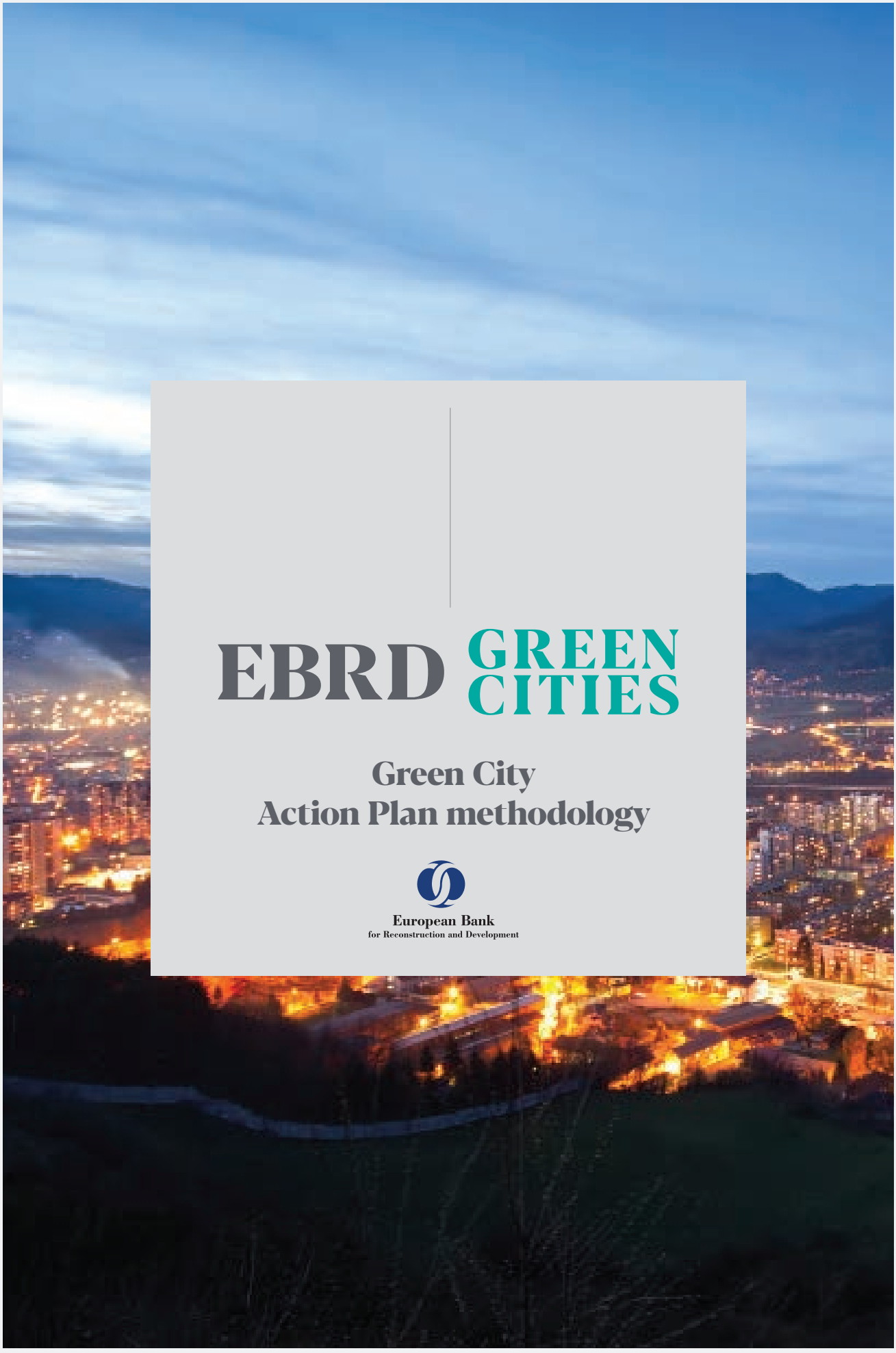

EBRD GREEN CITIES

Green City Action Plan methodology

European Bank
for Reconstruction and Development

The Green City Action Plans
are generously funded by:

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The document has been updated to account for the lessons learned over the past three years of Green City Action Plan development and implementation.

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Executive summary

Cities are dynamic and vital parts of society and the main engines of social, economic and technological development. However, rapid urban growth has vastly increased demand for resources, which, in turn, affects the environment as well as the quality of life of urban residents.

In the EBRD regions, these challenges are particularly acute due to demographic changes, insufficient investment in infrastructure and historical legacies of high energy and carbon intensity. In response, the EBRD has developed EBRD Green Cities, which strives to build a better and more sustainable future for cities and their residents. The programme achieves this by identifying, prioritising and connecting cities' environmental challenges with sustainable infrastructure investments and policy measures.

One of the programme's central components is the Green City Action Plan (GCAP), the process whereby a city's environmental challenges are systematically assessed, prioritised and addressed through various policy instruments and sustainable infrastructure investments. This document is a revision and update of the original methodology produced by the Organisation for Economic Co-Operation and Development (OECD) and ICLEI - Local Governments for Sustainability in 2016. The aim of this document is to capture the lessons learned to date and to simplify the process of developing a GCAP.

The primary audience for this document is consultants and city officials who are responsible for implementing GCAPs, as well as urban specialists who are interested in the programme's methodology. It offers implementers a step-by-step guide to developing a GCAP, and outlines the political, economic and social considerations that should be taken into account.

The document emphasises that developing a GCAP is a continuous process, allowing cities to adjust their visions and actions over time. The EBRD considers this to be a living document, and further updates may be made in the future. The following is an overview of EBRD Green Cities, as well as how the programme helps cities grow in a way that is socially, environmentally and economically sustainable.

Introduction

ABOUT THE EBRD

Founded in 1991, the European Bank for Reconstruction and Development (EBRD) is a multilateral development bank that promotes market economies in the regions where it invests, from central Europe to Central Asia, the Western Balkans and the southern and eastern Mediterranean region.

The Bank's investments and activities target reforms and restructuring aimed at improving the efficiency of the regions' markets and economic operations. Under its founding agreement, the EBRD is also committed to promoting "environmentally sound and sustainable development".
In recent years, environmental objectives have gained critical importance in the Bank's strategies and operations. In 2015, the EBRD launched the Green Economy Transition (GET) approach to help build low-carbon and resilient economies. Through the GET approach, the Bank aims to have 40 per cent of Annual Bank Investment in green projects by 2020.

Around the world, urban populations are growing rapidly. According to the United Nations, around half the world's population now lives in urban areas, with this figure likely to exceed 68 per cent by 2050.

To meet the rising demand for services, cities require vast amounts of resources, which, in turn, has a significant impact on the urban environment. For example, cities currently account for up to 75 per cent of energy use and 70 per cent of greenhouse gas emissions worldwide.

Other concerns include air quality, traffic congestion and pressure on limited green space, land and water resources. Cities are also particularly vulnerable to the impacts of climate change. Over 90 per cent of all urban areas are coastal, putting most cities at risk of flooding from rising sea levels and powerful storms.

These urban issues are particularly acute in cities in the EBRD regions, where energy intensity is up to three times greater than the European Union (EU) average (IEA, 2015). Public and private buildings often have poor energy performance and urban residents are also exposed to higher levels of air pollution.

Many economies where the EBRD invests are particularly vulnerable to the impacts of climate change. Water supply in Central Asia has decreased by 25 per cent since 1960 and is predicted to shrink by a further 25 per cent in the next 20 years.

Municipal solid waste management is another challenge in the EBRD regions, where much waste ends up in landfills that "are simply dumpsite areas where the municipal services (or contractors) pile up or simply deposit waste" (UNECE, 2010). Meanwhile, recycling of waste is negligible compared to the EU average of 39 per cent (European Environment Agency, 2015) and far short of the EU target of 50 per cent of municipal solid waste being recycled by 2020.

EBRD GREEN CITIES

To address these challenges, the EBRD developed the EBRD Green Cities programme, with the aim of building a better and more sustainable future for cities and their residents. The programme does this by identifying and prioritising environmental challenges, which are then connected with sustainable infrastructure investments and policy measures.

The EBRD defines a Green City as a city that:

- Preserves or improves the quality of its environmental assets (air, water, land, soil and biodiversity) and uses these resources sustainably
- Mitigates and adapts to the risks of climate change
- Ensures that environmental policies contribute to the social and economic wellbeing of residents.

To help cities achieve these goals, EBRD Green Cities employs a unique and systematic approach consisting of three central components:

1. **Green City Action Plan (GCAP):** Assessing and prioritising environmental challenges based on specific indicators and developing an action plan to tackle the challenges through policy intervention and sustainable infrastructure investments.
2. **Green infrastructure investment:** Facilitating and stimulating public or private green investments in water and wastewater, urban transport, district energy, energy efficiency in buildings, renewable energy, solid waste and climate resilience.
3. **Capacity building:** Providing technical support to city administrators to ensure that infrastructure investments are implemented effectively.

SUSTAINABLE INFRASTRUCTURE FINANCING

EBRD Green Cities builds on the Bank's proven track record in helping cities invest in sustainable municipal infrastructure.

- Since 1994, the Bank has invested over €8.2 billion in transformational municipal infrastructure across upwards of 450 projects in more than 200 cities in the EBRD regions.
- In 2018 alone, the Bank financed 36 projects in 32 cities and municipalities representing a total commitment of over €1 billion.
- These investments included public transport infrastructure, new or upgraded water supply and wastewater treatment, energy-efficient district heating solutions and municipal solid waste projects.

The following sections outlines the framework that the GCAP employs to assess and prioritise environmental challenges.

PRESSURE-STATE-RESPONSE FRAMEWORK

The GCAP process is built on the pressure-state-response (PSR) framework developed by the OECD. The PSR framework provides a useful structure to understand the linkages between activities that place pressure on the environment, the resulting state of the environment and associated responses by the government, residents and the private sector to address the pressures.

We use this framework to select indicators to assess a city's environmental performance.

For the GCAP, a distinction is made between core and elective (optional) indicators within the state and pressure categories. Only the core indicators must be assessed to fulfil the GCAP's minimum requirements. The elective indicators can be used to provide supplementary information, either in addition to the core indicators or in the event that a core indicator is not available. In total, there are 114 indicators, 35 of which are core indicators.

The PSR framework lays the foundation for the GCAP to identify, prioritise and address environmental challenges. The following sections outline subsequent steps to ensure successful GCAP development and implementation.

EXPLAINING THE PRESSURE-STATE RESPONSE FRAMEWORK

Pressure indicators
These indicators are used to understand the factors that may be negatively impacting the environment, for example, increased urban sprawl reducing the availability of green spaces.

State indicators
These indicators are used to understand the quality of the city's environment (for example, soil quality). It also assesses the city's resource availability (such as water storage) and climate risk (such as exposure to flooding).

Response indicators
These indicators measure actions that have been or could be taken to address pressures and improve the state of the environment, for example, imposing planning restrictions to increase green spaces.

1 Prepare and organise

To join EBRD Green Cities, a city needs to both initiate a GCAP and commit to a trigger investment project that meets the EBRD's investment criteria.
By committing to a GCAP, a city sets a priority for high environmental performance. Cities undertaking GCAPs should therefore take several steps before developing the action plan to identify relevant stakeholders, set up institutional structures, establish timelines and ensure compliance with all relevant laws, regulations and policies.

1.1. Secure initial commitment with city council

The EBRD should work to ensure senior political commitment to kick-start the GCAP process. To legitimise action, the mayor (or equivalent) and/or the city council should give municipal staff the official go-ahead and mandate to work on the GCAP. Municipal staff need to be engaged early on in the process, as staff members will institutionalise and implement the GCAP process and monitor developments.

The municipal government (the City) formally declares its commitment to develop a GCAP and become an EBRD Green City through one of two mechanisms:

1. Signing a commitment letter outlining its intention to develop a GCAP and undertake an EBRD-financed sustainable infrastructure project
2. Outlining a similar set of objectives in a Memorandum of Understanding with the EBRD.

1.2. Review policy

At this stage, the EBRD will conduct a review of existing policies in cooperation with the City. The review ensures that the GCAP builds on any urban policies previously developed. The policy review should also assess political support within the municipal government, legal and political risks related to the GCAP and the potential for subsequent investment.

1.3. Confirm approval process

The next step is to confirm the official approval process for the GCAP, including legal procedures, timelines and formal requirements. The City should draft a summary of the legal process for approving the GCAP in consultation with its legal department. The municipal budget cycle should also be considered to ensure alignment with infrastructure investments later proposed in the GCAP. Finally, the City should determine if a Strategic Environmental Assessment (SEA) or similar documentation is necessary and confirm requirements with relevant ministries. If a SEA is needed, it should be included in the GCAP.

1.4. Set up team and institutional structures

Developing and delivering a successful GCAP requires assembling various teams. See the box titled the 'The GCAP teams' for more information.

THE GCAP TEAMS

GCAP steering committee

To oversee and steer the GCAP process, the City should establish an internal GCAP steering committee consisting of senior members of various municipal departments, including from finance, communications and sectoral departments.

To enable the steering committee to effectively drive the development of the GCAP, the committee's mandate, task, communication and coordination with other groups within the municipal government should be clearly defined by the mayor or equivalent.

GCAP coordinator

The City should identify a member of staff who has the capacity and expertise to support the GCAP throughout its development.

This individual will serve as the key contact for the GCAP within the City and report directly to the mayor or equivalent.

GCAP expert group

The City should also appoint a GCAP expert group, consisting of technical experts within the City who will work closely with the consultant team and review the deliverables submitted. The City should submit a letter to the EBRD formalising City staff involved in this group.

Consultant team

The EBRD, together with the City, should select a team of consultants to support GCAP development on a day-to-day basis. The consultant team will consist of international and local experts, with experience in urban sustainability and green infrastructure investments.

The City will endorse the selected consultant team by signing a waiver with the EBRD outlining the scope of work for the consultants to carry out.

1.5. Identify and engage stakeholder groups

1.5.A. Identify stakeholders

An integrated and effective GCAP requires early involvement of key partners and stakeholders. A stakeholder analysis should be performed to identify key individuals and stakeholder groups, including private-sector representatives, local academics, civil society organisations (CSOs) and organisations responsible for municipal services such as energy, water, waste and transport utilities.

1.5.B. Stakeholder engagement plan

The above analysis should be detailed in a stakeholder engagement plan. The plan will help the City communicate with all stakeholders and ensure that the GCAP process is inclusive.

The plan should include:

- A list of stakeholders that will be involved in the GCAP development process
- Proposed dates for the stakeholder engagement workshops and the intended format for the consultations
- GCAP milestones and the extent of information that will be shared with stakeholders.

At least a week prior to any stakeholder engagement event, the City should update the stakeholder engagement plan as necessary and publish a brief summary of the upcoming event. This way, the plan becomes a continuous and engaging document, which reflects the GCAP's status. The EBRD has developed a Stakeholder Engagement Guide for GCAPs. This document can be used as a guide to defining, structuring and documenting engagement activities.

1.5.C. Identify local champions

Local Green City champions should be identified from this set of stakeholders. There are three types of local Green City champions:

- **Political champions:** the mayor or other high-level officials who are responsible for driving the GCAP.
- **Administrative champions:** individuals in the municipal government who work on the GCAP on a day-to-day basis. Administrative champions serve as key contacts for the execution of the GCAP and as liaisons with politicians.
- **Community champions:** key people, organisations and enterprises in the city that actively promote Green City initiatives relating to specific sectors or environmental concerns. Community champions may include private companies, institutions responsible for utilities in the city and CSOs.

1.6. Launch of GCAP process

1.6.A. Launch event

After completing the steps above, the first GCAP meeting should focus on introducing all relevant parties and outlining the scope of work for the coming year.

The second event should mark the official launch of the GCAP process and should be co-organised with the City. The objective of the event is to announce the City's intention to develop a GCAP, demonstrate its commitment to pursuing environmental goals, strengthen political commitment and publicise support from the EBRD and the donor community.

Experience has shown that the event should ideally:

- Include high-level remarks by the mayor or another senior representative. Other statements may be given by relevant national ministries such as the minister or deputy minister of the environment, a representative from the embassy of the donor country and the head of the EBRD resident office or equivalent.
- Involve media outlets with the goal of maximising visibility for the event.
- Undertake the first stakeholder engagement consultation, with the aim of collecting views from both internal and external stakeholders on the City's environmental quality, urban planning and infrastructure.

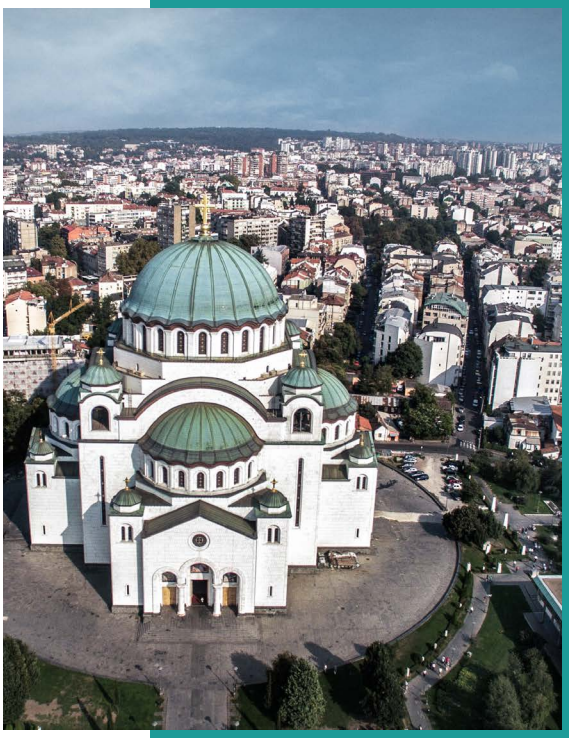
1.6.B. Stakeholder engagement: initial discussion on the city's environmental performance

The first stakeholder engagement session can be held in conjunction with the launch event. The aim of the workshop is to collect views from both internal and external stakeholders on the current situation of the environmental quality, urban planning and infrastructure development of the City. A wide range of participants should be invited to the workshop, including non-governmental organisations, universities and research institutions, as well as international and bilateral organisations conducting similar work in the city.

1.6.C. Publish stakeholder engagement plan

Following the launch of the GCAP process, the City should publish the stakeholder engagement plan. The plan should be publicly available and provide stakeholders with an overview of parties involved in the GCAP process, as well as upcoming stakeholder engagement events and the format of those events.

2 Identify and prioritise challenges



The next phase in developing a GCAP involves using the pressure-state-response framework to identify and prioritise a city's environmental challenges. Through consultation with key stakeholders, these challenges are then translated into Green City priorities.

Upon completion of these steps, the City will have established its Green City baseline, which documents the city's current environmental performance and identifies a set of priority environmental challenges that the City will address through its GCAP.

The following is an overview of steps that the consultant team should take in collaboration with the City to ensure the successful identification and prioritisation of Green City challenges, concluding the first half of the GCAP process and laying the foundation for the Green City action-planning phase to follow.

2.1. Technical analysis

2.1.A. Map external issues and conditions

When beginning this step, it is important to consider local, regional, national and international issues that may affect the GCAP. This requires mapping out relevant political, legal, economic, social and environmental conditions, as well as emerging issues and policies. This work should build on the policy review conducted by the EBRD in section 1.2.

The findings from this exercise should be consolidated in an external framework report, detailing the following.

- A summary of the City's past plans and studies to promote sustainable urban development. Areas where planning has been insufficient should also be identified.
- A list of key stakeholders for the GCAP across the municipal sectors (transport, energy, water, and so on). The level of influence the City has over specific environmental or infrastructure sectors should also be closely considered, with key parties identified to ensure responsibilities for GCAP actions are clear.
- A clear outline for the GCAP approval process. The City should confirm and endorse the approval process to provide a clear path for the GCAP's development and adoption. This should include a process for integrating GCAP actions into relevant city plans, including the municipal budget.

2.1.B. Map environmental performance

The next step is to map the city's environmental performance by collecting and benchmarking state and pressure indicators to international standards. This assessment is conducted through a traffic light screening of a prescribed set of indicators (Annex 2 presents the thresholds for this benchmarking exercise).
The GCAP set of state and pressure indicators includes 35 core indicators. In the event that core indicators are not available, elective indicators may be used to provide a more thorough analysis.

Although the set of PSR indicators provides a useful framework for evaluating urban environmental performance, the GCAP coordinator may amend or add indicators that address areas of critical concern for their city.

While the City and consultant team should strive to compile information for all indicators, a minimum of 85 per cent of core indicators has proven sufficient. Where quantitative information is not available for specific indicators, further analysis and stakeholder engagement will be necessary to fill these gaps with more qualitative information.

TRAFFIC LIGHT SCREENING

A traffic light screening is applied to each indicator to compare a city's environmental performance against international standards.

- Green light = good performance, in line with international standards
- Amber light = insufficient performance, cause for concern
- Red light = low performance, in need of critical attention

Once this information has been gathered, state and pressure indicators marked red in the traffic light screening can be used to develop an initial list of environmental challenges. If the traffic light screening results in a large number of red-flagged indicators, trend analysis[1] can be used to prioritise among them (for example, selecting only red-flagged indicators with declining trends). If the traffic light screening results in no or very few red-flagged indicators, amber indicators may be considered, using trend analysis to prioritise among them. These initially identified challenge areas will be further refined through subsequent analyses and stakeholder engagement.

[1] Trend analysis looks at the performance of a specific indicator over a given period. For example, has the local air quality improved or declined in the last decade?

2.1.C. Map local policy performance

Once initial environmental challenges have been identified, the next step is to collect and assess response indicators to evaluate whether the City has sufficient policies and initiatives in place to address its environmental challenges. The traffic light approach is also employed in this exercise.

Given that the response indicators are largely qualitative, the response gaps they reveal (for example, lack of investment or lack of regulations) will be general in nature. However, the response indicators assessment should still aim to indicate the presence, absence and quality of relevant policies.

2.1.D. Complete technical assessment and identify Green City challenges

The traffic light indicator screening provides a high-level picture of a city's environmental performance. The next step is to perform a deep technical assessment to uncover why the indicators appear as they do.

The following should be explored:

- **Drivers of indicator performance:** In the case of state indicators, related pressures and their level of influence may be explored: transport, land use, buildings, energy, solid waste, water cycle management and industries. For each pressure, a description of the current quality of its infrastructure should be highlighted. For instance, when exploring the city's transport infrastructure, the following may be considered: modality, private vehicle fleet, public and commercial fleet, congestion and infrastructure needs.
- **Existing management approaches:** Here, the body responsible for managing related pressure indicators should be determined (national, regional, municipal governments, and so on). Policies, directives, standards and legal frameworks governing or affecting the indicator should also be explored. For example, in the case of air quality, is there a directive in place to regulate ambient air pollution, establish fuel quality standards and reduce emissions across sectors?

Following the technical assessment, Green City challenges should be identified. These challenges should pinpoint areas of concern with respect to the current quality of environmental assets, potential future pressures from development, climate change, gaps in policy or strategies in relevant sectors. A high-level description of the kind of Green City actions that may be needed to address the challenges should be provided. It should highlight investments needed to address the challenges, setting the stage for more specific investments to be identified in the action-planning phase of the GCAP.

2.2. Stakeholder engagement: prioritising Green City challenges

A stakeholder consultation should be organised to present the findings from the external framework report (see section 2.1.A) and technical assessment (2.1.D). Ideally, stakeholder consultations should be interactive, collaborative and cross-departmental. Experts and citizen representatives involved should confirm or dispute the relevance of Green City challenges that have been identified.

To guide this process, a first draft of Green City priorities can be developed based on the technical assessment. Challenges stemming from core and elective indicators marked red in the traffic light screening should take priority. Challenges relating to indicators marked amber but trending towards red can also be prioritised.

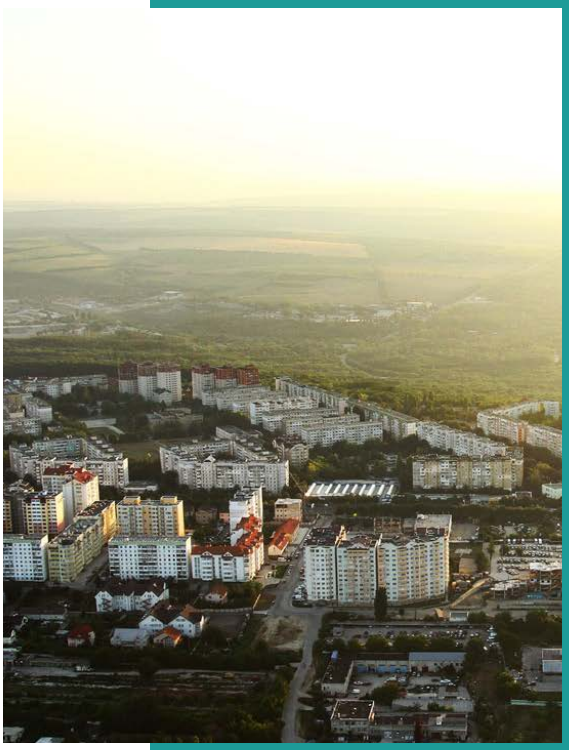
While the traffic light approach can help guide the prioritisation of Green City challenges, ultimately the City and local stakeholders can confirm key challenges and identify issues that are absent from the GCAP analysis thus far.

2.3. Complete Green City baseline

The results of all activities in this chapter constitute the Green City baseline, which documents the City's current environmental performance, including the governance and policy frameworks in place that affect it, and identifies a set of priority environmental challenges that the City will address through its GCAP.

As a final step in this phase, the baseline should be reviewed and confirmed by the City's GCAP coordinator or steering committee, ensuring buy-in from key stakeholders and experts. The Green City baseline does not necessarily require formal council approval at this stage, but it still offers a platform for political debate, review and recommendations. In any case, the City's GCAP steering committee should approve the Green City baseline and confirm that they agree with the findings.

3 Plan Green City actions



The GCAP process can be divided into two phases. The first establishes the Green City baseline, described in the previous chapter, which provides a comprehensive picture of where the city is today and which areas need attention. The second phase, planning Green City actions, lays out a plan to improve a city's environmental performance through targeted actions.

The following is an overview of this second phase.

Steps to formulating Green City actions

3.1 Develop a vision

3.1.A. Establish the GCAP structure

GCAPs can be structured according to the municipal sectors set out in the PSR indicators (for example, transport, water, buildings) or by specific cross-cutting themes (such as climate mitigation or resource efficiency). The selected structure should be agreed with the City and should promote a cross-sectoral, integrated approach to sustainable urban development.

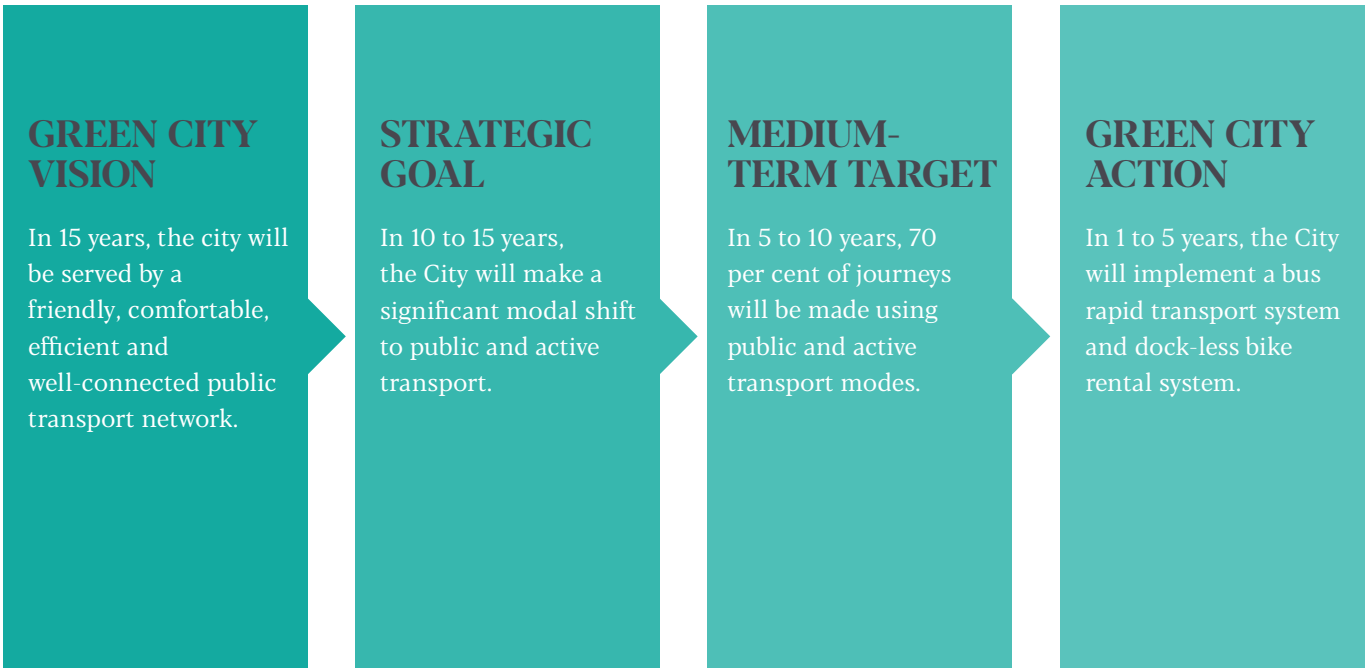
3.1.B. Stakeholder engagement: Green City vision and strategic goals

Using the Green City baseline as a starting point, the next step is to hold a stakeholder workshop to define the City's vision and strategic goals for green development.

- **Set vision for Green City development (15 years)**
  Here the city and stakeholders can develop a single, overarching vision for its Green City development, or multiple visions relating to specific sectors or thematic areas. While environmental improvement is the primary objective of the GCAP, the Green City vision should take socio-economic considerations into account. The resulting vision should be used to guide GCAP development and the selection of Green City action.
- **Determine strategic goals (10 to 15 years)**
  Having clarified its vision, the City then needs to set specific strategic goals for Green City development aimed at achieving this vision. These goals may relate to environmental improvements or socio-economic considerations. This will set the basis for a distance to-goal comparison over a 10 to 15 year period and should follow the same structure as the City's vision. (following the structure decided in 3.1.A).

  If there are multiple visions, there must be at least one strategic goal for every vision. Specfic PSR indicators may also be referenced in the strategic goals to help establish a measurable target.

Example relationship between Green City vision, strategic goals, medium-term targets and actions



3.2. Select Green City actions

3.2.A. Review existing Green City initiatives and responses

After the City has defined its vision(s) and strategic goals, the next step is to identify Green City actions in collaboration with the consultant team. Before developing a list of new actions, existing responses and initiatives addressing Green City challenges should be compiled. This should draw from the external framework report and should identify investment, policy and other initiatives the City already has planned for the next one to five years.

3.2.B. Select Green City actions (1 to 5 years)

Following the assessment of existing responses and policy gaps, an initial longlist of Green City actions may be developed. These actions should enable the City to achieve its strategic goals and vision. Green City actions may be categorised as follows:

- **Policy:** actions concerned with legislative, regulatory or standard-setting measures
- **Investments:** actions focused on capital expenditures to improve the environmental performance of local infrastructure
- **Other initiatives:** partnerships, outreach campaigns and other efforts that contribute to strategic goals.

Thorough consideration should be given to the scope of each action and the body responsible for executing it. While most actions should pertain to a city's geographic and political jurisdiction, some actions may need to be targeted at the national or regional level.
The list of actions developed should be feasible and particularly sensitive to the availability of finance to support the scope of activities identified.

3.3. Prioritise Green City actions

3.3.A. Stakeholder engagement: prioritisation of Green City actions

Once the initial longlist of Green City actions has been developed, the City should hold stakeholder consultations to check their relevance and revise and refine them in collaboration with the consultant team.

The format of the consultation should reflect the City's needs. In some cases, bilateral meetings may be needed to discuss the actions, while in others, a larger stakeholder workshop may be more appropriate.

3.3.B. Impact and cost implications of actions

As a next step, the resource and environmental implications of the refined list of Green City actions should be assessed. Impacts on the City's annual expenditure and capital expenditure (capex) budgets should be estimated and presented separately for each action proposed in the GCAP. In an effort to further prioritise the actions, benefits and savings should be estimated to allow for a thorough political consideration of proposed actions.

Potential sources of finance for the list of actions should also be identified. Traditional sources, such as municipal and national budget loans from international financial institutions, should be considered. In addition, non-traditional funding sources, such as external donor grants and private-sector financing, should also be explored. This analysis should provide the City with sufficient detail and clarity to finalise the list of actions in the next step.

For more information please see the box entitled entitled 'impact and cost implications of actions' on page 18.

3.3.C. Determine medium-term targets (5-10 years)

Setting benchmarks on a 5 to 10 year timescale, medium-term targets create links between the short-term Green City actions and longer-term strategic goals. As such, a medium-term target can relate to a single Green City action or a group of actions.

3.3.D. Stakeholder engagement: finalise Green City actions

The detailed list of Green City actions should be approved through a final round of stakeholder engagement. External experts, citizen representatives and other relevant parties should be given the opportunity to determine the relevance of proposed Green City actions. Public opinion and perspectives from CSOs are particularly important, as it is generally easier to undertake actions that citizens view favourably.

3.4. Finalise Green City Action Plan

3.4.A. Resource implications for implementing the GCAP

Throughout the GCAP process, areas in which the City lacks the capacity to undertake and monitor the implementation of Green City actions may become apparent. The GCAP should identify such capacity gaps and offer a list of general resources and capacity-building measures to support GCAP implementation.

These measures can broadly be divided into:

- human resources: additional staff required and capacity-building activities needed for relevant stakeholders
- public education and awareness measures
- data collection and monitoring measures: areas where data quality may need to improve to better assess environmental performance.

As with the GCAP actions, cost estimates for these capacity-building measures should be included.

3.4.B. Monitoring and reporting

A monitoring and reporting plan for overseeing the implementation and eventual impacts of Green City actions should be developed within the GCAP. Further details on the monitoring and reporting requirements for the GCAP are provided in step 4.

3.4.C. Draft GCAP

Findings from the Green City action-planning process should be compiled into the final GCAP. The GCAP's language should reflect that this is the City's document and should be written as such, including using first-person pronouns. The final document should also include a brief summary of how stakeholder feedback has been incorporated into the GCAP.

As certain information may be deemed too sensitive to be published, the consultant team should agree on the final contents of the GCAP with the City.

3.4.D. Present GCAP for approval

All GCAPs are submitted for approval to the city council or equivalent. Appropriate steps should be taken to ensure that the GCAP meets all requirements for approval. Public disclosure of the GCAP for comment is often required. The final GCAP should be published on the City's website for public access and should include a short summary of how the comments from the public disclosure period have been taken into account. This step is also important as it ensures buy-in for the Green City actions proposed.

If a SEA is required, the SEA should follow the procedures necessary to enable a GCAP's subsequent approval. Ideally, there will be no need to carry out separate GCAP and SEA consultation processes and a unified consultation approach can be designed.

Upon the conclusion of this step, the City will have clearly defined its vision, strategic goals, medium-term targets and Green City actions. With responsibilities clearly delineated and buy-in secured from relevant stakeholders, the City can then move to the implementation and monitoring step of the GCAP.

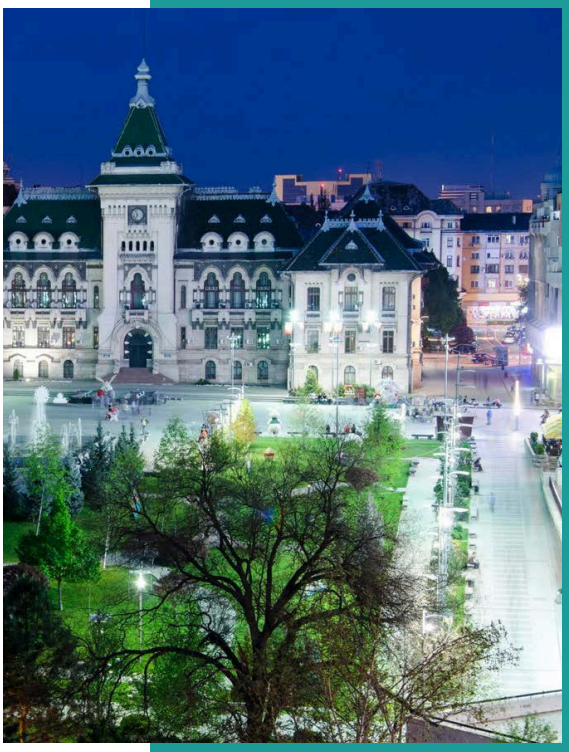
IMPACT AND COST IMPLICATIONS OF ACTIONS

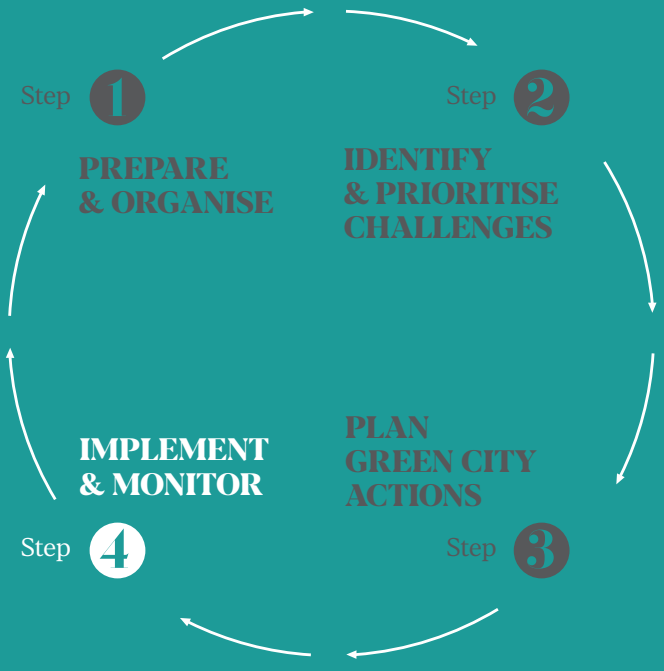
Based on international experience, the following are commonly provided in draft GCAPs.

- Estimated capex costs and annual implementation costs per action.
- Estimated environmental and social benefits per action, which include:
  - greenhouse gas emissions savings, water savings, individuals benefiting, material savings or reductions, primary energy savings and energy intensity reductions
  - climate resilience benefits in light of projected climate change: increased water availability, increased energy availability, increased agricultural potential, increased human health/ productivity, reduced damage and disruption
- Estimated economic benefits per action, which include:
  - potential reductions in operating expenditures (opex)
  - the estimated cost of pre-investment (feasibility and impact studies, and so on)
- Total estimated annual budget for the GCAP, including all actions, for the entire duration of the GCAP and per year.
- Indicative implementation and an operational timeline.

4 Implement and monitor

A GCAP provides cities with a blueprint for transforming their local environment and addressing their most pressing challenges. After defining its Green City vision, strategic goals, medium-term targets and actions, the City is now ready to implement and monitor the GCAP.





4.1. Implementation and monitoring

Continuous monitoring of all projects and measures in the GCAP is an integral part of implementation. By regularly and methodically tracking all Green City actions and their impacts on the environment, the City can determine whether the GCAP is progressing as planned and contributing as expected to the established goals. Successful monitoring requires two key components:

- **Implementation monitoring plan:** This tracks the status and progress of the GCAP projects being implemented.
- **Impact monitoring plan:** This measures the impact of the GCAP project and policies on the City's environmental performance.

The implementation and monitoring structure should be integrated into the GCAP and reviewed and approved by the City as part of the overall GCAP package.

4.1.A. Define responsibilities

The first step to effective implementation is to clearly define a key person responsible for overseeing all Green City actions.

Primary responsibility for implementation and subsequent monitoring should preferably be assigned to the City's GCAP coordinator, who has the authority to successfully coordinate with all relevant municipal departments. This person will serve as the implementation and monitoring coordinator.

Within each municipal department, a project leader should be appointed to manage internal staff responsible for:

- overseeing the implementation of specific actions
- reporting on the progress of implementation
- collecting the required impact data.

Each department should set budgets and timescales for delivering assigned actions. The assigned departmental staff should provide regular reports on the progress of implementation and environmental impact to the City's implementation and monitoring coordinator. The results of this will inform the planning of subsequent stages of each action, including amendments to timescales, resources and the budget, as needed.

Project leaders should also aim to align GCAP monitoring with other planned City activities and initiatives to prevent duplication and improve efficiency. For example, the results from the GCAP monitoring can be used for urban planning, disaster risk resilience and sustainability plans.

4.1.B. Develop implementation monitoring plan

Implementation monitoring should be done on both a short-term and long-term basis. The implementation monitoring plan should list all Green City actions and clearly indicate project status and milestones (started/not started, complete/not complete). The plan provides an opportunity to assess implementation by:

- comparing implementation efforts with original goals and targets: Are the actions being implemented?
- determining whether sufficient progress is being made towards achieving expected results: Are the targets being reached?
- determining whether implementation is progressing according to schedule.

4.1.C. Develop impact monitoring plan

While implementation monitoring tracks the progress of Green City actions, impact monitoring measures how effective these actions have been in achieving the environmental targets and goals.

These targets, goals and related actions all derive from the environmental challenges identified previously in the GCAP through the pressure-state-response (PSR) framework. The PSR framework therefore provides a useful model for categorising indicators in the impact monitoring plan. For example, the following pressure, state and response indicators could be employed when monitoring the effectiveness of extending a local bus system:

- **Pressure:** whether private transport has decreased.
- **State:** whether air pollution impacts have decreased.
- **Response:** how many buses and new connections have been introduced.

For each of the indicators to be tracked, the impact monitoring plan should also identify the municipal department responsible for providing the required data. It is important to note that while some impacts can be detected immediately, others, such as improved air quality and greenhouse gas emissions, can only be monitored in the long term

4.1.D. Set data collection standards

To help project leaders manage data correctly, the monitoring coordinator should set guidelines for the recording and storage of data. Since the GCAP indicators should be measured against global benchmarks, the data guidelines should also include definitions of terms within the local context and clarify data privacy principles. Data should be collected across all relevant PSR indicators

for each action to measure progress relative to the Green City baseline. Relevant indicators for each action will have previously been identified in the GCAP but may be expanded as new indicators and data collection tools become available. A full list of all indicators can be found in Annex 2.

When drafting the monitoring and implementation plans, consultants should use the templates developed by the EBRD.

4.1.E. Amend timelines and plans when needed

Unexpected events can change the GCAP implementation plan. For example, an extreme weather event could mean that the City needs to prioritise repairing critical infrastructure over a GCAP-recommended investment. The City could also delay implementing an action or decide to amend one. For example, instead of purchasing 100 electric buses to meet its air-quality and transport-sector targets, the City might only purchase 50.

The implementation and monitoring coordinator is responsible for updating and revising the implementation and impact monitoring plans to reflect these changes. The coordinator should work with relevant departments and stakeholders within the City to ensure that any updates to the monitoring plans receive appropriate approvals.

The path to becoming a Green City is continuous; through periodically monitoring the progress of the GCAP, the City can inform the public on what was accomplished and adjust their visions, strategic goals and actions as needed.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ANNEX 1.
List of stakeholder engagements

INITIAL DISCUSSION ON THE CITY'S ENVIRONMENTAL PERFORMANCE

Collect views from both internal and external stakeholders on the quality of the City's environment, infrastructure and urban development plans (see section 1.6)

PRIORITISING GREEN CITY CHALLENGES

Present the findings from the external framework report and technical assessment (see section 2.2)

GREEN CITY VISION AND STRATEGIC GOALS

Define the City's vision and strategic goals for green development (see section 3.1.B)

PRIORITISING GREEN CITY ACTIONS

Prioritise and refine the longlist of Green City actions (see section 3.3.A)

FINALISING GREEN CITY ACTIONS

Approve final detailed list of Green City actions (see section 3.4.D)

Annex 2. Pressure-state-response indicators for Green Cities

Green City indicators are structured according to the pressure-state-response framework. In total, there are 114 indicators, 35 of which are core indicators. An additional sub-classification between core indicators and elective (optional) indicators is proposed for the state and pressure categories only. This is to narrow down the number of indicators used for the benchmarking and prioritisation process. The core indicators are in bold and the optional indicators corresponding to each core indicator are listed in terms of priority. In other words, if Indicator 1 is not available, Indicator 1.1 should be the first choice to replace it, then 1.2, and so on. For each indicator, it is important to collect multiple years of data to assess and document whether the trend is upward, neutral or downward.

State indicators

Topic	Indicator	Unit	Benchmarks			Source of benchmark	Supplementary information to collect
Air	**1 Average annual concentration of $PM_{2.5}$**	µg/m³	< 10 (annual)	10–20 (annual)	> 20 (annual)	WHO	Sources of air pollution (in %) for each particle (PM_{10}, $PM_{2.5}$, SO_2, NO_x)
	1.1 Average annual concentration of PM_{10}	µg/m³	< 20 (annual)	20–50 (annual)	> 50 (annual)		
	1.2 Average daily concentration of SO_2	µg/m³	< 20 (24hour)	20–50 (24 hour)	> 50 (24 hour)		
	1.3 Average annual concentration of NO_x	µg/m³	< 40 (annual)	40–80 (annual)	> 80 (annual)		
Water bodies	**2 Biochemical oxygen demand (BOD) in rivers and lakes**	mg/L	< 2	2–4	> 4	EEA	Sources of water pollution (in surface and ground water)
	2.1 Ammonium (NH_4) concentration in rivers and lakes	µg/L	< 150	150–200	> 200		
Drinking water	**3 Percentage of water samples in a year that comply with national potable water quality standards**	%	> 97	90-97	> 90	IADB	
Soil	**4 Number of contaminated sites**	CSs/1,000 inhabitants (or km²)	< 10	10–20	> 20	EEA	Sources of soil contamination
	4.1a Concentration of mercury in soil	mg/kg	< 0.3	0.3–10	> 10	Dutch values	
	4.1b Concentration of cadmium in soil	mg/kg	< 0.8	0.8–12	> 12	Dutch values	
	4.1c Concentration of zinc in soil	mg/kg	< 140	140–720	> 720	Dutch values	
	4.2 Concentration of mineral oil in soil (using infrared spectroscopy)	mg/kg	< 50	50–5000	> 5000	Dutch values	

Topic	Indicator	Unit	Benchmarks			Source of benchmark	Supplementary information to collect
Water use	**5 Water Exploitation Index**	%	< 20	20–40	> 40	EEA	• Total water consumption • Water consumption by sector (domestic, commercial, industrial, agricultural)
Land use	**6 Open green space area ratio per 100,000 inhabitants**	hectares	> 10	7–10	< 7	IADB	• Share of population within 15 minutes of open green space by foot
	6.1 Share of green space areas within urban limits	%	> 50	30–50	< 30	OECD/ICLEI	
Biodiversity & ecosystems	**7 Abundance of bird species (all species)**	Annual % of change	Positive or stable	Slight decline (of 0%-2%)	Strong decline (> 2%)	OECD/ICLEI	• Sources of biodiversity degradation
	7.1 Abundance of other species	Annual % of change	Positive or stable	Slight decline	Strong decline		• Biodiversity index of specific species
Mitigation (ghg emissions)	**8 Annual CO_2 equivalent emissions per capita**	tonne/year capita	< 5	5–10	>10	IADB	• Total CO_2 emissions
	8.1 Annual CO_2 emissions per unit of GDP	tonne/US$ of GDP	< 0.35	0.35–0.8	> 0.8	IADB	• CO_2 emissions by sector
Adaptation (resilience to natural disaster risks)	**9 Estimated economic damage from natural disasters (floods, droughts, earthquakes) as a share of GDP**	%	< 0.5	0.5–1	> 1	OECD/ICLEI	• Human casualties • Main type of disaster that hit the city
	9.1 Percentage of public infrastructure at risk	%	< 10%	10–20%	> 20%	IADB	• Type of infrastructure at risk
	9.2 Percentage of households at risk	%	< 10%	10–20%	> 20%	IADB	• Type of household at risk (by income level and by location)

Pressure indicators

Sector: Transport

Source of pressure	Indicator	Unit	Benchmarks			Source
Energy efficiency and type of energy used	**10 Average age of car fleet (total and by type)**	years	< 6	6–12	> 12	IADB
	10.1 Percentage of diesel cars in total vehicle fleet	%	< 20	20–30	> 30	EEA
	10.2 Fuel standards for light passenger and commercial vehicles	n.a.	EURO 6	EURO 5	EURO 4 or below	OECD/ ICLEI
	10.3 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)	%	> 3	1–3	< 1	EEA
Choice of transport mode	**11 Transport modal share in commuting (cars, motorcycles, taxi, bus, metro, tram, bicycle, pedestrian)**	%	Private transport < 30%	Private transport = 30–50%	Private transport > 50%	OECD/ ICLEI
	11.1 Transport modal share in total trips	%	Private transport < 30%	Private transport = 30–50%	Private transport > 50%	OECD/ ICLEI
	11.2 Motorisation rate (number of cars per resident)	Number of vehicles per capita	< 0.3	0.3–0.4	> 0.4	IADB
	11.3 Average number of vehicles (cars and motorbikes) per household	Number of vehicles per household	< 0.5	0.5–1	> 1	OECD/ ICLEI
	11.4 Kilometres of road dedicated exclusively to public transit per 100,000 population	km	> 40	10–40	< 10	IADB
	11.5 Kilometres of bicycle path per 100,000 population	km	> 25	15–25	< 15	IADB
	11.6 Share of population having access to public transport within 15 minutes by foot	%	> 80	60–80	< 80	OECD/ ICLEI
	11.7 Frequency of bus service	Average number of passengers at station per hour, in total bus network	> 30	30–6	< 6	OECD/ ICLEI
Road congestion	**12 Average travel speed on primary thoroughfares during peak hour**	km/h	> 30	15–30	< 15	IADB
	12.1 Travel speed of bus service on major thoroughfares (daily average)	km/h	> 25	15–25	<15	EBRD
Resilience of transport systems	**13 Interruption of public transport systems in case of disaster**	n.a.	Bus and rail transit systems are able to run normally in case of disaster	Bus and rail transit systems are able to run in case of disaster, but with reduced efficiency	Bus and rail transit systems are not able to run in case of disaster	OECD/ ICLEI
	13.1 Efficiency of transport emergency systems in case of disaster	n.a.	Emergency transport systems are able to run normally in case of disaster	Emergency transport systems are able to run in case of disaster, but with limited efficiency	Emergency transport systems are not able to run properly in case of disaster	

Sector	Source of pressure	Indicator	Unit	Benchmarks			Source
Buildings	**Electricity consumption**	**14 Electricity consumption in buildings**	kWh/m²	< 47	47–75	> 75	Odyssee, CIBSE, IEA
		14.1 Electricity consumption in residential buildings	kWh/m²	< 21	21–26	> 26	
		14.2 Electricity consumption in non-residential buildings	kWh/m²	< 122	122–213	> 213	
	Heat/ fossil fuel consumption	**15 Heating and cooling consumption in buildings, fossil fuels**	kWh/m²	< 104	104–148	> 148	Odyssee, CIBSE, IEA
		15.1 Heating and cooling consumption in residential buildings, fossil fuels	kWh/m²	< 96	96–126	> 126	
		15.2 Heating and cooling consumption in non-residential buildings, fossil fuels	kWh/m²	< 127	127–210	> 210	
	Building standards	15.3 Share of city enterprises with ISO50001/EMAS certification or similar	%	n.a.	n.a.	n.a.	
		15.4 Total value of projects with green building certification as a share of the total value of projects granted a building permit per year	%	> 50	25–50	< 25	OECD/ ICLEI
Industries	**Electricity consumption**	**16 Electricity consumption in industries, per unit of industrial GDP**	kWh/2010 US$	< 0.3	0.3–0.4	> 0.4	OECD/ ICLEI
	Heat consumption	**17 Heat consumption in industries, per unit of industrial GDP**	MJ/2010 US$	< 0.1	0.1–0.25	> 0.25	OECD/ ICLEI
	Consumption of fossil fuels in industrial processes	**18 Heavy metals (Pb) emission intensity of manufacturing industries**	kg heavy metals equivalent released per million US$ GVA (gross value added)	< 0.02	0.02–0.04	> 0.04	EEA
		18.1Fossil fuel combustion in industrial processes, per unit of industrial GDP	MJ/US$	< 1.4	1.4–2.2	> 2.2	OECD/ ICLEI
		18.2 Share of industrial energy consumption from renewable energy	%	> 20	10–20	< 10	OECD/ ICLEI
	Industrial waste treatment	**19 Share of industrial waste recycled as a share of total industrial waste produced**	%	> 95% 90%)	80–95% (90%)	< 80%	OECD/ ICLEI
	Industrial wastewater	**20 Percentage of industrial wastewater that is treated according to applicable national standards**	%	> 60	40–60	< 40	OECD/ ICLEI

Sector	Source of pressure	Indicator	Unit	Benchmarks			Source
Energy	**Electricity provision**	**21 Share of population with an authorised connection to electricity**	%	> 90	70–90	< 70	IADB
		21.1 Annual average number of electrical interruptions per year, per customer	number/ year/ customer	< 10	10–13	> 13	IADB
	Thermal comfort provision	**22 Share of population with access to heating and cooling**	%	> 90	70–90	< 70	OECD/ ICLEI
	Renewable energy provision	**23 Proportion of total energy derived from RES as a share of total city energy consumption (in TJ; compared to benchmark of 20 per cent (links to EU target)**	%	> 20	10–20	< 10	EEA
	Resilience of the electricity network to climatic extremes	**24 Average share of population undergoing prolonged power outage in case of climatic extremes over the past five years**	%	< 10	10–25	> 25	OECD/ ICLEI
Water (supply, sanitation, drainage)	**Water Consumption**	**25 Water consumption per capita**	litres/day/ capita	120-200	80–200 or 200-250	< 80; > 250	IADB
		25.1 Water consumption per unit of city GDP	litres/day/ US$	< 0.022	0.022–0.055	> 0.055	
		25.2 Unit of water consumed in power plants, per unit of primary energy generated	litres/MW/h	See Annex 4	See Annex 4	See Annex 4	NREL
		25.3 Industrial water consumption as percent of total urban water consumption	%	< 17%	17–50%	50%	EBRD
	Efficiency of water supply networks	**26 Non-revenue water**	%	0–30	30–45	> 45	IADB
		26.1 Annual average of daily number of hours of continuous water supply per household	%	> 20 h/day	12–20 h/day	< 12 h/day	IADB
	Wastewater treatment	**27 Percentage of residential and commercial wastewater that is treated according to applicable national standards**	%	> 60	40–60	< 40	ADB
		27.1 Percentage of buildings (non-industrial) equipped to reuse grey water	%	> 80	60–80	< 60	OECD/ ICLEI
		27.2 Percentage of wastewater from energy generation activities that is treated according to applicable national standards	%	> 60	40–60	< 40	OECD/ ICLEI

Sector	Source of pressure	Indicator	Unit	Benchmarks			Source
Water (supply, sanitation, drainage)	**Resilience to floods**	**28 Percentage of dwellings damaged by the most intense flooding in the last 10 years**	%	< 0.5	0.5–3	> 3	IADB
		28.1 Annual number of storm water/sewerage overflows per 100 km of network length	number of events per year	< 20	20–50	> 50	OECD/ ICLEI
		28.2 Awareness of preparedness for natural disasters	n.a.	Citizens are well aware of natural disaster risk & know how to react	Citizens are aware of natural disaster risk but do not have resilient attitudes	Citizens are not aware of natural disaster risks & do not have resilient attitudes	OECD/ ICLEI
Solid waste	**Solid waste generation**	**29 Total solid waste generation per capita**	kg/year/ capita	< 300	300–500	> 500	OECD/ ICLEI
		29.1 GDP per domestic material consumption	US$/kg	< 1	1–2.5	> 2.5	OECD
	Collection of solid waste	**30 Share of the population with weekly municipal solid waste (MSW) collection**	%	90–100	80–90	< 80	IADB
	Treatment of solid waste	**31 Proportion of MSW that is sorted and recycled (total and by type of waste for example, paper, glass, batteries, PVC, bottles, metals)**	%	> 25	15–25	< 15	IADB
		31.1 Percentage of MSW which is disposed of in open dumps, controlled dumps or bodies of water, or is burnt	%	< 10	10–20	> 20	IADB
		31.2 Percentage of MSW landfilled disposed of in EU-compliant sanitary landfills	%	90–100	80–90	< 80	IADB
		31.3 Percentage of collected MSW composted	%	> 20	5–20	< 5	IADB
	Landfill efficiency/ capacity	**32 Remaining life of current landfill(s)**	years	> 8	5–8	< 5	IADB
Land Use	**Density/ integrated land use**	**33 Population density on urban land**	residents/ km^2	7000–20000	4000-7000; 20000-25000	<4000; >25000	IADB
		33.1 Average commuting distance	km	> 5	5–10	<10	OECD/ICLEI
		33.2 Average commuting time	min	< 30	30–60	> 60	OECD/ICLEI
		33.3 Proportion of the population living within 20 minutes to everyday services (grocery stores, clinics)	%	> 75	50–75	< 50	OECD/ICLEI
	Urban sprawl	**34 Average annual growth rate of built-up areas**	%	< 3	3–5	> 5	IADB
		34.1 Percentage of urban development that occurs on existing urban land rather than on greenfield land	%	> 40	20–40	< 20	OECD/ ICLEI
	Use of existing built-up areas	**35 Vacancy rates of offices**	%	< 6%	6–10%	> 10%	OECD/ICLEI
		35.1 Share of multi-family houses in total housing units	%	n.a	n.a	n.a	OECD/ICLEI

Response indicators

Sector	Source of pressure	Indicator	Benchmarks		
Transport	**Energy efficiency and type of energy used in transport**	36 High-polluting vehicles are regulated Energy-efficient vehicles are incentivised through fiscal instruments	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
	Choice of transport mode	37 Extension and improvement of public and non-motorised transport is planned and supported through investment 38 Public and non-motorised transport is promoted through Information and awareness campaigns			
	Congestion	39 Traffic demand is managed (congestion charges, smart technologies)			
	Resilience of transport systems	40 Public transport emergency management (in publicly and/or privately run networks) is planned and tested			
Buildings	**Electricity and heat consumption**	41 Green building is promoted through standards and fiscal incentives 42 Public and private investment in energy efficiency in buildings 43 Metering and billing for personal energy use is regulated	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
Industries	**Electricity and heat consumption/ energy efficient industrial processes**	44 Energy efficient industrial machinery is regulated and incentivised through fiscal instruments (electricity, heat, industrial processes) 45 Energy efficient industrial technologies (electricity, heat, industrial processes) is supported through private investment	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
	Industrial waste/ material consumption	46 Material efficiency of new built industrial facilities and waste recycling is regulated and incentivised through fiscal instruments			
	Industrial wastewater	47 Industrial wastewater treatment, re-use and recycling is promoted through regulations and fiscal incentives			
Energy	**Electricity and heat provision**	48 Coverage and quality of electricity and heat supply is improved through investment	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
	Renewable energy development	49 Renewable energy facilities in private buildings are incentivised through fiscal instruments 50 Renewable energy technologies are developed and supported through public and private investment			
	Resilience of the electricity network	51 Renewable energy facilities are incentivised through awareness campaigns 52 The resilience of electricity networks in case of disaster is tested and enhanced through investment			

Sector	Source of pressure	Indicator	Benchmarks		
Water (supply, sanitation, drainage)	**Water consumption**	53 Metering and billing for water use is regulated	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
		54 Water saving and reuse is encouraged through awareness campaigns			
	Efficiency of water supply networks	55 Coverage and efficiency of water supply networks is improved through plans and investment			
	Wastewater treatment	56 Buildings' access to wastewater collection and treatment systems is improved through plans and investment			
		57 Wastewater treatment is promoted through regulations and fiscal incentives			
		58 Wastewater billing is regulated			
	Drinking water pre-treatment	59 Drinking water pre-treatment is enhanced through plans and investment			
	Resilience to floods	60 Drainage facilities are developed through plans and investment			
		61 Business and community resilience is encouraged through awareness campaigns			
Solid waste	**Solid waste generation**	62 Reduction of material consumption and solid waste generation is promoted through awareness campaigns	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	None
	Collection of solid waste	63 Coverage of solid waste collection system is improved through plans and investment			
		64 Littering and non-compliance with sorting systems is disincentivised through fines and penalties			
	Treatment of solid waste	65 Composting, recycling and waste-to-energy facilities are developed through plans and investment			
		66 Solid waste reuse, sorting and recycling are promoted through information and awareness campaigns			
	Landfill efficiency and overcapacity	67 Overcapacity issues in landfills are tackled through plans and investment			
Land use	**Density/ integrated land-use/ urban sprawl**	68 Density is regulated	Existing and well implemented, and there is no significant need to further expand this type of response	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake	Not existing
		69 Transit-oriented development (TOD) is promoted			
	Use of existing built-up areas	70 Mixed-use development is promoted through zoning regulations and incentives			

Annex 3. Definition of Green City indicators

Topic	Indicator	Unit	Definition/Description	Source
Air	**1 Average annual concentration of PM2.5**	µg/m^3	Particulate matter in suspension, with a diameter lower than 2.5µm, annual average. The data should be collected twice a month through sensors in multiple locations of the city, and averaged. The locations should reflect the diversity of urban areas (residential, roadside, industrial zones, parks).	www.who.int/mediacentre/factsheets/fs313/en/
	1.1 Average annual concentration of PM_{10}	µg/m^3	Particulate matter in suspension, with a diameter lower than 10µm, annual average. The data should be collected twice a month through sensors in multiple locations of the city, and averaged. The locations should reflect the diversity of urban areas (residential, roadside, industrial zones, parks and so on).	
	1.2 Average daily concentration of SO_2	µg/m^3	Sulphur dioxide in suspension 24-hour average. The data should be collected twice a month through sensors in multiple locations of the city, and averaged. The locations should reflect the diversity of urban areas (residential, roadside, industrial zones, parks and so on.).	
	1.3 Average annual concentration of NO_2	µg/m^3	Nitrogen dioxide in suspension, annual average. The data should be collected twice a month through sensors in multiple locations of the city, and averaged. The locations should reflect the diversity of urban areas (residential, roadside, industrial zones, parks and so on.).	
Water bodies	**2 Biochemical oxygen demand (BOD) in rivers and lakes**	mg/L	BOD shows how much dissolved oxygen is needed for the decomposition of organic matter present in water. The data should be collected in several locations of each river or lake, twice a month.	EEA
	2.1 Ammonium (NH_4) concentration in rivers and lakes	µg/L	Ammonium concentrations are normally raised as a result of organic pollution, caused by discharges from waste water treatment plants, industrial effluents and agricultural runoff. The data should be collected in several locations of each river or lake, twice a month.	
Drinking water	**3 Percentage of water samples in a year that comply with national potable water quality standards**	%	The data should be collected in several locations of the water supply network. Ideally, the quality of water should be frequently measured to avoid health hazards (once a week).	IADB's ESC
Soil	**4 Number of contaminated sites**	CSs/1000 inhabitants	The term 'contaminated site' (CS) refers to a well-defined area where the presence of soil contamination has been confirmed and this presents a potential risk to humans, water, ecosystems or other receptors. Risk management measures, for eaxample remediation, may be needed depending on the severity of the risk of adverse impacts to receptors under the current or planned use of the site. Sensitive areas, such as industrial zones and solid waste disposal sites, should be covered.	EEA
	4.1a – 4.1c Concentration of heavy metals (Pb) in soil	mg/kg	Concentration of (a) mercury, (b) cadmium and (c) zinc in soil. Other heavy metals that could be measured include chromium, arsenic, lead, copper and nickel. The data should be collected in multiple locations of the city, twice a month. Sensitive areas, such as industrial zones and solid waste disposal sites, should be covered. Benchmarks follow standards set by the Dutch Ministry of Housing, Spatial Planning and the Environment.	
	4.2 Concentration of mineral oil in soil	mg/kg	The data should be collected in multiple locations of the city, twice a month. Sensitive areas, such as industrial zones should be covered. Benchmarks follow standards set by the Dutch Ministry of Housing, Spatial Planning and the Environment.	
Water	**5 Water Exploitation Index**	%	The Water Exploitation Index Plus (WEI+) is the total water use as a percentage of the renewable freshwater resources in a given territory and time scale.	EEA

Topic	Indicator	Unit	Definition/Description	Source
Green spaces	**6 Open green space area ratio per 100,000 inhabitant**	hectares	Hectares of permanent green space per 100,000 city residents. The data should be compiled biannually.	IADB's ESC
	6.1 Share of non-built-up areas within urban limits	%	This indicator measures the amount of green, blue and vacant land within urban limits. The data should be compiled bi-annually.	OECD/ICLEI
Biodiversity & ecosystems	**7 Abundance of bird species**	Annual % of change	This indicator measures the percentage of change in bird population in one year. The data for the whole city can be estimated from a sample of an inventory of bird population in a given area. The data should be compiled once a year.	EEA
	7.1 Abundance of other species	Annual % of change	This indicator measures the percentage of change in a given species population in one year. The data for the whole city can be estimated from a sample of an inventory of bird population in a given area. The data should be compiled once a year.	
Climate mitigation	**8 Annual CO_2 emissions per capita**	tonne/ year/ capita	CO_2 emissions of the city, divided by city population. This indicator controls for the size of city population. Estimates of CO_2 emissions must first be made within each sector (transport, electricity, and so on) and averaged. The data should be compiled once a month.	IADB's ESC
	8.1 Annual CO_2 emissions per unit of GDP	tonne/ US$ of GDP	CO_2 emissions, divided by the GDP of the city. The data should be compiled once a month.	IADB's ESC
Climate adaptation	**9 Estimated economic damage from natural disasters (floods, droughts, earthquakes) as a share of GDP**	%	This indicator should measure overall losses (not only uninsured losses). Usually a city already has such data. Otherwise, the information may be found in the EM-DAT database or the NatCatService database. If such data is not available, data on past damages can be used (as an average of damages over the past 10 years).	EEA
	9.1 Percentage of public infrastructure at risk of natural disaster	%	Percentage of public infrastructure vulnerable to natural disasters due to inadequate construction or placement in areas of non-mitigable risk. This requires an identification of urban areas exposed to a disaster (such as those located in a low-lying area or exposed to a landslide) together with information about the quality of housing in such areas. The data should be collected based on a selected climatic or geological event (for example, a 10-year flood, if flooding is the most common type of disaster that usually hits the city). The data should be collected biannually.	IADB's ESC
	9.2 Percentage of households at risk of natural disaster	%	Percentage of households vulnerable to natural disasters due to inadequate construction or placement in areas of non-mitigable risk. This requires an identification of urban areas exposed to a disaster (such as those located in a low-lying area or exposed to a landslide) together with information about the quality of housing in such areas. The data should be collected based on a selected climatic / geological event (for example, a 10-year flood, if flooding is the most common type of disaster that usually hits the city). The data should be collected bi-annually. The data should be collected biannually.	IADB's ESC

Sector	Indicator	Unit	Definition/Description	Source
Transport	**10 Average age of car fleet (total and by type)**	years	The data can be compiled from the vehicle registration database of the municipality, once a year.	IADB's ESC
	10.1 Percentage of diesel cars in total vehicle fleet	%	The data can be compiled from the vehicle registration database of the municipality, once a year.	EEA
	10.2 Fuel standards for light passenger and commercial vehicles	n.a.	Adoption of latest EURO standards or equivalent for light passenger and commercial vehicles.	ec.europa.eu/environment/air/transport/road.htm
	10.3 Share of total passenger car fleet run by alternative energy (total and by type)	%	Alternative energy here refers to LPG, natural gas and electric. The data can be compiled from the vehicle registration database of the municipality, once a year.	EEA
	11 Transport modal share in commuting	%	The number of commuters working in the subject city who use each mode of transport (cars, motorcycles, taxi, bus, metro, tram, bicycle, pedestrian) divided by the number of commuting trips to work. Surveys are a common data collection method. The data can be collected biannually.	IADB's ESC
	11.1 Transport modal share in total trips	%	The number of commuters working in the subject city who use each mode of transport (cars, motorcycles, taxi, bus, metro, tram, bicycle, pedestrian) divided by the number of all trips in the city. Surveys are a common data collection method. The data can be collected biannually.	OECD/ICLEI
	11.2 Motorisation rate	Number of vehicles per capita	Number of private vehicles (cars, motorcycles) per capita. This can be calculated by dividing the total number of vehicles (obtained from the vehicle registration database) by the population. The data can be collected biannually.	EEA
	11.3 Average number of vehicles (cars and motorbikes) per household	Number of vehicles per household	Number of private vehicles (cars, motorcycles) per household. This can be calculated by dividing the total number of vehicles (obtained from the vehicle registration database) by the number of households. The data should be collected biannually.	OECD/ICLEI
	11.4 Kilometres of road dedicated exclusively to public transit per 100,000 population	km	The total centreline kilometres dedicated exclusively to bus way and rail way, divided by 100,000 of city population. The data should be collected once a year.	IADB's ESC
	11.5 Kilometres of bicycle path per 100,000 population	km	The total centreline kilometres dedicated to bicycle paths, divided by 100,000 of city population. The data should be collected once a year.	IADB's ESC
	11.6 Share of population having access to public transport within 15 minutes by foot	%	Share of population that can reach a public transport station within 15 minutes by foot. The data can be collected through surveys, once a year.	OECD/ICLEI
	11.7 Frequency of bus service	Average number of services at stations per hour in total bus network	The data can be calculated from the timetable of each bus line, once a year.	OECD/ICLEI

Sector	Indicator	Unit	Definition/Description	Source
Transport	**12 Average travel speed on primary thoroughfares during peak hour**	km/h	The average travel speed for all private motorised vehicles and public transit vehicles, across all locally defined thoroughfares during the peak commuting hours (typically morning and evening).	IADB's ESC
	12.1 Travel speed of bus service on major thoroughfares (daily average)	km/h	The data should be collected continuously.	OECD/ICLEI
	13 Interruption of public transport systems in case of disaster	n.a.	A qualitative assessment of the ability of public transport systems to run efficiently during a natural disaster (flood, earthquake, storm, and so on).	OECD/ICLEI
	13.1 Efficiency of transport emergency systems in case of disaster	n.a.	A qualitative assessment of the ability of emergency transport systems (such as firefighters, police, ambulance) to run efficiently during a natural disaster (flood, earthquake, storm, and so on).	OECD/ICLE
Buildings	**14 Electricity consumption in buildings**	kWh/m^2	Electricity consumption in urban built environment per square metre	IEA Energy Efficiency Market Report 2015, Odyssee-Mure database, CISBE Guides 19, 72, 286
	14.1 Electricity consumption in residential buildings	kWh/m^2	Electricity consumption in urban residential buildings per square metre	
	14.2 Electricity consumption in non-residential buildings=	kWh/m^2	Electricity consumption in urban non-residential buildings per square metre	
	15 Heating / cooling consumption in buildings, fossil fuels	kWh/m^2	Heat (fossil fuel) consumption in urban built environment per square metre	IEA Energy Efficiency Market Report 2015, Odyssee-Mure database, CISBE Guides 19, 72, 286
	15.1 Heating / cooling consumption in residential buildings, fossil fuels	kWh/m^2	Heat (fossil fuel) consumption in urban residential buildings per square metre	
	15.2 Heating / cooling consumption in non-residential buildings, fossil fuels	kWh/m^2	Heat (fossil fuel) consumption in urban non-residential buildings per square metre	
	15.3 Share of city enterprises with ISO14001/ EMAS certification or similar	%	EMAS and ISO 14001 are the two most recognised and widely applied certification systems for environmental management applicable to both private companies and public institutions. EMAS is completely compatible with ISO 14001, but goes further in its requirements for performance improvement, employee involvement, legal compliance and communication with stakeholders.	
	15.4 Total value of projects with green building certification as a share of the total value of projects granted a building permit per year	%		EEA
Industries	**16 Electricity consumption in industries, per unit of industrial GDP**	kWh/2010 US$	This indicator measures the electricity productivity of industries.	OECD (2013) Green growth in cities
	17 Heat consumption in industries, per unit of industrial GDP	kJ/2010 US$	This indicator measures the heat productivity of industries.	OECD/ICLEI

Sector	Indicator	Unit	Definition/Description	Source
Industries	**18 Heavy metals (for example, Pb) emission intensity of manufacturing industries**	kg of heavy metals equivalent released per million US$ GVA	This indicator is used to illustrate the emission intensity of manufacturing industries expressed as the amount of pollutant discharged in water per unit of production of the manufacturing industries (one million USD gross value added). The indicator shows a decoupling of economic growth (GVA) from environmental impact (emission of pollutants).	OECD/ICLEI
	18.1 Fossil fuel combustion in industrial processes, per unit of industrial GDP	MJ/2010 US$	This indicator measures the fossil fuel use productivity of industries.	EEA
	18.2 Share of industrial energy consumption from renewable energy	%		OECD/ICLEI
	19 Share of industrial waste recycled as a share of total industrial waste produced	%	Green benchmark to be set as 90% or 95% with GCAP iterations.	OECD/ICLEI
	20 Percentage of industrial wastewater that is treated according to applicable national standards	%	The data should be collected every month.	OECD/ICLEI
Energy	**21 Share of population with an authorised connection to electricity**	%	Percentage of the City's households with a legal connection to sources of electrical energy.	IADB's ESC
	21.1 Annual average number of electrical interruptions per year, per customer	number/ year/ customer	Average number of electrical interruptions per year, per customer.	IADB's ESC
	22 Share of population with access to district heating and cooling	%	Percentage of the city's households with a legal connection to sources of district centralised heating	OECD/ICLEI
	23 Proportion of total energy derived from renewable energy sources as a share of total city energy consumption (in TJ; compared to benchmark of 20% (links to EU target)	%	The amount of renewable energy consumed for electricity, heating and cooling, and transport, and expressed as a share against gross final energy consumption.	EEA
	24 Average share of population undergoing power outage in case of climatic extremes over the past 5 years	%		OECD/ICLEI

Sector

Water (supply, sanitation, drainage)

Indicator	Unit	Definition/Description	Source
25 Water consumption per capita	litres/day/ capita	Annual consumption of water per capita of people whose homes have a water connection to the city's network. The data can be obtained from the utility agency supplying the water. The data should be collected several times per year, as climate differences across seasons are likely to result in different water consumption levels.	IADB's ESC
25.1 Water consumption per unit of city GDP	litres/day/ US$	This indicator measures water resource productivity. See remarks above on the sampling method.	OECD (2014), Green Growth Indicators 2014
25.2 Unit of water consumed in power plants, per unit of primary energy generated	l/MW/h	This indicator measures the productivity of water use in energy generation. The data should be obtained from the water supply utility of the municipality. Best practice benchmarks are based on IPCC and NREL standards.	OECD/ICLEI, NREL
25.3 Industrial water consumption as percentage of total urban water consumption	%	Used to flag if industrial water consumption represents a larger portion of total urban water consumption than international norms. Industrial water consumption marked as 'green' may still have water efficiency challenges, but total water consumption does not represent a burden on municipal water resources beyond international norms. The data should be obtained from municipal water supply utility.	EBRD
26 Non-revenue water	%	Percentage of water that is lost from treated water entering the distribution system and that is accounted for and billed by the water provider. This includes actual water losses (such as those from leaking pipes) and billing losses (for example, broken water meters, absence of water meters, and illegal connections). It should be calculated as the ratio of water production out of actual water consumption.	IADB's ESC
26.1 Annual average of daily number of hours of continuous water supply per household	%	The data should be collected through surveys, twice a year.	IADB's ESC
27 Percentage of residential and commercial wastewater that is treated according to applicable national standards	%	The data should be collected by analysing the quality of treatment in wastewater treatment facilities.	OECD/ICLEI
27.1 Percentage of buildings (non- industrial) equipped to reuse grey water	%	Percentage of buildings connected to facilities that treat wastewater from sinks, showers, tubes, and washing machines. The data should be collected through surveys, once a year.	OECD (2013) Green Growth in Cities
27.2 Percentage of wastewater from energy generation activities that is treated according to applicable national standards	%		OECD/ICLEI
28 Percentage of dwellings damaged by the most intense flooding in the last 10 years	%	Percentage of dwellings that were affected in terms of assets and health. The data can be collected through surveys. An estimate can be calculated from a sample population but it should be representative of different types of urban areas in the city (high/low elevation, close to/far from water bodies).	OECD/ICLEI
28.1 Annual number of storm water/ sewerage overflows per 100 km of network length	Number of events per year	The data should be collected by monitoring the number of overflow in some areas of the city, and by deriving an estimate for the entire city. The data should be calculated as an average of several measurements over the year.	OECD (2013) Green Growth in Cities
28.2 Awareness and preparedness of natural disasters	n.a.	This is a qualitative assessment of citizens' awareness about the threats of natural disasters and means to minimise damages (e.g. insurance, knowledge of shelters, measures to take at the building level, and so on).	OECD/ICLEI

Sector	Indicator	Unit	Definition/Description	Source
Solid waste	**29 Total solid waste generation per capita**	kg/year/ capita	The data can be collected once a year.	EEA
	29.1 GDP per domestic material consumption	US$/kg	This indicator measures material resource productivity.	OECD (2014), Green Growth Indicators 2014
	30 Share of the population with weekly municipal solid waste (MSW) collection	%	Percentage of the population whose solid waste is collected at least once a week. The data can be collected through surveys, once a year.	IADB's ESC
	31 Proportion of MSW that is sorted and recycled (total and by type of waste for example, paper, glass, batteries, PVC, bottles, metals)	%	Formally and informally recycled materials are those diverted from the waste stream, recovered, and sent for processing into new products, following local government permits and regulations.	IADB's ESC
	31.1 Percentage of MSW which is disposed of in open dumps, controlled dumps or bodies of water, or is burnt	%	-	OECD/ICLEI
	31.2 Percentage of MSW landfilled disposed of in EU-compliant sanitary landfills	%	Percentage of the city's MSW disposed of in sanitary landfills. Waste sent for recovery (composting, recycling, and so on) is excluded. To be considered sanitary, the landfill should have leachate and landfill gas collection and treatment systems. The data can be collected from estimates produced at each landfill. Several measurements over the year and an averaged mean may be necessary to obtain data representative of long-term patterns.	IADB's ESC
	31.3 Percentage of collected MSW composted	%	Percentage of the city's solid waste that is treated by composting (in terms of weight). The data on weight of solid waste composted can be produced at composting stations. Several measurements over the year and an averaged mean may be necessary to obtain data representative of long-term patterns.	IADB's ESC
	32 Remaining life of current landfill(s)	years	Remaining useful life of the site of the sanitary or controlled landfill, based on the city's municipal solid waste generation projections (in years). The data can be collected twice a year.	IADB's ESC

Sector	Indicator	Unit	Definition/Description	Source
Land use	**33 Population density on urban land**	residents/ km^2	People who live in the urbanised area of the municipality, per km2 of urbanised area of the municipality. The data can be collected biannually.	IADB's ESC
	33.1 Average commuting distance	km	Average distance travelled by all commuters to work. The data should be collected through surveys, once a year.	OECD/ICLEI
	33.2 Average commuting time	minutes	Average time spent commuting by all commuters. The data should be collected through surveys, once a year.	OECD/ICLEI
	33.3 Proportion of the population living within 20 minutes to everyday services (grocery stores, clinics)	%	Proportion of the population living within 20 minutes by any mode of transport to everyday services. The data should be collected through surveys, once a year.	OECD/ICLEI
	34 Average annual growth rate of built-up areas	%	Average annual growth rate of the areal urban built-up areas (excluding green space and vacant land) within the City's official limits. The data should be collected from the building permits database, once a year.	IADB's ESC
	34.1 Percentage of urban development that occurs on existing urban land rather than on greenfield land	%	Ratio of urban development that occurs on brownfield over development that occurs on greenfield on the urban fringes. The data should be collected from the building permits database, once a year.	OECD/ICLEI
	35 Vacancy rates of offices	%	Percentage of offices that are vacant out of the total office stock. The data can be collected through surveys once a year.	OECD/ICLEI
	35.1 Share of multi-family houses in total housing units	%	A multi-family house is defined as a building that contains multiple separate housing units. The data can be collected from land use database, once a year.	OECD/ICLEI

Response indicators

	Indicator	Examples of response
Transport	36 High-polluting vehicles are regulated Energy-efficient vehicles are incentivised through fiscal instruments	- Interdiction of circulation and fines for high-emitting vehicles - Subsidies to replace vehicles older than 2000 or diesel-powered vehicles - Fuel standards (EURO 6, EURO 5 and so on)
	37 Extension and improvement of public and non-motorised transport is planned and supported through investment in place	- Sustainable transport development plan
	38 Public and non-motorised transport is promoted through information and awareness campaigns	- Car-free days
	39 Traffic demand is managed (congestion charges, smart technologies)	- Congestion charges - Smart automated traffic regulation - Parking management
	40 Public transport emergency management (in publicly and/or privately run networks) is planned and tested	- Transport resilience action plan - Tests for road transport evacuation - Tests on efficiency of emergency transport systems
Buildings	41 Green building is promoted through standards and fiscal incentives	- Green buildings standards - Subsidies for installation of energy efficient building infrastructure
	42 Public and private investment in energy efficiency in buildings	- Public and private investment in retrofitting
	43 Metering and billing for personal energy use is regulated	- Billing based on actual consumption - Smart metering technologies in households
Industries	44 Energy efficient industrial machinery is regulated and incentivised through fiscal instruments (electricity, heat, industrial processes)	- Penalties for high-emitting industrial technologies - Subsidies for the purchase of energy efficient industrial technologies
	45 Energy efficient industrial technologies (electricity, heat, industrial processes) are supported through private investment	
	46 Material efficiency of new built industrial facilities and waste recycling is regulated and incentivised through fiscal instruments	- Penalties for low recycling rate of industrial waste - Subsidies for material efficient technologies and recycling facilities - Mandatory recycling rates
Energy	47 Industrial wastewater treatment, re-use or recycling is promoted through regulations and fiscal incentives	- Energy (electricity and heating) master plan
	48 Coverage and quality of electricity and heat supply is improved through investment	- Subsidies for the development of solar panels on rooftops - Subsidies for the development of solar water heaters
	49 Renewable energy facilities in private buildings are incentivised through fiscal instruments	
	50 Renewable energy technologies are developed and supported through public and private investment	- Renewable energy education programmes in schools
	51 Renewable energy facilities are incentivised through awareness campaigns	- Energy resilience action plan - Tests on the resilience of the energy supply network - Smart technologies to detect power breakdown

	Indicator	Examples of response
Water (supply, sanitation, drainage)	52 The resilience of electricity networks in case of disaster is tested and enhanced through investment	
	53 Metering and billing for water use is regulated	- Billing based on actual consumption - Smart metering technologies in households
	54 Water saving and reuse is encouraged through awareness campaigns	- Water saving education programmes in schools
	55 Coverage and efficiency of water supply networks is improved through plans and investment	- Water master plan - Investment to reduce leakage in water pipes - Investment to provide more continuous water supply in households
	56 Buildings' access to wastewater collection and treatment systems is improved through plans and investment	- Investment to equip buildings with individual or communal grey and black water treatment facilities - Investment to connect buildings to wastewater treatment plants - Construction of new wastewater treatment facilities
	57 Wastewater treatment is promoted through regulations and fiscal incentives	- Mandatory wastewater collection facilities for new buildings
	58 Wastewater billing is regulated	- Wastewater collected is charged to households
	59 Drinking water pre-treatment is enhanced through plans and investment	- Construction or upgrading of drinking water treatment facilities
	60 Drainage facilities are developed through plans and investment	- Resilience master plan - Construction of drainage tunnels - Construction of dykes - Construction of retention ponds
	61 Business and community resilience is encouraged through awareness campaigns	- Information on business continuity plans on the city hall's website - Education programmes on resilience to natural disasters (floods, earthquakes, and so on) in schools
Solid waste	62 Reduction of material consumption/solid waste generation is promoted through awareness campaigns	- Education programmes on solid waste reuse/recycling in schools and in companies
	63 Coverage of solid waste collection system is improved through plans and investment	- Action plan to reduce amounts of solid waste dumped in the streets
	64 Littering and non-compliance to sorting systems is disincentivised through fines and penalties	
	65 Composting, recycling and waste-to-energy facilities are developed through plans and investment	- Construction of recycling facilities - Construction of waste-to-energy facilities - Construction of composting facilities
	66 Solid waste reuse, sorting and recycling are promoted through information and awareness campaigns	- Education programmes on solid waste reuse and recycling in schools and in companies
	67 Overcapacity issues in landfills are tackled through plans and investment	- Construction of new landfills
Land use	68 Density is regulated	- Density targets - Incentives for higher densities (for example, floor-area-ratio bonus)
	69 Transit-oriented development (TOD) is promoted	- TOD is promoted in transport and land use master plans - Higher density regulations near public transport lines
	70 Mixed-use development is promoted through zoning regulations and incentives	- Zoning regulations promote mixed-use development - Fiscal incentives for mixed-use development for developers

Annex 4.
Water consumption factors for energy technologies (Litre MW-1 h-1)

Fuel Type	Cooling	Technology	Min	Median	Range	Max	Sample Size
Photovoltaic (PV)	n.a	Utility scale PV	0	1	1-5	5	3
Wind	n.a	Wind turbine	0	0	0-0	0	2
Concentrated solar power	Tower	Trough	725	906	906-1,109	1,109	18
		Power tower	751	786	786-912	912	4
		Fresnel	1,000	1,000	1,000-1,000	1,000	1
	Dry	Trough	43	78	78-79	79	11
		Power tower	26	26	26-26	26	1
	Hybrid	Trough	117	338	338-397	397	3
		Power tower	102	170	170-302	302	2
	n.a	Stirling	4	5	5-6	6	2
Biopower	Tower	Steam	480	553	553-965	965	4
		Biogas	235	235	235-235	235	1
	Once-through	Steam	300	300	300-300	300	1
	Pond	Steam	300	390	390-480	480	1
	Dry	Biogas	35	35	35-35	35	1
Geothermal	Tower	Flash	5	15	15-361	361	4
		Dry Flash	5	5	5-5	5	1
		Binary	270	270	270-270	270	1
		EGS	290	505	505-720	720	1
	Hybrid	Binary	221	461	461-700	700	2
Hydropower	n.a	In-stream and reservoir	1425	4491	4491-18000	18000	3
Nuclear	Tower	Generic	581	672	672-845	845	
	Once-through	Generic	100	269	269-400	400	6
							4
	Pond	Generic	560	610	610-720	720	
							2
Natural gas	Tower	Combined cycle	130	205	205-300	300	6
		Steam	662	826	826-1170	1170	4
		Combined cycle with carbon capture and storage (CCS)	378	393	393-407	407	2
	Once-through	Combined cycle	20	100	100-100	100	3
		Steam	95	240	240-291	291	2
	Pond	Combined cycle	240	240	240-240	240	1
	Dry	Combined cycle	0	2	2-4	4	2
Coal	Tower	Generic	480	687	687-1100	1100	5
		Subcritical	394	479	479-664	664	7
		Supercritical	445	493	493-594	594	8
		Integrated gasification combined cycle	318	380	380-439	439	8
		Subcritical with CCS	394	479	479-664	664	7
		Supercritical with CCS	445	493	493-594	594	8
		IGCC with CCS	318	380	380-439	439	8
	Once-through	Generic	100	250	250-317	317	4
		Subcritical	71	113	113-138	138	3
		Supercritical	64	103	103-124	124	3
	Pond	Generic	300	545	545-700	700	2
		Subcritical	737	779	779-804	804	3
		Supercritical	4	42	42-64	64	3

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ABBREVIATIONS

CIBSE Chartered Institute of Building Engineers

CSO Civil society organisation

EBRD European Bank for Reconstruction and Development

EEA European Environment Agency

GCAP Green City Action Plan

GET Green Economy Transition

IADB Inter-American Development Bank

IEA International Energy Agency

NREL National Renewable Energy Laboratory

OECD Organisation for Economic Co-operation and Development

PSR Pressure-state-response

SEA Strategic Environmental Assessment

UNECE United Nations Economic Commission for Europe

WHO World Health Organization

GLOSSARY

Administrative champions: individuals in the municipal administration who work on the GCAP day to day. Administrative champions serve as key contacts for the execution of the GCAP and as liaisons with politicians.

The 'City': the municipal government of a city.

City council: the body that approves legislation put forward by the office of the mayor or equivalent head of municipal government.

Community champions: key people, organisations and enterprises in the community that actively promote Green City initiatives relating to specific sectors or environmental concerns. Community champions may include private companies, utilities and CSOs.

Consultant team: a team of international and local experts, selected by the EBRD and the city, with experience in urban sustainability and green infrastructure investing. The consultant team supports GCAP development on a day-to-day basis.

EBRD Green City: the EBRD defines a Green City as a city that i) preserves the quality of its environmental assets (air, water, land/soil and biodiversity) and uses these resources sustainably; ii) mitigates and adapts to the risks of climate change; and iii) ensures that environmental policies and developments contribute to the social and economic wellbeing of residents.

External framework report: an assessment of relevant political, legal, economic, social and environmental conditions that may affect the GCAP. Past strategic plans and sectoral studies conducted for or by a city should be reviewed and integrated as appropriate.

Green City Action Plan (GCAP): a core component of the EBRD Green Cities programme that involves assessing and prioritising environmental challenges based on various, specific indicators, and developing an action plan to tackle them through policy interventions and sustainable infrastructure investments.

Green City baseline: the Green City baseline documents the city's current environmental performance, including the governance and policy frameworks in place that affect it; and identifies a set of priority environmental challenges that the city will address through its GCAP.

GCAP expert group: technical experts within the city who work closely with the consultant team and review the deliverables submitted.

GCAP steering committee: a group consisting of members of various municipal departments, including finance, communications and sectoral departments, that is responsible for overseeing and steering the GCAP process.

GCAP coordinator: selected individual within the municipal government who has the capacity and expertise to support the GCAP throughout its development.

Impact monitoring plan: a formal plan that monitors how effective Green City actions have been in achieving established environmental targets and goals.

Implementation monitoring report: a formal plan that lists all Green City actions and clearly indicates project status and milestones.

Implementation and monitoring coordinator: the person, ideally a member of the city's GCAP team, who is primarily responsible for GCAP implementation and subsequent monitoring.

Municipal government: a city's ruling body, also referred to as 'the City'.

Municipal staff: civil servants employed by the municipal government.

Political champions: the Mayor or other high-level officials who are responsible for driving the GCAP. Political champions should be part of the City's internal task force to oversee GCAP development.

Pressure-state-response (PSR) framework: developed by the OECD, the PSR framework categorises various, specific indicators to illustrate the causal linkages between environmental pressures, the resulting state of the environment, and associated responses by the government, residents and the private sector.

Stakeholder engagement plan: a detailed plan and program for engaging with stakeholders in a meaningful and culturally appropriate manner throughout the GCAP development.

Strategic Environmental Assessment (SEA): a systematic decision support process, aiming to ensure that environmental and possibly other sustainability aspects are considered effectively in policy, plan and programme making.

Traffic light screening: a simple method of assessing and comparing a city's environmental performance indicators with established benchmarks, whereby a green light indicates good performance in line with international standards; an amber light indicates insufficient performance and cause for concern; and a red light indicates low performance and need for critical attention.

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