



2. PROGRESS REPORTING

2.1 PRESIDENT'S REPORT

Societal challenges in a 10 years' perspective as seen by CAS

- High Impact Weather and its socio-economic effects in the context of global change
- Water: Modelling and predicting the water cycle for improved DRR and resource management
- Integrated GHG Information System: Serving society and supporting policy
- Aerosols: Impacts on air quality, weather and climate
- Urbanization: Research and services for megacities and large urban complexes
- Evolving Technologies: Their impact on science and its use

The societal challenges are addressed through the projects in GAW and WWRP. The whole earth system is involved, and seamlessness across time and space scales is aimed for. Seamless data-processing and forecasting is a cross cutting issue in WMO and has a strong R&D component. (Cfr. The mandate of the steering group for global data processing and forecasting system (GDPFS), led by CBS.

See: <https://www.wmo.int/pages/prog/www/DPFS/Future%20GDPFS/Future-GDPFS.html>

The involvement of CAS is important here, as "science for service" is an essential component in the value chain(s) in meteorology/earth system services. The outcome of the World Weather Open Science Conference in Montreal in August 2014 provides a useful fundament for the work.

There are structural challenges related to research within the various technical commissions of WMO and within undertakings co-sponsored by WMO, like GCOS, WCRP, WGNE. It is not obvious that the value chains are served in an optimal way by the current functioning of the TCs and the cosponsored undertakings.

The evolution of the value chain concept is important and several challenges appear, for instance:

- Services are becoming more and more specialized, Internet based and without a clear institutional brand
- WIGOS is important for the data processing and needs to outgrow the WMO traditional domain
- Sustainable data management is becoming a big issue (high volume, high velocity, high variety)
- WMO and NMHSs' role in the global weather enterprise
- «Big data» vs the traditional WMO controlled observational data flows
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Impressions from recent meetings of WCRP steering committee, WWRP SSC, GAW SSC, WGNE

The WCRP SSC-meeting last year was held from 8 to 10 April 2015 in Geneva. WCRP has accomplished a lot and has moved climate science forward significantly, it has mobilized the best climate scientists and provided an organization for them that has been very effective. WCRP is an important driver of the IPCC process, and the IPCC process in turn reinforces WCRP. For WMO as a co-sponsor of WCRP, it is important that WCRP directs a good share of their resources to the science to service chain. Examples already functioning are the issuing of

decadal forecasts in the same way as done for seasonal forecasts. About ten global centres already provide decadal projections. Another urgent need is climate projection analysis for spatial and temporal scales appropriate for specific societal sector needs. Methods used involve dynamical downscaling, empirical statistical downscaling, use of non-uniform resolution and other more or less seamless approaches, use of various ensembles of projections, bias correction, etc.

WWRP SSC was held in Geneva, from 24 to 27 November 2015. Among the discussion items was the Aviation Research and Demonstration Project AvRDP organized by the Commission for Aviation Meteorology. Aviation meteorology forecasting is moving towards increasing integration of high-resolution meteorological data into 4-D Air Traffic Management decision support systems to support and enable more efficient trajectory-based (gate-to-gate) operations. This transition from the traditional product-based 'briefing and advising' approach to one based on the application of the best data by air traffic management decision support systems will result in significant changes to current aviation meteorological service delivery. This is the reason why we are working with the Commission for Aviation Meteorology not only in carrying out their Aviation Meteorology Research and Demonstration Project (AvRDP), where the purpose is to demonstrate and quantify the benefits of end-to-end nowcasting aviation weather services for the terminal area focused on high impact weather (<https://avrpd.hko.gov.hk/>), but to extend the scope to become end-to-end for the flight itself. The resourcing of AvRDP also needs attention; a trust fund is required.

Aerosols and their impacts on air quality, weather and climate, is one of the six priority challenges in CAS. The aerosol theme in NWP has been explored to some extent by WGNE and it seems to be considered as a second order effect where a high level of new detail in the model formulation is not justified. This should be pursued further, not least in view of the significant role of aerosols in upholding the full climate change effect of the increasing global greenhouse gas emissions, as judged by the results of earth system model calculation.

The GAW SSC was held in Geneva, from 15 to 17 March 2016. GCOS was reported on and discussed. An important discussion for CAS (and GCOS) is how can GCOS contribute to the nurturing of its underlying observational data streams from e.g. GAW? How can GAW and GCOS together promote and trigger resource mobilization for IG3IS?

UNEP was represented at the GAW SSC meeting (Valentin Foltescu), and this provided helpful and important exchange of information and plans between CAS and UNEP. An example is the setup by UNEP of inexpensive air quality monitoring systems: what is their quality as judged by the quality assurance procedures in place in GAW? GAW can provide a statement of the reliance/qualification of cheap air quality sensors. It was pointed out that a unified, global aerosol observing system is not in place, while there are some contributing global networks (NOAA). Michael Williams, from the communication part of WMO, said that the GHG bulletin is one of the strongest documents of communication from WMO, and that the aerosol bulletin is also important. Events, like the ash cloud from Eyafjällajökull, provide opportunities for exposure of WMO capabilities. Phil de Cola (NASA Goddard), who is engaged to develop and promote IG³IS, gave a report on his work to create interest among stakeholders, underlining that IG³IS is designed "to help making informed GHG emissions estimates".

WGNE met at CSIR in Pretoria, South Africa, from 26 to 29 April 2016. WGNE lives up well to its mandate, which is:

- (a) fostering the development of atmospheric circulation models for weather, climate, water and environmental prediction on all time scales and diagnosing and resolving shortcomings;
- (b) co-ordinate numerical experimentation for validating model results, observed atmospheric properties, exploring the natural and forced variability and predictability of the atmosphere;
- (c) refining numerical techniques, and the formulation of atmospheric physics processes;

(d) monitors the advances in data assimilation and analysis methods, review reanalysis projects to provide a multi-year homogenous data set for atmospheric and climate diagnostic studies.

UN International Law Commission (ILC), Palais des Nations, 4 May 2016. The UN ILC is mandated to develop international legislation "On the protection of the atmosphere". To inform the ILC, two informal sessions have been held with scientists (7 May 2015 and 4 May 2016), and I have taken part in both events with talks on "Scientific aspects of the atmosphere: A general overview", and "Geoengineering, a way forward?". The work of the commission is important and may lead to the adoption of legislation parallel to the UN Convention on "The law of the sea" (1982).

The members and chair persons of all the groups in GAW, WWRP, WGNE and WCRP are thanked for all their efforts, and the WMO secretariat for its very able support.