Executive Summary of Draft Report of COS Task Team on Observations for Adaptation

For consideration at GCOS SC Meeting, Paris, October 30 2019

1. Introduction and Context

GCOS was established in 1992 with its key purpose to facilitate coordinated climate observations globally and to regularly report on the adequacy of the global climate observing, ensuring that the information needed to address climate-related issues is obtained and made available to all potential users. Much of GCOS's work to date has been in support of the activities of WGI of the IPCC.

The 22nd Conference of Parties of the UNFCCC (COP22) established the Global Stocktake (to happen at 5-year intervals from 2023) as a tool to track global efforts in addressing climate change, including adaptation. Article 14 of The Paris Agreement specifies these measures. "*The Global Stocktake shall*

- Recognize adaptation efforts of developing country Parties;

- Enhance the implementation of adaptation action taking into account the adaptation communication referred to in paragraph 10 of this Article;

- Review the adequacy and effectiveness of adaptation and support provided for adaptation." The Article furthermore "*noted the important role of the Global Climate Observing System in meeting the need for climate observation and climate services under the Convention […]*."

Consequent to the requirements outlined in COP22, observational needs for adaptation became a key element of the most recent GCOS Implementation Plan, where the first and fourth action items are dedicated to adaptation:
Action G1: <u>Guidance and best practice for adaptation observations:</u> Produce guidance and best practice for climate observations for adaptation. This would include advice on using the global and regional requirements at a national and local level, and guidance and best practice on prioritization of observations, implementation, data stewardship and reporting. Promote the use of this guidance by parties and donors. Review the use of this guidance and requirements and revise as needed.
G4: <u>Indicators for adaptation and risk:</u> Promote definition of, and research supporting, the development of indicators linking physical and social drivers relating to exposure, vulnerability and improved resilience, in line with national requirements

The purpose of this report is, in light of the adaptation information needs of individuals, organisations and governments, to review the current scope of observations to determine their adequacy for the needs of the community as well as to provide data to

assist in tracking progress of adaptation. The vision is to make GCOS an essential collaborator in the global stocktake process, in direct support of the activity of UNFCCC as well as WGII (Impacts, Adaptation and Vulnerability) of the IPCC.

The key focus of this initiative is to investigate potential support to the global stocktake and IPCC WGII. In line with this, our analysis is framed around the core concepts of WGII Assessment Report 5 (AR5) (IPCC, 2014) as shown in Figure 1 below.

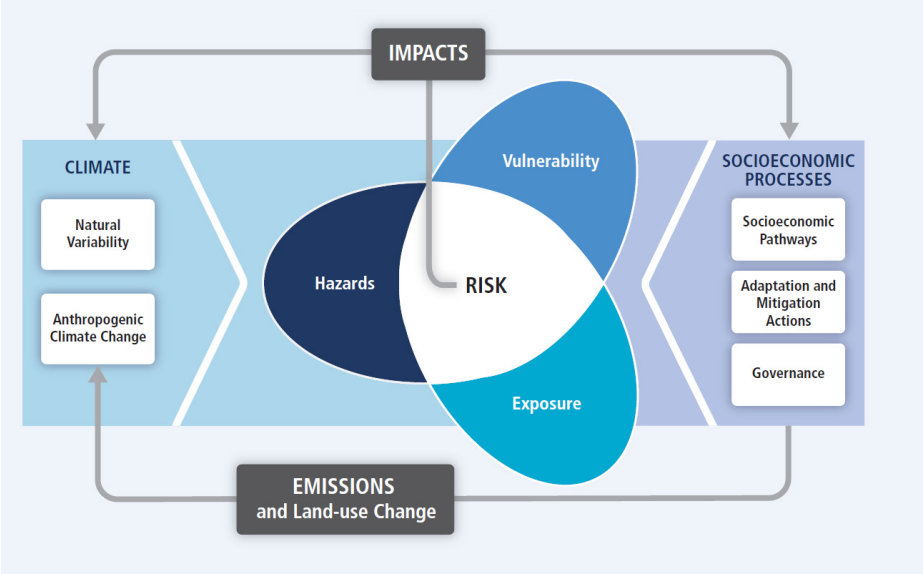

Figure 1. Risk of climate-related impacts results from the interaction of climate-related hazards (including hazardous events and trends) with the vulnerability and exposure of human and natural systems. Changes in both the climate system (left) and socioeconomic processes including adaptation and mitigation (right) are drivers of hazards, exposure, and vulnerability (IPCC, 2014).

GCOS already provides key observations (as the existing Essential Climate Variables - ECVs) of the climate system that feed into the analysis of climate hazards, as well as the core business of supporting the WGI community. There is considerable potential to also contribute to understandings of exposure, with potential extensions to vulnerability and impact. Through this, GCOS can provide information (and indicators) to inform adaptation ('indicators for adaptation'). Moving to the right of the diagram it is recognized that adaptation is a socioeconomic process. While this is likely to be of less direct relevance for earth observation information, there could be areas where it is possible to observe adaptation and potentially produce adaptation indicators (i.e. 'indicators of adaptation'). Most likely this would involve GCOS working with other organizations with various degrees of connection to the UNFCC, e.g. WMO-GFCS, UNESCO, UNEP, World Bank, C40 Cities, 100 Resilient Cities, Global Commission on Adaptation, Green Climate Fund, etc.

2. Key Considerations – Adaptation Indicators

Adaptation policy, programs, plans and implementation are usually developed using a cycle (UKCIP, 2003) where the final key step in the cycle is monitoring and evaluation of the adaptation to assess its effectiveness and efficiency during and after

implementation, and to assess if the anticipated benefits have been realised. To help with this evaluation process, policies, plans and projects often use theory of change or logic models (HMT, 2011) to support a structured and quantitative approach.

This theory of change is important when considering potential indicators for adaptation, and indicators of adaptation. Ideally, indicators should reflect the anticipated outcome of the policy or project, i.e. to ensure that it measures the anticipated effects. However, it is extremely difficult to generate outcome-based indicators for adaptation. This is because the effects of adaptation are often difficult to distinguish or attribute from climate variability, and because more pro-active adaptation activities normally deliver benefits that fall outside a typical programme or project lifespan. As a result, progress towards adaptation is often measured with process-based indicators (i.e. is there a plan or how many plans?) or output based indicators (e.g. km of shoreline protected).

The combination of the WGII core concepts, as well as the different types of indicators, does mean there is a matrix of possible indicators i.e.

- Hazard, exposure, vulnerability, impact or adaptation indicators; and
- Process-based, output-based or possibly outcome-based indicators.

In seeking to identify a set of adaptation indicators, whether they are indicators of or indicators for adaptation, it is useful to establish criteria against which potential indicators can be evaluated. By taking this approach, a consistent set of indicators can be constructed. Potential criteria include that an indicator should be:

Simple. Adaptation indicators are often used as a tool for communication, and for building capacity and awareness around climate change and its potential effects. As such, an indicator should be easy to explain in terms of what it represents – what variables are used in its construction, what the indicator captures in terms of the geo- and bio-physical environment, and what changes in the indicator represent in terms of informing us about global change.

Sustainable. Adaptation indicators are used to evaluate change over time, to understand whether systems are becoming more or less exposed, more or less vulnerable, and whether adaptation activities are leading to a reduction in exposure and vulnerability. As such, it would be pointless to select an indicator in the absence of confidence that the variables used in its construction are going to be continually and consistently measured over the long term (where long term represents over the order of decades).

Universally consistent: By 'universally consistent', an indicator should mean, in terms of adaptation, the same thing everywhere. This is desirable but in reality may be hard if not impossible to achieve for global indicators because of the effects of intervening factors such as development. For example, irrigation which reduces vulnerability of agriculture to drought may be regarded a positive adaptation in developing countries, whereas increased water abstraction from already stressed rivers in countries with highly-developed irrigated agricultural systems would be seen as a negative.

Objective. To allow comparison across space and time, the data used to construct an adaptation indicator should be measured in the same way everywhere. This may be

difficult to achieve, particularly with socio-economic variables. For example, there is no universal definition of flood as it applies to flooding of property.

Replicable. If two people set out independently to calculate the same adaptation indicator, they should arrive at the same answer. This implies careful documentation both in the set-up phase and over the lifetime of the indicator, for example to record any changes in instrumentation or measurement practice.

Traceable. In a heavily debated field such as climate change, it is particularly important that an indicator can be subjected to intense scrutiny. This requires that there should be careful documentation of the construction process, and that the underlying datasets are readily and publicly accessible. This will allow for reconstruction and hence verification of the indicator.

3. GCOS's Potential Role in Developing Adaptation Indicators

The previous discussion suggests that GCOS, through its ECVs can contribute to efforts around the global stocktake to (1) provide clear indicators to inform adaptation *(indicators for adaptation)* e.g. key information about hazards and the links to exposure/risk, as well as (2) provide the possibility, through some ECVs, to directly observe adaptation *(indicators of adaptation)*.

Opportunities for GCOS to contribute, *using the example of TOPC in the first instance*, are in four areas - three of them largely within existing capabilities (below and Table 1).

- **A.** Improved understanding of climate change impacts and adaptation imperatives through provision of geospatial data inputs relevant to bio-geophysical modelling (observations for adaptation) *e.g. input to regional climate models, agro-ecological models, coastal and flood risk models (relevant ECVs would include sea-level, soil moisture, and LULC change).*
- **B.** Improved understanding of climate change impacts and adaptation imperatives through provision of geospatial data inputs relevant to assessment of climate-related risk (observations for adaptation) *e.g. input of geospatial data on geographic distribution of developed land cover (relevant ECV) subject to certain climate hazards, spatial distributions of active fire/fire burnt area (relevant ECV), etc.*
- **C.** Use of (possibly enhanced) existing ECVs to extract information on the spatiotemporal development of adaptation (i.e. observations of adaptation) for a limited number of examples *e.g. shifts in LULC (ECVs reflecting changes in agricultural patterns, urban land cover change), anthropogenic use of fire, prescribed burning (active fire ECV), etc.*
- **D.** Possible new ECV(s), developed in collaboration with other organizations, to provide information on human adaptation (i.e. observations of adaptation) for certain examples – these might be related to existing ECVs or could be completely new ECVs, not necessarily physical/climate related *e.g. tracking*

green cover in cities, tracking Green Climate Fund budget on adaptation, investment in coastal infrastructure, mapping development of coastal defenses, etc.

A key issue for **A, B** and **C** may be the inadequacy of the existing GCOS ECV data sets, for example the spatial resolution of these data for modelling, risk assessment or adaptation observation requirements. Resolution is likely to be adequate for bio-geophysical modelling (100-1000m resolution), but may not be for risk assessment or adaptation observation (where 1-10m resolution may be needed). Larger scale shifts in agricultural land cover may be an exception. For **D** it will likely be necessary for GCOS to identify a limited number of appropriate adaptation ECVs and partners to work with. Consideration will need to be given to the criteria described above, so that the new ECV(s) are appropriate for purpose.

Table 1. Opportunity for GCOS TOPC to contribute to global adaptation monitoring (1st cut)

Terrestrial ECV	**Services A, B or C?**	**Spatial/temporal adequacy of data**
River discharge	B	Y
Anthropogenic water use	C	Y?
Groundwater	C	Y
Lakes	C	Y
Snow cover	A	Y
Glaciers		
Permafrost		
Albedo	A, C	Y
Land cover	A, B, C	N
FAPAR		
Leaf area index	A	Y
Above-ground biomass	A, C	N?
Fire disturbance	A, B, C	Y
Soil moisture	A, C	Y
Soil carbon	C	N
Ice sheets	A	Y
Latent fluxes	A, C	Y
Surface temp	A, C	Y

4. Recommendations

The following recommendations are put to GCOS SC for consideration

a.) Each of the GCOS Panels review their ECVs for their suitability to contribute to the activities of WGII and the Global Stocktake, under the **A, B** and **C** headings outlined above. Panels should consider whether existing spatial and temporal resolutions would be suitable for purpose and how any inadequacies could be addressed.

b.) That GCOS, through a designated sub-committee develops a process, in collaboration with other relevant organisations, to identify one or more potential new ECVs (**D** heading above) that could be developed in collaboration with (or by) other organisations for the purpose of tracking adaptation progress globally.

c.) That progress on a) and b) be reported back to GCOS SC by *(mid-2020?)*.

References

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