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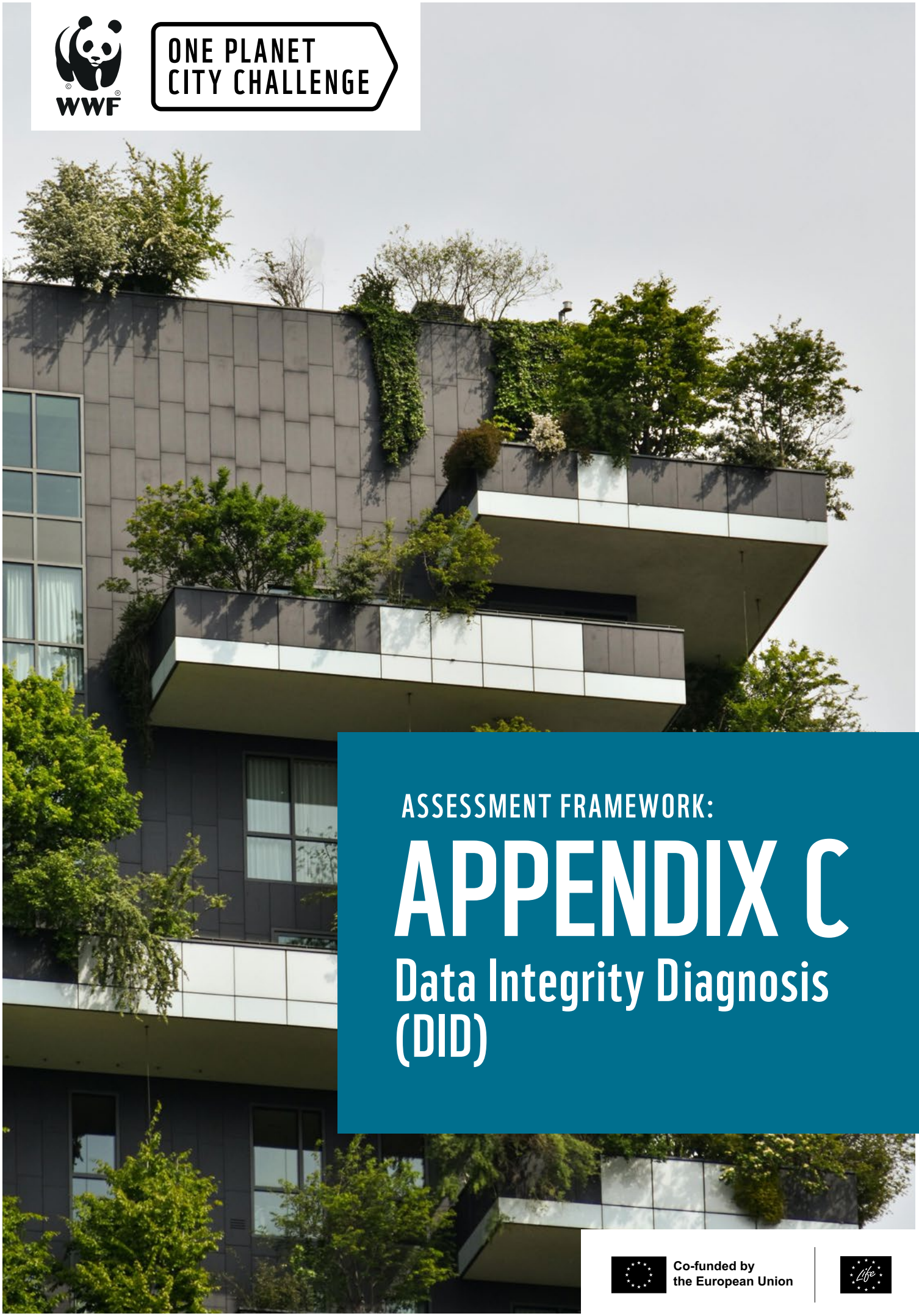
ONE PLANET CITY CHALLENGE



ASSESSMENT FRAMEWORK:

APPENDIX C

Data Integrity Diagnosis (DID)

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This appendix presents the technical foundation of the Data Integrity Diagnosis (DID) used in the 2025 One Planet City Challenge (OPCC) Assessment Framework. It outlines the verification rules and criteria applied across submitted data to ensure consistency, plausibility, and completeness. This document must be read alongside WWF's OPCC Assessment Framework – Technical Document 2025.

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DID Verification Checks

Table 1: Data Integrity Diagnosis (DID) framework.

RELEVANT MODULE	INDICATOR [CODE] AND DESCRIPTION	DATA VERIFICATION RULES AND CRITERIA
Governance data	[G1] Current population lies within the expected order of magnitude (Q 1.2, Col. 6).	Rule: The current population is not unreasonably over or underestimated Criteria: - Current population is greater than 2,000 - Current population is less than 14,000,000
	[G2] Projected population lies within the expected order of magnitude (Q 1.2, Col. 8).	Rule: The projected population is not unreasonably over or underestimated Criteria: - Annual population growth is greater than -0.06% - Annual population growth is less than 4.35%
	[G3] Area of the jurisdiction lies within the expected order of magnitude (Q 1.2, Col. 4).	Rule: The area of the jurisdiction is not unreasonably over or underestimated Criteria: - Area of the jurisdiction is greater than 1 km^2 - Area of the jurisdiction is less than 100,000 km^2
	[G4] The jurisdiction has processes in place to oversee climate-related issues (Q 1.3, Col. 1).	Rule: The jurisdiction provides details of at least one process in place to oversee climate-related risks and opportunities.
	[G5] The jurisdiction ensures the equitable distribution of climate action opportunities and benefits (Q 1.4, Col. 4).	Rule: The jurisdiction outlines at least one process to ensure the equitable distribution of climate action opportunities and benefits.
	[G6] The jurisdiction actively collaborates with national government, business, and/ or civil society on climate-related issues (Q 1.6, Cols. 1 and 5).	Rule: The jurisdiction provides details of the primary entities collaborated with.
Assessment - Climate risk and	[A1] Boundary of the CRVA is the same or larger than the city's jurisdiction boundary (Q 2.1.1, Col. 4).	Rule: All CRVAs reported meet this boundary condition.

vulnerability (CRVA)	[A2] Most significant climate hazards faced by the jurisdiction are fully characterised (Q 2.2, Cols. 1-10).	Rule: The following details are given for the most significant climate hazards listed: - Vulnerable population groups and sectors most exposed, and their impacts - Proportion of the population exposed to the hazard - Current probability and magnitude of impact of hazard - Expected future change in hazard intensity and frequency - Timeframe of expected future changes
Assessment - Emissions inventory	[A3] Boundary of the inventory is the same or larger than the city's jurisdiction boundary (Q 3.1.1, Col. 5).	Rule: GHG emissions inventory reported meets this boundary condition.
	[A4] GHG emissions inventory takes into account multiple GHGs (Q 3.1.1, Col. 10).	Rule: GHG emissions inventory reported includes -at least- the following GHGs: CO_2, CH_4 and N_2O.
	[A5] Sector emissions value falls under the expected margin per sector per region (Q 3.1.2, Col.1/ 3.1.3, Cols. 1, 3, and/or 5/ 3.1.4, Col. 4).	Rule: 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. Criteria: Stationary energy*: 42,500,000 Transport*: 41,000,000 Waste*: 7,400,000 IPPU*: 10,400,000 AFOLU*: 2,000,000 * The specific ranges vary depending on the region (see Table 2). Values are rounded.
	[A6] When no emissions have been reported for a given sector, the city should use a notation key in the report (Q 3.1.2, Col. 2/ 3.1.3, Cols. 2, 4 and/or 6).	Rule: If there are no emissions reported for a particular sector, one of the following notation keys should be used: - Not Occurring (NO) - Included Elsewhere (IE) - Not Estimated (NE) - Confidential (C)
	[A7] The jurisdiction accounts for their consumption-based emissions (Q 3.2, Col. 1).	Rule: The jurisdiction has a consumption-based emissions inventory.
Assessment - Sectoral data	[A8] The jurisdiction assesses energy-related data (Q 4.1, Col. 1).	Rule: The jurisdiction reports on at least one specific indicator for each of the following categories: sustainable energy, energy security, and affordable energy.
Targets - Adaptation goals	[T1] Valid adaptation goal base year (Q 5.1.1, Col. 4).	Rule: Goal baseline figures lie within the expected order of magnitude and do not exceed reasonable overestimate. Criteria: - Goal baseline year is 2010 or later - Goal baseline year is earlier than goal target year
	[T2] Valid adaptation goal target year (Q 5.1.1, Col. 5).	Rule: Target year of goal figures lie within the expected order of magnitude (later than baseline) and do not exceed reasonable overestimates. Criteria: - Goal target year is later than goal baseline year - Goal target year is 2050 or earlier

	[T3] The adaptation goals taken by the city address all of the hazards identified in the CRVA (Q 5.1.1, Col. 3).	Rule: The adaptation goals reported in question 5.1.1 address all of the hazards reported in the CRVA (Q 2.2, Col. 1).
Targets - Mitigation	[T4] Boundary of the mitigation target is the same or larger than the city's jurisdiction boundary (Q 6.1.1, Col. 3).	Rule: All mitigation targets reported meet this boundary condition.
	[T5] Mitigation targets cover all the sectors reported in the emissions inventory (Q 6.1.1, Col. 5).	Rule: Mitigation targets cover all the emissions sources which are included in the jurisdiction inventory (Q 3.1.2/ 3.1.3/ 3.1.4).
	[T6] All mitigation targets' establishment year is valid (Q 6.1.1, Col. 11).	Rule: Year the mitigation target was established is before the target year.
	[T7] Covered emissions for the year when all mitigation targets were established are valid (Q 6.1.1, Col. 12).	Rule: Emissions in the year the target was established are greater than emissions in the target year.
	[T8] Base year of all mitigation targets is valid (Q 6.1.1, Col. 13).	Rule: All targets' base years are before their target years.
	[T9] The emissions covered in the base year for all mitigation targets are valid (Q 6.1.1, Col. 14).	Rule: Covered emissions in base year are not unreasonably lower or higher than emissions reported in city inventory (Q 3.1.2/ 3.1.3/ 3.1.4). Criteria: - Covered emissions should be no more than 50% below emissions value reported in city inventory - Covered emissions should be no more than 50% above emissions value reported in city inventory
	[T10] For intensity targets, the emissions included in the base year are valid (Q 6.1.1, Col. 15).	Rule: Covered emissions lie within the expected order of magnitude by region and do not exceed reasonable overestimates. Criteria: Intensity target per unit of GDP - Covered emissions in base year are above 3.11 E-05 kgCO2 per $ of GDP - Covered emissions in base year are below 11.13 kgCO2 per $ of GDP Intensity target per capita* - Covered emissions in base year are above avg. 3.66 tCO_2 per capita - Covered emissions in base year is below avg. 9.20 tCO_2 per capita * The specific values vary depending on the region (see Tables 3 and 4).
	[T11] The target year specified in the mitigation target is valid for all targets (Q 6.1.1, Col. 16).	Rule: Target year is after the base year and the year the target was established.
	[T12] The estimated BAU emissions in the target year are valid for all mitigation targets (Q 6.1.1, Col. 17).	Rule: BAU emissions in the target year are greater than emissions in the base year and in the year the target was established.
	[T13] All mitigation targets use a valid percentage for emissions reduction (Q 6.1.1, Col. 18).	Rule: Percentage value should be greater than 0% and less than or equal to 100%.
	[T14] The net emissions in the target year are valid for all mitigation targets (Q 6.1.1, Col. 19/20).	Rule: Net emissions in the target year should be lower than emissions in the

		base year and in the year the target was established.
	[T15] Mitigation targets are science-based and explicitly aligned to a recognized methodology (Q 6.1.1, Col. 21).	Rule: Mitigation targets should be science-based and explicitly aligned to a recognized methodology (WWF's One Planet City Challenge (OPCC), C40 Cities Deadline 2020, Tyndall Centre or others (must be specified).
Targets - Sectors	[T16] The jurisdiction has set targets for energy-related issues (Q 7.1, Col. 1).	Rule: The jurisdiction provides at least one energy poverty/energy access target.
	[T17] The boundary of the target relative to the jurisdiction boundary is the same or larger (Q 7.1, Col. 3).	Rule: All targets reported meet this boundary condition.
	[T18] The base year for all energy and climate-related targets is valid (Q 7.1, Col. 8).	Rule: Base year is after 2005 and before target year.
	[T19] The metric value in base year for all the energy and other climate related targets is valid (Q 7.1, Col. 9).	Rule: Changes in metric values between the base year and target year are classified as positive (+), negative (-), or not applicable (N/A), depending on the target type and the metric used. The specific values vary depending on the type of target (see Table 5).
	[T20] The target year of all the energy and other climate related targets is valid (Q 7.1, Col. 10).	Rule: The target year is before 2051 and after base year.
	[T21] The percentage of total energy that is renewable in the target year is valid (Q 7.1, Col. 14).	Rule: Percentage value is greater than 0% and less than or equal to 100%.
Planning	[P1] The boundary of the climate plan relative to the jurisdiction boundary is the same or larger (Q 8.1.1, Col. 5).	Rule: All plans reported meet this boundary condition.
	[P2] The end year of the plan is valid (Q 8.1.1, Col. 14).	Rule: End year of the plan is after the current year and in 2030 or earlier.
	[P3] The jurisdiction has processes for monitoring, evaluation, and updates of climate action plans (Q 8.1.1, Col. 6).	Rule: All climate action plans have associated details on the processes for monitoring, evaluation, and updates of plans.
	[P4] The jurisdiction assesses the synergies of actions (Q 8.1.1, Col. 12).	Rule: All climate action plans assess the synergies of actions.
Actions - Adaptation	[M1] The adaptation actions taken by the city address all of the hazards identified in the CRVA (Q 9.1, Col. 3).	Rule: The adaptation actions listed in question 9.1 address all of the hazards reported in the CRVA (Q 2.2, Col. 1).
	[M2] The adaptation actions taken by the jurisdiction are fully characterised (Q 9.1, Cols. 3-12, and 14).	Rule: The following details are given for at least the key adaptation actions: - Climate hazards addressed - Action description, including the sectors the action applies to, and the attributes of resilience enhanced - Co-benefits realised - Timeframe of expected increased resilience - Proportion of population and/ or ecosystems with increased resilience - Status of action - Funding sources, and total cost of action
	[M3] The adaptation actions taken by the city have positive synergy with energy-related objectives (Q 9.1,	Rule: At least one of the adaptation actions taken by the city contributes to

	Col. 15).	the jurisdiction's energy access and/ or energy poverty objectives.
Actions - Mitigation	[M4] The start year of the action is valid (Q 9.2, Col. 4).	Rule: The start year of action is before 2030.
	[M5] The estimated emissions' reduction is valid (Q 9.2, Col. 7).	Rule: The emissions reductions reported are lower or equal than the total emissions reported in inventory (Q 3.1.2/ 3.1.3/ 3.1.4).
	[M6] Mitigation actions have been taken to address all sectors included in the emissions inventory (Q 9.2, Col. 2).	Rule: Mitigation actions addressing all sectors identified in the emissions inventory in Q 3.1.2/ 3.1.3/ 3.1.4 are listed in Q 9.2.
	[M7] The mitigation actions taken by the jurisdiction are fully characterised (Q 9.2, Cols. 3-12 and 14).	Rule: The following details are given for at least the key mitigation actions: - Action description - Start year of action - Year for which mitigation is expected to last - Impact indicators measured - Estimated reduction in annual inventory emissions or annual energy savings or annual renewable energy generation - Co-benefits realised - Status of action - Funding sources, and total cost of action
	[M8] The mitigation actions taken by the city have positive synergy with energy-related objectives (Q 9.2, Col. 15).	Rule: At least one of the mitigation actions taken by the city contributes to the jurisdiction's energy access and/ or energy poverty objectives.

Expected Sectorial Emissions by Region

Table 2: Sectorial figures expected order of magnitude by region, based on cities submissions to CDP-ICLEI Track in 2024 (units: metric tonnes CO_2e).

REGION	SECTOR	MAX USED IN 2024 DID
Africa	Stationary Energy	14,489,097
	Transport	9,416,984
	Waste	7,420,962
	IPPU	2,623,304
	AFOLU	1,716,064
Asia	Stationary Energy	42,578,298
	Transport	17,684,300
	Waste	4,331,350
	IPPU	10,356,600

	AFOLU	1,510,920
Central and South America	Stationary Energy	14,541,292
	Transport	13,546,691
	Waste	3,696,165
	IPPU	2,705,356
	AFOLU	1,448,359
Europe	Stationary Energy	24,407,267
	Transport	14,928,640
	Waste	3,480,663
	IPPU	1,684,609
	AFOLU	2,059,089
North America 1	Stationary Energy	37,973,074
	Transport	40,988,405
	Waste	2,592,538
	IPPU	3,108,515
	AFOLU	98,951
North America 2	Stationary Energy	7,579,657
	Transport	5,373,874
	Waste	951,866
	IPPU	4,321,978
	AFOLU	180,262
North America 3	Stationary Energy	5,081,352
	Transport	13,546,691
	Waste	3,696,165
	IPPU	1,357,990
	AFOLU	979,089
Oceania	Stationary Energy	2,821,997
	Transport	4,042,696
	Waste	531,605
	IPPU	6,243,000
	AFOLU	860,042

Expected Order of Magnitude for Emissions Covered by Mitigation Targets

Table 3. Expected order of magnitude for emissions covered by Intensity targets per capita (units: metric tons of CO_2 emissions per capita)[1]

Note the following: Geometric mean of Min values (3.66) and Max values (9.20).

REGION	MIN PER CAPITA EMISSIONS (2010-2023)	MAX PER CAPITA EMISSIONS (2010-2023)
Africa	0.784641	1.107587
Asia	5.824015	7.304664
Central and South America	1.017341	4.657025
Europe	1.713722	17.9757
North America 1	13.46907	17.84796
North America 2	14.34536	16.77066
North America 3	2.42912	3.069494
Oceania	6.761818	7.874708

Table 4. Expected order of magnitude for emissions covered by Intensity targets per unit of GDP (units: kg of CO_2 emissions per PPP $ of GDP) (World Bank, 2025).

REGION	MIN PER GDP EMISSIONS (2020)	MAX PER GDP EMISSIONS (2020)
Worldwide	3.11 E-05	11.13

References

World Bank. (n.d.). World Bank Open Data. Retrieved July 24, 2025, from https://data.worldbank.org/

[1] These values exclude emissions from land use, land-use change, and forestry (LULUCF) and are derived from World Bank Open Data (2025), using time series data spanning 2010 to 2023. The aggregation is based on the following regional groupings: Africa (Africa Eastern and Southern, and Africa Western and Central), Asia (East Asia & Pacific, South Asia, and Middle East, North Africa, Afghanistan & Pakistan), Central and South America (Latin America & Caribbean), Europe (European Union), North America 1 (United States), North America 2 (Canada), North America 3 (Mexico), Oceania (Australia and New Zealand), and Small Islands (Small States). For each group, the minimum and maximum values were calculated by identifying the lowest and highest annual per capita emissions recorded among all included entities during the reference period.

Expected Change Criteria by Target and Metric Type

Table 5. Criteria for interpreting the expected direction of change (+/–/N/A) based on target type and metric used in T19.

TARGET	METRIC
Renewable Energy	*Increase* targets in "Renewable energy generation", "Renewable energy consumption" and "Renewable energy installed capacity" result in a (+) change. *Reduce* targets result in a (-) change. *Other* targets result in an (N/A) change.
Energy Efficiency	Generally result in a (-) change. If the metric is *Percentage (%)* or *Number of buildings/ households*, it results in a (+) change. Other metrics result in an (N/A) change.
Energy Poverty/Access	*Increase*, *Address* and *Improve* targets result in a (+) change. *Reduce* targets result in a (-) change.
Building Specific Emissions Reduction	Generally result in a (-) change. If metrics include *Percentage of net zero carbon buildings (%)*, *Percentage of net zero energy buildings (%)*, or *Percentage of buildings with a green building certificate (%)*, it results in a (+) change.
Transport	Generally result in a (+) change. If the metric is *Metric tonnes of CO2e (t)*, it results in a (-) change.
Waste	*Increase* and *Other* targets result in a (+) change. *Reduce* targets result in a (-) change.
Water	*Increase water use efficiency* and *Reduce water consumption* targets generally result in a (-) change. *Increase*, *Restore/improve*, *Address pollution*, and *Towards net-zero water* targets result in a (+) change.
AFOLU	Generally result in a (+) change, except for *Target to reduce deforestation*, *Target to reduce peatland loss*, and *Target to reduce conversion of other remaining natural ecosystems*, when using "Hectares (ha)", which results in a (-) change.
Food	*Increase* targets result in a (+) change. *Reduce* targets result in a (-) change, except when metrics are *Number of individuals*, *Number of households*, or *Number of parks/gardens*, which derive a (+) change. *Other* targets result in an (N/A) change.
Air Quality	*Increase* targets generally result in a (+) change, except when *Concentration of pollutant (µg/m3)* is used, resulting in a (-) change. *Reduce* targets generally result in a (-) change, except when *Number of monitoring stations* is used, resulting in a (+) change. *Other* targets result in an (N/A) change, except when *Number of monitoring stations* is used, resulting in a (+) change.

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OUR AIM IS TO SUPPORT THE CREATION OF ONE PLANET CITIES ACROSS THE GLOBE. CITIES WHERE ALL PEOPLE THRIVE WITHIN THE ECOLOGICAL LIMITS OF OUR ONE AND ONLY PLANET.

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