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Report of Chair JSC OPAG-EPAC

(submitted by Chair OPAG EPAC)

Purpose of Document and Major Decision(s) Requested

Air pollution policy usually is addressed on the local, national or regional level. WMO is a truly global organisation and through GAW and its strategic plan WMO is well positioned to support and join together the national and regional efforts even more than today. WMO is well placed to pursue a global technical coordination of the analysis of the distribution of air pollution, and to provide advice to policy makers. The CAS MG is encouraged to support this development and to note and promote the role that GAW plays in the analysis of the air pollution – climate change impact (both ways), the nitrogen cycle (both oxidised and reduced nitrogen) and the link between air pollution and health/mortality.

Summary of Activity

OPAG EPAC (GAW) provides global technical underpinning of several important environmental problems linked to climate change, stratospheric ozone depletion, acidification, eutrophication, visibility degradation, surface ozone change, UV radiation, urban air pollution and population exposure (health).

The main scientific and technical work in GAW is coordinated by the Science Advisory Groups:

- UV Radiation (SAG UV)
- Aerosols (SAG Aerosols)
- Ozone (SAG Ozone)
- Precipitation chemistry (SAG Precipitation Chemistry)
- Greenhouse Gases (SAG Greenhouse Gases)
- Reactive Gases (SAG Reactive Gases)
- Urban Research Meteorology and the Environment (SAG GURME)

All the SAGs are active and reflect the growing concern about how air pollution feed into the environmental problems listed above.

Air pollution policy usually is addressed on the local, national or regional level. WMO is a truly global organisation and through GAW and its strategic plan WMO is well positioned to support and join together the national and regional efforts even more than today. As an example, in Europe the EU and the UNECE CLRTAP provides the regional emission controls required to reach specific environmental targets. The scale-overarching character of air pollution and its effects create a need for instance in Europe to extend the geographical focus from Europe itself to include also North America, Russia, EECCA countries (East Europe, Caucasus and Central Asia) and North African countries, and also other continents as the influence of other continents on air pollution in a given continent like Europe, increases.

Also the interaction between air pollution, long range transport, climate change and the reactive nitrogen cycle shows that it is important to develop science and policy arenas that are appropriate in their geographical dimension (ie need to be global) and scope in order to address the issues properly.

These considerations are supported by the GAW Strategic Plan. WMO is well placed to pursue a global technical coordination of the analysis of the distribution of air pollution, and to provide advice to policy makers. The CAS MG is encouraged to support this development.

The 20th century was a period of unprecedented change: global population increased from 1.7 billion to 6.1 billion, global GDP increased nineteen-fold, and the use of fossil fuels grew fifteen fold. The enormous expansion in the global production of goods and services has allowed the world to sustain much larger populations and higher standards of living than at any time in human history. However, to support this growth, natural resources have been consumed at increasingly unsustainable rates and environmental degradation has accelerated. Air pollution is one of the consequences of this unprecedented change. The World Health Organisation (WHO) estimates that 2 million people worldwide now die prematurely each year as a result of poor air quality; by comparison in 2005 an estimated 2.9 million people died from AIDS and in 2006 1.7 million died from tuberculosis. Air pollution is clearly a significant global problem. The main air pollutants are particulate matter (PM), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and nitric oxide (NO) known together as nitrogen oxides (NO_X), carbon monoxide (CO), lead (Pb), and ground-level ozone (O_3).

A particularly important global initiative where GAW will supply important information including near real time observations, is GEOSS and its European component GMES (KOPERNIKUS). This is planned as a services providing process assessments; day-by-day analysis of the atmosphere at various space/time scales; key information on long range transport of atmospheric pollutants; overviews and initial and boundary conditions for air quality models; sustained monitoring of greenhouse gases, aerosols and reactive gases such as tropospheric ozone. In Europe the primary themes are Climate Forcing; Air Quality; Stratospheric Ozone and Solar radiation.

Air pollution is becoming more and more globalised. Emissions grow fast in the Far East; there is globalisation of the economy with consequences for intercontinental transport of air pollution; aircraft emissions (ICAO); shipping emissions (IMO); changes in biomass burning and forest fire frequency and extent). There is increasing attention to the intercontinental transport of air pollution and its contribution to the pollution levels in various regions (Europe, the Arctic, marginal seas, etc.). WMO through GAW supports many of the technical initiatives regionally and globally.

Air pollution changes as climate variability and trends change. Climate variability and change have consequences for atmospheric composition. The adaptation of societies to climate change has consequences for atmospheric composition e.g. through changes in the emissions from energy consumption as the energy production system moves towards more extensive inclusion of renewable energies including biofuels.

Open data policy is an essential element for the success of GAW. The UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (The Aarhus Convention, adopted 1998) states that “In a democracy, the people have the right to gain access to information, including environmental information. The government has the responsibility of supporting the public interest by making it easy to

access that information. To ensure that this fundamental democratic right is fully realized in practice, the Convention elaborates on the specific rights of individuals. Some key questions people ask about the right to know are: Anyone can ask for any environmental information possessed by any governmental agency or any private body that serves a public function. The person making the request does not have to be citizen or resident of that State and does not even have to provide an interest or a reason. NGOs can request information regardless of where they are legally registered."

Air pollution changes as climate variability and trends change. The air quality development over the next decades (2010-2050) will be influenced by the coupling between climate variability/change and air quality/atmospheric composition and deposition. A regional focus is here of special importance (cfr summer-2007 air pollution event in the Eastern Mediterranean, and droughts in the Mediterranean countries). Trends in the geographical distribution of the population are also important to note (cfr megacity evolvement in Asian cities, Mexico City, Greater London incl the Low Countries, the Po Valley, Istanbul; Cairo).

Climate adaptation will have consequences for the transboundary air pollution as the energy production system moves towards more extensive inclusion of renewable energies including biofuels. There are feedbacks between the biosphere and the atmosphere, for example the feedbacks between changes in CO_2 and O_3 on biomass growth and emissions (VOC, NO_x); and feedbacks between changes in temperature and precipitation on the one hand and changes in biomass growth and emissions of biogenic VOC and NO_x on the other.

Particulate matter and ozone has a direct effect on the population, and GAW is making important contributions to the characterization of the physical and chemical composition of atmospheric particulate matter.

The atmospheric component of the biogeochemical cycle of reactive nitrogen including its relation to the sequesteration of carbon in ecosystems, is not well known. (Reactive nitrogen cascades through environmental compartments with approximately 165 MtN of reactive nitrogen produced each year, of which about 75% is related in some way to agriculture and 25% to the combustion of fossil fuels and the industrial use of nitrogen. This is an emerging field where GAW is positioned to make important contributions.

In the understanding of atmospheric physical processes, it is important to quantify fluxes of exchange between terrestrial ecosystems and the atmosphere, and between the oceans and the atmosphere (focus on fluxes rather than concentrations). Pollution exchange between scales need to be characterized: urban, regional, hemispheric, global, including the forecasting of both air quality and of derived quantities like transboundary pollution fluxes and source-receptor relationships on the European, hemispheric and global scales. The interaction between the hydrological cycle and biogeochemical cycles is important in climate change and GAW can provide essential information.

GAW is moving from an atmospheric observation programme to understand the atmospheric system. This is done through modelling which include process descriptions and data assimilation. Chemical transport models are developed into Earth System Models (ESMs) to properly account for the coupling of dynamics, physics and chemistry; and the cycling of biogeochemical tracers between the soil, the atmosphere and the oceans. Emissions estimates essential to characterize fluxes between the surface and the atmosphere (anthropogenic surface sources, biogenic sources including emissions from biomass burning and forest fires, aircraft (ICAO) and shipping (IMO) emissions).

GAW has an open, transparent and free data policy, the goal is to close time gaps between reporting and the period being reported in line with the technological advances and user requirements (acquisition and processing of space and *in-situ* observations in near real-time (NRT) or in delayed mode where the delay is as brief as possible);

The CAS MG is encouraged to take note in particular of the role that GAW plays in the analysis of the air pollution – climate change impact (both ways), the nitrogen cycle (both oxidised and reduced nitrogen) and the link between air pollution and health/mortality.