



Data needs for addressing Climate Change – UNEP's perspective

UNEP/DEWA scoping paper

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1. Introduction: Climate Change tops the environmental policy agenda

Earlier this year, in February 2008, the UN Secretary-General Ban Ki-moon addressed the UN General Assembly in a High-Level Thematic Debate (“Addressing Climate Change: the United Nations and the world at work”), saying:

“We have moved climate change up to top of the agenda, where it belongs.... The United Nations is called on to ensure we can implement existing mandates, as well as future ones. Every part of the UN system is committed to supporting Member States as an effective, inclusive and credible partner in mitigating and adapting to climate change”. This momentum was generated in large part by the IPCC, which made clear that climate change is already happening and accelerating. UNDP's Human Development Report highlighted the devastating effects climate change is already having on the poorest and most vulnerable, making the achievement of the Millennium Development Goals more challenging. UNEP's flagship GEO-4 report concludes that adaptation to climate change is now a global priority, and calls for improved monitoring and enhancing our scientific understanding of the potential tipping points beyond which reversibility is not assured.

2. UNEP & the issue of Climate Change

With the release of the IPCC Fourth Assessment Report and the Bali Action Plan adopted by UNFCCC COP13, UNEP finalized its Medium Term Strategy (MTS) with six thematic priorities topped by Climate Change. Several other priority areas are very much related to climate change, such as ecosystem management, disasters and conflict, and environmental governance. Related to Climate Change, four themes were identified: adaptation, mitigation, science and communication.

UNEP's mandate to address climate change issues flows from its role as “*the leading global environmental authority that sets the global environmental agenda and one that promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system*” (from the Nairobi Declaration). For climate change the focus is on meeting the twin needs of vulnerable countries for environment protection and economic development and assisting them in integrating adaptation into their multi-faceted planning and deliberative processes. Three key pillars were identified i.e.

- Building key adaptive capacity of developing world
- Increasing ecosystem resilience and reducing the risk of climate-related disasters

- Mobilizing and using knowledge for adaptation planning

Twelve actions have been proposed around these pillars, such as establishing a global adaptation network, undertaking a global adaptive capacity assessment, using knowledge for integrated adaptation planning, managing water resources, coastal zones and sensitive ecosystems, and reducing risk of climate-related disasters.

UNEP is to *improve the understanding of climate change science* and communicate key scientific messages regarding climate change in clear and understandable way, by means of:

- Supporting the IPCC by disseminating its assessments and special reports,
- Providing climate change information to national governments, in partnership with the IPCC,
- Improving the understanding of greenhouse gas emissions from deforestation and forest degradation, and
- Providing scientific, legal and institutional support to developing country climate change negotiators and their institutions.

The overall objective to *strengthen the ability of countries to integrate climate change responses into national development processes*, implying that UNEP will assist vulnerable states to adapt to a changing climate by building resilience in sectors of national priority with *special focus on national, sub-national and city-level assessments*, ecosystems management, economic incentives, disaster preparedness and supporting the achievement of the MDGs.

UNEP/DEWA, with the overall responsibility on [UNEP] science, has been asked ‘to step up cooperation and engagement in the IPCC process’ while this cooperation should ‘be based on the common responsibility of bringing an understanding of the IPCC findings to bear on national development processes’, and work on the need to provide credible assessments on impacts and adaptation to climate change at sub-regional and national scales. Basically, every credible integrated assessment of climate change depends to large extent on the availability of official statistics related to weather and climate as well as socio-economic trends.

3. How can this be translated to data needs [for addressing the climate change issues of adaptation and mitigation]?

Taking into account the above strategic framework, objectives and action plans to address climate change, and analyzing various IPCC reports, most notably those of WG2 and WG3 under AR4, as well as the Essential Climate Variables (ECVs) that support the work of UNFCCC and IPCC, one can distill a number of *scientific* data and indicators that are needed to analyze and *communicate* the issues of *adaptation to* and *mitigation of* climate change. Mitigation refers to anthropogenic interventions to reduce the sources or enhance the sinks of greenhouse gases, and adaptation is concerned with addressing the consequences of climate change. Their co-dependency (e.g. planting trees in urban areas both increases greenhouse gas sinks (mitigation) and acts to cool surrounding areas (adaptation) calls for or climate change policies that address the two responses simultaneously. Also, many experts see little utility in isolated climate data if they are not supported by those on socio/economic/natural resources and environment. An integrated approach is needed, along with a solid time coverage - long time series are required, going back 50 years or even more.

The most relevant identified sets of variables are the following:

A. Observed changes in climate and weather indicators (Intergovernmental Panel on Climate Change, 2007):

- Air temperature
- Ocean temperature
- Sea level
- Snow cover
- Mountain glaciers
- Arctic sea-ice extent
- Permafrost extent
- Heavy precipitation events
- Droughts
- Heat waves
- Tropical cyclones
- Cold days and nights
- Hot days and nights
- Hot extremes

B. Essential Climate Variables: (WMO/GCOS,

<http://www.wmo.ch/pages/prog/gcos/index.php?name=essentialvariables>)

The Essential Climate Variables (ECVs) are required to support the work of the UNFCCC and the IPCC. All ECVs are technically and economically feasible for systematic observation. It is these variables for which international exchange is required for both current and historical observations. Additional variables required for research purposes are not included in this table. The order below is simply for convenience and is not an indicator of relative priority.

1) Atmospheric domain (over land, sea and ice):

- a) Surface: Air temperature, Precipitation, Air pressure, Surface radiation budget, Wind speed and direction, Water vapour.
- b) Upper-air: Earth radiation budget (including solar irradiance), Upper-air temperature (including MSU radiances), Wind speed and direction, Water vapour, Cloud properties.
- c) Composition: Carbon dioxide, Methane, Ozone, Other long-lived greenhouse gases, Aerosol properties.

2) Oceanic domain:

- a) Surface: Sea-surface temperature, Sea-surface salinity, Sea level, Sea state, Sea ice, Current, Ocean colour (for biological activity), Carbon dioxide partial pressure.
- b) Sub-surface: Temperature, Salinity, Current, Nutrients, Carbon, Ocean tracers, Phytoplankton.

3) Terrestrial domain: River discharge, Water use, Ground water, Lake levels, Snow cover, Glaciers and ice caps, Permafrost and seasonally-frozen ground, Albedo, Land cover (including vegetation type), Fraction of absorbed photosynthetically active radiation (fAPAR), Leaf area index (LAI), Biomass, Fire disturbance, and as emerging ECV: Soil moisture.

C. Key impacts as a function of increasing global average temperature change (impacts will vary by extent of adaptation, rate of temperature change, and socio-economic pathway) (derived from IPCC Figure AR4-WG2 SPM.2):

Water:	Water availability and droughts in tropics, high latitudes, mid-latitudes and semi-arid low latitudes Number of people exposed to (increased) water stress
Ecosystems:	Number and risk of extinction Coastal wetlands, area Coral bleaching Species range shifts and wildfire risk
Food:	Productivity of cereals at low-mid-high altitudes Local impacts on small holders, subsistence farmers and fishers
Coasts:	Number of people exposed to coastal flooding each year Damage from floods and storms Average rate of sea level rise
Health:	Changed distribution of some disease vectors Burden from malnutrition, diarrhoeal, cardio-respiratory, and infectious diseases Morbidity and mortality from heat waves, floods, and droughts Burden on health services (expenditures)

D. Mitigation variables: (derived from IPCC Figure AR4-WG3 SPM.3)

General:	GHG emission trends (CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, SF ₆) Population, urban and rural, poverty, migration Land cover and land use change, land degradation GDP and PPP, sector value added, household consumption
Energy:	Energy use, supply and intensity (by sector), production and use of renewable energy (solar, wind, hydro, geothermal, biofuels), nuclear power, natural gas, coal, oil, gas.
Transport:	Number of hybrid and cleaner diesel vehicles, transport volume by rail/road/water/air/non-motorized
Buildings:	Use of energy-saving bulbs, improved cook stoves, isolation
Industry:	Material recycling and substitution rates, heat and power recovery etc.
Agriculture:	Afforestation, reforestation, forest management, avoided deforestation, harvested wood product management
Waste management:	Landfill methane recovery, composting of organic wastes, waste disposal, treatment and recycling, waste water treatment
Policies:	Climate policies and measures, carbon prices, emission trading, budgets and expenditures for climate policies, meteorological monitoring.

4. And how does this again translate into needs for official statistics?

Many of the above world-wide climate-related data and indicators are collected through scientific measurements e.g. temperature, precipitation, radiation and so forth. Others are compiled by international agencies on the basis of statistical surveys, often using national statistical sources and more recently also remote sensing data. This holds for example for population (UN Population Division), GDP (UNSD and World Bank), forestry and agriculture (FAO), health (WHO), energy (IEA) etc. But various additional data need to be collected and/or compiled to adequately address the climate change adaptation and mitigation issues. If one then tries to identify those additional data and indicators for which it is expected that national statistical offices can play a role in (strengthening of) collecting information on a regular basis, one can distill the following list:

- Air emission reporting, most notably in non-Annex 1 countries, and including underlying energy and activity data
- Data on infrastructure development (roads etc) and building volumes (houses, offices, industrial plants etc)
- Use of energy-saving technology (bulbs, building isolation, hybrid cars etc)
- Use of certified wood products
- Use of emission trading and climate compensation schemes (including carbon prices)
- Volume data on transport modes (motorized and non-motorized)
- Material recycling and substitution
- Water use
- Land/vegetation cover and ecosystems areas (wetlands, coasts)
- Species extinction, migration patterns
- Harvest and crop production (wheat, maize, rice etc)
- Mortality and morbidity (specific diseases)
- Number and extent of natural disasters (floods, fires, storms, droughts, heat & cold waves) and the damage they cause
- Budgets and expenditures on health services, disaster prevention & damage repair

The challenge is to identify and specify those data variables for which new or additional efforts are needed by statistical offices and international partners in the immediate future. Such variables could include for example: carbon emission trading, number and extent of natural disasters by type, budgets/expenditures on climate-related preventive measures and disasters, material recycling and substitution, use of renewable energy sources, eco-labelling and use of certified products.

5. Conclusion

Climate change is now at the top of the world's agenda, and adaptation and mitigation are among the biggest challenges ever faced by society. UNEP is making its contribution by committing to communicate and address the issues of adaptation and mitigation based on sound data and science to policy-makers and the wider public. While a vast amount of data and indicators is already available for analysis and information purposes, more data of high quality are needed and national statistical offices can play an important role in collecting new and additional data and, together with UNSD and other agencies, also in strengthening and harmonizing existing surveys and other data collection activities in the area of adaptation to and mitigation of climate change.

Besides 'real' physical climate data, it is important to consolidate and improve authoritative data collections and compilations in the socio-economic and natural resources realms, using statistical surveys but possibly also other sources such as satellite imagery – the end goal is having proper, authoritative data in place to assess and address climate change issues adequately at all levels.