

Global Set of Climate Change

Statistics and Indicators:

a tool to identify multi-purpose indicators on climate change



National workshop: Generating climate change and disasters indicators for policy decision-making in Saint Vincent and the Grenadines

(27-29 June 2022)

United Nations Statistics Division



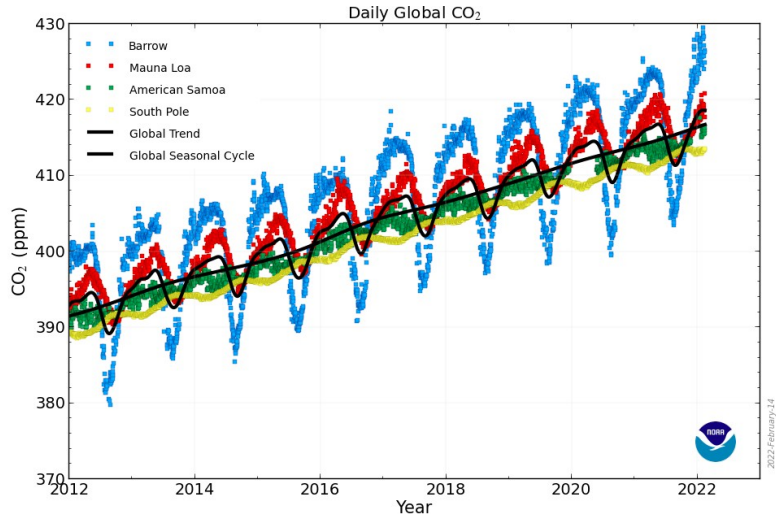
Outline

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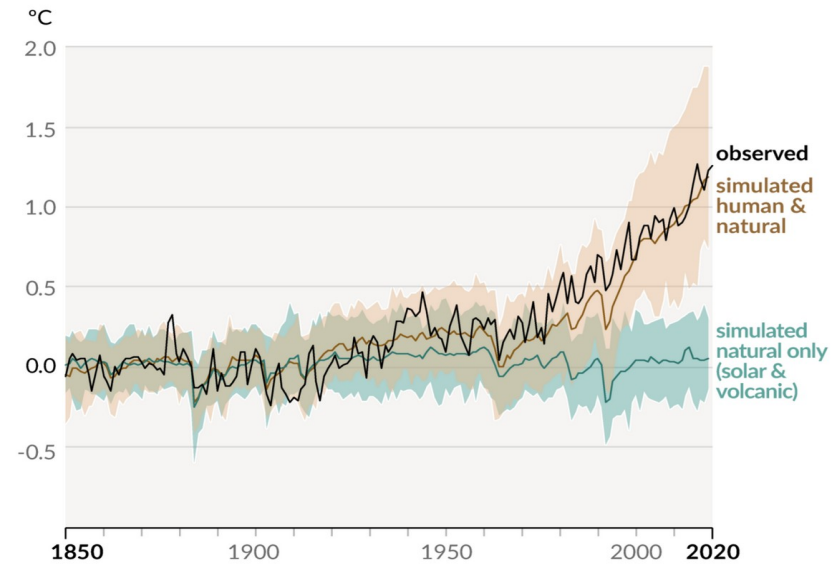
The need for monitoring climate change is more compelling than ever

NOAA, [Global Monitoring Laboratory - Carbon Cycle Greenhouse Gases \(noaa.gov\)](https://www.climate.gov/global-monitoring-laboratory-carbon-cycle-greenhouse-gases)



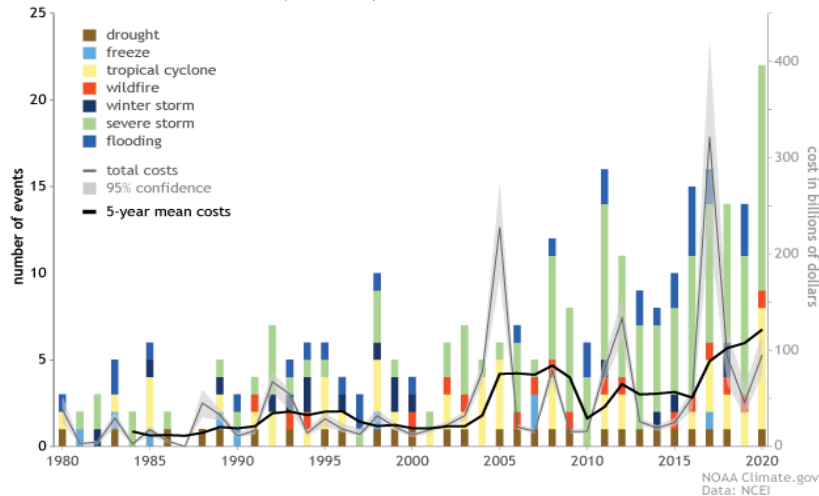
AR6 Climate Change 2021: The Physical Science Basis — IPCC

b) Change in global surface temperature (annual average) as **observed** and simulated using **human & natural** and **only natural** factors (both 1850-2020)



NOAA, <https://www.climate.gov/disasters2020>

Billion-dollar disasters and costs (1980-2020)



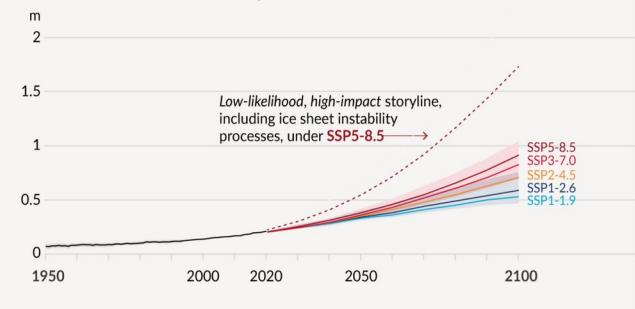
SIXTH ASSESSMENT REPORT
Working Group I – The Physical Science Basis

ipcc

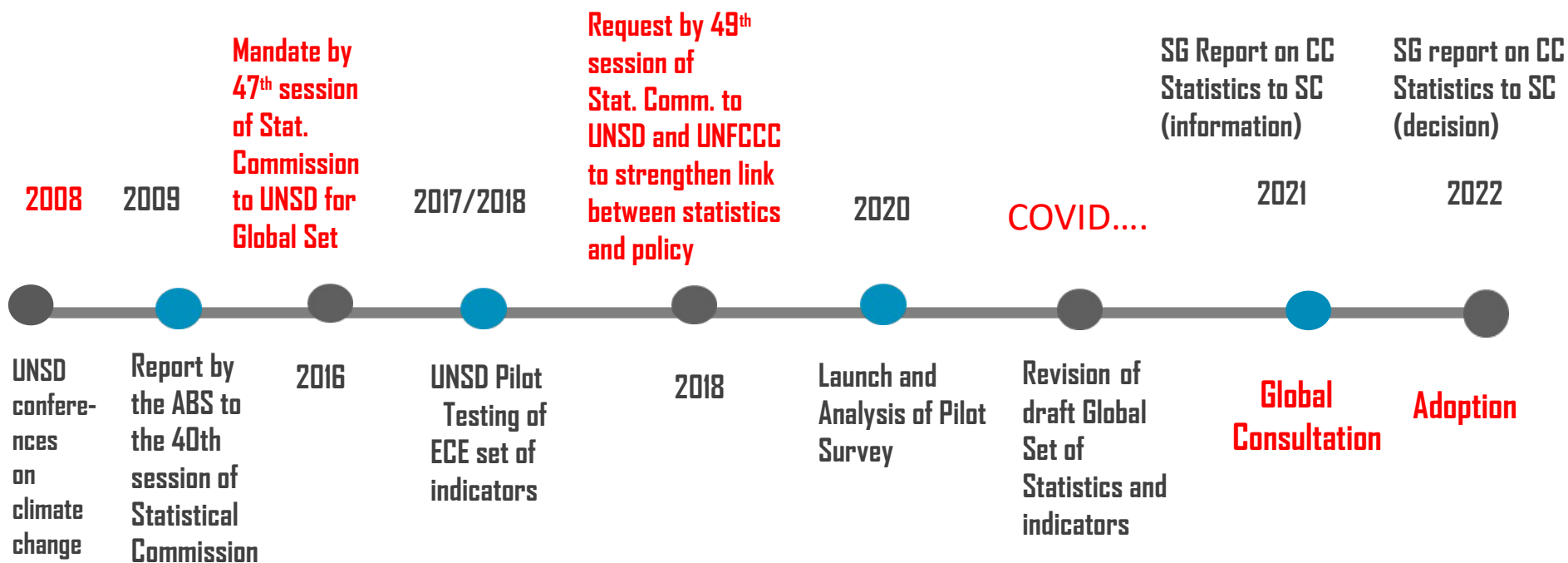
WORLD METEOROLOGICAL ORGANIZATION
UNITED NATIONS ENVIRONMENTAL PROGRAM

Human activities affect all the major climate system components, with some responding over decades and others over centuries

d) Global mean sea level change relative to 1900



More than a decade long process: 2008 – present



Decisions of the Statistical Commission:

Decision 47/112 (2016), UNSD requested to develop a global set of climate change statistics and indicators, applicable to countries at various stages of development:

<http://unstats.un.org/unsd/statcom/47th-session/documents/Report-on-the-47th-session-of-the-statistical-commission-E.pdf>

Decision: 49/113 (2018), UNSD and UNFCCC to strengthen the link between statistics and policy

— <https://unstats.un.org/unsd/statcom/49th-session/documents/Report-on-the-49th-session-E.pdf>

Decision 53/116 (2022), the Global Set was adopted at the 53rd session of the Statistical Commission:

<https://unstats.un.org/unsd/statcom/53rd-session/documents/2022-41-FinalReport-E.pdf>

Process and approach

UNSD prepared a draft Global Set, based on:

- **Bottom up approach** which started with systematic review of climate change statistics and indicators from 130 countries, with representative regional coverage, and identification of most commonly repeated statistics/indicators;
- discussions at several meetings of the UNSD-led **Expert Group on Environment Statistics (EGES)**;
- **bilateral consultations with specialized agencies** and in-depth discussions with several countries; and
- inputs from an extensive **Pilot Survey** that took place in 2020 and a **Global Consultation** in 2021.

More information:

<https://unstats.un.org/unsd/envstats/climatechange.cshtml> and

https://unstats.un.org/unsd/envstats/ClimateChange_StatAndInd_global.cshtml

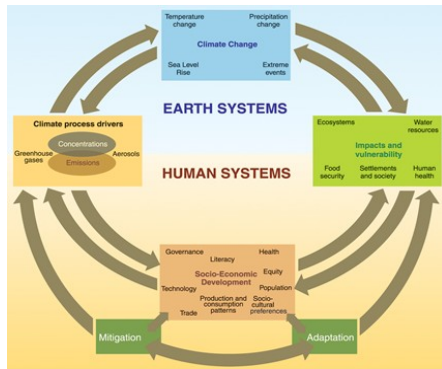


Global Set of Climate Change Statistics and Indicators

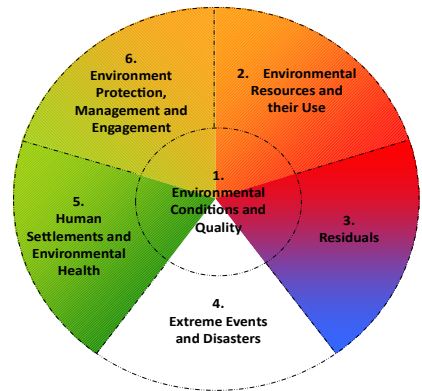


Methodological foundation

- Given that there was no underlying framework linking the reporting requirements stemming from the Paris Agreement and the necessary statistics or indicators to support climate policy action, UNSD worked closely with UNFCCC to develop such a framework explicitly for climate change.
- The Global Set, developed in close collaboration with UNFCCC, is structured according to the IPCC framework and FDES, with a tiering system as in the FDES and the SDG indicators.

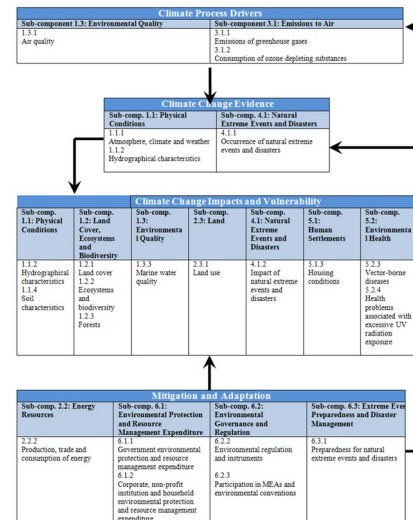


IPCC, 2007, Fourth Assessment Report



Framework for the Development of Environment Statistics (FDES 2013)

Relevant chapters of the Manual of the BSES
https://unstats.un.org/unsd/envstats/fdes/manual_bses.cshml



FDES cross-cutting application (Chapter 5) links climate change and environment statistics based on the IPCC Framework



Goal 13

SENDAI FRAMEWORK
 FOR DISASTER RISK REDUCTION 2015-2030



Main structure (1)

- **158 indicators**, which serve to support developing and monitoring of national climate policies and international reporting requirements, in particular those under the Paris Agreement.
- **190 statistics**, which serve three main purposes:
 - (i) to provide less complex options for countries with less developed statistical systems to initiate climate monitoring through official statistics;
 - (ii) to provide statistics needed to compile the indicators (for Tier 1 and 2); and
 - (iii) to provide inputs to further define and develop the Tier 3 indicators.

Statistics were not introduced for the indicators for which:

- (i) indicator and statistic are identical (9 cases, denoted with ‘Equivalent to the indicator’ in the metadata sheets); and
- (ii) indicators for which the statistics and their metadata are fully described within the cited methodology source, e.g. often from SDG and Sendai Framework indicators (21 cases, denoted with ‘Refer to original source in metadata’ in the metadata sheets).



Main structure (2)

- **Five areas:** drivers, impacts, vulnerability, mitigation and adaptation. These events are applied as five top-level areas in the Global Set. Each indicator is assigned to one of the five IPCC areas as a primary belonging, while some indicators were also assigned as applicable in one or more additional areas.
- **34 topics,** represent the quantifiable aspects of the areas taking into account the types and sources of the statistics needed to describe them.
- **Paris Agreement article:** Correspondence between the indicator/statistic and the articles in the Paris Agreement specifying the reporting requirements.
- **PAWP-Katowice:** Correspondence between the indicator/statistic and the decisions from the Paris Agreement Work Programme (PAWP), adopted in Katowice, specifying the reporting requirements.
- **Statistical references** (next slide)



Statistical references

The main statistical references including the internationally accepted frameworks, standards and guidelines, are presented in abbreviated form in the last column (entitled Method):

- **IPCC:** the Intergovernmental Panel on Climate Change 2006 guidelines, (6 indicators and 4 statistics follow IPCC)
- **FDES:** the Framework for the Development of Environment Statistics and its Manual on the Basic Set of Environment Statistics (BSES), (10 indicators and 110 statistics follow the FDES, either verbatim, in ‘similar to’ or in a ‘related to’ form)
- **SDG:** Sustainable Development Goal indicators metadata, (43 indicators and 8 statistics match SDG indicators either verbatim, in ‘similar to’ or in a ‘related to’ form)
- **Sendai:** Sendai Framework for Disaster Risk Reduction 2015-2030, (9 indicators and 3 statistics follow Sendai guidance)
- **UN-ECE:** the Conference of European Statisticians set of core climate change-related indicators metadata, (25 indicators and 10 statistics match UN-ECE indicators either verbatim, in ‘similar to’ or in a ‘related to’ form)
- **IRES:** the International Recommendations for Energy Statistics, (7 indicators and 17 statistics follow IRES)
- **SEEA-CF:** the System of Environmental-Economic Accounting Central Framework (10 indicators and 13 statistics follow SEEA-CF)
- **SEEA-EA:** the System of Environmental-Economic Accounting–Ecosystem Accounting. (8 indicators and 15 statistics follow SEEA-EA)



Tiers

Defined by considering the relevance (to climate change), methodological soundness and data availability. The relevance or connection to climate change varies per indicator, however a certain relation to climate change has been identified for all the indicators included in the Global Set. Tier 1 indicators and statistics are shown in bold, Tier 2 are in normal text, Tier 3 are in italics. The Tiers were defined as follows:

- o Tier 1 are relevant, methodologically sound, and for which more than 50 per cent of the countries that responded to the Global Consultation indicated that data are available. However, this rule was not applied for the SDG indicators included in the Global Set and the original SDG indicator Tiers are used. Nineteen indicators and 47 statistics are assessed as Tier 1.

- o Tier 2 are relevant, methodologically sound, and for which less than 50 per cent of the countries that responded to the Global Consultation indicated that country data are available. However, this rule was not applied for the SDG indicators included in the Global Set and the original SDG indicator Tiers are used. Eighty-one indicators and 109 statistics are assessed as Tier 2.

- o Tier 3 are relevant, but not methodologically sound, and country data may not be available. Fifty-eight indicators and 34 statistics are assessed as Tier 3.



Indicators and statistics side-by-side

AREA/ TOPIC	Indicator	Statistic	Tier	Paris Agreement	PAWP-Katowice	Method
DRIVERS						
TOTAL GREENHOUSE GAS EMISSIONS						
	1. Total greenhouse gas emissions per year		1	13.7a	Decision 18/CMA.1, chapter II, para. 47-49	IPCC; SDG; UN-ECE
		Total emissions of direct greenhouse gases (excluding LULUCF)	1			IPCC; FDES
	2. Total emissions of indirect greenhouse gases		1			IPCC; FDES
	3. Greenhouse gas emissions from land use, land use change and forestry		1			IPCC; FDES; UN-ECE
	4. Total greenhouse gas emissions from the national economy		2			SEEA-CF; UN-ECE
	5. Greenhouse gas emissions per capita		1			IPCC; FDES
		Total emissions of direct greenhouse gases (excluding LULUCF)	1	13.7a	Decision 18/CMA.1, chapter II, para. 47-49	IPCC; FDES
	6. <i>Greenhouse gas emissions in gross fixed capital formation of direct investment</i>		3			SEEA-CF
	7. <i>Greenhouse gas emissions in value added of foreign controlled multinational enterprises</i>		3			SEEA-CF
		<i>GHG emissions in output of foreign-controlled multinational enterprises</i>	3			SEEA-CF
		<i>GHG emissions in exports of foreign-controlled multinational enterprises</i>	3			SEEA-CF
	8. Carbon footprint		2			SEEA-CF; UN-ECE
ATMOSPHERIC CONCENTRATION OF GREENHOUSE GASES						
	9. Global concentration of greenhouse gases		2			FDES
ENERGY PRODUCTION, SUPPLY AND CONSUMPTION						
	10. Total primary energy production from fossil fuels		1	4.8; 4.13; 13.7b	Decision 18/CMA.1, chapter III; Decision 4/CMA.1	IRES
		Total energy production	1			IRES; FDES
	11. Total energy supply from fossil fuels		1			IRES

Global set, metadata

36. Renewable freshwater resources per capita

Field	Description			
Indicator	Renewable freshwater resources per capita			
Statistics		Precipitation	Evapotranspiration	Inflow
Area	Impacts			
Topic	Freshwater resources			
Themes	Water resources			
Paris Agreement article	7; 13.8	7; 13.8	7; 13.8	7; 13.8
PAWP-Katowice	Decision 18/CMA.1, chapter IV; Decision 9/CMA.1	Decision 18/CMA.1, chapter IV; Decision 9/CMA.1	Decision 18/CMA.1, chapter IV; Decision 9/CMA.1	Decision 18/CMA.1, chapter IV; Decision 9/CMA.1
FDES		1.1.1.b	2.6.1.b.1	2.6.1.a.2 [similar to]
SDG				
Sendai Framework				
Tier	2	1	2	2
Definition	<p>The indicator measures the renewable freshwater resources divided by the population of the country.</p> <p>Renewable freshwater resources = Internal flow + Inflow of surface and groundwaters from neighbouring countries.</p> <p>Renewable freshwater (surface and groundwater) resources are replenished by precipitation (less evapotranspiration) falling over the territory of the country that ends up as runoff to rivers and recharge to aquifers (internal flow), and by surface waters and groundwater flowing in from</p>	<p>Total volume of atmospheric wet precipitation (rain, snow, hail, dew, etc.) falling on the territory of the country over one year, in millions of cubic metres.</p> <p>[UNSD/UNEP Questionnaire, https://unstats.un.org/unsd/envstats/Questionnaires/2020/q2020_Water_English.pdf]</p> <p>[FDES BSES manual, Water resources, p.11, https://unstats.un.org/unsd/environment/FDES/MS%202.6%20Water%20Resources.pdf]</p>	<p>Actual evapotranspiration: Total actual volume of evaporation from the ground, wetlands and natural water bodies and transpiration of plants. According to the definition of this concept in Hydrology, the evapotranspiration generated by all human interventions is excluded, except unirrigated agriculture and forestry. The 'actual evapotranspiration' is calculated using different types of mathematical models, ranging from very simple algorithms (Budyko, Turn Pyke, etc.) to schemes that represent the hydrological cycle in detail.</p>	<p>Total volume of river run-off and groundwater generated over the period of a year, in natural conditions, exclusively by precipitation into a country. The internal flow is equal to precipitation less actual evapotranspiration and can be calculated or measured. If the river and groundwater generation are measured separately, transfers between surface and groundwater should be</p>

	<p>neighbouring countries (inflow). [UNSD/UNEP Questionnaire, https://unstats.un.org/unsd/envstats/Questionnaires/2020/q2020_Water_English.pdf]</p> <p>[FDES BSES manual, Water resources, p.7, p.48, https://unstats.un.org/unsd/environment/FDES/MS%202.6%20Water%20Resources.pdf]</p>		<p>[UNSD/UNEP Questionnaire, https://unstats.un.org/unsd/envstats/Questionnaires/2020/q2020_Water_English.pdf]</p> <p>[FDES BSES manual, Water resources, p.13, https://unstats.un.org/unsd/environment/FDES/MS%202.6%20Water%20Resources.pdf]</p>	<p>netted out to avoid double counting.</p> <p>[UNSD/UNEP Questionnaire, https://unstats.un.org/unsd/envstats/Questionnaires/2020/q2020_Water_English.pdf]</p> <p>[FDES BSES manual, Water resources, p.12, https://unstats.un.org/unsd/environment/FDES/MS%202.6%20Water%20Resources.pdf]</p>
Relevance	<p>Freshwater-related risks of climate change increase significantly with increasing greenhouse gas (GHG) concentrations. Modelling studies since AR4, with large but better quantified uncertainties, have demonstrated clear differences between global futures with higher emissions, which have stronger adverse impacts, and those with lower emissions, which cause less damage and cost less to adapt to. For each degree of global warming, approximately 7% of the global population is projected to be exposed to a decrease of renewable water resources of at least 20% (multi-model mean). [IPCC AR5, p 232, https://www.ipcc.ch/site/assets/uploads/2018/02/WGIAR5-Chap3_FINAL.pdf]</p>			
National data sources	Meteorological office/Ministry of natural resources/Water and related agencies	Meteorological office/Ministry of natural resources/Water and related agencies	Meteorological office/Ministry of natural resources/Water and related agencies	Meteorological office/Ministry of natural resources/Water and related agencies
Data collection methods		Monitoring systems	Monitoring systems	Monitoring systems
Update frequency		Monthly, annual	Annual	Annual
Category of measurement	Volume	Volume	Volume	Volume
Computation/compilation methods	Precipitation plus inflows minus evapotranspiration divided by the population	Interpolation of point measurements over a geographic area (GCWAS pg. 71). GIS modelling of precipitation.	Residual of precipitation less surface and sub-surface runoff (GCWAS pg. 71).	Sum of inflows from other territories
International primary data reference	UNSD Environmental Indicators (Inland water resources); FAO	UNSD Environmental Indicators (Inland water resources); AQUASTAT (FAO's Global Information System on Water and Agriculture), https://www.fao.org/aquastat/en/ ;	UNSD Environmental Indicators (Inland water resources); AQUASTAT (FAO's Global Information System on Water and	UNSD Environmental Indicators (Inland water resources); AQUASTAT (FAO's Global Information System on Water and

		FAO	Agriculture), http://www.fao.org/aquastat/en/ ; FAO	Agriculture), http://www.fao.org/aquastat/en/ ; FAO
International primary data reference, description	Renewable freshwater resources per capita; AQUASTAT (FAO's Global Information System on Water and Agriculture)	Precipitation; AQUASTAT (FAO's Global Information System on Water and Agriculture)	Actual evapotranspiration; AQUASTAT (FAO's Global Information System on Water and Agriculture)	Inflow of surface and groundwaters from neighbouring countries; AQUASTAT (FAO's Global Information System on Water and Agriculture)
International primary data reference, URL	https://unstats.un.org/unsd/envstats/qindicators ; http://www.fao.org/aquastat/en/			
Type	C	C	C	C
International secondary data references				
Other data references				
Potential aggregations and scales	National Regional	National	National	National
Methodological guidance	UNSD/UNEP Questionnaire, https://unstats.un.org/unsd/envstats/Questionnaires/2020/q2020_Water_English.pdf ; FDES BSES manual, Water resources, https://unstats.un.org/unsd/environment/FDES/MS%20202.6%20Water%20Resources.pdf ; International Recommendations for Water Statistics, http://unstats.un.org/unsd/EconStatKB/Attachment491.aspx?AttachmentType=1 ; Draft Guidelines for the Compilation of Water Accounts and Statistics, https://seea.un.org/sites/seea.un.org/files/guidelines_comp_water_stats_en.pdf ; Renewable Water Resources Assessment 2015 AQUASTAT methodology review, http://www.fao.org/3/bc818e/bc818e.pdf ; Key water statistics in AQUASTAT, http://www.fao.org/3/19241EN/i9241en.pdf ; Review of world water resources by country, http://www.fao.org/3/Y4473E/y4473e.pdf			



The Global Set, concluding remarks

- The Global Set of Climate Change Statistics and Indicators is a comprehensive statistical framework, with statistics, indicators and metadata, designed to support countries in preparing their own sets of climate change statistics and indicators according to their individual concerns, priorities and resources.
- It will assist countries embarking on the development of climate change statistics programmes by providing the scope and coverage as to what may be considered relevant to climate change.
- It can also assist countries already involved in this area of statistics by providing a reference list.
- It will help to streamline the supply of data for national policies and international reporting by mapping the commonalities, overlaps and gaps under multiple policy demands and statistical methods/guidelines.



Implementation support



Access and implementation support for the Global Set

- The Global Set is introduced and briefly described in the [Report of the Secretary-General on Climate Change Statistics to the Statistical Commission \(E/CN.3/2022/17\)](#) available in the six UN languages:
https://unstats.un.org/unsd/envstats/climatechange_docs_conf.cshtml
- The full description of the Global Set and its metadata is included in the Background document to the Report of the Secretary-General on Climate Change Statistics, entitled [Global Set and metadata](#).
- Implementation support materials including a self-assessment tool and e-learning materials will be disseminated via UNSD website:
<https://unstats.un.org/unsd/envstats/climatechange.cshtml>
- In addition, if implementation advice and support are required (including the indicators and statistics in a spreadsheet form – Excel file) please contact UNSD at: envstats@un.org



Implementation steps

1. NSOs in collaboration with climate reporting authorities to conduct a self-assessment which will prioritize the nationally relevant indicators and statistics
2. Establish a committee/working group with relevant stakeholders
3. Map sources of available indicators/statistics and assess them in terms of quality and utility
4. Define and prioritize gaps in data and methods
5. Collect data and compile statistics and indicators
6. Contribute to national policy demands and international reporting requirements
7. Disseminate national climate change statistics and indicators



Draft Implementation guidelines (under development)



- Description of the Global Set
- Key issues of climate change
- Self-assessment
- Institutional set-up
- Key stakeholders
- Technical committees
- Existing toolkits and templates
- Data sources
- Data collection and exchange
- Database building
- Dissemination and publication guidelines
- Capacity building and resource mobilization

Global Set of Climate Change Statistics and Indicators

Implementation Guidelines (Draft)



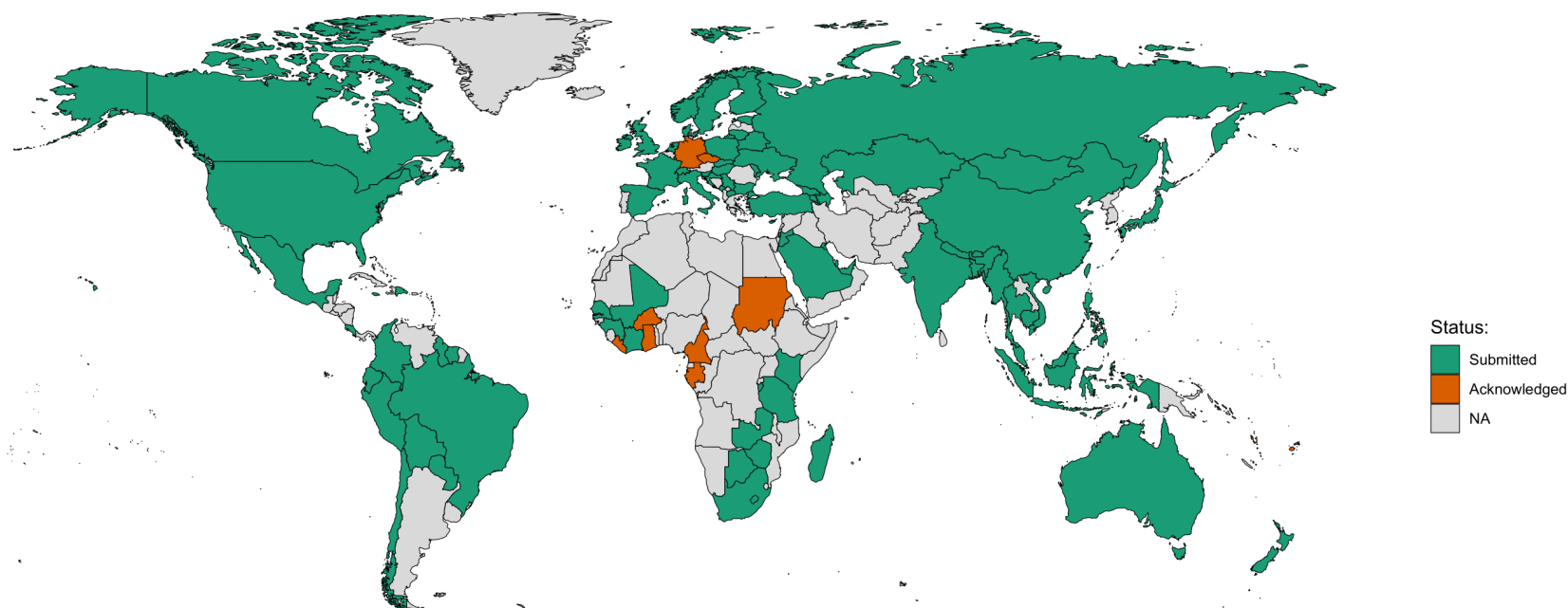
Relevant examples and resources

- **Reports and compendia** on:
 - environment statistics:
<https://unstats.un.org/unsd/envstats/fdescompendia.cshtml> and
 - climate change statistics:
https://unstats.un.org/unsd/envstats/climatechange_reports.cshtml
- **Outcomes of the Global Consultation**, responses and feedback were received from 86 States and areas and 26 agencies (see annex I in the [Report of the Secretary-General on Climate Change Statistics to the Statistical Commission](#) (E/CN.3/2022/17)). Detailed summaries and geographical analysis are presented in the background document entitled "[Global Consultation on the Global Set](#)".
- Other relevant resources are comprehensively reviewed in the above background report
- **UNFCCC Operationalization of the Enhanced Transparency Framework:**
<https://unfccc.int/enhanced-transparency-framework>



Growing engagement of countries

Global Consultation (May- Sept 2021) – 86 countries (68 on part 1 and 75 part 2) and 26 organizations



- The engagement is wider than that, e.g. 14 member states **acknowledged**.
- UNSD funded consultancies helped 2 more countries to do the assessment, another 9 countries to improve their earlier assessments in Africa
- Ongoing regional initiatives are also strengthening climate change statistics in countries

"Acknowledged" means that the national statistical offices of the countries (to whom we sent out the invitations to participate) communicated with us regarding the Global Consultation after we sent out our invitation, but that they did not submit a response.



Current and future work



Capacity development activities

UNSD, in collaboration with the secretariat of the UNFCCC and other relevant bodies, would carry out capacity development activities with support from regional and other development partners by:

- (a) Offering continuous (remote, online) support to countries in their efforts to set up national processes;
- (b) Organizing regional workshops based on the findings of the global consultation, which highlighted pronounced geographical gaps;
- (c) Leading advisory missions in countries based on raised demands and requests for support.



Further development of the methodology

UNSD, in collaboration UNFCCC and other relevant bodies, would further develop the methodology for climate change statistics and indicators by:

- (a) Reviewing and updating the tier 3 indicators and completing their metadata. Consultations will be organized to advance towards internationally agreed methods;
- (b) Following up ongoing statistical processes to ensure that latest guidance is reflected for the indicators at all tiers. These include the latest reports of the IPCC and advances in methodological guidance, as well as further work by the post-2020 global biodiversity framework of the CBD, ECE, the International Programme for Action on Climate (IPAC) of OECD and the climate change indicators dashboard of IMF, among others. Additional fields in the metadata, such as rationale and limitations, will also be considered for inclusion;
- (c) Continuing to improve the attribution to climate change or the relevance of the indicators to climate change by narrowing the scope and definition of several indicators or introducing new disaggregation items. This requires the development of new classifications (e.g. on human health and diseases, and climate-induced disasters) or revision of existing ones (e.g. on expenditure and environmental activities);
- (d) Following up policy and science to identify new indicators to be included in the global set of climate change statistics and indicators in future revisions, and also to possibly remove certain indicators from the list.



Development of training materials and strategies for capacity development and resource mobilization

UNSD, in collaboration with UNFCCC and other relevant bodies, would develop training materials and strategies for capacity development and resource mobilization by:

- (a) Developing a strategy with key partners to promote bridging the gap between policy and statistics and between national statistical offices and climate change reporting agencies at the national level;
- (b) Developing implementation guidelines for national consultations and data-sharing processes on climate change statistics;
- (c) Developing training materials, including e-learning modules, organized according to thematic areas, along with guidance and best practices, on addressing climate change issues by including climate change-related questions in national censuses and surveys, and best practices on the dissemination of climate statistics;
- (d) Mobilizing resources to facilitate the training of trainers, based on the assessment of the capacity development needs in the countries revealed by the global consultation;
- (e) Developing a climate change assessment tool similar to the Environment Statistics Self-Assessment Tool



Role of NSOs at the country level

- (a) Develop national climate change statistics programmes using the global set of climate change statistics and indicators as the framework for climate change statistics and indicators and continue to assess the availability of data for the indicators and statistics according to the tiering system;
- (b) Continue to strengthen their collaboration with the national focal points for UNFCCC (or national authorities responsible for reporting climate change-related information);
- (c) Continue to be more involved in the preparation of data submissions to UNFCCC, for supporting the implementation of the Paris Agreement;
- (d) Advocate to have a more central role in coordinating climate change statistics based on their mandates to produce official statistics and their role in coordinating national statistical systems;
- (e) Strengthen environment statistics, using the FDES, as the basis for developing climate change statistics, given their close interrelationship;
- (f) Enhance data collection in the area of climate change statistics by conducting specialized climate change surveys or including related modules in existing surveys and censuses;
- (g) Produce and disseminate climate change statistics via dedicated reports, websites or other means.



Thank you for your attention!

For more information please contact the Environment Statistics Section
at the United Nations Statistics Division:

E-mail: envstats@un.org

Website: <https://unstats.un.org/unsd/envstats/>

Climate Change Statistics Website

<https://unstats.un.org/unsd/envstats/climatechange.cshtml>

and

https://unstats.un.org/unsd/envstats/ClimateChange_StatAndInd_global.cshtml

