Global set of climate change statistics and indicators

Expert Forum for producers and users of climate change-related statistics

(Geneva, 2-4 October 2018)

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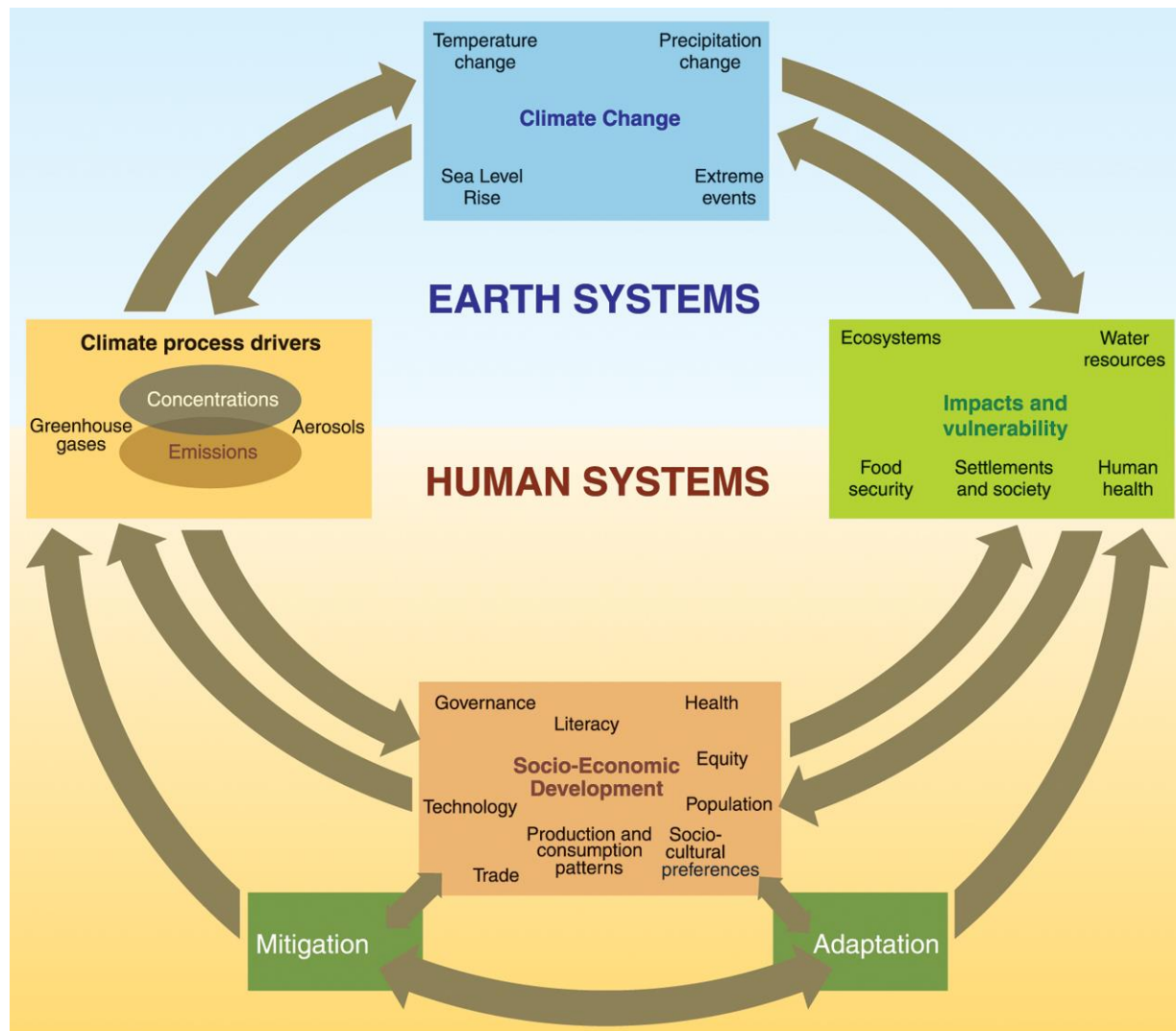
United Nations Statistics Division

UNSD past activities

- At the Statistical Commission in 2009 a programme review on climate change and official statistics carried out by the Australian Bureau of Statistics was presented.
  - Specify how official statistics may be used for climate change measurement and analysis
  - Identify recommendations and actions to mainstream the climate change aspect in official statistics
- UNSD Conferences on climate change and official statistics
  - Oslo, 14-16 April 2008 (http://unstats.un.org/unsd/climate_change/default.htm)
  - Seoul, 11-12 December 2008 (http://unstats.un.org/unsd/climate_change/Korea/default.htm)
- No follow-up to the programme review was asked by the Statistical Commission in 2009.
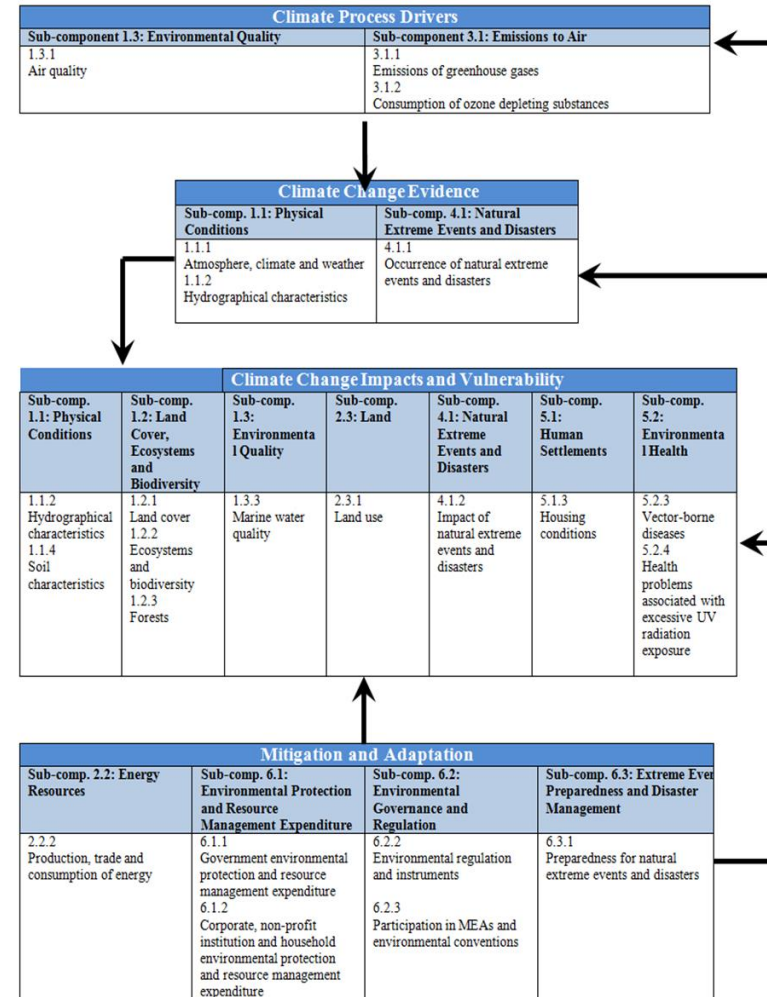
IPCC Framework

IPCC, 2007, Fourth Assessment Report
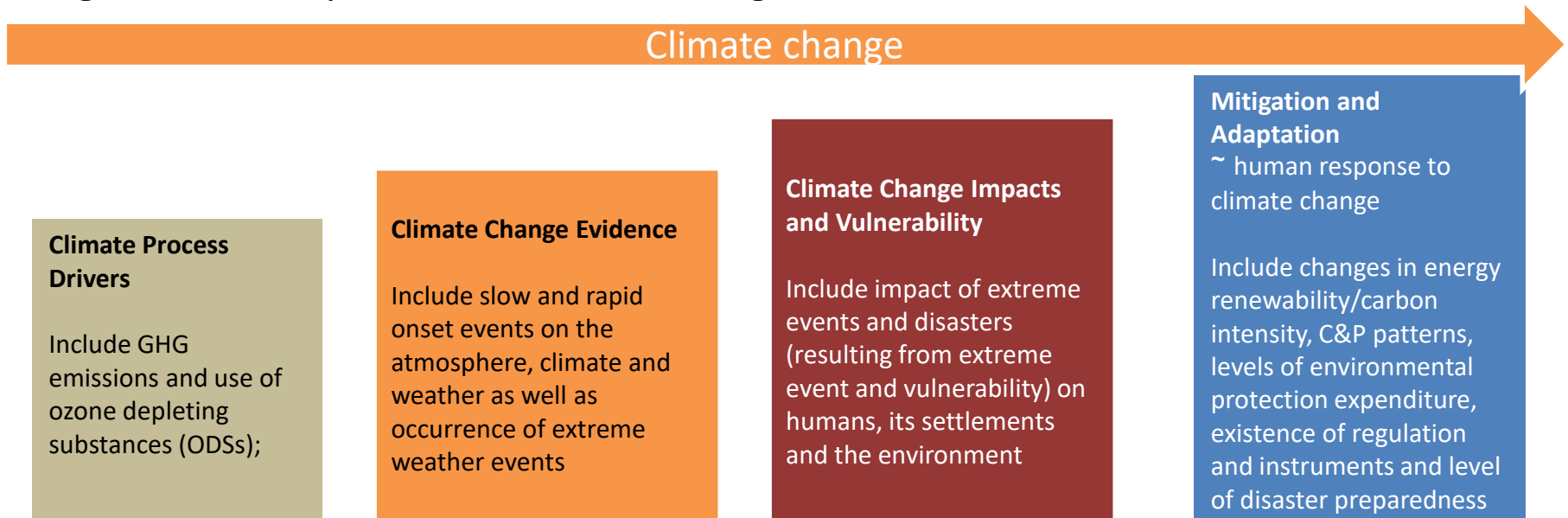
FDES & climate change statistics

- FDES cross-cutting application (Chapter 5) links climate change and environment statistics based on IPCC Framework (4th report in 2007)
- Integrating official statistics for climate change monitoring

Climate Process Drivers

Sub-component 1.3: Environmental Quality	Sub-component 3.1: Emissions to Air
1.3.1 Air quality	3.1.1 Emissions of greenhouse gases 3.1.2 Consumption of ozone depleting substances

Climate Change Evidence

Sub-comp. 1.1: Physical Conditions	Sub-comp. 4.1: Natural Extreme Events and Disasters
1.1.1 Atmosphere, climate and weather 1.1.2 Hydrographical characteristics	4.1.1 Occurrence of natural extreme events and disasters

Climate Change Impacts and Vulnerability

Sub-comp. 1.1: Physical Conditions	Sub-comp. 1.2: Land Cover, Ecosystems and Biodiversity	Sub-comp. 1.3: Environmental Quality	Sub-comp. 2.3: Land	Sub-comp. 4.1: Natural Extreme Events and Disasters	Sub-comp. 5.1: Human Settlements	Sub-comp. 5.2: Environmental Health
1.1.2 Hydrographical characteristics 1.1.4 Soil characteristics	1.2.1 Land cover 1.2.2 Ecosystems and biodiversity 1.2.3 Forests	1.3.3 Marine water quality	2.3.1 Land use	4.1.2 Impact of natural extreme events and disasters	5.1.3 Housing conditions	5.2.3 Vector-borne diseases 5.2.4 Health problems associated with excessive UV radiation exposure

Mitigation and Adaptation

Sub-comp. 2.2: Energy Resources	Sub-comp. 6.1: Environmental Protection and Resource Management Expenditure	Sub-comp. 6.2: Environmental Governance and Regulation	Sub-comp. 6.3: Extreme Event Preparedness and Disaster Management
2.2.2 Production, trade and consumption of energy	6.1.1 Government environmental protection and resource management expenditure 6.1.2 Corporate, non-profit institution and household environmental protection and resource management expenditure	6.2.2 Environmental regulation and instruments 6.2.3 Participation in MEAs and environmental conventions	6.3.1 Preparedness for natural extreme events and disasters

IPCC sequence of climate change

The IPCC Framework (4ᵗʰ report in 2007) was the basis upon which the stages of the sequence of climate change were constructed to substantiate the application of the FDES to climate change statistics.

The FDES application to climate change statistics identifies the components, topics and individual statistics that are needed to inform about each of the stages of the sequence of climate change:

Climate change

Climate Process Drivers

Include GHG emissions and use of ozone depleting substances (ODSs);

Climate Change Evidence

Include slow and rapid onset events on the atmosphere, climate and weather as well as occurrence of extreme weather events

Climate Change Impacts and Vulnerability

Include impact of extreme events and disasters (resulting from extreme event and vulnerability) on humans, its settlements and the environment

Mitigation and Adaptation
~ human response to climate change

Include changes in energy renewability/carbon intensity, C&P patterns, levels of environmental protection expenditure, existence of regulation and instruments and level of disaster preparedness

State of statistics and guidance

- **Climate process drivers** - statistics relatively more available.
  - ➤ Greenhouse gas (GHG) emissions transform into global concentrations.
- **Climate change evidence** - statistics relatively more available.
  - ➤ Temperature and precipitation are available over long periods of time.
- **Climate change impacts** and **vulnerability** - some statistics are produced on impacts but more are needed. For vulnerability, need to develop methodologies and capacity.
  - ➤ Emerging data needs: Extreme climate-related meteorological events and natural disasters increase in frequency and intensity.
- **Mitigation** and **adaptation** statistics are less often produced and more difficult to capture statistically.
  - ➤ Insufficient resources for measurement and lack of guidance.
  - ➤ Adaptation statistics, while may be produced for particular sectors, need to be linked to climate change statistics.

Report of the Secretary-General on Climate Change Statistics to the 47th session of the Statistical Commission

UNSD, in collaboration with UN-ECE, prepared the Report of the Secretary-General on Climate Change Statistics to the 47th session of the Statistical Commission (E/CN.3/2016/15) (New York, 8-10 March 2016).
http://unstats.un.org/unsd/environment/climatechange_docs_conf.html

Decision 47/112:
http://unstats.un.org/unsd/statcom/47th-session/documents/Report-on-the-47th-session-of-the-statistical-commission-E.pdf

Main decisions:
For countries: Use the FDES 2013 to guide the development of climate change statistics and indicators given the close interrelationship between environment statistics and climate change statistics.
For UNSD: Review and consider the set of climate change-related statistics and indicators of the Economic Commission for Europe as a basis for developing a global set of climate change statistics and indicators, applicable to countries at various stages of development.

UNSD: Globalizing climate change statistics and indicators

Mandate by Statistical Commission

2017/2018

Submission of SG Report on Climate Change Statistics to Statistical Commission

2019/2020

Submission of a list of indicators to the Commission

2016

UNSD Pilot Testing

2018

Launch of a Global Consultation
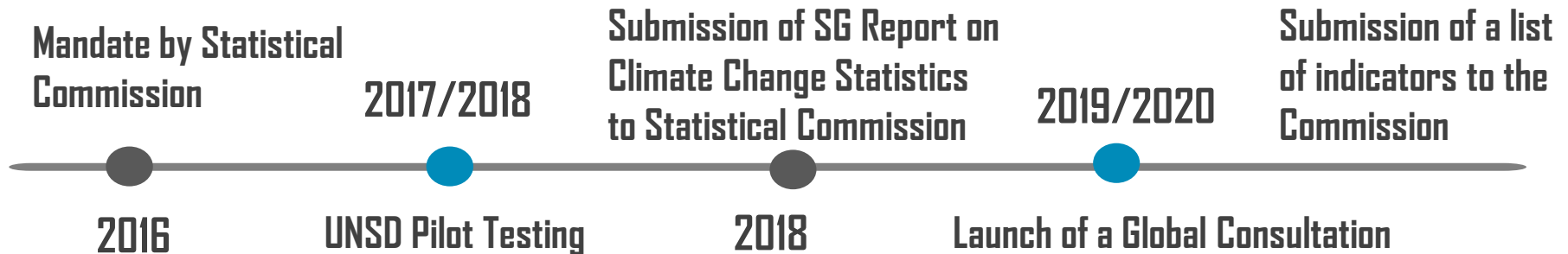
The UN-ECE set of indicators was endorsed by the Conference of European Statisticians plenary session in June 2017 as an initial list.

UNSD:

- has pilot tested the UN-ECE set of indicators with countries and analyzed the responses to assess its applicability for developing countries, in particular to consider areas of concern such as adaptation/vulnerability.

- has discussed the set of indicators in various fora, including the Expert Group on Environment Statistics (EGES), and regional and national capacity building workshops.

EGES website: https://unstats.un.org/unsd/envstats/fdes/fdes_eges.cshtml

United Nations Statistics Division

UNSD Pilot Survey on Climate Change-related Statistics and Indicators - summary

- The UN-ECE set includes 39 indicators, grouped into five areas:

  Drivers – Emissions – Impacts – Mitigation – Adaptation

- **12** countries (11 developing and 1 developed), most of which are part of Expert Group on Environment Statistics (EGES), responded to Pilot Survey.

- The Pilot Survey contained 13 questions for the 39 indicators that were identical to those used by UN-ECE.

- UNSD has summarized responses to:

  Question 1: Is this indicator available in your country? [Yes/No]

  Question 9: [If not] Which are the main problems in developing this indicator?

  Question 4.1: Is this indicator compiled by the NSO? [Yes/No]

Observations from the Pilot Survey and the EGES

- Methodological issues/Need clear definitions.
- Lack of technical capacity; constraint of human/financial resources.
- No policy framework.
- Specialized surveys needed/Lack of resources to conduct specialized surveys/Low survey response rates/Data quality issues.
- Lack of dedicated inter-institutional working group at national level focusing on climate change statistics.
- Some NSOs are highly involved in indicator compilation; others not.
- Several indicators not applicable/relevant (e.g., proportion of pop. living in dwellings with air conditioners or air conditioning), not available, not top priority, not significantly important, or too complex.
- Need to adjust indicators to reflect attribution and to include new sub-areas (such as oceans) or indicators which may be pertinent to developing countries, and to expand on areas such as adaptation which are of particular relevance to developing countries.
- Reporting methodologies, procedures and guidelines under negotiation at the UNFCCC.

Pilot Survey – key points

Demonstrated the need to develop:

- New or additional indicators to reflect situation in developing countries.

- Process on how to identify/modify the indicators based on:

  - existing global processes (e.g., incorporating indicators identified in adaptation and mitigation plans being submitted to UNFCCC).

  -regional and national policies, priorities and processes.

- Systematic process for a full consultation at national level to involve all stakeholders.

Report of the Secretary-General on Climate Change Statistics to the 49th session of the Statistical Commission

UNSD, in collaboration with UN-ECE and UNFCCC, prepared the Report of the Secretary-General on Climate Change Statistics to the 49th session of the Statistical Commission (E/CN.3/2018/14) (New York, 6-9 March 2018).
https://unstats.un.org/unsd/statcom/49th-session/documents/2018-14-ClimateChange-E.pdf

Decision: 49/113
https://unstats.un.org/unsd/statcom/49th-session/documents/Report-on-the-49th-session-E.pdf

Main decisions
For countries: (i) Participate in the Pilot Survey on Climate Change-related Statistics and Indicators currently being undertaken by UNSD, as well as in the planned Global Consultation on Climate Change Statistics and Indicators; (ii) Enhance collaboration between national statistical offices (NSOs) and national authorities responsible for reporting climate change related information to UNFCCC Secretariat;
For UNSD and UNFCCC: Strengthen the link between statistics and policy, for example, by: (i) undertaking joint initiatives in the development of climate change statistics and indicators; (ii) encouraging joint capacity building efforts and trainings with other partners, and exploring ways to encourage NSOs to be more involved in the preparation of data submissions to the UNFCCC secretariat, for supporting the implementation of the Paris Agreement.

UNSD: Globalizing climate change statistics and indicators (current activities/plans)

UNSD:

- presented the SG's Report on Climate Change Statistics to the 49th session of the Statistical Commission (6-9 March 2018).

- has reviewed the UN-ECE and the IPCC/FDES frameworks and identified links to the Paris Agreement.

- is reviewing the UN-ECE list of indicators and consulting other lists (international organizations (UNFCCC, WMO, FAO), regional institutions (UNECE, ESCWA, ECLAC, OECD), research (IPCC) national agencies (US EPA, New Zealand EPA), national reports (National Adaptation Plans, National Communications) and NGOs (Climate Reality, World Resources Institute) with a view to developing a suitable list prior to the Global Consultation.

- is developing a work plan based on the list of planned activities contained in the SG's Report to the 49th session of the Stat. Commission.

- is planning to develop an inventory of related work on climate change statistics by partner organizations.

- is planning to conduct the Global Consultation in 2019/2020.

UNSD: Globalizing climate change statistics and indicators (current activities/plans)

To strengthen the link between statistics and policy, UNSD is engaging closely with UNFCCC to develop the global set of climate change statistics and indicators. Some examples are:

- Joint report to the 49th session of the Stat. Commission (with UN-ECE)

- Joint Side Event at the 49th session of the Stat. Comm. (with UN-ECE/FAO)

- UNFCCC participates in the Expert Group on Environment Statistics

- UNSD participated in the Workshop on national **adaptation** goals/indicators and their relationship with the SDGs and the Sendai Framework for Disaster Risk Reduction in Tokyo in July 2018. Main discussions as they relate to statistics:

  (i) NSOs should be more engaged in the development of the national indicator reporting system on climate change given their experience in data compilation and dissemination, as well as their expertise in assessing data quality and availability which were stressed as fundamental to this work;

  (ii) while integration of the three frameworks was seen as important it was also emphasized that this could be quite challenging as both the SDG and the Sendai indicator frameworks are intended for global monitoring while climate adaptation indicators are more applicable at sub-national levels due to the nature of adaptation in the local context resulting in different type of indicators; and

  (iii) while it was stressed that global adaptation indicators should be established parallel to local indicators, the lack of data for effective monitoring was seen as a serious obstacle.

5th EGES meeting – key points on climate change

<u>Framework for Climate Change Statistics and Indicators:</u>

Expert Group agreed to use the areas of the IPCC framework (drivers, impacts, vulnerability, mitigation, adaptation,) to structure the global set of statistics and indicators as it would create a direct link to international policy and reporting to UNFCCC through the Paris Agreement.

<u>Global Set of Climate Change Statistics and Indicators:</u>

Expert Group agreed that indicators should be based on IPCC framework and linked to UNFCCC through the Paris Agreement to strengthen relationship between statistics and policy. The set of indicators should be limited in number to provide clear guidance for policy makers and encourage an inclusive and universal set applicable to all countries. It was agreed that a limited core set with additional indicators developed in a tiering system to cater to countries with different concerns, priorities and capabilities would be useful.

5th EGES meeting – key points on climate change

Role of National Statistical Offices (NSOs):

Expert Group discussed that existing structures in a country may provide an entry point and the NSO could become the national aggregator of the climate change information by mining National Communications reported to UNFCCC and putting them into context. The role of the NSO was seen as providing transparency and in raising awareness of climate change as an issue among a broad range of stakeholders. Expert Group discussed that NSOs could play a more active role in the national climate change committees.

Global Consultation on Climate Change Statistics and Indicators:

Expert Group discussed that the Global Consultation should take place in 2019-2020 and the results be ready prior to the Global Stocktake of the Paris Agreement (first one in 2023) to be available to collectively assess progress and implementation to address the information needs of the Global Stocktake. Guidance to implement the Transparency Framework of the Paris Agreement will most probably be finalized at the COP24 in Dec 2018. The implementation guidance is expected to shed more light on the data reporting requirements of the Paris Agreement, so exact dates of when to conduct the Consultation will be determined in due course.

Towards the global set of climate change indicators

(consulted sources to date)

International and Regional Sources

- IPCC Reports
- WMO
- FAO
- FDES
- SDG Indicators
- SEEA
- ECE
- EEA
- Other Academic/NGO institutions or frameworks

National Sources (80 to date)

- State of environment reports
- UNFCCC National Communications
- National Adaptation Plans (NAPs)
- National environmental protection agencies
- National Statistics Offices (NSOs)
- Ministry websites
  - Ministries of Environment
  - Ministries of Natural Resources
  - Ministries of Sustainable Development
  - Ministries of Energy
  - Bureaus of Meteorology

Towards the global set of climate change indicators

(consulted 80 national sources to date)

Towards the global set of climate change indicators

- In the growing list of climate change indicators, there are approximately 6000 indicators related to Drivers, Impacts, Mitigation, Adaptation, and Vulnerability. Many of which are repeated across different countries and organizations.

- Indicators come from documents which published by national bodies, such as the M. of Environment or National Statistical Offices, which contain country-relevant information, at least one national source has been taken from 80 countries. Besides, international and regional sources such as SDG indicators, FDES, IPCC reports and ECE have been taken into account to identify other key indicators.

- Currently, most country-specific indicators come from State of Environment reports or UNFCCC National Communications. Data from ministries of energy, meteorology and natural resources has also been considered.

- The lack of availability of indicators in the list does not mean countries do not report them, rather they were not explicitly reported in the national source which was accessed.

- Presented are the 17 common indicators for Drivers, 34 indicators for Impacts, 16 indicators for Mitigation, 24 for Adaptation and 20 for Vulnerability. The common indicators occur often and cover the majority (about 6000) of reported indicators which have been extracted so far.

Identifying the common indicators - Drivers

Common Indicators	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Overall GHG emissions..….. (includes emissions from CO_2, CH_4, N_2O, PFCs, HFCs, SF_6 and from production activities)	133	72
Waste generation (including wastewater).................................	120	38
Total energy consumption..… (indicates overall energy used by transport sector, household/capita, commercial and residential)	105	54
Area under land cover categories (land use/cover change)..................	72	66
Use of pesticides/fertilizers...	48	13
Livestock/cattle stock	39	29
Emission of NMVOC..	28	28
Number of vehicles...	18	16

Identifying the common indicators - Drivers

Common Indicators	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Energy intensity of the economy…………………………………………………….	18	12
Deforestation………………………………………………………………………………	17	14
Total energy efficiency of the economy………………………………………	11	8
SO$_2$ emissions……………………………………………………………………………..	7	5
Emissions of ozone depleting substances (ODS)……………………………	7	4
GHG emissions from land use/LULUCF………………………………………………	5	1
GHG emissions from households…………………………………………………….	4	2
Carbon intensity of energy for the economy……………………………………	4	1
CO$_2$ emissions from fuel combustion……………………………………………	3	2

Identifying the common indicators - Impact

Common Indicators

	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Occurrence of natural extreme events and disasters............	176	50
Impact of natural extreme events and disasters....................	125	30
Agricultural production...	114	51
Air temperature...	107	63
Precipitation..	90	59
Freshwater availability...	83	47
Land degradation..	70	32

Identifying the common indicators - Impact

Common Indicators

	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Water-related diseases and conditions……………………………..	50	36
Vector-borne diseases…………………………………………….	47	34
Airborne diseases and conditions………………………………….	46	29
Concentration of particulate matter or dust $(PM_{10}, PM_{2.5})$………	41	23
Sea level rise……………………………………………………….	34	30
Insolation/ Cloudiness…………………………………………….	30	19
Surface winds…………………………………………………….	26	24

Identifying the common indicators - Mitigation

Common Indicators

	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Increase in forest area ………………………………………………………	70	31
List of protected reserves to mitigate (forest/land/species/water etc.)………	59	49
Renewable energy use in overall consumption……………………………	45	14
Share of climate change mitigation expenditure……………………………	44	22
Share of energy and transport related taxes ………………………………	32	18
Sustainable practices and other preventive measures to mitigate………	31	19
Environmental monitoring (early warning systems, regulations)…………	20	9
Progress towards reducing GHG emissions………………………………	18	13

Identifying the common indicators - Mitigation

Common Indicators	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Research and development (R&D) on mitigation efforts	18	9
Various developments related to mitigation.................................	15	10
Total CC related subsidies and similar transfers/GDP...................	15	6
Policies in place to enhance climate change mitigation................	12	10
Carbon sequestration and trading...	4	1
Use of hybrid and electric vehicles..	3	1
Pro-environment activities and NGOs...	3	1
Resilience..	2	2

Identifying the common indicators - Adaptation

Common Indicators	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Distribution and status of known species ……………………………..	112	48
Energy production or supply ………………………………………………….	94	44
Use of water …………………………………………………………………….	85	42
Expenditure for adaptation……………………………………………….	84	33
Area which is protected …………………………………………………….	64	47
Early warning systems, mitigation strategies, published…………. forecasts accessible to the public	62	19
Number of climate-change-relevant plans/policies developed…	54	30
Population accessibility to water…………………………………………….	50	31

Identifying the common indicators - Adaptation

Common Indicators	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Population living in hazard-prone areas…………………………	33	18
List & description of green/environmental taxes……………	32	17
Utilization of adaptive agricultural methods or crops……..	23	11
Energy intensity of economy or sectors…………………….…	21	11
Use of renewable water resources…………………………….…	14	12
Progress in GHG emission reduction…………………………….…	14	11
Population accessibility to food………………………………………	14	9
Production of food ………………………………………………………	14	9
Carbon stock in soil………………………………………………………	7	5

Identifying the common indicators - Vulnerability

Common Indicators	**Number** of occurrences (both national/int'l)	**Countries** which have reported (out of 80 consulted)
Population living in coastal areas…………………………………………	48	29
Threats to crops and vegetation…………………………………………	42	26
Affects on fish production…………………………………………………	36	20
Vulnerability to the ecosystems…………………………………………	25	16
Vulnerability to water management ………………………………………	22	9
Electricity price……………………………………………………………	21	17
Population living below the poverty line……………………………….	18	17
Occurrences of extreme events/disasters……………………………	18	10

Identifying the common indicators - Vulnerability

<u>**Common Indicators**</u>	**Number** of occurrences (both national/int'l)	**Countries** which have reported (out of 80 consulted)
Endangered/vulnerable species………………………………………..	15	10
Affects on Mortality rate (both infant and maternal)………………	14	14
Various forms of risks (to species, water bodies and soil quality)…………………	13	7
Vulnerability due to Exposure to various elements ………………… (consists of exposure to UV/electromagnetic radiations, noise, degraded air, PM and Ozone)	12	7
Threats to Vegetation Cover……………………………………………..	9	6
Vulnerability to Food Security………………………………………………	9	5
Incidence of vector borne diseases………………………………………..	6	6
Population living in slums………………………………………………….	6	4

Identifying the common indicators - Vulnerability

Common Indicators

	Number of occurrences (both national/int'l)	Countries which have reported (out of 80 consulted)
Population living in hazard-prone areas…………………………..	5	2
National vulnerability index…………………………………………	4	3
Homeless population………………………………………………	4	1
Population with inadequate sanitation…………………………..	3	3

Further work on the global set of climate change indicators

- Continue compilation of indicators from more sources and identification of common indicators.

- Review/compile metadata for the common indicators (maybe just Tier 1) to promote international applicability and harmonization.

- Continue to engage with UNFCCC and other partners to strengthen the link between statistics and policy, e.g., by: (i) undertaking joint initiatives in the development of climate change statistics and indicators; and (ii) encouraging joint capacity building efforts and training (e.g. UNFCCC will participate in a workshop on env. stats. for the Arab region organized by UNSD in collaboration with UN-ESCWA, UNEP and EEA – Beirut, Nov 2018).

- Ensure linkage of the work on the global set of indicators to:
  - the Adaptation Programme of UNFCCC (Article 7 - Paris Agreement);
  - the Global Stocktake of the Paris Agreement (Article 14); and
  - the Transparency Framework of the Paris Agreement (Article 13), given that the implementation guidance is expected to shed more light on the data reporting requirements of the Paris Agreement.