule by the Lydian, Greek, Roman, and Ottoman empires. It therefore boasts a wide variety of archaeological sites, museums, markets and mosques.

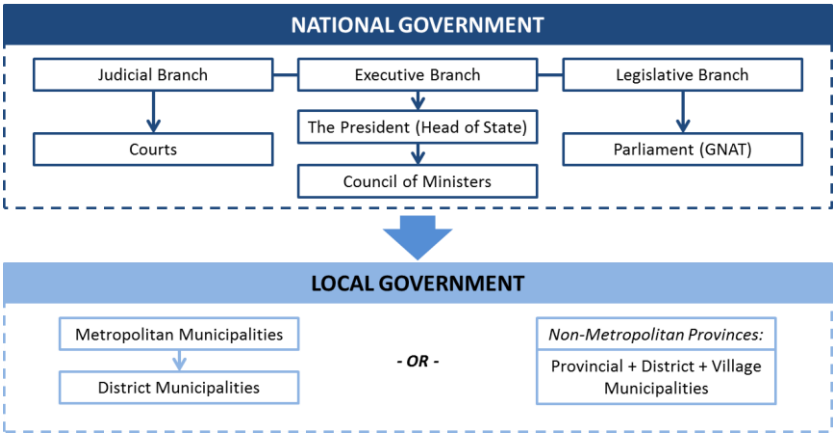
Governance Context

This section covers the governance structure of Turkey and Izmir Metropolitan Municipality. The political hierarchy in Turkey, local government bodies and their responsibilities are explained. In addition, the authorities and responsibilities of Izmir Metropolitan Municipality administrative branches and the Mayor of IBB are defined.

Governance Structure

Turkey is a presidential republic. The President of Turkey acts as both head of government and head of state, with the power to appoint cabinet ministers, who collectively exercise executive authority, and judges, who are appointed by the President. The Grand National Assembly of Turkey (GNAT), or Parliament, forms the legislative branch; its members are elected by a national vote.

The chart below shows the political hierarchy in Turkey.



The Turkish Parliament comprises a unicameral system in which the GNAT exercises all legislative functions. There are 18 sectorial permanent Commissions in the GNAT. Those that are most relevant to the development of the GCAP are listed below:

Name of Commission
Public Works, Reconstruction, Transportation and Tourism
Environment
Agriculture, Forestry and Rural Affairs
Industry, Trade, Energy, Natural Resources, Information and Technology
Plan and Budget

i. Turkish Local Governments and Metropolitan Municipalities

Turkey is divided into 81 geographic provinces, which are further sub-divided into districts. As of 2018, approximately 77% of the population of Turkey live within a Metropolitan Municipality; Izmir is one of the largest of these. Metropolitan municipalities operate using a two-tier local government structure. The Metropolitan Municipality (in this case, IBB) forms the upper tier, overseeing macro-services, whereas District Municipalities operate micro-services.

ii. Functions of Metropolitan Municipalities

The major functions of Metropolitan Municipalities are to:

- Prepare the higher scale (1/5,000 to 1/25,000) land development plans;
- Approve the implementation plans (1/1,000 scale) prepared by the District Municipalities;
- Supervise the compliance to planning guidelines regarding land development by district municipalities;
- Produce land plots and housing to ensure orderly urbanisation, build infrastructure as required for industry and trade;
- Draw up the metropolitan transport master plan, plan and implement public transport;
- Build squares, boulevards, avenues and main roads;
- Protect and develop the environment, agricultural land and water basins;
- Recycle and store solid waste;
- Deliver water and sewer services;
- Build open and closed parking spaces;
- Build regional parks, zoos, museums, sporting, leisure and recreational facilities;
- Build cemeteries, wholesale food markets and slaughterhouses; and
- Provide fire-fighting and emergency services.

iii. Functions of District Municipalities within metropolitan areas

Within metropolitan areas, micro services are entrusted to District Municipalities, as follows:

- Street upkeep and hygiene;
- Collect domestic waste;
- Prepare implementation plans (1/1,000 scale);
- Issue building licenses;
- Social municipal services (reducing poverty, social aid, skills training for the unemployed);
- Promote amateur sports; and
- Education, sports and culture services.

iv. Relation between Metropolitan and District Municipalities

Since they operate in the same jurisdiction, their services are complementary in nature. Metropolitan and District Municipalities need to work in close cooperation and coordination. The Metropolitan Municipality (in this case, IBB) is tasked with ensuring coordination and resolving disputes among municipalities in the metropolitan area. This prevents gaps or overlaps in services. In addition, district mayors and some district councillors serve on the Metropolitan Council.

Izmir was designated as a Metropolitan Municipality in 1984. The establishment of IBB consolidated the central (urban) districts with those in the surrounding area. IBB is comprised of 30 districts, with a total area of 11,891 km². Note that the scope of the GCAP includes the whole of Izmir Province. IBB is organised around three key bodies: The Metropolitan Council, the Metropolitan Executive Committee, and the Mayor.

v. The Municipal Council

The Municipal Council is the decision-making body of the municipality. Members are directly elected by voters to serve five-year terms. The Izmir Metropolitan Council comprises 175 councillors plus the Mayor; the number of seats is determined by the number and size of districts within the Municipality.

Key duties of the Municipal Council are to:

- Approve the municipality's strategic plan, budget, work program and investment program;
- Approve the municipality's revenues and expenditures, and annual report for the previous year;
- Approve land development plans;
- Decide on granting concessions, establishing enterprises and companies, allow sales of companies;
- Allow the municipality to borrow, purchase and sell property;
- Set the fee rates for municipal services; and
- Make decisions relating to the organization of the municipality.

vi. The Municipal Executive Committee

The Municipal Executive Committee is responsible for implementing the resolutions of the Municipal Council. The Mayor acts as the chairperson of the Municipal Executive Committee. Five of the members (i.e. half) are councillors elected by the Municipal Council, and the other five are municipal administrators selected by the Mayor.

Major functions of the Municipal Executive Committee are to:

- Review the Municipality's strategic plan, annual work programme, budget and revenues and expenditures of the previous year to be submitted to the Municipal Council;
- Adopt expropriation decisions;
- Hold tenders on the purchase, sale and lease of property; and
- Impose statutory penalties.

vii. The Mayor

The Mayor of IBB is the head of the Metropolitan Municipality administration and is directly elected for a five-year term by the citizen electorate within IBB. The Mayor holds significant administrative power locally, as the speaker of the Council and chairperson of the Executive Committee. The Mayor has the mandate to set the agenda, to appoint and remove all municipal administrators and employees, and exercises control over the municipal budget.

The Mayor has the following key responsibilities:

- Chair the meetings of the Municipal Council and Municipal Executive Committee, and implement decisions/resolutions;
- Govern the Municipality in accordance with the strategic plan, work programme and resolutions of the Municipal Council;
- Pursue and collect the Municipality's revenue and income;
- Protect the rights and interests of the Municipality;
- Represent the Municipality; sign official documentation and contracts on behalf of the Municipality;
- Appoint municipal administrators and employees;
- Manage the Municipality's affiliated entities and municipal enterprises; and
- Manage the Municipality's property.

The Secretary General acts on behalf of the Mayor and executes municipal services under the Mayor's directive. Duties of the Secretary General are carried out in accordance with the legislation, aims, policies, strategic plan and annual programmes of the Municipality. The City elected a new Mayor in 2019 and has developed a new strategic plan covering 2020-2024 period for Izmir in line with his vision for the City. This plan sets out the priorities for the

both the management of the IBB and for the development of the City itself. It will be important for the GCAP to account for this strategic plan; the GCAP will help to identify key environmental issues that need prioritising and can be funded through donor funds and / or other EBRD mechanisms.

Legal and Policy Framework

This section provides a summary of legislation, policies and plans that are relevant to the key environmental issues covered by the GCAP. They are grouped by the 'Pressure-State-Response' (PSR) framework used by all cities developing a GCAP. The aim of this section is to:

- Identify where responsibilities lie for policymaking and management of key environmental issues;
- Provide an overview of existing laws and requirements;
- Determine potential areas of influence for the GCAP and the mechanisms through which influence could be achieved.

Air quality (State)

National Governance Arrangements	Local Governance Arrangements
National air quality targets were established in the 'Regulation of Air Quality Assessment and Management', which is based on Article 6 of Environmental Law No. 2872.The provisions of this Regulation are executed by the MoEnvU. The 'Air Quality Assessment and Management Circular' No. 2013/37, published in 2013, outlined measures to prevent air pollution. The Provincial Directorate of Environment and Urbanisation of the MoEnvU works to improve air quality in coordination with IBB, and also has produced the 'Izmir Clean Air Action Plan.	IBB is responsible for implementing measures to achieve the standards regarding ambient air quality. For instance, improvement of transportation planning and providing better public transportation, encouraging green buildings and the use of renewable energy, and increasing the number and quality of green open spaces within the province. IBB was granted authority to audit solid fuels and impose administrative sanctions. IBB additionally controls seven fixed air quality monitoring stations and one mobile monitoring station which measure concentrations of PM_{10}, SO_2, CO, NO, NO_2 and NO_x.

Biodiversity and ecosystems (State)

National Governance Arrangements	Local Governance Arrangements
Turkey became a signatory to the United Nations Convention on Biological Diversity in 1992. The government prepared a National Biodiversity Strategy and Action Plan (NBSAP) (2007-2017) and National Biodiversity Action Plan (NBAP) (2018-2028) which aim to ensure the conservation and sustainable use of Turkey's biological resources.	IBB Department of Parks and Gardens is responsible for parks and gardens with the province. IBB Department of Agricultural Services produce projects that support agriculture in line with local development goals. The IBB Strategic Plan 2020-2024 includes a strategy focused on biodiversity in Izmir and the 1/25000 scale Izmir Metropolitan Landscaping Plan (2012) considers biodiversity a key factor.

Soils (State)

National Governance Arrangements	Local Governance Arrangements
Soil protection issues are the responsibility of the MoEnvU. Both the MoEnvU and the MoAF are responsible for coordinating, planning and implementing mitigation measures related to land degradation and desertification. The Provincial Directorate of the MoEnvU is responsible for managing soil contamination in Izmir.	IBB is responsible for producing zoning plans that define the areas suitable for further construction and urbanisation. One of IBB's targets for improving the local economy of Izmir is to identify fertile soil areas for protection within the provincial borders, although there is no strategy on contaminated soils.

Greenhouse gases and climate mitigation (State)

National Governance Arrangements	Local Governance Arrangements
Turkey has developed the 'National Climate Change Strategy' (NCCS, 2010) to contribute to global efforts to reduce the impacts of climate change, considering its own special circumstances and capacity.	In 2015 IBB became a party to the Covenant of Mayors (CoM), established under the European Commission, whose main objective is to promote and support the use of renewable and clean energy resources.

The Department of Climate Change within the MoEnvU is responsible for monitoring greenhouse gas emissions, coordinating studies to combat climate change and protect the ozone layer, and preparing legislations. They are also responsible for developing awareness raising and training activities related to climate change adaptation, which are primarily targeted at local administrations.

In accordance with the agreement, IBB has prepared a Sustainable Action Plan (in coordination with local stakeholders) to reduce greenhouse gas emissions at least 20% caused by their own assets and operations by 2020 and by %40 until 2030. IBB has also developed its Sustainable Energy Climate Action Plan (SECAP) in line with this commitment.

Climate and disaster risk (State)

National Governance Arrangements	Local Governance Arrangements
Disaster and emergency response are managed by the Disaster and Emergency Management Authority (AFAD) and carried out in line with the Turkish National Disaster Response Plan (2013). AFAD is responsible for disaster-related issues and has also prepared the 'National Earthquake Strategy and Action Plan 2012-2023' to prevent or reduce the physical, economic, social, environmental and political damages and losses that earthquakes can cause and to create new earthquake-resistant, safe, prepared and sustainable environments.	The Disaster and Emergency Management Centre is operated by the Izmir Provincial Directorate of Disaster and Emergency. In addition, IBB established the Directorate of Search and Rescue, and Disaster Affairs in 2014. Izmir Earthquake Scenario and Izmir Earthquake Master Plan were prepared by IBB and Boğaziçi University. IBB has been implementing climate adaptation and mitigation actions through the 'Izmir Sustainable Energy Action Plan' (2016) and the 'A framework for Resilient Cities to Climate Change: Green Revision Guidebook' (2019).

Water supply, sanitation and drainage (State/Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
The General Directorate of State Hydraulic Works (DSI) is Turkey's primary state agency responsible for overseeing water resources. In addition to the DSI, the Department of Water and Soil Management of the MoEnvU is also responsible for the protection of groundwater, surface water and soil, and the disposal of wastewater to prevent pollution. In addition, General Directorate of Water Management, MoAF is responsible for developing policies for protection, improvement and utilization of water resources.	The Izmir Water and Sewage Administration (IZSU) provides distribution of drinking water and collection and disposal of wastewater within İzmir Metropolitan Municipality. Water supplied to the City of Izmir is monitored with monthly measurements at 80 locations, by the Provincial Directorate of Public Health and IZSU. IZSU prepared a 'Potable Water Master Plan' (2017) that creates a road map against climate change up to 2050. IZSU Halkapinar laboratory carries out studies to determine and monitor the quality of potable water, drinking water and wastewater within IBB.

Land use (State/Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
The MoEnvU as well as the MoAF are responsible for coordinating, planning and implementing mitigation measures related to land degradation and desertification. Turkey became party to the United Nations Convention to Combat Desertification (UNCCD). Turkish National Action Programme to Combat Decertification was completed in 2003. Additionally, a national report titled 'Land Degradation Neutrality in Turkey, 2016-2030' was produced in 2016, in cooperation with the UNCCD.	In 2012, IBB produced a 1/25000 scale Izmir Metropolitan Landscaping Plan (updated in 2017), which classifies districts within different geographic areas in relation to the City centre. Furthermore, the IZKA has determined strategies to prevent the negative effects of climate change on water resources, natural resources, agricultural production and open space for recreation.

Transport (Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
The MoTI is the main responsible agency for the development and implementation of transport policy in Turkey. The General Directorate of Highways is responsible for traffic control, collection and monitoring of transport statistics, and	The IBB Transportation Department is responsible for the preparation of the UPI 2030 published in 2017, which outlines key priorities for transportation in Izmir and is updated every five years.

development of road infrastructure for different regions, including the IBB area. Intercity public transportation is mainly provided by private companies.

At a national level, legal regulations for specific fuel quality standards for petrol, diesel, and other types of fuel are addressed by the 'Regulation on the Environmental Effects of Gasoline and Diesel Types'.

The public transport bus service of Izmir is provided by ESHOT General Directorate, affiliated to IBB. ESHOT started the Zero Emission Public Transportation Project in April 2017. While ESHOT is the main service provider for public transportation within central Izmir, private companies and individuals also provide informal transportation.

IBB is also responsible for local road maintenance and public transportation services within its boundaries.

Buildings (Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
All official and private buildings constructed in Turkey are subject to the provisions of Building Law no. 3194. Activities relating to Izmir Urban Transformation and Development Projects are realised within the scope of Article 73 of the Law No. 5393. The 'Green Certificate Regulation' (30279/2017) for buildings and settlements covers the assessment and certification of buildings regarding the environmental, social and economic performance. The 'Waterproofing Regulation' (30223/2017) and the 'Regulation on Protection of Buildings Against Noise' (30082/2017) regulates other environmental issues.	The IBB General Directorate of Construction is responsible for the construction of public facilities, sports facilities, green spaces and restoration of historical buildings. District Municipalities are responsible for issuing building permits, building occupancy permits, and work permits. A total area of 1,223.67 hectares in Izmir has been declared with a Presidential Decision as a 'Risky Area / Urban Renewal and Development Project Area.' Recent urban regeneration projects in disaster-exposed areas have been completed. The 'Izmir Earthquake Scenario' and 'Izmir Earthquake Master Plan' have been jointly prepared by IBB and Bogazici University.

Industries (Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
The MoIT is the main agency responsible for monitoring and regulating the industrial sector. General Directorate of Industry and Productivity within MoIT assists in the production and evaluation of studies used to inform industrial policy and monitors developments in environment and climate change issues as relevant to industrial policy. Turkish Sustainable Development Report (2012) prepared by the Presidency of Strategy and Budget, lays out a Green Growth Approach and Road Map for Turkey, with objectives relevant to the industrial sector.	Izmir hosts a large share of the industrial enterprises of Turkey and industrial enterprises are encouraged to be located outside urban areas. There are 13 Organised Industrial Zones (OIZ) in Izmir; which are designated by the MoIT, to allow companies to operate within an investor-friendly environment with ready-to-use utilities. There are also 11 Small Industrial Sites in Izmir, which generally accommodate the automotive sub-industry, small workshops, iron workshops and automotive. There are additionally two free zones (FZ), the Aegean Free Zone and the Izmir Free Zone. FZs are special sites deemed outside the customs area.

Energy (Pressure/Response)

National Governance Arrangements	Local Governance Arrangements
The General Directorate of Energy Affairs under the MoENR is responsible for keeping an inventory of power plants and energy sources. It also undertakes the planning work necessary to meet the country's energy demand. The Turkish Electricity Transmission Company (TEIAS) is the only transmission company, while distribution is performed by private companies in Turkey. Turkey Electricity Generation Inc. (EÜAS) is a publicly owned corporation that produces and sells electricity. Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP) outlines Turkey's national energy policy.	The electricity and gas distributors in Izmir are private companies, which are the sole operators in the area. GDZ Elektric Dağıtım has been distributing electricity to its consumers in Izmir and Manisa since 2013. Izmir Natural Gas Distribution Company is the only company authorised to distribute natural gas and transport it through local gas pipeline network. A biogas facility with an installed capacity of 20 MW was put into service in the Harmandalı Solid Waste Landfill Facility in İzmir Çiğli. At the Harmandalı Biogas Plant, 80 million cubic meters of methane gas is produced annually, generating approximately 160,000 MWh of electricity.[95] There are plans to increase the capacity of the facility to 40MW in the future. Biogas plants will are also planned to be built in Ödemiş, Bergama and Menderes solid waste

[95] *https://www.izmir.bel.tr/tr/Haberler/izmir-de-tarihi-acilis/41066/156*

facilities, further increasing the electricity generation capacity from landfill gas The generation of electricity from biogas produced by waste is supported by national legislation, in line with EU directives.

Solid Waste (Pressure/Response)

National Governance Arrangements

Solid waste management is carried out by municipalities but is regulated through the Environment Law No. 2872/1983 and the Law of Health Care No.3359/1987.

Waste is managed in line with the requirements of the MoEnvU's 'National Waste Management Plan 2016-2023'. The Plan aims to protect natural resources and ecosystems and to create a healthy and liveable environment for present and future generations.

Implementation of the plan requires cooperation and coordination between the MoEnvU and IBB.

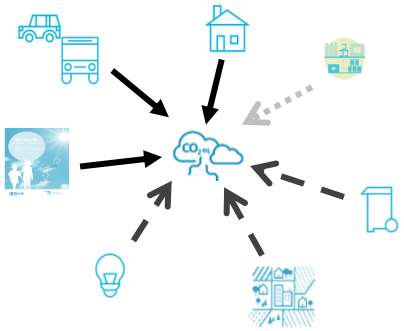
Local Governance Arrangements

IBB is fully responsible for transporting all municipal waste and medical waste through transfer stations, and for their disposal. District municipalities are responsible for collection and transportation and IBB is responsible for their coordination. This is carried out by the IBB's Waste Management Department. Additionally, Izmir has two solid waste landfill facilities.

The National Waste Management and Action Plan prepared by the MoEnvU set out a target of recycling 35% of all waste generated by 2023. IBB has proposed strategies to achieve these objectives through Integrated Solid Waste Management Plan (2018).

Environmental Challenges

GHG Emissions

<table>
<tr><th colspan="2">State of the environment</th><th colspan="4">Existing pressures</th></tr>
<tr><th colspan="2">Available data</th><th>Transport</th><th>Buildings</th><th colspan="2">Industries</th></tr>
<tr><td>Indicator</td><td>Latest value</td><td rowspan="2">• Transportation is a main contributor to GHG emissions in Izmir as of 2018 baseline emissions inventory.
• Road vehicles account for 23% of GHG emission.
• 19.9% of modal share of journeys are by private car, this is expected to increase unless infrastructure investments are made into public transport.
• There is a high level of congestion at peak hours with parking on main highways and roads, which increases journey time and consequently GHG emissions
• High age of the private vehicle fleet (13 years average), high proportion of diesel vehicles
• The use of bicycles as a transport mode is very low.</td><td rowspan="2">• Industrial Buildings are a main contributor to GHG emissions in Izmir. (31.4% of 2018 SECAP inventory)
• Trends indicate that demand for fuel types is increasing which would result in higher GHG emissions.
• Age of building stock is high (46% prior to 1990) resulting in relatively poor building performance.</td><td colspan="2" rowspan="2">• Industrial buildings and processes account for the largest source of GHG emissions in Izmir.
• There is an increase in the use of natural gas and electricity in industrial sector since 2000, but a decrease in the use of coal.
• Cement processing was a main scope 1 emitter in the 2014 SEAP inventory (6% of total).</td></tr>
<tr><td>Annual CO_2 equivalent emissions per capita</td><td>3.31 tCO_2e / year/capita (2018)</td></tr>
<tr><td>Annual CO_2 emissions per unit of GDP</td><td>0.34 (National) tonne per m/$
  </td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">IBB Level of influence: Medium</td><th>Energy</th><th>Water</th><th>Solid Waste</th><th colspan="2">Agriculture and Land Use</th></tr>
<tr><td>Energy generation capacity within Izmir remains largely focused on traditional fossil fuel energies with natural gas (2,4120MW) imported coal (350MW), fuel oil (315MW), Geothermal heat is supplied to around 40,000 homes</td><td>• Carbon intensity of wastewater treatment.</td><td>• Emission from the transport of solid waste to landfill.
• Emissions from decomposition of MSW.</td><td colspan="2">• Livestock and manure management accounted for 8.2% of emissions in Izmir.
• Conversion of land from green areas such as forests or grassland emits CO_2.
• The occurrence of forest fires emits large quantities of CO_2</td></tr>
<tr><td colspan="2" rowspan="2">Sectors affecting performance
  </td><td colspan="5">Existing management approaches
• Izmir's SEAP and SECAP are the two primary instruments for reducing emissions in Izmir
• Member of the UNFCCC since 2004
• National Climate Change Strategy 2010-2023
• National Energy Efficiency Action Plan 2017-2023</td></tr>
<tr><td colspan="5">Key challenges and implications for the GCAP
• Decreasing total GHG emissions while increasing the amount of built environment development is a significant challenge that would require wide-ranging changes in building energy standards, energy infrastructure, and fuel use.
• Energy demand and GHG emissions from buildings and emissions from ageing vehicle fleet are set to continue increasing unless there is significant intervention. A warming climate will increase the need for cooling in summer, which will exacerbate this trend.
• Improving the share of clean energy is a challenge and an opportunity for Izmir. The SEAP found that Izmir has significant opportunities to increase the proportion of renewable energy entering the network due to its wind, solar and geothermal resources. There is also potential to develop smaller, building scale, renewable energy projects on larger roofs in the city.
• Reducing non-revenue water losses is a key challenge as they were measure at 28.86% in 2018.
• Segregating waste streams is another challenge with implications for the GCAP as all waste is currently directly sent to landfill with no recycling or composting.
• Ensuring the active participation of the Ministry of Environment, facilitating emission reduction within sectors that fall under their remit of responsibility.</td></tr>
</table>

Climate adaptation and disaster risk

Existing hazards

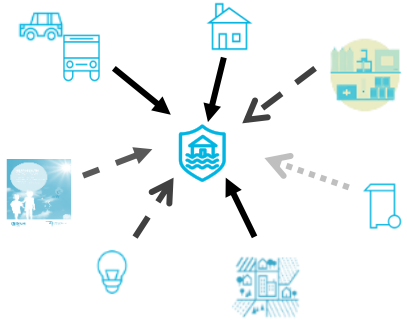
Natural Hazards

- Flooding
- Landslide
- Wildfire
- Earthquake
- Tsunami
- Extreme heat
- Water scarcity

Climate Projections RCP 8.5

Variable	2021-2050	2051-2100
Change in mean annual mean temperature (°C)	+1.7	+4.6
Change in annual maximum temperature (°C)	+1.6	+3.6
Change in mean annual precipitation (mm)	+2.0	-65.0
Solar radiation ($w/m^{2)}$	+4.0	+9.0

Sectors affected by climate risks



Resilience of GCAP Sectors

Transport

- Transport can be severely disrupted by flooding and earthquakes. No indication of implemented resilience measures of transport network.
- Transport infrastructure is susceptible to damage by heat, flooding, and ground instability due to erosion and drought.
- Heatwaves can impact the stability and robustness of road infrastructure, and rail infrastructure can be affected due to expansion of tracks.
- Adaptation and Disaster risk management is not included within transport strategies.

Buildings

- As nearly half of buildings in Izmir were constructed before 1990, energy performance, insulation and earthquake resilience are low, with a lack of incentives, support or sanctions to improve.
- Projected higher temperatures will require investments in cooling interventions.
- Acute natural hazards and incremental sea level rise can damage properties along the 60-kilometre long coastline
- There are currently no incentives, support or sanctions in place for energy efficiency in buildings.
- There is currently no consideration for resilience to wind.

Energy

- Climate change will affect energy demand patterns. Higher temperatures will increase demand for energy to cool buildings and industrial facilities and put pressure on energy supplies.

Water

- Infrastructure projects separating the collection of storm water and wastewater is being continued by IZSU, but the current situation is insufficient.
- The high annual number of stormwater or sewerage overflows per 100km of network length illustrates existing challenges coping with flash flooding. Increasing urbanisation rates and an increase of impermeable surfaces will likely contribute to more severe impacts of flooding, and cause further overflows
- There is currently no greywater collection, with a lack of incentives for development.
- Water scarcity and drought is a serious risk in the Küçük Menderes and Gediz Basin, with the Water Risk Atlas indicating an 'extremely high' water scarcity risk.

Industries

- Izmir's food industry exports 11% of Turkey's food and beverages. Food production is threatened by projected climate change through drought and depleted water resources.
- Global climate change can also have indirect impacts on Izmir's industries through supply chain disruptions.

Solid Waste

- Fires are occurring in landfill areas

Land Use

- Land use planning is a key driver of climate change and disaster risk in cities. Existing land use plans in Izmir do not give regard to climate change projections.
- Given the urban heat island effect spurred by rapid urban development and higher temperatures, this should be considered in land use planning.
- Due to overcrowding and an increase in informal settlements, earthquake disaster risk has increased.
- Forest Fires are a developing hazard. The August 2019 event in Izmir demonstrating the prevailing threat they hold.
- Adaptation and disaster risk management is not included within land use planning.

Existing management approaches

- At the national level, a new disaster management model was implemented after the establishment of AFAD in 2009
- National Climate Change Strategy (2011) and the National Adaptation Strategy and Action Plan (2012)
- Urban Green Up 2020: 50 tons of CO_2 sequested each year, 5000 new trees along a 10km cycle and pedestrian route.
- Izmir Earthquake Master Plan: Increasing earthquake resilience.
- IBB Strategic Plan 2020 – 2024: recognises climate risks and sets target to mitigate them.

Key challenges and implications for the GCAP

- **Increasing temperatures and urban heat island effect**, driven by climate change, rapid urban development, population growth and a lack of green space. The GCAP could consider measures across all sectors to adopt passive cooling techniques, whole-home retrofits, reforestation and more varied green spaces, and decrease heat absorption in buildings roofs and roads, ensure new transport infrastructure can cope with heat stress.
- **Water scarcity and droughts**. Drought is a serious risk in the Küçük Menderes and Gediz Basins. Sectoral water allocation plans and drought management strategies will help mitigate the issue, but should be supported by further action, such as: system leakage reduction, reducing water consumption, improve efficiency in agriculture and industrial processes, and use native plants for urban green space (which require less water).
- Other challenges and implications detailed in the Technical Assessment include flash **flooding, sea level rise and coastal erosion**, lack of a city-wide climate adaptation plan, limited consideration of **climate change projections** in construction of new infrastructure and lack of a recent earthquake masterplan.

Green Space and Biodiversity

State of the environment

Available data

Indicator	Latest value
Open green space area ratio per 100,000 inhabitants	8.6m² per capita (2019)[96]
Population density on urban land	4,630 residents per km²

Existing pressures

Transport

- Growing motorisation rate which increases demand for road coverage and parking spaces which competes with green space for land use.
- Road networks can cause fragmentation of habitats

Buildings

- Limited provision of open space due to increasing levels of construction
- Increasing building heights could pose threats to bird populations
- Lack of incentives for the inclusion of sustainable design in buildings e.g. green roofs and rainwater collection.

Industries

- Industrial zone is in close proximity to the Gediz Delta Wetlands (Izmir Bird Sanctuary) and causes noise, light and air pollution.
- Increasing tourism demands exerts pressure on green space as more land is allocated to serve tourism industry.
- The expansion of agricultural practices threatens availability of green space and natural ecosystems.

IBB Level of influence: Medium

Energy

- The conversion of land for energy-generating activities
- Energy infrastructure can fragment ecosystems and impact biodiversity (windfarms)
- Pollution from power stations can also affect biodiversity

Water

- Seawater intrusion have been found to affect water quality.
- Water diverted from ecosystems through dams or irrigation for human use (agriculture) disrupt local ecosystems.
- Rainwater is not currently collected separately. Works for separated collection is being continued but the current situation is insufficient.
- Ground water depletion due to impermeable surfaces.

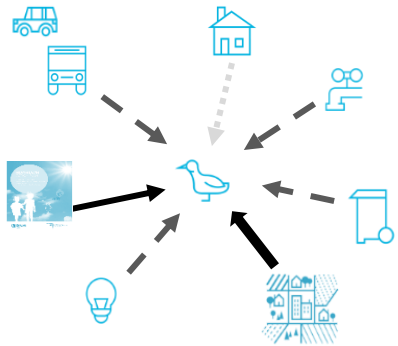
Solid Waste

- High amounts of waste generated increasing strain on existing infrastructure. Illegal dumping can contaminate local environment.
- Waste is not separated or recycled –increasing the land needed for landfilling.

Land Use

- Rapid urbanisation has converted green space to built-up areas degrading, fragmenting or removing ecosystems.
- Urban sprawl has fragmented habitats
- Impact of reduced green area on native species.
- Lack of green space within the urban areas
- The impact of tourism activity is not currently evaluated.

Sectors affecting performance



Existing management approaches

- Izmir is one of three frontrunner cities for the EU funded Urban GREENUP project which renatures urban plans.
- IBB Green Infrastructure Strategy (2018) sets out recommendations to promote green infrastructure, such as natural solid waste treatment, a green belt around the city, and an ecological corridor to the south.
- Key biodiversity areas (KBAs), where biodiversity is protected on a local scale, are monitored by NGOs such as Doğa Derneği,
- IBB Strategic Plan 2020 – 2024 sets targets to increase the m² of green space per capita, number of trees planted, and better integration of green space.

Key challenges and implications for the GCAP

The key challenge for the GCAP is **competing land use priorities**. Green and natural spaces are competing with residential, commercial and industrial constructions as well as all transport and utilities infrastructure. One key option to be considered by IBB is that any new master planning and development must incorporate elements of green space and must steer clear from agricultural land and existing green spaces (especially the Gediz Delta). It should be explored whether **urban expansion** should be focused to the south of the city, avoiding rich natural areas, and if further protection of natural habitats should be adopted.
Other key challenges and implications detailed in the Technical Assessment include:
Green space **connectivity**
Green space **accessibility**
Green space **typology** (for example need for more drought and wildfire resistant species)
Managing biodiversity

[96] *IBB Annual Report 2019.*

Soil Quality

State of the environment

Available data

Indicator	Latest value
Concentration of cadmium in soil	No data
Concentration of zinc in soil	
Concentration of lead in soil	

IBB Level of influence: Low

Existing pressures

Transport

- Increasing road construction and heavy road traffic contribute to erosion of semi-arid soils.
- Chemicals used in the preservation of the railroad can detrimentally impact soil.

Buildings

- Construction is a driver of decreased soil quality as it removes topsoil the most biologically active component of soil.
- Consideration of soil quality in building and development planning regulations.

Industries

- Industrial activity leads to air and soil pollution.
- Soil health is negatively impacted by industrial agricultural practices like mono-cropping, synthetic fertilisers, and pesticides, among others.
- Discharge of industrial effluents into soil causes changes to the localised biological and chemical profile of soil.
- Mining activities in the area negatively impact soil quality.
- No consideration for the impact of geothermal power activity on soil quality, specifically the return of thermal water.

Energy

- Impacts result from pollution linked to fuel consumption and oil spills, or changes in land use arising from the construction of new power plant or other facilities.

Water

- Izmir province faces a lack of appropriate rainwater drainage systems, which increases the risk of flooding which impacts soil quality and causes erosion.
- No assessment of the quality of water used for irrigation.

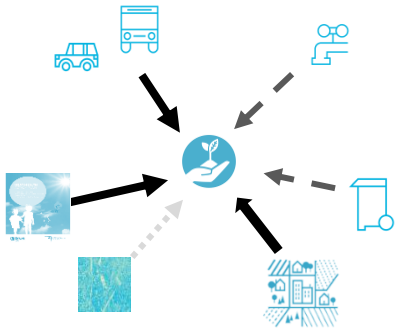
Solid Waste

- Instance of illegal waste dumping and burning; leachate and particulate negatively impacts soil quality
- Incorrect solid waste disposal can pollute the physicochemical characteristics of the soil by increasing the heavy metal content
- Excessive use of plastics and plastic waste can negatively affect soil quality.

Land Use

- Rapid expansion and increasing agricultural pressures; reduction of green space increases soil aridity and erosion.
- There is a lack of data around agricultural practices and the impact of over-ploughing of soil.
- Increased rates of erosion and a subsequent reduction in soil quality due to a loss of forested area and current agricultural practices.

Sectors affecting performance



Existing management approaches

- Policy around soil protection is set at the national level, while the provincial level is responsible for policy implementation.
- The Soil Pollution Control and Point Source Contaminated Sites Regulation (No. 27605) from 2010 regulated the use of sewage and compost and implemented the 'polluter-pays' principle.
- One of IBB's targets for improving the local economy of Izmir is to identify fertile soil areas for protection within the provincial borders. There is currently no IBB strategy to address contaminated soils, though the IBB Strategic Plan 2020 – 2024 states that there will be further focus on the Aliağa industrial region in relation to soil pollution and solid waste disposal.

Key challenges and implications for the GCAP

- **Lack of data** availability relating to soil quality will pose a challenge to the GCAP in terms of setting a baseline and measuring change.
- **Ineffective solid waste disposal practices** and illegal dumping of domestic, construction or industrial waste can contribute to poor soil quality and increase heavy metal contamination having consequent impacts on biodiversity.
- **Deforestation** in the region and its consequent feedback loops has negative effects on soil quality in the region.

Industrial agriculture negatively affects soil health and the atmosphere, by reducing organic matter and releasing carbon. Sustainable agricultural techniques can be explored to help to improve soil quality, avoiding the need for synthetic fertiliser and pesticide use while protecting natural soil biodiversity

Air Quality

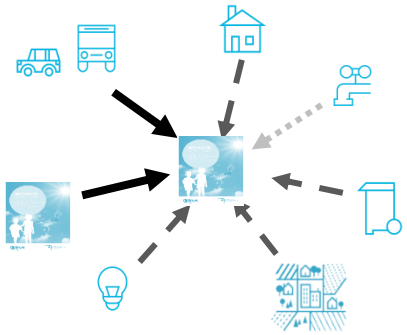
State of the environment

Available data (state and pressure)

Indicator (in (µg/m^3)	Latest value
Average annual concentration of PM_{10}	40.61 (average across all stations)
Percentage of diesel cars in total vehicle fleet	46%
Average age of car fleet	12.6

IBB Level of influence:
Medium – Buildings, Energy, Industry
High – Transportation

Sectors affecting performance



Existing pressures

Transport

- Emissions from road vehicles are a major source of air pollution in Izmir, exacerbated by the growing population demand for cars and an increasing congestion.
- The proportion of diesel vehicles is 46%, which is likely to contribute to high particulate matter concentrations across Izmir.
- The high proportion of CEVs is a cause of $PM_{2.5}$, PM_{10}, SO_2, and NOx level exceedances.

Buildings

- The building stock in Izmir is relatively old (46% having been built prior to 1990, i.e. prior to the introduction of thermal standards) and therefore energy performance standards are relatively low. Older buildings tend to have higher heat demands and less efficient services, and therefore have higher GHG emissions than modern structures.
- Where electricity is used (whether for heating or cooling), air quality impacts are local to the point of generation, not the point of use.

Industries

- There are a range of large industrial companies in Izmir, including iron, steel and cement production facilities.
- Industrial enterprises in Izmir have caused serious air pollution concerns, especially Aliaga region, which includes of the biggest refineries in Turkey (STAR).
- There is a lack of information available on-air pollution from industry.
- Limited regulations for air pollution within the construction / demolition industry.

Energy

- Fossil fuel dominated energy and heat production.
- National level energy policies and incentive structures promote uptake of fossil fuel sources above renewables.

Solid waste

- Landfill gas is generated as a result of decomposition of solid waste in landfills. The emitted landfill gas is collected and used in electricity generation.

Land Use

- Most built-up areas of Izmir suffer from a lack of green open space, which can negatively impact the city's air quality. Greenery can absorb harmful gases.
- Medium inversion risk means wind direction needs to be considered in land use planning.

Existing management approaches

- Izmir already has several regulations and strategies in place to address air quality challenges, and other cross-cutting plans that are not directly aimed at improving air quality which also contribute to improving air quality (such as the ITMP).
- Air protection in Turkey is mainly regulated through the Law of Environment No. 2872/1983. Air quality targets were established in the Regulation of Air Quality Assessment and Management, which is based on Article 6 of Environmental Law No. 2872.
- IBB Strategic Plan 2020 – 2024 and ITMP outline investment to increase public transport availability, as well as cycling infrastructure.

Key challenges and implications for the GCAP

- Data provided by the monitoring stations in Izmir does not necessarily give a good indication of overall **air quality distributed** across the city, and data from certain monitoring stations is unavailable.
- Main sources of air pollution in Izmir are **transport and industrial facilities**, and to a smaller extent, domestic heating equipment used in winter.
- Izmir's population growth has caused a rise in the number of **private motorised vehicles** which directly affects the quality of air.
- **Limited green space** availability within and surrounding the city (reducing due to land use demand) reduces mitigation of air quality.
- Izmir Municipality is **limited in its influence / authority** over neighbourhood management and energy use.
- As noted in the SEAP, there are opportunities to significantly expand the use of **renewable energy** in Izmir, by linking more properties to geothermal heat sources (although only available in Balçova), increasing uptake of solar PV (particularly in industrial areas) and increasing wind energy generation. This will help alleviate air quality.

Water Quality and Availability

State of the environment

Available data

Indicator	Latest value
Water Exploitation Index	73%
Ammonium [NH_4] in G. Basin, K. Menderes and K. Ege	5.22 – 9.39 mg/L
Biochemical Oxygen Demand in G. Basin, K. Menders and K. Ege	0.42 to 0.031 mg/L.

IBB Level of influence: Medium

Existing pressures

Transport

- Diffuse urban pollution of heavy metals and particulates.

Buildings

- None of the buildings in Izmir are equipped to reuse grey water.
- Although potable water is supplied to 98% of properties across Izmir, the age and condition of internal plumbing means that in some locations water may be unsuitable for drinking, leading to high use of bottled water.

Industries

- Uncontrolled wastewater discharges, industrial effluents and agricultural runoff pollute water bodies
- Low standards for officially discharged water.
- High water demand for irrigation and industrial activities

Energy

- Izmir thermal power plant, other natural gas power plants, and biogas plants use water for cooling purposes. No data was available regarding the treatment of wastewater from the energy sector.

Water

- The water loss-leakage ratio for 2018 was calculated as 28.86%.
- Heavy metal and particle pollution due to old pipe infrastructure.

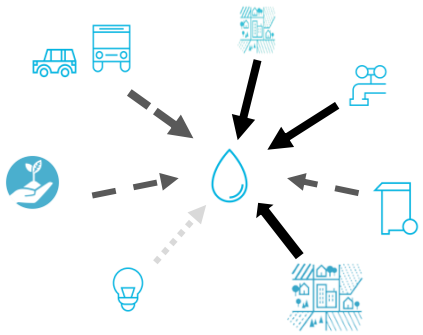
Solid Waste

- Effects on water quality due to inappropriate waste disposal is not significant on a city-wide scale; however, where inappropriate disposal does occur there may be localised impacts for surface and groundwater.

Land Use

- Rapid urbanisation and increased water use put pressure on water availability
- Extension of the water network
- Agricultural water requirements

Sectors affecting performance



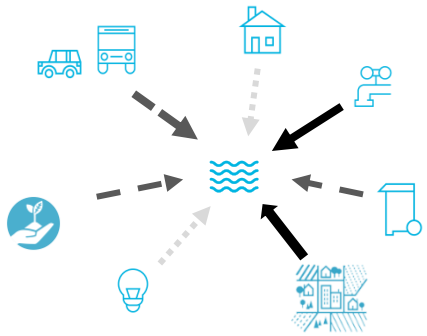
Existing management approaches

- IZSU prepared a Potable Water Master Plan (2017) up to 2050 - the plan proposes two desalination projects in Ceşme and Foça districts
- Gediz Basin Water Allocation Plan and Küçük Menderes Basin Water Allocation Plan - General Directorate of Water Management of MoAF
- Within the scope of Izmir Sewage Sludge Master Plan prepared by IZSU in 2015, studies have been carried out on how the sewage sludge composed of various WWTPs should be managed by 2050.

Key challenges and implications for the GCAP

- Pressures on Izmir's water quality and availability are being driven by **population growth**, land use management (including **irrigation for agriculture**), use in the energy sector, use in industry, and waste management. This is exacerbated by the existing water scarcity and growing climate change pressures.
- **Ageing infrastructure for potable water** (internal plumbing) affects water quality in older buildings.
- **Wastewater and stormwater are collected together** and transferred to Cigli and Southwest WWTPs. Stormwater can be collected separately to reduce the burden on the drainage network and WWTPs.
- Treatment of wastewater by smaller companies is hard to audit.
- **Water loss-leakage** ratio for 2018 was calculated at 28.86%. IZSU has a target to reduce this to 25% by 2045 but given high water scarcity it is worth considering if this can be progressed quicker.
- There is a high number of small sized companies whose **wastewater release is unregulated**.

Marine biology

<table>
<tr><th colspan="2">State of the environment</th><th colspan="4">Existing pressures</th></tr>
<tr><th colspan="2">Available data</th><th>Water</th><th>Solid Waste</th><th colspan="2">Industries</th></tr>
<tr><td>Indicator</td><td>Latest value</td><td rowspan="2">• Izmir Bay is characterised as being heavily polluted from nutrients and organic material, with increased levels of chemicals and heavy metals in the water and sediments.
• The pollution in Izmir Bay, particularly of nutrients, has given rise to harmful algal blooms, or red tides, of toxic dinoflagellate species, which causes fish mortalities and human food poisoning.</td><td rowspan="2">• Minor pollution to surface and groundwater which may impact marine biology.
• Domestic and industrial waste upstream from the Gediz River has negatively affected the Homa Lagoon.</td><td colspan="2" rowspan="2">• Untreated effluent discharges causing water contamination, for example due to textile pigment, metal plating and paper factories
• Pesticides from agricultural drainage pollutes water
• Overfishing in the bay (increasing demand due to population growth and tourism)
• There is no co-ordinated management of marine biology in relation to tourism and recreational activities and other industries which rely upon the environment.
• Illegal fishing and lack of monitoring and sanctions on this activity.
• Responsible fishing codes are not adhered too by amateur fishing, with a data gap on risks and threats of this activity to the environment.
• The activities of Alsancak Port Located within the Gulf are poorly monitored.</td></tr>
<tr><td>Water Quality Eutrophication</td><td>TRIX Values (2018)[97]:
Inner Bay – Medium to Bad Quality
Outer Bay – High Quality
Foça SEPA – High Quality</td></tr>
<tr><td>Sediment Quality Guidelines[98]</td><td>Izmir Bay (2017):[99]
Hg > ERM,
Cr, Cu, Zn, Pb between ERL and ERM</td><td colspan="4"></td></tr>
<tr><td colspan="2" rowspan="2">IBB Level of influence: Medium</td><td>Transport</td><td>Energy</td><td>Buildings</td><td>Land Use</td></tr>
<tr><td>• Marine transport activities through freight, passenger and commercial vessels in-parts pressure on marine biology due to pollution.</td><td>• Lack of data around the impact of using sea water for cooling in the energy sector and how it impacts ecosystems.</td><td>• N/A</td><td>• Encroachment on protected areas and coastal wetlands due to urban development and increasing demand for land.
• Lack of consideration of coastal environments in land-use planning.</td></tr>
<tr><td colspan="2" rowspan="2">Sectors affecting performance
  </td><td colspan="4">Existing management approaches</td></tr>
<tr><td colspan="4">• Izmir Bay contributes significant marine biodiversity value. Designated sites that reflect the importance of some of this diversity are; the Foça Special Environmental Protection Area (SEPA), Karaburun - Ildır Bay SEPA, Çakalburnu Lagoon, Meles Delta and the Gediz Delta Ramsar site which needs more protection. In 2006/2007 the MoAF developed a National Biological and Diversity Strategy Action Plan (NBSAP) for 2007-2017, recently updated in the National Biodiversity Action Plan (NBAP) 2018-2028.
• Since 2011, marine monitoring studies have been carried out by MoEnvU on the basis of an ecosystem-based management approach under an Integrated Marine Pollution Monitoring Programme, coordinated by TUBITAK Marmara Research Centre.
• Since 1996, Izmir Bay Oceanographic Monitoring Project has been carried out by IZSU and Dokuz Eylül University.
• Izmir Regional Plan 2014 includes a commitment to reduce threats to coastal and marine biological diversity
• IBB Strategic Plan 2020 – 2024 aims to initiate one project each year to improve the Bay's water quality.</td></tr>
<tr><td colspan="2"></td><td colspan="4">Key challenges and implications for the GCAP</td></tr>
<tr><td colspan="2"></td><td colspan="4">• Pressure on Izmir's marine ecology is largely driven by coastal development and urbanisation (as a result of increased population growth and tourism), though fishing activities, agricultural activities, and climate change also pose a threat to the marine biology of the region.
• The pressures include direct coastal encroachment and indirect effects such as marine noise and litter, as well as industrial and domestic pollution as a result of a rapidly growing population and economy
• The Izmir marine region, in particular the Inner Bay, has unfavourable water and sediment quality with a negative effect on existing marine fauna and flora and potential consequences for human health and fisheries.
• Marine habitats in the Gulf of Izmir, such as lagoons and seagrass meadows, are already under threat from direct habitat loss and the indirect effects from industrial and domestic activity.
• Izmir Bay contributes significant marine biodiversity value. There are five designated sites (the Foça SEPA, Karaburun - Ildır Bay SEPA, Çakalburnu Lagoon, Meles Delta and the Gediz Delta Ramsar site) that reflect the importance of some of this diversity, these may need further protection and expansion of protected areas.
• Population growth and increased tourism all increase the demand for seafood in an already heavily exploited fishing grounds both by artisanal, industrial and recreational fishers.</td></tr>
</table>

[97] *MoEnvU, 2018b*
[98] *National Oceanic and Atmospheric Administration (NOAA) Sediment Quality Guidelines (SQG)*
[99] *IZSU - Dokuz Eylül University, Izmir Bay Oceanographic Monitoring Project Final Report, 2018*

Appendix D Benefits Assessment Criteria

Benefit category	Sub-category	Description
Health, wellbeing and safety	Public health – more active lifestyles	The action establishes opportunities for activity, including through active transport and increased desire to be outside.
	Public health – reduced pollution	The action reduces air, soil, and water pollution, thereby improving health outcomes.
	Workplace safety	The action improves worker safety.
Social inclusion	Access to basic services	The action improves access to basic services. This includes waste collection, transport, health, and educational services.
	Skills development	The action provides skills training to individuals or organisations.
	Social equity	The action will reduce inequality.
	Strengthens social fabric	The action will strengthen the social fabric of Izmir. This would include the action providing opportunities for community or public engagement and strengthening social networks and political voice.
Economic development	Economic growth	The action increases the goods or services produced in Izmir This includes property values and individual spending.
	Employment creation	The action has the potential to create jobs.
	Increased economic efficiency	The action will reduce economic losses due to inefficiencies in the urban built environment or Izmir's institutional arrangements.
	Revenue/savings generating activities	The action has the potential to generate revenue, either for the investor, the Municipality, or in comparison to the counterfactual, or has the potential to generate saving opportunities
	Avoided damages	The action will reduce the likelihood of damage or disruption to infrastructure, services, or livelihoods.
Environmental	Reduced pollution: either air, water or ground.	The action will result in a reduction of pollution levels, whether air, water or ground.
	Mitigation of GHG emissions	The action either prevents future or reduces existing GHG emissions.
	Enhanced ecological value.	The ecological value of an area, either urban, rural or natural, will be enhanced within the timeframe of the action.
	Prevention of biodiversity loss.	The action will help reduce the loss of biodiversity; whether flora or fauna.

Appendix E SECAP Specific Actions

Total number: 14

Mitigation: 10

I.D	Headline
Buildings: Municipal, Tertiary, Residential	
SECAP B1	Insulation of Tertiary Buildings
SECAP B2	Energy Efficiency in Municipal Buildings
SECAP B3	Energy Efficient Light Bulb change in Tertiary Buildings
SECAP B4	Encourage and incentivise thermal insulating in existing residential buildings.
SECAP B5	Encourage and incentivise energy efficient lighting systems in existing residential buildings (LED etc.)
Transport	
SECAP T1.3	Apply smart traffic management: e.g. command centre
SECAP T1.4	Eco driving training (driving more economically) for IBB employees (As per SEAP Action - in lieu of EV / hybrid vehicles)
Energy: local electricity, heat, cold production	
SECAP ES1.2	Encourage the fuel switch from Coal to more renewable sources in residential areas (geothermal, electricity).
SECAP ES1.14	Municipality to encourage the private sector to install solar panels using existing national subsidies or financial schemes.
Waste	
SECAP SW1.8	Development of a detailed analysis (number, type, size, age etc) and action plan for the development and low-emission management of dumpsites / landfills (both closed and operational). This could incorporate the development of mandatory energy recovery and landfill gas and anaerobic digestion.

Adaptation: 4

I.D	Headline
Agriculture & Forestry	
SECAP AF1	Prepare a drought action plan.
SECAP AF2	Develop a management strategy for forest fires.
Health	
SECAP H1	Periodic collection and monitoring of data by creating a monitoring board to address climate and health impacts.
SECAP H2	Identifying groups that are vulnerable to the public health effects of climate change and implementing strengthening strategies targeting these groups.

Appendix F Economic Assumptions

All costs were calculated based on the assumptions in relation to UK prices in June 2020. A blanket location factor of **0.41** was then applied to reflect the prices in Turkey, calculated as seen in the table below. Prices were then converted into Euro from GB Pounds, based on a conversion rate of **€1.12 - £1.00**. All costs exclude VAT and Local Taxes. Where a range is presented, the upper value represents the costs based on the provided assumption, the lower range value is assumed at **80%** of the upper value.

2019 Comparative Price Levels[100]	
UK	104
Turkey	38

	Price Level Exchange Rate[101]	Currency Exchange Rate: GBP to Euros[102]	PPP Exchange Rate[103]
UK To Turkish	0.37	1.12	0.41

ID	Action	Type of Investment	Cost estimates - CAPEX	Cost estimates - OPEX	Cost estimates – Design / Development	Key Assumptions
Basket 1: Access transition to low emission vehicles.						
T1.1.3	Promote a step change in the uptake of privately /	Capital Investment and Study	**Rapid charging points:**	-	-	Cost based on 50 rapid charging points and 50 slow charging points (based on Spons 20[104]) Cost of rapid charging points assumed to be £750 per charging point.

[100] *https://stats.oecd.org/Index.aspx?DataSetCode=CPL#*
[101] *Calculated by dividing the Turkish comparative price level with the UK figure.*
[102] *Currency exchange rate at the time of analysis (June 2020).*
[103] *Calculated by divided the Price Level Exchange Rate by the Currency Exchange rate.*
[104] *AECOM (Ed.). (2020). Spon's Civil Engineering and Highway Works Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294778*

	Municipality owned low emission vehicles.		€17,000 / 50 charging points **Slow charging points:** €11,000 / 50 charging points			Cost of slow charging points assumed to be £500 per charging point..
T1.5	Municipal fleet and service vehicles: electric and low carbon vehicles.	Capital Investment and Study	€400,000,000 - €600,000,000	€78,000 - €96,000	€64,000 - €80,000	**Assumptions for studies / other costs:** Steps 1 and 2 assume no costs for municipal staff. Step 3 assumes overnight charging buses. Studies will cost £10k per site to investigate local grid capacity and constraints, charge rate, number of buses to be changed overnight, space requirement, equipment requirement, and integrating battery systems for storage. Studies will take place on all existing sites and six new sites proposed by IBB/ESHOT. Assumes two more depots will be required, as well as another site for charging service vehicles. Step 4 assumes PV on large bus depots. Also assumes 11 sites will require a PV feasibility study, at £5k per site. **Assumptions for CAPEX costs:** Step 5 assumes 1000 to 1500 new e-buses will be required up to 2030 at €400,000 per vehicle. (based on ESHOT price for e-buses purchased in 2017). **Assumptions for OPEX costs:** Step 6 assumes 100 service vehicles will be required, at Euro 207 per month[105].

[105] *https://www.rvsleasing.co.uk/search?offset=0&vt=car&ft=ch0&pricesort=asc&price=100&pricerange=50&st=full*

Basket 2: Develop more sustainable mobility options						
T1.7	More sustainable urban mobility: mass transit and local mobility.	Capital Investment and Study	**Pedestrianisation:** €172,405,000 for 145km (with a width of 15m) **Cycling infrastructure:** €69,498,000 for 351km (with a width of 5m)	-	-	Costs provided per km of 15m wide pedestrianisation and 15m wide cycling infrastructure. Cost for 15m wide pedestrianisation (based on Spons 20[106]) assumed to be £2,700,000 / km. / €1,189,000 / km Cost for 5m wide cycling infrastructure (based on Spons 20[106]) assumed to be £450,000 / km / €198,000 / km
Basket 3: Develop a more sustainable logistics sector						
I: B	Undertake baseline studies with a view of developing policy to ensure that sustainable practices, environmental and cultural factors are adopted in port operations (international and national logistics) and the development of coastal structures.	Study and Policy	-	-	€8,000 - €20,000	All steps are based on costs provided by a Port specialist. Assumes the study will consist of four weeks of work, covering the yard, the quay and the channel. Marine Port, Marine biology, Marine Consenting, and Climate specialists will be required within the project team.

[106] *AECOM (Ed.). (2020). Spon's Civil Engineering and Highway Works Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294778*

Basket 4: Commit to net zero energy and end the use of single use plastics in the municipality buildings and encourage other organisations, business and institutions to follow IBBs leadership.						
B1.6	Municipality to develop policy that commits to net zero in all new public sector buildings by 2030.	Study and Policy	-	-	€21,000 - €31,000	Feasibility studies for 4 out of 8 priority buildings. Estimated cost per building: £10k for small building, £30k for large building. Cost calculated to assume 8 small buildings.
SW1.10	Municipality to commit to banning the use of single-use plastics within their buildings, encouraging local businesses to do the same.	Study and Policy	-	€600 - €800	€15,000 - €20,000	**Assumptions for studies / other costs:** Study work based on costs provided by an Environmental Consultant. Costs to promote the use of eco-friendly alternatives assumed to be associated with providing alternatives to everyday single use plastics. No other implementation costs have been assumed. **Assumptions for OPEX costs**: Assumes publicity campaign costs include monthly Instagram post promotion (at £200 per campaign) targeting approximately 210,000 people with business interests, linking to a mid-range small business website with content from the study.
ES.A	Develop Izmir bioeconomy and action plan	Plan / Strategy			€60,000	Costing based on IBBs experience in producing similar strategies.
Basket 6: Enhance evidence for action through studies / assessments						
B1.9	Undertake circular economy assessments on all municipality refurbishment	Study	-	-	€40,000 - €50,000	Step 1, 2 and 5 are based on costs provided by a Sustainability Consultant. Steps 3 and 4 assume no costs for municipal staff. Step 5 assumes Instagram post promotion (at £200 per publication) targeting approximately 210,000 people with business interests. Also assumes

	and demolition projects, encouraging uptake in private projects.					professional website content creation to produce page on Izmir Council website, with 12 publications per year, at £240 per publication. Costs for Step 6 only includes guidance to private companies. Step 5 is based on costs provided by an Environmental Consultant.
ES1.4	Local renewable energy options study.	Study	€105,000,000	-	-	Costs are based on an options study to understand the feasibility of deploying renewable energy technologies, for areas in the city that are close to high energy users. A PV array of up to 700 MW has an assumed cost of £340,00 / MW. (Spons 20[107])
ES1.11	Implement an environmental labelling scheme for companies within Izmir to help improve and develop product value, with an aim of encouraging industrial businesses to participate in clean energy and green infrastructure efforts.	Campaign	-	€500 - €700	€10,000 - €13,000	**Assumptions for studies / other costs:** Assumes Step 1 will be undertaken in-house. Costing for Step 2 includes a study to develop supporting public information and behavioural campaigns and Step 3 are based on costs for Monitoring Studies provided by an Environmental Consultant. **Assumptions for OPEX costs:** Costing for Step 2 also includes the delivery of information and behavioural campaigns, which assumes an annual Instagram campaign reaching 1,400,000 to 3,700,000 people and a mid-range small business website (with content from the study).
ES1.1	Undertake mapping and associated baseline analysis to understand the	Study	-	-	€20,000 - €33,000	Step 1 assumes no costs for municipal staff. Steps 2-6 are based on costs by an Energy Consultant.

[107] *AECOM (Ed.). (2020). Spon's Mechanical and Electrical Services Price Book 2020. London*

	number and consumption of public sector (municipality) and industry buildings where possible that currently use fossil fuel-based heating with an aim of expanding and connecting them to the geothermal heat network, without compromising pressure levels.					
Basket 8: Develop Municipality funded subsidy schemes, grant programmes and/or investments						
B1.11	Explore ways to support residential retrofits being undertaken to a higher and greener energy performance standard.	Policy / Behavioural / Training	n/a	€2,081,250	€312,188	These costs assume that the study is limited to 1,000 houses of 100m^2 GIA each and 1,000 apartments of 90m^2 GIA each, acting as a representative of the City as a whole. Prices based on Spons 20[108]. Step 1: based on £2,500/ property and 2,000 properties including 1,000 houses and 1,000 apartments Step 2: lump sum of £250,000 Step 3: lump sum of £100,000 Step 4: lump sum £500,000 Step 5: lump sum of £250,000
SW1.3	Make separate collection of key dry recyclable	Study and Policy	**Collection asset set-up cost:**	**Public Information Campaign:**	**Studies & Info Campaign:**	**Assumptions for studies / other costs:** Steps 1 and 2 are based on costs provided by an Environmental Consultant.

[108] *AECOM (Ed.). (2020). Spon's Architects' and Builders' Price Book 2020. London*

	materials mandatory, formulating policy at the district municipality level.		€980,000 - €1,230,000	€1,300 - €1,600 **Collection asset cost per year:** €1,600,000 - €2,400,000	€23,000 - €29,000	Step 3 assumes no costs for approving policy and enforcement measures. Step 4 includes a study to develop supporting public information and behavioural campaigns, based on costs provided by Environmental Consultant. **Assumptions for OPEX costs for public information campaigns:** Step 4 also assumes annual campaigns reaching 1,400,000 to 3,700,000 people and a mid-range E-commerce website to facilitate the ordering of recycling boxes, bags etc. **Assumptions made for CAPEX and OPEX cost for potential collection infrastructure investment:** These are broad estimates for mixed dry recycling collection infrastructure and operations of £3M CAPEX set-up cost and £5M OPEX per year thereafter. These figures are on an estimate for Wales[109], who introduced a co-mingled recycling collection service for an urban authority (e.g. Cardiff). OPEX is dependent on revenues for sales of recyclates, the price of which fluctuates a lot.
SW1.4	Supplement and speed up investment in waste separation facilities, (dry recyclables and organic waste), a clean materials recovery infrastructure and composting facilities, building on IBB's Integrated Solid Waste	Capital Investment and Study	**Clean materials recovery facility:** €8/ tonne **Composting:** €18 / tonne	-	-	Costs are provided per tonne of waste management via clean materials recovery facility and per tonne of composting. Assumes no requirement for main contractors' costs. Assumes a rate of £23.65 / Tonne at 2020 prices for clean materials recovery facility[110]. Assumes a rate of £52.68 / Tonne at 2020 prices for composting facility.[110]

[109] http://www.wrapcymru.org.uk/sites/files/wrap/Kerbside%20Collections.pdf
[110] *WRAP, 2017: 'Comparing the costs of waste treatment options' [online] available at:* http://www.wrap.org.uk/sites/files/wrap/Gate%20Fees%20report%202017_FINAL_clean.pdf

	Management Strategy (2018).					
Basket 9: move toward network / infrastructure level water cycle management						
WCM1.10	Upgrade the existing water management infrastructure to incorporate the separation of wastewater and stormwater lines.	Capital Investment and Study	**Surface Water Network:** €100,000 / km **Foul Water Network:** €50,000 / km	-	-	Costs provided per km of Surface Water Network and Foul Water Network. Assumed price of work includes main contractors' costs. Cost for Surface Water Network assumed to be £262,000 / km. Cost for Foul Water Network assumed to be £131,000 / km.
WCM1.5	Integration of stormwater management techniques with urban greening e.g. sponge city principles.	Capital Investment and Study	**Stormwater deposition tanks:** €88 / m^3 **Green roofs:** €80 / m^2 **Permeable spaces:** €79 / m^2 **Green spaces to absorb rainwater:** €11 / m^2	-	-	Costs provided per m^2 of green roofs, permeable spaces and green spaces, and m^3 of stormwater deposition tank Cost of stormwater deposition tanks (based on Spons 20[111]) assumed to be £200/m^3. Cost of green roofs (based on Spons 20[111]) assumed to be £182.5/m^2. Cost of permeable spaces (based on Spons 20[111]) assumed to be £180/m^2. Cost of green spaces (based on Spons 20[111]) assumed to be £26/m^2.
Basket 10: Support building level water cycle management						
WCM1.4	Stormwater management storage systems for Municipality	Capital Investment and Study	**Collection tanks for buildings:** €88 / m^3	-	-	Costs provided per m^3 of collection tanks for buildings and attenuation basins for open space.

[111] *AECOM (Ed.). (2020). Spon's External Works and Landscape Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294792*

	owned or operating Buildings and infrastructure at a building level, under-ground with links to green spaces.		**Attenuation basins for open space:** €22 / m^3			Cost of collection tanks for buildings (based on Spons 20[112]) assumed to be £200/m^3. Cost of attenuation basins for open space (based on Spons 20[112]) assumed to be £50/m^3.
WCM1.9	Incorporate SUDs (Sustainable Urban Drainage) and WSUD (Water Sensitive Urban Design) principles into all planned green areas and publicly owned buildings within the scope of green infrastructure.	Capital Investment and Study	**Rainwater harvesting for publicly owned buildings:** €4 / m^2	-	-	Costs provided per m^2. Cost of rainwater harvesting on public buildings (based on Spons 20[112]) assumed to be £8.75/m^2.
WCM1.11	Incorporate sustainable water practices and design within existing municipal-owned buildings and municipality controlled open spaces through	Capital Investment and Study	**Sustainable water practices for offices (rainwater harvesting, grey water and black water recycling and water efficient fittings):** €14 / m^2	-	-	Costs provided per m^2 of sustainable water practices for offices (rainwater harvesting, grey water and black water recycling and water efficient fittings) and irrigation to open spaces. Cost of sustainable water practices for offices (based on Spons 20[113]) assumed to be £31.95/m^2 (including £8.75/m^2 for rainwater harvesting, £5.70/m^2 for grey water harvesting, £10/m^2 for black water recycling, and £7.50/m^2 for upgrading water efficient fixtures and fittings). Costs for water efficient irrigation (based on Spons 20[112]) assumed to be £2.35/m^2.

[112] *AECOM (Ed.). (2020). Spon's External Works and Landscape Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294792*
[113] *Langdon, D. (2009). Spon's Civil Engineering and Highway Works Price Book 2009. London: Spon Press, https://doi.org/10.1201/9781482266306*

	refurbishment and retrofitting.		**Irrigation to open spaces:** €1 / m^2			
Basket 13: Address the urban heat island effect.						
LU1.7	Identify and implement techniques to mitigate the Urban Heat Island Effect.	Capital Investment and Study	**Tree cover:** €21 / m^2 **Green roof:** €80 / m^2 **Cool roofs:** €83 / m^2 **Cool pavements:** €81 / m^2 **Shading in public spaces:** €286 / m^2	-	-	Costs are provided per m^2 of tree cover, green roof, cool roofs, cool pavements, and shading in public spaces Costs for tree cover (based on Spons 20[114]) assumed to be £47.50/m^2. Costs for green roofs (based on Spons 20[114]) assumed to be £182.50/m^2. Costs for cool roofs assumed to be £187.50/m^2 (based on Spons 20[114]), with an addition £5/m^2 for solar reflected paint). Costs for cool pavements assumed to be £185/m^2 (based on Spons 20[114] estimate of £180/m^2 for concrete pacing, plus an additional £5/m^2 for solar reflective finishes). Costs for shading in public spaces (based on Spons 20[114]) assumed to be £650/m^2.
Basket 15: Protection, restoration and regulation of the natural environment and ecosystems						
LU1.2	Maintain, protect and enhance existing biodiversity and ecological habitats through the restoration of wetlands, lagoons and afforestation (incorporating natural	Capital Investment	€129,000 / 1000m^2 of wetlands, 1000m^2 of lagoons and 1000m^2 of forests	-	-	Cost based on 1,000m^2 of wetlands, 1,000m^2 of lagoons and 1,000m^2 of forests. Costs for wetlands (based on Spons 20[115]) assumed to be £100/m^2. Costs for lagoons (based on Spons 20[116]) assumed to be £145/m^2 (as depth assumed to be five meters). Costs for forests (based on Spons 20[115]) assumed to be £47.50/m^2.

[114] *AECOM (Ed.). (2020). Spon's External Works and Landscape Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294792*
[115] *AECOM (Ed.). (2018). Spon's External Works and Landscape Price Book 2019. London: CRC Press, https://doi.org/10.1201/9780429464478*
[116] *AECOM (Ed.). (2020). Spon's Civil Engineering and Highway Works Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294778*

	ecosystem creation).					
WCM1.14	Conservation, protection and enhancement of marine biodiversity in Izmir Gulf, increasing the cleanliness of the Gulf	Study and Policy	-	-	€29,000 - €37,000	Costs for Step 1 include a desk base study to identify the existing protection goals for marine diversity, review existing management actions and identify gaps in provision and delivery, and research management actions in other areas to identify new approaches. Costs for Step 2 include a desk-based study to research financing mechanisms and explore grant and research funds, review green economy approaches and compliance with measures, undertake cost benefits analysis for actions and mechanisms, and identify environmental cost benefits from improvements to ecosystem services. Liaison with environmental economists and other experts will be required. Costs for Step 3 include a desk-based study (specifically for marine biodiversity) to identify key stakeholders, input into questionnaires and workshops, develop a stakeholder engagement plan, and analyse and report data. Costs for face-to-face stakeholder engagement include running an online consultant programme or workshops, public information boards, and document materials. Costs are dependent on the extent of engagement and the travel required. Costs for Step 4 include preparation of an outline implementation plan. Costs for Step 5 include a desk-based study to identify the indicators that need to be monitored with guidelines on how they will be measured and modified. Costs exclude the cost for actual monitoring of the indicators.
I: A	Further regulate fishing operations in the gulf aiming to achieve sustainability of fish stocks and habitats.	Study and Policy	-	-	€10,000 - €15,000	Assumes steps 1, 2 and 3 will be done in-house by the city authority. Step 4 based on costs for Stakeholder Engagement provided by an Environmental Consultant. Step 5 based on costs for Monitoring Studies provided by an Environmental Consultant. Implementation is excluded from the costing, as this would vary depending on the level of enforcement required.

Basket 16: Reduce Pollution						
I1.8	Address emissions and pollution within industrial areas through: - Undertaking Air Quality Assessments with the aim of implemented mitigation measures to reduce pollution and encourage the voluntary adoption of sustainable measures by industrial stakeholders e.g. science-based targets - Strengthen the existing air quality monitoring through installation of appropriate	Study	-	-	€60,000 - €110,000	All steps are based on costs from an Air Quality Consultant. Step 1 will include the review of industrial activities within industrial areas, available air quality data, and existing air quality strategies. Step 2 involves a qualitative assessment with be undertaken for each area, per industrial processes and assumes that the data can be sourced from an existing emissions inventory. This step will also identify knowledge gaps and further monitoring needs. Step 3 will identify techniques to control pollution per sector. Step 4 will involve the development of an industrial emissions strategy (per sector), a permitting and compliance plan, and an auditing and reporting strategy. Step 5 will produce a stakeholder engagement plan, including a data collection questionnaire and attitudes to pollution control. Assumes no costs for Step 6. Implementation is excluded from the costs for Step 7. It is assumed that on-going day-to-day implementation will cost the municipality approximately £3-10 million per year.

	monitoring stations (PM2.5).					
Basket 18: Enhance the Municipality's adaptation planning and implementation						
WCM1.18	Initiate a flood protection scheme for high risk areas e.g. industrial, residential.	Study		-	€207,000	Costs are based on a design study and are assumed to be 0.5% of the construction costs of approximately $155m. This has been assumed based on previous similar projects (including the Amman GCAP).
Basket 19: Understand the impacts of climate change on tourism						
I1.10	Commission a study to better understand both the direct and indirect impacts of climate change on tourism: both positive and negative and recommendations to improve the industry's resilience.	Study	-	-	€6,000 - €8,000	Steps 1 and 2 assume no costs for municipal staff. Costings for Step 3 include analysis of tourism drivers/attractions/revenues, literature review of key impacts of climate change on tourism, identification of key risks and opportunities, and reporting.
Basket 21: Collaborate with the agricultural industry to become more sustainable						
I1.1 & I1.2	Support the implementation of low carbon farming techniques and climate-smart	Study and Campaign	-	-	€19,000 - 25,000	Steps 1, 2 and 6 based on costs provided by an Environmental Consultant. Steps 3 – 5 assumes one face to face training workshop in each of three key agricultural basins with cost provided by an agricultural consultant. This excludes policy development and implementation costs and assumes £2.5k for training material and £2.5k for each workshop

	agriculture across the province.					
I1.6	Increase farm biodiversity through appropriate techniques, such as increasing diversity in plant species and establishing nest blocks.	Study and Campaign	-	-	€19,000 - 25,000	Steps 1, 2 and 6 based on costs provided by an Environmental Consultant. Steps 3 – 5 assumes one face-to-face training workshop in each of three key agricultural basins with cost provided by an agricultural consultant. This excludes policy development and implementation costs and assumes £2.5k for training material and £2.5k for each workshop