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ONE PLANET CITY CHALLENGE




# OPCC ASSESSMENT FRAMEWORK

## Technical document 2023

# THE OPCC IN A NUTSHELL

The **One Planet City Challenge** (OPCC) is a biennial competition organised by WWF to guide cities towards effective climate action while publicly recognising and celebrating the most ambitious and innovative ideas, actions, people, and policies.

The OPCC aims to help cities develop the most effective climate mitigation and adaptation practices[1] and to disseminate this practice globally. As part of the challenge process, WWF reviews cities' plans against good practice climate action planning criteria and assesses whether their targets align with the Paris Agreement's goal of limiting global warming to a maximum of 1.5 °C. This review takes into account cities' differing capacities and responsibilities. We also provide high level guidance on the most effective actions needed to meet cities' necessary targets .

Additionally, best-performing cities are put forward to an international jury of experts that choose national and global winners according to criteria set by the OPCC. These winners are rewarded with public recognition and supported in promoting their actions and plans to their citizens, as well as gathering citizen suggestions to further accelerate change. In a new pilot program, rejoining national winners from the previous cycle will be separately assessed by the jury. These cities will be recognised as "OPCC All Stars" and compete for a global award that recognises progress made since their win.

We invite OPCC cities to report their climate plans, including targets and actions, on CDP-ICLEI Track using the 2023 Cities Questionnaire. CDP-ICLEI Track is the world's leading climate progress accountability mechanism for cities – tracking over 1,000 cities' climate action in 2022 – supported by partnerships with other global organisations such as C40, the Global Covenant of Mayors, and WWF.

In the platform, we encourage OPCC participants to report in alignment with the Common Reporting Framework (CRF) of the Global Covenant of Mayors (GCoM). This includes a set of global recommendations to ensure robust climate action planning, implementation, monitoring, and reporting procedures. This kind of public disclosure promotes transparency and accountability, and through international reporting, your city adds its voice to global support for advancing the climate agenda, both nationally and globally.

The OPCC has grown steadily since its inception in 2011. At this point, over 700 cities from nearly 70 countries on 6 continents have taken part at least once in the OPCC.



1 As well as good practices in secure, sustainable and affordable energy access and energy poverty alleviation.



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This document is designed to provide in-depth methodological information on the 2023 version of the One Planet City Challenge's (OPCC) Assessment Framework to OPCC participants. It also provides guidance that complements the instructions found in the OPCC's Participants Booklet (see Participants Documents here), and on the CDP-ICLEI webpage (www.cdp.net/en/cities).


## Contributors

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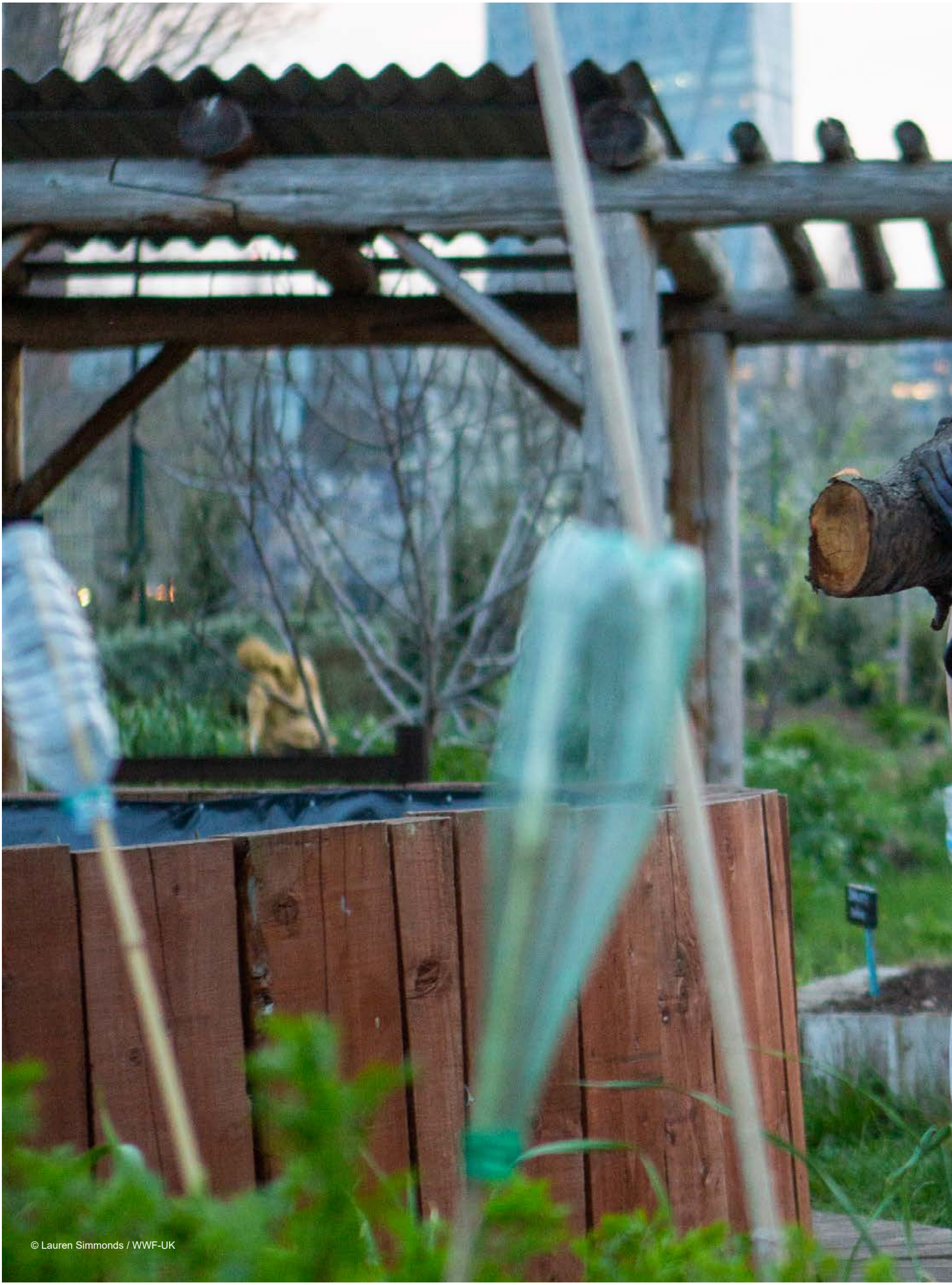


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## Contact information

Please contact your national WWF office or WWF's international OPCC Technical Helpdesk (at opcc-helpdesk@wwf.se) for specific questions about OPCC's Assessment Framework.


**Cover photo:** © Global Warming Images / WWF

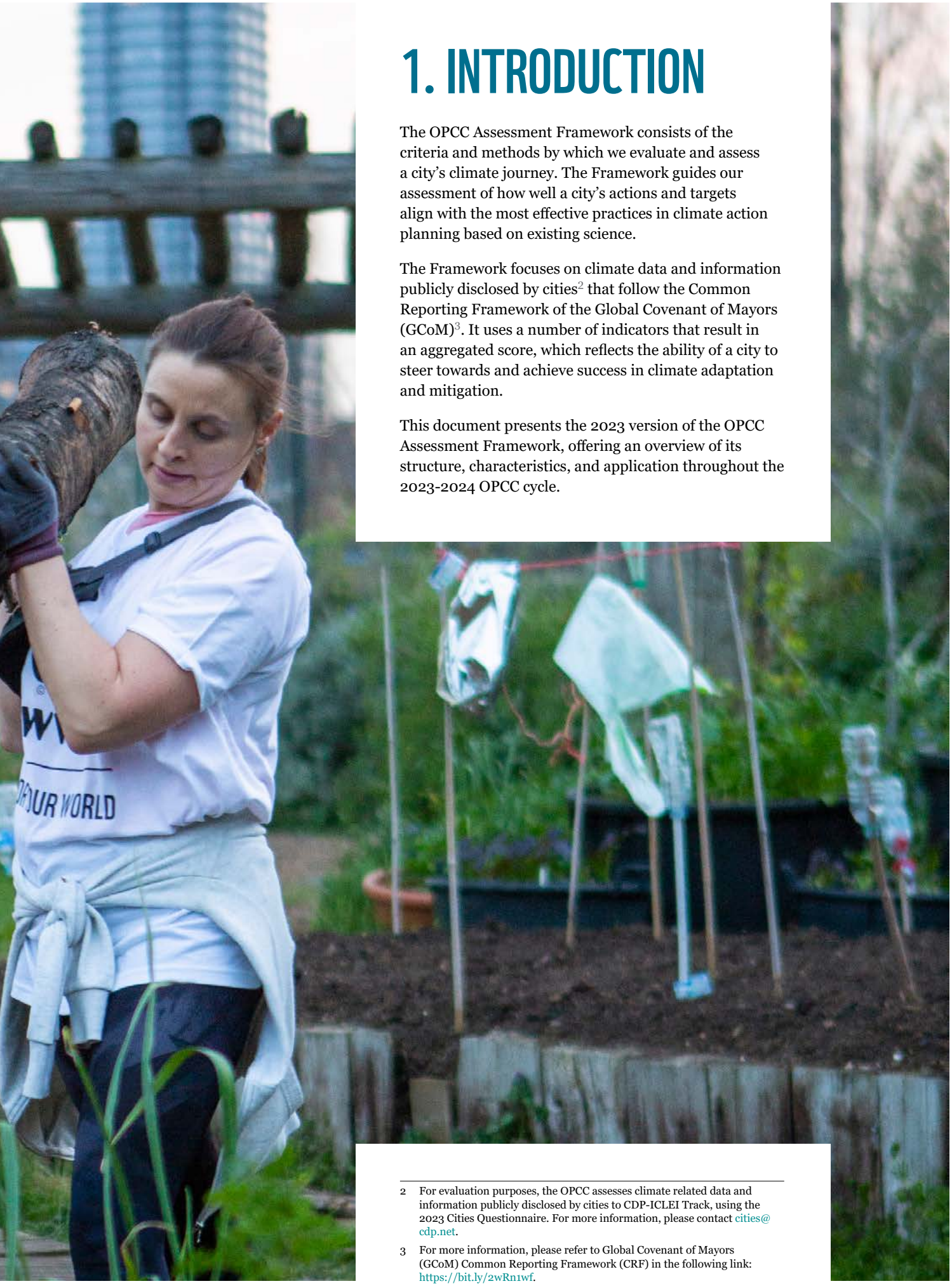

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# 1. INTRODUCTION

The OPCC Assessment Framework consists of the criteria and methods by which we evaluate and assess a city's climate journey. The Framework guides our assessment of how well a city's actions and targets align with the most effective practices in climate action planning based on existing science.

The Framework focuses on climate data and information publicly disclosed by cities[2] that follow the Common Reporting Framework of the Global Covenant of Mayors (GCoM)[3]. It uses a number of indicators that result in an aggregated score, which reflects the ability of a city to steer towards and achieve success in climate adaptation and mitigation.

This document presents the 2023 version of the OPCC Assessment Framework, offering an overview of its structure, characteristics, and application throughout the 2023-2024 OPCC cycle.



2 For evaluation purposes, the OPCC assesses climate related data and information publicly disclosed by cities to CDP-ICLEI Track, using the 2023 Cities Questionnaire. For more information, please contact cities@cdp.net.

3 For more information, please refer to Global Covenant of Mayors (GCoM) Common Reporting Framework (CRF) in the following link: https://bit.ly/2wRn1wf.

# 2. SCORING CRITERIA

The data submitted by cities participating in the OPCC is assessed against a set of *scoring criteria* composed of 36 indicators, which are combined into five themes covering the following areas:

- Assessed GHG emissions and risks from climate change
- Mitigation targets and adaptation goals (inclusive, integrated, and science-based)
- Climate action plans
- Implementation of strategies and/ or actions
- Results-based monitoring

The indicators identify good climate practices and can also serve as a basis for cities to analyse their current situation and enhance their climate ambition and action.

The OPCC Scoring aggregates indicators in two high level dimensions: 'Vision' and 'Impact':

- *'Vision'* represents a city's commitment and ability to drive change (i.e., assessment of impacts and risks, emissions inventories, climate targets, and monitoring and reporting).
- *'Impact'* represents the reduction potential of a city's current climate action (i.e., mitigation and adaptation action plans and their implementation).

The following tables (Tables 1, 2 and 3) list the indicators along with corresponding maximum scores, i.e., the weighting assigned to each category. Click on each indicator to access a detailed description, associated questionnaire questions, and scoring rationale.

**Table 1: OPCC total aggregated scores (maximum).**

| THEME | MAXIMUM SCORE |
|---|---|
| Assessed GHG emissions and risks from climate change | 28 |
| Mitigation targets and adaptation goals | 22.5 |
| Climate action plans | 35.5 |
| Implementation of climate strategies and/or actions | 41.5 |
| Results-based monitoring | 22.5 |
| **Max total score** | **150** |

**Table 2: OPCC scoring criteria for the *Vision* dimension.**

| THEME | INDICATOR | DESCRIPTION | SCORING CRITERIA | MAXIMUM SCORE | CITIES QUESTIONNAIRE 2023 QUESTION |
|---|---|---|---|---|---|
| **Assessed GHG emissions and risks from climate change** | Presence of Climate Risk and Vulnerability Assessment | Checks whether the city has named and attached a Climate Risk and Vulnerability Assessment | Assessment status: no but intending (0.5 pts), in progress (1 pt), yes (1.5 pts) | 1.5 | 1.1 |
| | Boundary of assessment | Checks for the boundary of the Climate Risk and Vulnerability Assessment | Boundary of assessment relative to jurisdiction boundary: smaller (1 pt), partial (1.5 pts), same or larger (3 pts) than city boundary | 3 | 1.1a |
| | Factors covered | Checks the number of factors considered in the Climate Risk and Vulnerability Assessment | Factors: between one and five (1.5 pt), between six and nine (2.5 pts), all factors covered/ considered (3.5 pts) | 3.5 | 1.1a |
| | Completeness of hazards | Checks for the completeness of hazards covered by the Climate Risk and Vulnerability Assessment | One fully reported hazard (4 pts), additional fully reported hazards (1 pt); capped to 6 pts.<br>One partially reported hazard (2 pts), additional partially reported hazards (0.5 pts); capped to 4 pts.<br>No reported hazards (0 pts) | 6 | 1.2 |
| | Inventory status | Checks for the presence of an emissions inventory | Attachment and/ or unrestricted access provided (1.5 pts) | 1.5 | 2.1a |
| | Up-to-date emissions inventory | Checks for the date of creation of the emissions inventory | Emissions inventory within last year (0.5 pts), within last 6 years (0.4 pts), older than 6 years (0.2 pts), no inventory (0 pts) | 0.5 | 2.1a |
| | Scope of emissions | Checks for 3 sectors of scope 1 emissions, and 2 sectors each of scope 2 and scope 3 emissions | Scopes: one scope considered (1 pt), two scopes considered (2 pts), three scopes considered (3 pts) | 3 | 2.1 (b/ c/ d) |
| | Sectors of inventory | Checks to what extent all sectors are considered under the chosen framework *[where notation key 'Not Occuring' is used in the reporting, the total number of sectors will change]* | Sectors:<br>20% of sectors considered (0.6 pts),<br>40% of sectors considered (1.2 pts),<br>60% + of sectors considered (1.8 pts),<br>all sectors considered (3 pts) | 3 | 2.1 (b/ c/ d) |
| | Level of data quality | Checks the quality of data for "Activity data" and "Emissions factors" | Additive score capped to 2 points. High data quality (1 pt), medium data quality (0.5 pts), low data quality (0.3 pts) | 2 | 2.1a |
| | Boundary of emissions inventory | Checks for the boundary of the emissions inventory | Boundary of inventory relative to jurisdiction boundary: smaller (0.5 pts), partial (1 pt), same or larger (2 pts) than city boundary | 2 | 2.1a |
| | Gases covered | Checks for the number of GHG covered by the emissions inventory | Gases: 1 option (0.4 pts), 2 options (0.6 pts), 3 options (1.2 pts), all options (1.5 pts) | 1.5 | 2.1a |
| | Consumption-based emissions inventory (CBE) | Checks whether the city has a CBE inventory | Response: "No, but intending to develop and report in the next 2 years" (0.2 pts), "No, but development in progress and report in the next year" (0.4 pts), "Yes" (0.5 pts) | 0.5 | 2.2 |

| THEME | INDICATOR | DESCRIPTION | SCORING CRITERIA | MAXIMUM SCORE | CITIES QUESTIONNAIRE 2023 QUESTION |
|---|---|---|---|---|---|
| **Mitigation targets and adaptation goals** | Boundary of mitigation target | Checks for the boundary of the (city-wide/ sectoral) targets | Boundary of target relative to jurisdiction (city-wide/ sectoral): government operations only (0.25 pts/ 0.1 pts), smaller or partial (0.5 pts/ 0.2 pts), same or larger (1 pt/ 0.4 pts) than city boundary | 1 | 5.1a |
| | SBT alignment | Checks whether the emissions (city-wide/ sectoral) targets are considered Science-Based Targets (SBT) | SBT alignment (city-wide/ sectoral): the city considers its target to be an SBT but it does not align to an SBT methodology (0.5 pts/ 0.2 pts), the city considers its target to be an SBT and a specific methodology is selected (1 pt/ 0.4 pts) | 1 | 5.1a |
| | GHG targets aligned with a trajectory based on fair-share budget | Checks for long-term achievement of net-zero emissions (city-wide) | Net-zero emissions target: after 2050 (1.8 pts), by 2050 (2.5 pts), by 2040 (3 pts), within the next 10 years (3.5 pts) | 3.5 | 5.1a |
| | | Checks for the presence of a short-term target in line with a fair share of limiting global warming to 1.5 °C (city-wide) *[based on the OPCC 1.5 °C Alignment Method]* | Target options: Target not aligned with a 1.5 °C trajectory for any year (0.5 pts), target aligned with a 1.5 °C trajectory after 2040 (1 pt), target aligned with a 1.5 °C trajectory by 2040 (1.5 pts), target aligned with a 1.5 °C trajectory by 2030 (2 pts) | 2 | 5.1a |
| | | Checks for sectoral targets (energy, transport, and waste) | Additive score capped to 1.5 points. Every sector covered by a sectoral target with target year > current year (0.5 pts) | 1.5 | 5.1a |
| | Renewable energy/ electricity targets towards neutrality | Checks for renewable energy/ electricity target(s) as a percentage of total in the target year | Score is proportional to the percentage of renewable energy in the target year compared to the base year levels (same or larger/ smaller or partial or government operations only):<br>All energy types (1.25 pts/ 0.75 pts), renewable electricity (0.625 pts/ 0.375 pts), renewable heating and/ or cooling (0.375 pts/ 0.225 pts) | 1.25 | 6.1 |
| | Energy efficiency targets | Checks for energy efficiency target(s) as a percentage of total in the target year | Score is proportional to the percentage change in target year compared to the base year levels (same or larger/ smaller or partial or government operations only):<br>Reduce energy consumption jurisdiction-wide (1.25 pts/ 0.75 pts), increase energy efficiency jurisdiction-wide or all buildings (0.625 pts/ 0.375 pts), any other energy efficiency target (0.375 pts/ 0.225 pts) | 1.25 | 6.1 |
| | Adaptation goals and milestones towards a climate resilient city | Checks for the presence of adaptation targets and their timeline | Additive score capped to 5.5 points.<br>Target period is: 6 years or older (0 pts), older than present time but no older than 5 years (1.1 pts), between present and 2030 (2.2 pts), between 2031 and 2040 (3.3 pts), for 2041 onwards (5.5 pts) | 5.5 | 4.1a |
| | | Checks whether the city's adaptation goal(s) cover the most significant hazards faced by the jurisdiction | Proportional score capped to 5.5 points for alignment of hazards covered by adaptation goal(s) with most significant hazards reported by the jurisdiction | 5.5 | 4.1a |

| THEME | INDICATOR | DESCRIPTION | SCORING CRITERIA | MAXI-MUM SCORE | CITIES QUES-TIONNAIRE 2023 QUESTION |
|---|---|---|---|---|---|
| **Results-based monitoring** | Overseeing mechanisms | Checks whether the city actively oversees climate-related risks and opportunities | Additive score capped to 5.5 points based on mechanisms to inform, consider, and assign responsibilities on climate related issues | 5.5 | 0.2 |
| | Processes for the mitigation plan | Checks whether processes for monitoring, evaluation and updating have been established | Additive score capped to 8.5 points.<br>Monitoring, evaluation and updating processes: every 5 years (1 pt), every 3 years (2 pts), annually (3.5 pts) | 8.5 | 7.1a |
| | Processes for the adaptation plan | Checks whether processes for monitoring, evaluation and updating have been established | Additive score capped to 8.5 points.<br>Monitoring, evaluation and updating processes: every 5 years (1 pt), every 3 years (2 pts), annually (3.5 pts) | 8.5 | 7.1a |


Yunaidi Joepoet / WWF

**Table 3: OPCC scoring criteria for the *Impact* dimension.**

| THEME | INDICATOR | DESCRIPTION | SCORING CRITERIA | MAXIMUM SCORE | CITIES QUESTIONNAIRE 2023 QUESTION |
|---|---|---|---|---|---|
| **Climate action plans** | Climate change mitigation plan | Checks whether the city has attached a climate change mitigation plan | Plan status: no but intending (0.875 pts), in progress (1.75 pt), yes (3.5 pts) | 3.5 | 7.1 |
| | Areas covered by action plan | Checks the alignment of action plan sectors with emissions inventory sectors and IPCC strategies[4] | Proportional score capped to 6 pts for alignment of action plan sectors with inventory sectors and 2 pts for alignment with IPCC strategies | 8 | 9.1 |
| | Completeness of mitigation actions | Checks for the data completeness of mitigation actions reported | One fully reported action (3 pts), one partially reported action (2 pts), no reported actions (0 pts). For every additional fully/ partial reported actions (0.8/ 0.6 pts) | 8 | 9.1 |
| | Co-benefits of mitigation actions | Checks whether the city has identified co-benefits against its mitigation actions | Identified more than 1 co-benefit for at least half of reported actions (0.75 pts), for all actions (1.5 pts) | 1.5 | 9.1 |
| | Climate adaptation plan | Checks whether the city has attached a climate adaptation plan | Plan status: no but intending in the next 2 years (0.5 pts), in progress (1 pt), yes (2 pts) | 2 | 7.1 |
| | Boundary of climate adaptation plan | Checks for boundary of plan | Boundary of adaptation plan relative to jurisdiction boundary: smaller (0.5 pt), partial (1 pts), same or larger (1.5 pts) than city boundary | 1.5 | 7.1a |
| | Alignment with hazards | Checks the alignment of adaptation actions with reported hazards | Proportional score for every hazard covered by adaptation actions. Capped to 9 points | 9 | 8.1 |
| | Co-benefits of adaptation actions | Checks whether the city has identified co-benefits against its adaptation actions | Identified more than 1 co-benefit for at least half of reported actions (1 pt), for all actions (2 pts) | 2 | 8.1 |
| **Implementation of climate strategies and/or actions** | Distribution of opportunities and benefits | Checks whether the city actively ensures the equitable distribution of climate action opportunities and benefits | Proportional score capped to 8.5 pts based on the assessment of opportunities, the collection of data, the engagement with community, the design/ implementation of actions addressing the needs of frontline communities, and the assessment of wider benefits and/or equity for its climate actions | 8.5 | 0.3 |
| | Stakeholder engagement | Checks whether the city actively collaborates on climate-related issues | Engagement: collaboration with at least 1 stakeholder (3.5 pts), collaboration with at least 3 stakeholders (7 pts) | 7 | 0.5 |
| | Status of climate mitigation actions | Checks the implementation status of the mitigation actions reported | Between 1 and 3 actions in implementation stages (5 pts), between 4 and 7 actions in implementation stages (10 pts), more than 8 actions in implementation stages (13 pts) | 13 | 9.1 |
| | Status of climate adaptation actions | Checks the implementation status of the adaptation actions reported | Between 1 and 3 actions in implementation stages (5 pts), between 4 and 7 actions in implementation stages (10 pts), more than 8 actions in implementation stages (13 pts) | 13 | 8.1 |

4 For more information on IPCC strategies, see section 3.2.1, including Table 5, in this document.

# 3. OPCC COMPLEMENTARY FEEDBACK FORECASTING

The One Planet City Challenge (OPCC) provides each participant with strategic guidance on how their climate targets align to 1.5 °C and what big-win actions are needed to ensure an effective climate action package. Since 2018, the OPCC has followed a complementary forecasting methodology to achieve this purpose. The methodology comprises three methods:

- OPCC 1.5 °C Alignment Method
- OPCC High Impact Mitigation Actions Method
- OPCC High Potential Adaptation Actions Method

The first assesses whether a city's emissions reduction target aligns with a fair share of limiting global warming to 1.5 ˚C in the mid-term, or net-zero (by 2050 at the latest). The other two methods are used to review the alignment of cities' reported action plans with an evidence-based assessment of what the most effective climate action planning would be, given their characteristics.

## 3.1 OPCC 1.5 °C ALIGNMENT METHOD

The OPCC 1.5 °C Alignment Method is based on data from IPCC's Special Report on Global Warming of 1.5 °C (2018). The approach incorporates considerations of fair emissions budget allocation, aligning with the objective of limiting global warming to 1.5 °C. The method is suitable for any type of city that reports in line with GCoM's Common Reporting Framework. The method has been applied to 280 cities participating in OPCC's 2021-2022 cycle.

### 3.1.1 Description

Building on the regional models presented in the IPCC Special Report, the OPCC requires cities to have city-wide[5] mid-term and long term targets for Scope 1 and 2 emissions:

- 2030: Reduce per capita GHG emissions in line with a global reduction of 50 %; and,
- 2050: Reduce total GHG emissions to net-zero.

Since the IPCC models are applied on a regional scale, the OPCC adds an additional layer of equity and fairness by applying the Human Development Index (HDI). This national adjustment is used to require faster decarbonization from cities in more developed countries. The HDI factor does this by modifying the midterm target, providing per capita emission reduction targets ranging between 25-65 %.

5 I.e., covering the entire city and nothing else.

### 3.1.2 Data points required

The method uses the following key data points[6]:

- National HDI / Global average HDI for year 2018
- City-wide (total Scope 1 and 2) emissions baseline in 2018
- Population data for year 2018
- Population prognosis for year 2030

### 3.1.3 Calculation

The following steps are required to calculate the level of emissions reduction a target should achieve to comply with the OPCC 1.5 °C Alignment Method's 2030 interim target:

1. Gather 2018 Scope 1 and Scope 2 city-wide GHG emissions and divide by 2018 population to obtain baseline per capita emissions. We recommend estimating baseline emissions using the Global Protocol for Community-Scale GHG Emissions Inventory (GPC), but other methods can also be used[7].

2. Use the Human Development Index (HDI) to estimate a reduction target, from 2018 levels that reflects a fair share[8] of the 50 % global emissions' reduction by 2030 identified in the IPCC Special Report on Global Warming of 1.5 °C. Find a country's HDI here[9]. Use the following formula:

   $$Reduction\ target = 0.5 \times (HDI\ correction\ factor)$$

   *where*

   $$HDI\ correction\ factor = \frac{HDI_{Country}}{HDI_{Global\ average}}$$

3. Translate the 2030 reduction target (Step 2) to a reduced per capita emissions value using baseline emissions (Step 1). Use the following formula:

   $$Emissions\ in\ 2030_{Per\ capita} =$$
   $$(1\text{-}Reduction\ target) \times Baseline\ emissions\ in\ 2018_{Per\ capita}$$

4. To estimate the absolute emissions level to be reached by 2030 in line with the OPCC 1.5 °C Alignment Method, multiply the emissions per capita estimated in Step 3 by the forecasted population by 2030 of the city.

6 For methodological coherence, we recommend using documented or estimated data for 2018. However, data from other years can be used as a proxy. Note that the closer the data is to 2018, the more methodologically coherent the estimates will be.

7 It is recommended that, regardless of the method used, emissions inventories are verified in accordance with recognized verification standards.

8 Climate fair-share refers to the approach taken to define the level of emissions reduction effort that should be embraced based on historical responsibilities, capacities and intergenerational justice. For more information, see SBTN's Guide for Cities (November 2020).

9 An alternative to the use of national level HDI is the use of sub-national level HDI. Using the latter can better reflect the structural conditions of cities and thus make the target calculation more representative. The Global Data Lab (GDL) publishes a list of estimated sub-national HDIs for various countries and regions that can be used as an alternative to national HDI. For more information on sub-national HDI and its limitations, visit the GDL's website here: https://globaldatalab.org/methods/.

## 3.2 OPCC HIGH IMPACT MITIGATION ACTIONS METHOD

The OPCC High Impact Mitigation[10] Actions Method offers strategic mitigation feedback tailored to each participating city based on their urban form and growth profiles. The method identifies a city's most impactful actions based on overarching mitigation strategies that have the largest potential to decrease current -and avoid future- emissions while ensuring the largest positive cascading effects[11] (IPCC, 2022b). This 'forward-looking' advice can enable climate innovation in design, planning, and implementation, as it points out the action-oriented opportunities a city may consider for a steeper emissions' reduction.

### 3.2.1 Description

The IPCC has identified four overarching strategies for efficient climate mitigation to reduce the amount and speed of future climate change (by reducing greenhouse gases (GHG) or by increasing their removal from the atmosphere). The selection of actions suggested to cities is based on cities' urban form[12], particular urban growth characteristics[13] and geographical context[14], to ensure local relevance (see Table 4). WWF provides action-oriented recommendations to cities based on those strategies (see Table 5).

**Table 4. City typologies.**

| | | URBAN GROWTH PROFILES[15] | | |
|---|---|---|---|---|
| | | **Emerging** *(4.35 % or larger)* | **Rapidly growing** *(0.67 % or larger)* | **Established** *(lower than 0.67 %)* |
| URBAN FORM[16] | **Dispersed and Auto-centric** *(Region 1: < 2,000 Region 2: < 4,000)* | Dispersed emerging | Dispersed growing | Dispersed established |
| | **Compact and Walkable** *(Region 1: > 2,000 Region 2: > 4,000)* | Compact emerging | Compact growing | Compact established |

The percentages given in the urban growth profiles refer to the annual population growth of a city. The numbers given in the urban form profiles represent the different city densities (residents per km$^2$). Region 1 includes Latin America, North America, the Middle East and Africa. Region 2 includes Europe, Southeast Asia, South Asia, East Asia and Oceania.

### 3.2.2 Data points required

The method uses the following key data points:

- Urban growth profile (using population growth as a proxy)
- Urban form profile (using population density as a proxy)

10 In this context, high impact mitigation can be understood as that which enables the greatest positive impacts in terms of emissions reduction and sustainable development.

11 Cascading effects: when a single event generates a sequence of secondary events, and the resulting impact is significantly larger than the initial impact (either positive or negative) (IPCC, 2022a).

12 Urban form refers to the patterns and spatial arrangements of land use, transportation systems, and urban design, i.e., how compact vs. dispersed a city is (IPCC, 2022b).

13 Urban growth characteristics define whether a city is new and emerging, rapidly growing, or established.

14 The geographical context of cities has been validated through surveys in six continents to identify the urgency of different strategies for different geographical contexts.

15 The urban growth profile ranges are defined by calculating the 30th and 90th percentiles of the average annual rate of change of urban population (by country) between 2010 and 2015 (United Nations, 2018).

16 The urban form ranges describe optimal population densities as defined by Litman, T (2017).

### 3.2.3 Calculation

Mitigation actions (CDP, 2022) are recommended to cities based on their urban profile, as described above. To identify a city's urban form, use a city's population density (residents per square kilometre) and compare it to the ranges given in Table 4. To identify a city's urban growth profile, use the city's annual growth rate and compare it to the ranges given in Table 4. A list of the final mitigation actions per strategy is shown in Table 5.

**Table 5. List of the top mitigation actions organised by IPCC strategy (as reportable on CDP-ICLEI Track). Additional explanations are given in square brackets.**

| IPCC STRATEGY | HIGH IMPACT MITIGATION ACTIONS *(SEE APPENDIX – MITIGATION ACTIONS, CDP, 2022)* |
|---|---|
| **Spatial Planning, Urban Form, and Infrastructure**: refers to mitigation approaches such as co-location and mixed land uses, urban infill and densification, and transit-oriented development. | Low-carbon industrial zones |
| | Policy, zoning, or financial support for local food production (such as farmers markets, community gardens, regional agriculture, etc.) |
| | Development of zero emission zones [transport emissions] |
| | Policies to address urban sprawl |
| | Development of 15/30-minute neighbourhoods (complete neighbourhoods) |
| **Electrification and Net-Zero Emissions Resources**: refers to strategies that include the electrification of mobility, heating and cooling, the decarbonization of electricity and energy carriers, and switching to net-zero materials and supply chains. | Install advanced thermal treatment/waste to energy |
| | Increase use of clean energy sources for heating and cooling buildings |
| | Purchase of low-carbon electricity, heat, steam or cooling (i.e., power purchase agreement, supply agreement, renewable energy credit or other sourcing method) |
| | On-site renewable energy generation |
| | Switching to consumption of low-carbon fuels |
| | Procurement of zero emissions buses |
| | Procurement of electric vehicles for government fleet |
| | Electric vehicle charging points and infrastructure |
| | Measure that restricts internal combustion engines |
| | Advancing use of Life Cycle Assessments in planning policy and processes |
| | Recycling or composting collections and/or facilities |
| | Action to decarbonise building/construction materials |
| | Implement practices and policies to promote circular economy |
| | Action to advance net zero carbon municipal buildings |
| **Urban Green and Blue Infrastructure**: refers to actions that conserve existing green and blue assets, the use of greenways, and urban forests, street trees and green space. | Promote conservation efforts for natural areas |
| | Water recycling and reclamation |
| | Conversion of natural habitats [nature positive restoration, regeneration and transformation] |
| | Green space and/ or biodiversity preservation and expansion |
| | Action to address deforestation within the jurisdiction |
| | Action to address forest degradation |
| | Forest restoration |

| IPCC STRATEGY | HIGH IMPACT MITIGATION ACTIONS *(SEE APPENDIX – MITIGATION ACTIONS, CDP, 2022)* |
|---|---|
| **Socio-Behavioural Aspects**: refers to strategies that shape the behaviour and choices that consumers make with regards to residential location, mobility, and the consumption of materials, energy, food, and other resources. | Developing the green economy |
| | Eco-district development strategy |
| | LED / CFL / other luminaire technologies |
| | Waste prevention/recycling policies and programs |
| | Energy efficiency/ retrofit measures addressing existing commercial, residential and/or municipal buildings |
| | Requirements which incentivise net zero carbon, *Passivhaus* or other ultra-high-efficiency standards for new buildings |
| | Improve the efficiency of waste collection |
| | Water use efficiency projects |
| | Improve the efficiency of freight systems |
| | Advance micromobility transportation |
| | Public-use bicycles/Bike share schemes |
| | Improve walking, cycling and integrated transit access |
| | Improve bus infrastructure, services, and operations |
| | Improve rail, metro, and tram infrastructure, services and operations |

### 3.3 OPCC High Potential Adaptation Actions Method

The OPCC High Potential Adaptation Actions Method offers strategic adaptation feedback tailored to each participating city. The method identifies specific adaptation actions with the highest potential for reducing a city's significant climate risks. This 'forward-looking' advice provides participants with suggestions for common actions to deal with the climate hazards that are most likely to occur in their specific location.

#### 3.3.1 Description

Participating cities report their major climate hazards and associated exposure and vulnerability (magnitude and likelihood) in their data submissions. While climate hazards are certain to vary across cities, the responses to the same climate hazards are likely to be the same or similar. Therefore, by analysing existing adaptation actions in other cities with similar climate hazards, a package of adaptation actions can be allocated to each participating city. This approach does not show which actions are most impactful, but it does suggest which are likely to be achievable.

#### 3.3.2 Estimation

The OPCC provides participants with suggestions for common actions for dealing with climate hazards based on city information. See Table 6 for a complete list[17]. Where a city reports fewer than five climate hazards, additional region-specific hazards and their corresponding top adaptation actions are included. These are taken from the tables published in the IPCC AR5 report (IPCC, 2014).

**Table 6. List of the top adaptation actions to climate hazards (as reportable on CDP-ICLEI Track).**

| CLIMATE HAZARD | TOP 5 ACTIONS | | | | |
|---|---|---|---|---|---|
| **Biodiversity loss** | Community engagement/ education | Increasing biological diversity | Ecological restoration (including wetland and floodplain conservation and restoration) | Green infrastructure | Land zoning laws (including restrict development in at risk areas) |
| **Coastal flooding** | Sea walls and coastal protection structures | Flood defence, such as flood levees and culverts | Community engagement/ education | Land zoning laws (including restrict development in at risk areas) | Flood mapping |
| **Drought** | Community engagement/ education | Water saving technologies (including rainwater harvesting) | Green infrastructure | Afforestation and reforestation | Disaster planning and preparedness |
| **Extreme cold** | Social safety nets and social protection | Community engagement/ education | Disaster planning and preparedness | Community- based adaptation | Building standards |
| **Extreme heat** | Green infrastructure | Community engagement/ education | Afforestation and reforestation | Resilience and resistance measures for buildings | Disaster planning and preparedness |
| **Extreme wind** | Community engagement/ education | Disaster planning and preparedness | Afforestation and reforestation | Public preparedness (including exercises/ drills) | Hazard resistant infrastructure design and construction |
| **Fire weather (risk of wildfires)** | Community engagement/ education | Disaster planning and preparedness | Ecological restoration (including wetland and floodplain conservation and restoration) | Public preparedness (including exercises/ drills) | Bushfire reduction and prescribed fire |

17 Actions presented in Table 6 represent the actions most commonly reported per hazard globally. Final actions recommendations to cities will be given based on actions most commonly reported per hazard regionally.

| CLIMATE HAZARD | TOP 5 ACTIONS | | | | |
|---|---|---|---|---|---|
| **Heat stress** | Community engagement/ education | Green infrastructure | Social safety nets and social protection | Afforestation and reforestation | Disaster planning and preparedness |
| **Heavy precipitation** | Community engagement/ education | Flood defence, such as flood levees and culverts | Green infrastructure | Storm and wastewater management | Improved drainage |
| **Hurricanes/ cyclones/ typhoons** | Disaster planning and preparedness | Community engagement/ education | Flood defence, such as flood levees and culverts | Hazard resistant infrastructure design and construction | Resilience and resistance measures for buildings |
| **Increased water demand** | Community engagement/ education | Municipal services (including water and sanitation) | Disaster planning and preparedness | Social safety nets and social protection | Water saving technologies (including rainwater harvesting) |
| **Infectious disease** | Social safety nets and social protection | Community engagement/ education | Essential public health services | Municipal services (including water and sanitation) | Disease prevention measures |
| **Loss of green space/green cover** | Afforestation and reforestation | Community engagement/ education | Green infrastructure | Land zoning laws (including restrict development in at risk areas) | Biodiversity monitoring |
| **Mass movement** | Disaster planning and preparedness | Community engagement/ education | Green infrastructure | Afforestation and reforestation | Ecological restoration (including wetland and floodplain conservation and restoration) |
| **Oceanic events** | Community- based adaptation | Disaster planning and preparedness | Land zoning laws (including restrict development in at risk areas) | Flood mapping | Increasing biological diversity |
| **Other coastal events** | Land zoning laws (including restrict development in at risk areas) | | Flood mapping | Hazard resistant infrastructure design and construction | |
| **River flooding** | Flood defence, such as flood levees and culverts | Community engagement/ education | Disaster planning and preparedness | Ecological restoration (including wetland and floodplain conservation and restoration) | Green infrastructure |
| **Snow and ice** | Community engagement/ education | Disaster planning and preparedness | Community- based adaptation | Public preparedness (including exercises/ drills) | Adaptive management |
| **Soil degradation/ erosion** | Community engagement/ education | Disaster planning and preparedness | Municipal services (including water and sanitation) | Increasing biological diversity | Community- based adaptation |
| **Storm** | Community engagement/ education | Hazard resistant infrastructure design and construction | Early warning and response systems | Flood defence, such as flood levees and culverts | Storm and wastewater management |
| **Urban flooding** | Community engagement/ education | Green infrastructure | Flood defence, such as flood levees and culverts | Improved drainage | Disaster planning and preparedness |
| **Water stress** | Soil and water conservation | Community engagement/ education | Water saving technologies (including rainwater harvesting) | Upgrading existing water supply infrastructure | Adaptive management |

# 4. DATA INTEGRITY DIAGNOSIS (DID)

The OPCC employs the Data Integrity Diagnosis (DID) process to evaluate the quality of data provided by participating cities. The DID assesses the city's responses to nine of the twenty two mandatory questions outlined in the Cities Questionnaire 2023 (refer to Table 7.). Using this information, the DID evaluates the data against logical verification rules and criteria, flags entries that do not meet OPCC data standards, and pinpoints areas requiring corrections and improvements. The DID-generated quality check is included in the OPCC's *Gaps Report*, which helps cities identify any inconsistencies in their OPCC data submissions and rectify any errors or unintentional entries.

The DID automatically evaluates city data using specific quantitative rules and criteria that establish the anticipated responses for key indicators. Constraints are set to define the expected ranges of results (e.g., between 10,000 and 500,000), orders of magnitude (e.g., 10 instead of 10,000), or calculations that reference another response (e.g., if the city's population is x, then the peak energy demand is expected to be in the order of magnitude of [a*x], where 'a' is a constant or variable). Table 7 presents a comprehensive summary of the main rules and criteria employed as part of the DID.

**Table 7. Data Integrity Diagnosis (DID) framework.**

| CITIES QUESTIONNAIRE 2023 RELEVANT QUESTION | INDICATOR DESCRIPTION | DATA VERIFICATION RULES AND CRITERIA |
|---|---|---|
| **0.1 Population data** | Current population lies within the expected order of magnitude. | **Rule:**<br>The current population is not unreasonably over or underestimated<br>**Criteria:**<br>• Current population is greater than 1,000<br>• Current population is less than 17,000,000 |
| | Projected population lies within the expected order of magnitude. | **Rule:**<br>The projected population is not unreasonably over or underestimated<br>**Criteria:**<br>• Annual population growth is greater than -0.06%<br>• Annual population growth is less than 4.35 % |
| **1.1 Climate risk and vulnerability assessment (CRVA)s** | Boundary of the CRVA is the same or larger than the city's jurisdiction boundary. | **Rule:**<br>All CRVAs reported must meet this boundary condition. |

| CITIES QUESTIONNAIRE 2023 RELEVANT QUESTION | INDICATOR DESCRIPTION | DATA VERIFICATION RULES AND CRITERIA |
|---|---|---|
| **2.1 Emissions inventory data** | Boundary of the inventory is the same or larger of the city's jurisdiction boundary. | **Rule:**<br>GHG inventory reported must meet this boundary condition. |
| | Sector emissions value falls under the expected margin per sector per region. | **Rule:**<br>Sectorial figures lie within the expected order of magnitude by region and do not exceed reasonable overestimates. When sector data is not reported, notation keys have been used to indicate reasoning.<br>**Criteria:**<br>Stationary energy*: 58,310,172<br>Transport*: 17,072,414<br>Waste*: 9,579,742<br>IPPU*: 12,674,960<br>AFOLU*: 892,023<br>* The specific range varies depending on the region. |
| | When no emissions have been reported for a given sector, the city should use a notation key in the report. | **Rule:**<br>If there are no emissions reported for a particular sector, one of the following notation keys should be used:<br>• Not Occurring (NO)<br>• Included Elsewhere (IE)<br>• Not Estimated (NE)<br>• Confidential (C) |
| **4.1 Adaptation goals** | Valid adaptation goal base year. | **Rule:**<br>Goal baseline figures lie within the expected order of magnitude and do not exceed reasonable overestimate.<br>**Criteria:**<br>• Goal baseline year is later than 2010<br>• Goal baseline year is earlier than goal target year |
| | Valid adaptation goal target year. | **Rule:**<br>Target year of goal figures lie within the expected order of magnitude (later than baseline) and do not exceed reasonable overestimates.<br>**Criteria:**<br>• Goal target year is later than goal baseline year<br>• Goal target year is earlier than 2050 |
| **5.1 Mitigation targets** | Boundary of the mitigation target is the same or larger than the city's jurisdiction boundary. | **Rule:**<br>All mitigation targets reported must meet this boundary condition. |
| | Mitigation targets cover all the sectors reported in the emissions inventory | **Rule:**<br>Target covers all the emissions sources which are included in the jurisdiction inventory |
| | All mitigation targets' establishment year is valid | **Rule:**<br>Year mitigation target was established is before target year. |
| | Covered emissions for the year when all mitigation targets were established are valid. | **Rule:**<br>Emissions in year target was established are greater than emissions in target year. |
| | Base year of all mitigation targets is valid | **Rule:**<br>Base year targets are before target year. |

| CITIES QUESTIONNAIRE 2023 RELEVANT QUESTION | INDICATOR DESCRIPTION | DATA VERIFICATION RULES AND CRITERIA |
|---|---|---|
| **5.1 Mitigation targets** | The emissions covered in the base year for all mitigation targets are valid. | **Rule:**<br>Covered emissions in base year are not unreasonably lower or higher than emissions reported in city inventory.<br>**Criteria:**<br>• Covered emissions should be greater than 50% below emissions value reported in city inventory<br>• Covered emissions should be less than 50% above emissions value reported in city inventory |
| | For intensity targets, the emissions included in the base year are considered valid. | **Rule:**<br>Covered emissions in base year are not unreasonably lower or higher than:<br>**Criteria:**<br>Intensity target per unit of GDP<br>• Covered emissions in base year should be above 0.032 tCO2 per unit GDP<br>• Covered emissions in base year should be below 0.774 tCO2 per unit GDP<br><br>Intensity target per capita*<br>• Covered emissions in base year should be above avg. 0.46 tCO2 per capita<br>• Covered emissions in base year should be below avg. 12.82 tCO2 per capita<br><br>* The specific values vary depending on the region. |
| | The target year specified in the mitigation target is valid for all targets. | **Rule:**<br>Target year is after base year and year target was established. |
| | The estimated BAU emissions in the target year are valid for all mitigation targets. | **Rule:**<br>BAU emissions in target year are greater than emissions in base year and in the year the target was established. |
| | All mitigation targets use a valid percentage for emissions reduction. | **Rule:**<br>Percentage value should be greater than 0% and less than or equal to 100%. |
| | The net emissions in the target year are valid for all mitigation targets. | **Rule:**<br>Net emissions in target year should be lower than emission in the base year and in the year the target was established. |
| **6.1 Energy and other climate related targets** | The base year for all energy and climate-related targets is valid | **Rule:**<br>Base year is after 2005 and before target year. |
| | The metric value in base year for all the energy and other climate related targets is valid | **Rule:**<br>Change in metric value between base year and target year is positive. |
| | The target year of all the energy and other climate related targets is valid | **Rule:**<br>The target year is before 2050 and after base year. |
| | The percentage of total energy that is renewable in target year is valid | **Rule:**<br>Percentage value should be greater than 0% and less than or equal to 100%. |
| | The boundary of target relative to jurisdiction boundary is the same or larger. | **Rule:**<br>All targets reported must meet this boundary condition. |

| CITIES QUESTIONNAIRE 2023 RELEVANT QUESTION | INDICATOR DESCRIPTION | DATA VERIFICATION RULES AND CRITERIA |
|---|---|---|
| **7.1 Climate action plans** | The boundary of the climate plan relative to jurisdiction boundary is the same or larger. | **Rule:** All plans reported must meet this boundary condition. |
| | The end year of the plan is valid. | **Rule:** End year of plan is after current year and before 2030. |
| **8.1 Adaptation actions** | The adaptation actions taken by the city have addressed all of the hazards identified in the CRVA. | **Rule:** The actions listed in question 8.1 have addressed all of the hazards reported in question 1.2. |
| **9.1 Mitigation actions** | The start year of the action is valid. | **Rule:** The start year of action is before 2030. |
| | The estimated emissions' reduction is valid. | **Rule:** The emissions reductions reported are lower or equal than the total emissions reported in inventory. |
| | Mitigation actions have been taken to address all sectors included in the emissions inventory. | **Rule:** Mitigation actions addressing all sectors identified in the emissions inventory in Q2.1 are listed in Q9.1 col 1. |

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