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ON DATA ISSUES AND POLICIES
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1. OPENING OF THE MEETING

Dr Wenjian Zhang, WMO Assistant Secretary-General opened the meeting and welcomed the participants to Geneva on behalf of the Secretary-General. He highlighted the importance of the WMO data policy for the Members, and he reminded the meeting that the Earth System approach to monitoring, understanding and prediction of weather, climate and water outlined in the newly adopted Strategic Plan of WMO will require access to data from all physical domains at increased spatial and temporal resolution. In order to guarantee access to the wealth of data required to achieve the goals laid out in our Strategic Plan based on Earth System, reviewing and where necessary updating our data policies will be critical.

Dr Sue Barrell, Australia (Chair), welcomed the participants to Geneva, and highlighted the main objective of the meeting, which was to, in response to Resolution 56 (Cg-18) and Resolution 2 (EC-71), provide the Executive Council via its Policy Advisory Committee (PAC) with an analysis of WMO data policies to support and inform their review. In the subsequent discussion the meeting agreed to adopt a broader interpretation of its mandate and decided that one of the deliverables from the meeting would be a set of concrete suggestions for next steps in the WMO data policy development

2. OPERATIONAL EXCHANGE OF WEATHER DATA IN WMO

Dr Lars Peter Riishojgaard, WMO Secretariat, introduced the meteorological value chain. Some elements of the value chain, i.e. the acquisition and exchange of observations and their utilization in numerical weather prediction, need to be implemented based on a global view and are entirely dependent on the worldwide coordination efforts undertaken by WMO.

The primary purpose of WWW (with its components GOS, GTS, GDPFS) was to ensure that all WMO Members obtain the meteorological information they require for operational work and for research. The WMO landscape in 2020 has changed in many ways since WWW was first conceived and the WWW paradigm has evolved and broadened with the Earth System approach and the move to WIGOS, WIS and Seamless GDPFS. The wider scope of the Earth System approach has to be reflected in the data policy.

[Subsequently, WMO Resolution 40 \(Cg-12\)](#), upon which most of WMO's current data exchange practice for weather data is based, was introduced by Mr Dimitar Ivanov, WMO Secretariat. Mr. Ivanov reminded the participants that the discussions around the drafting of this resolution had been at times very difficult, and that its adoption was – and continues to be – considered a major milestone for WMO. It was noted that Resolution 40 is based on the central principle of free and unrestricted international exchange of meteorological data between national Meteorological Services. Furthermore, Resolution 40 distinguishes between *essential data* necessary for the provision of services in support of the protection of life and property and the well-being of all nations that Members are obligated to ("shall") exchange, and *additional data* required to sustain WMO Programmes at the global, regional, and national levels and, further, as agreed, to assist other Members in the provision of meteorological services in their countries and which Members are encouraged to ("should") exchange.

It was noted that the WMO Convention places an obligation on those Members who are unable to implement technical elements adopted via a Congress resolution (e.g. Res. 40), to inform the Secretary-General about this in writing, but that this is rarely

followed in practice. Several WMO Members have in various fora expressed their desire to see a stronger push from WMO to ensure that the agreed data policy is followed in practice. However, there is no clear and universal agreement on what the enforcement mechanisms would be.

Several meeting participants considered the concept of free and unrestricted exchange of data as articulated in the Resolution 40 to be so fundamental to the work of WMO and to the general practice of meteorology worldwide that the possibility of including it as an article in the WMO convention should be explored.

An unintended impact of Resolution 40 is due to the fact that some Members consider it not as the minimum requirement, but as the only requirement in terms of observations. Some Members have thus artificially limited their declared networks down to the minimum level of observations stipulated in Resolution 40.

It was noted that the decision to leave the implementation of Resolution 40 in particular and of the WMO observing networks in general up to the Regional Associations has resulted in significant fragmentation, and that it has helped weaken the impact of the resolution. The group recognized that the global nature of meteorology means that certain design, implementation and monitoring activities regarding the observing systems are more appropriately undertaken at the global level.

The history of data policy resolutions (Res. 40, Res. 25 and Res. 60) was also discussed. It was noted that several new application areas had emerged over the last several years that would over time need their own data policy resolutions if WMO were to follow the same trajectory. In particular, the Earth System approach adopted by WMO as a strategic thrust will act as a driver for exchange of data regarding an even broader set of disciplines, including atmospheric composition, cryosphere, ocean, space weather, etc. These data are outside the scope of the existing Resolution 40. The meeting expressed a very strong preference not to continue to develop separate data policy statements for each application area, but to instead seek to formulate an overarching WMO data policy encompassing all activities of the organization. The view was that this could be done in a way that still would allow for the necessary flexibility to take into account the differences between the various application areas.

The [Geneva Declaration 2019](#) provides a strategic direction for WMO future Public Private Engagement, and highlights the need for inclusive partnership amongst public, private and academic sectors. The Congress reaffirmed the commitment of Members to broaden and enhanced Free and unrestricted exchange of meteorological, climatological, hydrological and related environmental information and services.

On behalf of Dr. Anthony Rea, WMO Secretariat, Lars Peter Riishojgaard gave [an introduction to WMO's system for monitoring the routine exchange of observations](#) ingested by global Numerical Weather Prediction (NWP) systems, and he explained how the monitoring results have helped pave the way for the GBON (Global Basic Observing Network) initiative. NWP is global by necessity rather than by choice, and it needs a constant supply of real-time observations from all over the globe. This is true for meteorology as a whole, but global NWP is a foundational activity for most weather and climate services, while at the same time having some of the strictest requirements on observational data in terms of coverage and timeliness. It was pointed out that rather than being implemented in response to a new WMO data policy, the GBON development is running ahead of it, and as such it has become a facto driver for current WMO data policy developments.

[Dr Erik Andersson from ECMWF discussed the current trend toward earth system modeling \(ESM\)](#), which will complement and perhaps over time replace the strictly classical numerical weather prediction that focuses primarily on atmospheric modeling. The ESM trend is driven by the need for information about environmental variables beyond just the atmospheric ones, the need to extend the forecast range to subseasonal, seasonal and beyond, as well as the general need to improve skill at all ranges. Dr Andersson pointed out that ESM has important implications for observational data requirements and hence for data policy. It was noted that the policy discussions concern not only the observations themselves but also the resulting products.

Similar to NWP, Earth system modelling needs accurate input from a wide range of observing systems, including satellites, radar, ocean floats and buoys, weather stations, weather balloons and aircraft. However, the ESM requirements come from a larger variety of Application Areas (AAs). It was noted that observational data gaps currently persist across the full range of AAs relevant for ESM. It was further noted that many of the required observations are already now being made by a large number of NMHSs and other entities, but are not available for global exchange. An update of WMO data policy was therefore seen as critical also to the success of the ESM approach.

3. CURRENT CONTEXT: NATIONAL DATA POLICIES, TECHNICAL CAPABILITIES/FINANCIAL RESOURCE CONSTRAINTS, EVOLVING ROLES OF PUBLIC AND PRIVATE SECTOR DATA PROVIDERS

[Mr Enrico Fucile, WMO Secretariat, presented preliminary results from the recently completed WMO survey on data policy.](#) In total, 60 of 193 WMO Members had responded to the survey. The analysis of the responses was still ongoing and the meeting was informed that further details would be published in a dedicated report at a later stage.

Among the preliminary findings the following items were mentioned:

- No national policy on meteorological data in force in 20% of the Members (45% for hydrology);
- More clarity from WMO's side requested in the definition of additional data (even the definition of essential data was not considered 100% clear);
- Potential to provide surface observations at higher spatial and temporal resolution without extra costs for NMHS;
- 20% of existing upper air data were not exchanged internationally;
- Inconsistent application of WMO data policy application for marine and aircraft observations;
- Significant scarcity of public funding for observations and related infrastructure (worse for hydrology); this issue was particularly pronounced in Regions I and II;
- Significant capacity gaps in technology, funding and skills;
- Tech., funds and skills gap more significant in RA I and II (severe in RA I)

- Policy issues around aeronautical meteorological data; is there a better policy than cost recovery?
- 10-20% of climate data are priced above cost recovery, 10-25% are at cost recovery.

Three WMO Permanent Representatives, Ms Chin Ling Wong, Singapore, Mr [Michael Staudinger](#), Austria, and Mr Franz Uirab, Namibia, provided various NMHS perspectives on data policy. All were of the view that the commitment to free and open data exchange articulated in Resolution 40 and reaffirmed in the 2019 Geneva Declaration was fundamental to the practice of meteorology and the delivery of services.

They also pointed out the tremendous strength of the data exchange and the nearly unparalleled level of international collaboration that characterizes almost all of WMO Members' NMHSs, and that this is driven by needs of the global NWP on which all WMO Members are dependent for their service delivery.

However, they all noted that there are weaknesses in the current policy application and resulting data exchange; among them the following were mentioned:

- Not all Members are fully complying with the spirit of Resolution 40;
- Large observational data gaps (e.g. in Region I);
- No enforcement mechanisms behind Resolution 40 and related materials;
- Data provided by private sectors for profit do not naturally fit within the existing framework;
- In some cases Members are willing to exchange their data only with a limited (Regional or sub-Regional) group of other Members;
- Resolution 40 dates from 1995; both in terms of data requirements and data providers the current landscape is totally different.

[Prof. Sarah Dance from the UK provided a research and operational perspective of data policy for NWP](#). She noted that on the order of tens of millions of observations are ingested during every cycle (two to four times per day) by the global NWP models in order to generate initial conditions for weather forecasts. Observational data at even higher resolution are needed for regional/convective scale models that are run every 1-3 hours, and for nowcasting updates that in some services are run every 15 minutes.

Key issues are to have a reliable data stream and to receive the observations with low latency (fast delivery). Several operational centres are moving to continuous cycling for global forecasts, which may change data latency requirements.

Observations are a significant cost-driver and historically, WMO Members have covered the cost of acquiring the necessary observations over their own territory and have exchanged them freely at no cost with each other. However, some commercial providers are complaining that this business model essentially ruins the market for observational data.

The FAIR principles (Findable, Accessible, Interoperable, Reusable) have been widely adopted as a standard requirement for research data.

During the discussion, it was noted that if developing countries are to revise their data policies and provide more of the required observations to the global NWP systems, they have a legitimate expectation of being granted open and unrestricted access to the resulting NWP output in return. This further highlights the fact that the discussions of WMO data policy will have to include both observational data and the products generated from them.

[The President of Hydrometeorological Equipment Industry Association, Jim Anderson, Earth Networks](#), provided a private sector perspective on the WMO data policy and its relationship to the lack of observations in certain areas. He introduced the concept for a different cost-sharing model between public and private sectors as an alternative to the traditional model in which the entire burden is born by the public sector.

Regarding the specifics of a new WMO data policy, Mr Anderson's view was that the private sector could accept a number of different models, but that clarity and consistency of implementation would be crucial. He provided the following list of attributes that were considered desirable:

- Clear and transparent;
- Codified in Law and Policy;
- Allow for commercial exchange of data and derivative works;
- Allow for private ownership of certain data and redistribution and resale;
- Foster development of private or regional networks to meet specific needs;
- Allow for government entities to purchase certain data for their own use without necessarily redistributing it to all other agencies or the public;
- Allow for data exchange modalities and metadata management practices that can accommodate different types of data ownership, e.g. for high density networks such as the U.S. National Mesonet.

It was pointed out during the discussion that the private sector in meteorology is not a monolithic entity when discussing data policy. There are large numbers of companies for which the business models are based on post-processing and adding value to openly available data generated under the WMO World Weather Watch data policies, and whose businesses depend on free and unrestricted exchange of data. At the other end of the scale there are companies seeking to develop a market for provision of core observational data for profit, and whose business models are more difficult to align with free and unrestricted sharing of data.

[Mr Paul Counet, EUMETSAT, presented the data policy of his organization](#), and among the issues he highlighted were:

- The use of licensing (even for data that are free of charge), in order to limit the right to redistribution of data and preserve EUMETSAT ownership of data;

- The evolutionary trend over recent years toward simplification and increased provision of data on a free and unrestricted basis in support of WMO programs and EU policies, e.g. to African countries and other non-EUMETSAT member states;
- The need for EUMETSAT data policy to further evolve in order to take into account the evolution of the market environment and recent technological developments, driven e.g by the increased capabilities of the next generations of EUMETSAT satellites and other new developments such as the European Weather Cloud, and the future implementation of WIS 2.0.

Regarding EUMETSAT relations with the private sector, a new legal framework has been developed to allow EUMETSAT to purchase data from private companies for the benefit of its Members. The following conditions have to be met to allow such purchases to be made:

- It must represent an ancillary activity, i.e. purchase of supplementary data would amount to a small fraction of the cost of operations of a EUMETSAT core satellite system;
- It must be requested by a significant number of Member States;
- Data services must be purchased from a European provider (located in a EUMETSAT Member States) and based on European technology.

Mr Counet also provided an update on recent data policy related discussions taking place within the Coordination Group for Meteorological Satellites (CGMS). Key points were:

- At the 47th CGMS Plenary Session in Sochi 2019, WMO presented its plan for the Global Basic Observing Network (GBON) as a new, high-level global approach to designing, implementing and monitoring those parts of surface-based observing network that are providing critical input to the global NWP systems;
- The CGMS members were highly supportive of the GBON initiative and were considering adopting a similar approach to the provision of space-based data, recognizing the critical role of global NWP as a backbone for almost all weather- and climate-related products and services;
- Action agreed: WMO to provide a report at next CGMS (May 2020) on baseline requirements for satellite products for global NWP;
- This will be addressed by WMO in the context of the NWP Impact Workshop planned in May 2020;
- CGMS members will discuss the reference list of observations and products and, if agreed, will add it to the CGMS baseline, which represent the commitments of CGMS members to the WMO Vision for WIGOS 2040;
- This might support the discussions in WMO on the Revision of Resolution 40, as such a list could become part of a revised Annex I to Res.40.

[A private sector perspective on the provision of meteorological satellite data was given by Adm. Conrad Lautenbacher, GeoOptics](#), former NOAA Administrator. He highlighted the current situation and presented some of the drivers for change. One is the ongoing technology explosion, with concepts such as big data, machine learning, cloud computing, machine to machine communication, and the personalization of services due to social media gaining wide-spread attention. Another driver is the large and continuously expanding role of the commercial sector in all parts of the meteorological value chain, and with an increasing number of companies that seek to play also international roles in this.

Yet another driver is the rapidly increasing cost of the satellite systems that provide vast amounts of critical data for meteorology. Over the last decade, the cost of developing and operating the US part of the satellite systems has exceeded the entire budget of the National Weather Service (the NMHS of the US) by a factor of 1.5 to 2.5. This level of expenditure is beyond the reach of most governments, and alternate solutions that could meet the requirements at a much reduced cost should be explored, perhaps in innovative collaboration arrangements between private, government and academia partners.

4. TOWARD A NEW WMO POLICY FOR THE INTERNATIONAL EXCHANGE OF WEATHER DATA

[Mr William Maynard from ICAO introduced](#) the data policy of his organization and noted that the provision and use of meteorological data is structured around a cost recovery principle. This has led to a general policy that aviation observations can only be used for aviation purposes and cannot be used for free in other activities, including NWP. This exclusion of aviation data from the general policy articulated in Resolution 40 is indeed noted in annex 1 to the resolution, but its implementation is highly inconsistent. It was considered desirable to have this clearly noted in the body of the text if a new data policy resolution were to be adopted. On the other hand, during the discussion it was also noted that aviation benefits enormously from the vast majority of observations to which the industry provides no financial contribution at all. A data policy based on the notion that only users who fund certain observations would be allowed to benefit from them was deemed to be impossible to draft and at odds with the basis on which WMO was founded.

[Mr Fabio Venuti from ECMWF provided](#) an introduction to the data policy adopted by the Copernicus program of the European Union. He pointed out that there are no restrictions on the use of Copernicus data (whether commercial and non-commercial) nor are there restrictions on the nationality of the users (European as well as non-European user have identical access rights). A free of charge version of any Copernicus dataset is always available on the Copernicus dissemination platform, and any data and information will remain available worldwide without limitation in time. He explained that the Copernicus data policy derives from fundamental EU policy principles establishing that access to information is a fundamental right and that one of the main *raison d'être* of the EU internal market is the creation of the conditions for the development of services and products across Europe.

5. DATA EXCHANGE IN HYDROLOGY

[Ms Silvana Alcoz from Uruguay](#) provided a briefing on data policy issues and current data exchange practices for hydrology. She noted that according to Resolution 25, "Members shall provide on a free and unrestricted basis those

hydrological data and products which are necessary for the provision of services in support of the protection of life and property and for the well-being of all peoples”, and that the text of the resolution further urges Members to

- *Make their best efforts to implement the practice on the international exchange of hydrological data and products;*
- *Assist other Members, to the extent possible, and as agreed upon, in developing their capacity to implement the practice described.*

Ms Alcoz acknowledged the clearly recognized need and the long history of international data exchange in the meteorological community, and explained that the situation in hydrology is quite different. There are a number of reasons why producers of hydrometric data have, historically, been very reluctant to share information, some of which have to do with the economic value of the data, some of which have to do with a lack of agreed requirements. Additional reasons for this reluctance noted by Ms Alcoz included

- Not considering the entire basin as a relevant planning and management unit, (upstream countries often have no need for data downstream);
- Conflicts between countries over the use of the water resources, both in quantity and quality;
- Fear of being judged for wrong water management practices;
- For considering that holding and restricting the use of data means power;
- Seeing the data themselves as a potential source of income;
- Reluctance to share data that may be deemed of low quality by international community;
- Data sharing may be incompatible with current national or institutional legal frameworks;
- Difficulties in sustaining the monitoring networks.

Nevertheless, this situation is changing, and there appears to be an increasing recognition of the need to exchange data internationally.

Regardless of data policy issues and whether or not a Member is willing to participate in international data exchange, it is important for Members to have access to a framework of good practice based on the collective experience of a large number of international partners, and WMO can provide an important service to Members in this respect. However, one of the limiting factors is that WMO still is not widely known in the hydrology community, and that the organization thus is not recognised as an authoritative voice. It is therefore important that any WMO data policy regarding hydrology be disseminated along with communication explaining its benefits to Members.

It was pointed out that WMO can play a very important role in advocating for and facilitating the integration of all kinds of observations, meteorological, ocean, hydrological, etc., via its earth system approach, which has been a main driver of the recent reform. This will be very challenging at many levels, but it will be absolutely necessary in order to meet societal demands for weather, climate, water and other environmental information at all timescales. WMO should help Members by addressing appropriate levels of national governments to ensure that NMHSs are adequately

equipped to meet these challenges. She further noted that data policy has to be accompanied with technological development and other institutional capacities in order to achieve the desired goal of saving lives, safeguarding goods and allowing the integrated management of water resources. In particular, adequate number of well-trained personnel in NMHSs is crucial.

Finally, Ms Alcoz presented the ongoing collaboration between five countries sharing the La Plata river basin in South America and the synergy created between WMO and the basin organization (the Intergovernmental Coordination Committee of the countries of the La Plata Basin) as an example of a regional and international collaboration involving exchange of hydrological data with recognized mutual benefits.

6. EXCHANGE OF CLIMATE DATA

[Mr Stefan Rösner, Germany, provided an introduction to WMO Resolution 60 \(Cg-17\)](#) of climate data. He explained that the Resolution was drafted building on the experience with Resolutions 40 and 25, but that it was aimed specifically at application areas that had emerged later, largely driven by the growing concern about global warming and the associated impact on human life and prosperity in many areas of the globe.

Resolution 60 therefore encompasses a number of datatypes not previously considered under Resolution 40, but that are necessary to support various climate activities undertaken by entities such as IPCC, UNFCCC and GFCS. He highlighted the special requirements that exist for climate data, e.g. long-term commitment to observing records, high data quality, and access to relevant metadata including uncertainty information. He also pointed to the fact that some 50 GCOS Essential Climate Variables (ECVs) have been identified, that not all of them are being routinely exchanged, and that some ECVs depend on observations that are outside the areas of responsibility of the WMO Member NMHSs.

Concerning the status of implementation, it was noted that Resolution 60 had been adopted in 2015, and that the experience with it therefore was still rather limited. One of the difficulties was found to be that many of the entities responsible for providing the data are outside the NMHS community, and in many Members the national governments have not been very active in communicating the responsibilities of such entities under this new Resolution. In fact one third of the respondents to the data policy survey discussed earlier reported having no policy in place regarding the exchange of climate data.

7. STATUS AND ADEQUACY OF DATA EXCHANGE AND DATA POLICY FOR OTHER APPLICATION AREAS

[Mr Jörg Klausen, Switzerland, gave a presentation on various issues related to data exchange for atmospheric composition](#), noting that the current data exchange practice is rooted in Resolutions 40 and 60, and that no separate resolution for atmospheric composition data has been adopted.

For publicly funded satellite measurements of atmospheric composition, most agencies are following policies that guarantee free and open data availability, but for surface observations, the landscape is much more complex. Historically – and to a large extent also at the present time – surface-based atmospheric composition observations rely heavily on non-NMHS contributions, with academia and research organizations providing the bulk of the data. In recent years the role of the private sector has been

increasing, e.g. with EarthNetworks for greenhouse gases, and a number of companies making localized air quality measurements. For academia in particular, the funding is based on metrics that are tied to the publishing records of the Principal Investigator (data provider). WMO will need to consider ways of formally acknowledging contributions of non-NMHSs and to document data provenance, provide appropriate citation and preserve data policy rights. In parallel, Members will need to work towards providing more base funding for operation of observing systems for atmospheric composition as these data gain in importance, both globally and locally.

Mr. Klausen also discussed the concept of data licenses, which are widely used in the context of scientific data exchange, citing examples such as Creative Commons, and he mentioned that the use of licensing would worth considering in the process of WMO data policy review.

[Prof. Nadia Pinardi, Italy, gave an introduction to data policies pertaining to ocean observations.](#) In 2019 IOC had adopted a new data policy that makes reference to the core principles articulated in WMO's Resolution 40. In its preamble, the new policy notes that

The timely, free and unrestricted international exchange of oceanographic data is essential for the efficient acquisition, integration and use of ocean observations gathered by the countries of the world for a wide variety of purposes including the prediction of weather and climate, the operational forecasting of the marine environment, the preservation of life, the mitigation of human-induced changes in the marine and coastal environment, as well as for the advancement of scientific understanding that makes this possible.

Concerning the implementation of the data policy, Prof. Pinardi noted the following strengths:

- Strong links with the academic community;
- Rapid rate of technology innovation due to research community involvement;
- Networks easy to start; brought together by common technologies;
- IODE started to work early on the data exchange and now NODCs share best practices;
- Present ocean data policy supports operational forecasting and some ocean health and climate services.

On the other hand, she also noted some weaknesses:

- Lack of sustainability of some networks;
- Transition to operations of new research and new technology remains difficult;
- Integrated Observing System (links between networks) difficult to build;
- Lack of enforcement mechanisms for free data sharing;
- Additional environmental services are needed by Member States; requisite data policies are not yet in place;

- Communications between ocean and WMO (meteorological) communities still not consolidated at national level.

Finally it was noted that with the WMO reform, the governance and collaboration structures between WMO and IOC will be reorganized. The newly formed Joint Collaborative Board (JCB) will support the work of realignment of data policies between IOC and WMO. This opens an important opportunity for WMO and IOC to jointly address data policy issues impacting the ocean community and all user of ocean observations.

[Mr Øystein Godøy, Norway, provided a Global Cryosphere Watch \(GCW\) perspective](#) on data exchange and data policy issues. He noted that both in terms of types of data and in terms of data providers, GCW is extremely heterogeneous. It is a very diverse community with very diverse scientific and operational interests, which makes the implementation of GCW somewhat challenging but also highly relevant in the WMO context since it bridges between internal and external communities to WMO.

The contribution to GCW in terms of data made by the scientific community is extremely significant, and in a situation that is very similar to Global Atmospheric Watch (GAW) discussed earlier, many data providers thus operate under a need to make publications and to be cited. The only incentive for the scientific community to provide data to international activities such as GCW is the recognition and visibility within their community that it provides. This is a key point to consider when implementing effective data policy that apply to scientific efforts. The main technical requirement is that the data can be referenced with a Digital Object Identifier (doi).

Mr Godøy further noted that WMO table-driven data formats are not widely used beyond the WMO community, whereas NetCDF following the Climate and Forecast (CF) convention is widely used in scientific communities. A coordinated WMO approach to the use of NetCDF-CF profiles would be useful to better integrate with external communities.

8. WAY FORWARD

The following paragraphs present the overall conclusions and suggested way forward in narrative form. [The summary slides introduced by the Chair and discussed by all participants during the final day of the meeting can be found here.](#)

Over the course of the discussions taking place during the first two days of the workshop, a common understanding had emerged that adoption of a new WMO data policy resolution was an absolute necessity. After detailed discussions, it was further agreed that WMO should strive to adopt one common, overarching data policy resolution, rather than pursuing a set of separate resolutions structured by discipline, as had been the case in the past with Resolutions 40, 25 and 60. It was recognized that at a more detailed level, different policies would necessarily apply to different types of data for different application areas, but it was nonetheless the view of the meeting that there would be considerable strength in unity when a new WMO data policy statement will be rolled out.

The following overarching guiding principles were agreed on the new policy resolution:

- The resolution should reaffirm the commitment to the intention already articulated in Res 40 toward "...broadening and enhancing the free and unrestricted exchange of meteorological and related data and products";
- It was acknowledged that the meteorological/hydrological value chain extends all the way from input through to delivery of services to users, with an increasing diversity of players (public, private and academic), involved at all stages of the value chain. However, the view of the group was that the initial focus of the work toward a new data policy resolution should be on issues at the inputs end of chain, i.e. on observations, model and analysis fields and other quantitative data products, recognizing that
 - the service delivery end of the value chain, including the last mile, is in most cases a national prerogative and as such primarily subject to national policies, which will in turn benefit from improved 'front end' data policy;
 - improved clarity and level playing field for all sectors with respect to data policy and its implementation will help in further development of effective PPE.
- The highest immediate priority, in line with WMO's unique role as a global coordinator, is to focus on policy aspects that are relevant for global data exchange and to provide much needed clarity and certainty for all stakeholders across all sectors;
- Documentation and publication of compelling evidence as to benefits and impacts on Members of global data sharing for all relevant WMO application areas may influence Members to strengthen their commitment to the data they share globally on a free and unrestricted basis, and in defining fair national policies;
- There may be a need to identify three levels or layers of policy practice – essential, additional, and 'emerging' data
 - Global NWP, in the context of seamless and cascading earth system modelling, is the driver of 'essential' data and products, with periodic review informed by the Rolling Review of Requirements process;
 - Retain concept of 'additional' data, meaning data exchanged under certain conditions, but additional clarity/guidance on what this entails will be needed;
 - Introduce new 'emerging' data to reflect the changing data landscape, with non-traditional data platforms and sources/providers, often supporting specific applications (e.g. health, agriculture...), and possibly guidelines to inform development of national policies for these within a global framework.
- There is a recognized need to ensure that any new WMO data policy is subsequently translated into regulatory material wherever possible and appropriate in order to ensure that it is easily accessible, that the implications for operational implementation are clear, and that the compliance of Members can be easily and unequivocally monitored.
- A process or arrangements for review of the types or domains of data that fall within the established categories should be addressed within a new resolution

in order to meet both changing Member needs and changing availability of data.

After having agreed on the guiding principles listed above, the meeting developed a proposed rough initial outline of what a new WMO data policy resolution might look like. It is clear that some of the ideas in the proposed structure will need further refinements during a drafting phase that is planned to start later during this year.

The resolution should be divided into three main parts: i)Policy, ii)Practice, and iii)Guidelines.

i) Policy

- Build on resolution 40 (25, 60), but modernize and update (recognize additional stakeholders, set in context of 2020/21 status of requirements and capabilities);
- New preamble linked to global agenda including SDGs, WMO Strategic Plan and collaboration with key partners;
- Reaffirm commitment to free and unrestricted international exchange;
- Clearly state intention to codify in terms of regulatory material where possible;

ii) Practice; describe the basic characteristics

- Essential data;
- Additional data; to be broader than Res. 40 definition;
- Emerging data (both the need for this and the term 'emerging' still subject to discussion);

iii) Guidelines

- Annex 1: definition of essential data
- Annex 2: PPE (including economic aspects)
- Annex 3: Atmosphere
- Annex 4: Cryosphere
- Annex 5: Hydrosphere
- Annex 6: Ocean
- Annex 7: Climate
- Annex 8: Research
- Annex 9: Space Weather

The list of annexes will require more detailed elaboration. The annexes could be structured either by domain (atmosphere, ocean, cryosphere, rest of the hydrosphere, ...) or by discipline (weather, climate, hydrology, ...). Either approach has strengths and weaknesses, and the current initial list provided above is a hybrid of the two.

The notion of creating incentives (financial or others) to foster the provision of additional observations, advocated strongly by certain parts of the private sector, was discussed, but no decision was proposed as to whether or not to include this in the data policy resolution. Most of the participants saw this as a potential implementation mechanism to be considered by individual WMO Members rather than as a

fundamental WMO data policy issue, and as such they considered it out of scope for the resolution.

The idea of enforcement mechanisms to ensure compliance with the data policy was also discussed. There was very strong support for the idea that compliance should be monitored and that action should be taken by WMO in case of non-compliance. However, most of the participants saw this as an implementation issue and as such more appropriate to be included in the subsequent regulatory and guidance material than in the policy resolution itself.

The need for extensive outreach on the WMO data policy, the impacts and benefits that could accrue, and the role of WMO, was seen as a critical success factor, especially for the many programmes and domains (e.g. ocean, GAW, GCW, hydrology) whose data contributors extend well beyond NMHSs.

9. WORKPLAN

Finally, the meeting agreed on the following draft initial workplan for a set of activities that would lead up to the discussion of a new WMO data policy resolution at the Extraordinary World Meteorological Congress in 2021:

- SG-DIP-1 (this meeting);
- INFCOM-1 (4-8 April 2020); SG-DIP formally established, with updated ToRs and core membership; should be open to additional voluntary participation, similar to SG-DIP-1;
- PAC-1 (22-24 April 2020): Report from SG-DIP-1, focusing on principles and future work plan;
- EC-72 (June 2020): Overarching principles, work plan approved if successful;
- SG-DIP teleconferences (monthly between July and November 2020): Draft data policy (draft Cg (Ext)-21 resolution, annexes) developed with involvement of key stakeholder communities;
- WMO Data Conference (19-21 November 2020); Draft data policy (Congress resolution) is socialized, discussed; feedback recorded as Conference output ;
- SG-DIP informal meeting with Data Conference;
- SG-DIP-2 (January 2021); Input from Data Conference incorporated into draft Congress resolution;
- PAC-2 (spring 2021); final adjustment to draft Congress resolution;
- Cg (Ext)-21: Resolution on WMO Data Policy;

ANNEX 1. LIST OF PARTICIPANTS

1. Sue Barrell (former Chairperson of CBS-lead EDI) Chairperson
2. Eizi Toyoda (RA2) (Japan)
4. Fred Branski (RA4 (USA)
5. Zeng Qin (RA2) (China) (Teleconference)
6. Francis Moseleho (RA1) (South Africa)
7. Ramon de Elia (RA3) (Argentina)
8. Michael Staudinger (RA6) (Austria)
10. Øystein Godøy (GCW) (Norway)
11. Silvana Alcoz (Hydrology) (Uruguay)
12. Steve Kopp (Hydrology) (ESRI)
13. William Maynard (Aviation) (Canada)
14. Stefan Rösner (Climate) (Germany)
15. Fabio Venuti (ECMWF, Copernicus)
16. Erik Andersson (EU) (Teleconference)
17. Rachelle Antal-Wokes (EUMETSAT)
18. Paul Counet (EUMETSAT)
19. Steve Early (The Weather Company IBM) (teleconference)
20. William McCairns (Ecomet)
21. Jim Anderson (HMEI)
22. Conrad Lautenbacher (GeoOptics)
23. Sarah Dance (WWRP) (UK) (teleconference)
24. Nadia Pinardi (Ocean and Marine) (Italy)
25. Wong Chin Ling (RA5) (Singapore)
26. Franz Uirab (RA1) (Namibia)
27. Joerg Klausen (GAW) (Switzerland)
28. Simon McLellan (RA6) (UK)
29. Aileen Semple (RA6) (UK)
30. Manon Vignes (RA6) (France)

WMO Secretariat

Wenjian Zhang
Antony Rea
Lars Peter Riishojgaard
Dimitar Ivanov
Enrico Fucile
Boram Lee
Rodica Nitu
Dominique Berod
Paolo Ruti
Claudio Caponi

ANNEX 2. AGENDA

Tuesday February 11		
	1. Opening	
9:30	Welcome	(ASG, D/INF)
	Meeting arrangements	Secretariat (Enrico Fucile)
	Introductions	All
	Ground rules, objectives of the meeting	Sue Barrell (Chair)
10:15-10:30	Coffee break, group photo	
	2. Operational exchange of weather data in WMO	
10:30-11:45	The WMO Convention, the World Weather Watch, and the evolution toward WIGOS, WIS and S-GDPFS	Lars Peter Riishojgaard
	WMO Policy statements: Resolution 40 (1995) and the Geneva Declaration (2019)	Dimitar Ivanov, Michael Staudinger
	The evolving requirements for global data exchange WIGOS data availability and GBON	Erik Andersson Anthony Rea
11:45-12:30	<i>Discussion: Taking stock of the data exchange practice within WMO</i>	<i>Chair, all</i>
12:30-14:00	Lunch break	
	3. Current context: National data policies, technical capabilities/financial resource constraints, evolving roles of public and private sector data providers;	
14:00-16:00	WMO Member data policy survey	Enrico Fucile
	WMO Member perspectives (short interventions)	Michael Staudinger, Chin Ling Wong Franz Uirab
	Science and NWP perspective	Sarah Dance
	Private sector views on WMO data policy	Jim Anderson
	Private sector views (short interventions)	Private sector representatives
	Satellite data, the role of the public sector	Paul Counet
	Satellite data and the role of the private sector	Conrad Lautenbacher
16:00-16:30	Coffee break	
	4. Toward a new WMO policy for the international exchange of weather data	
16:30-17:30	<i>Discussion: Guiding principles for a new WMO data policy, main drivers for change, what needs to change and what must be preserved with respect to the current WMO data policy?</i>	<i>Chair, all</i>
17:30	Adjourn	
Wednesday February 12		
	4. Toward a new WMO policy for the international exchange of weather data (<i>continued from the previous day</i>)	

9:00	ICAO data policy; cost recovery	William Maynard
	Copernicus and European data policy	Fabio Venuti
9:30-10:30	<i>Resume discussion and draw to conclusion: Guiding principles for a new WMO data policy, main drivers for change, what needs to change and what must be preserved with respect to the current WMO data policy?</i>	<i>Chair, all</i>
10:30-11:00	Coffee break	
	5. Data exchange in hydrology	
11:30	Introduction on data exchange in hydrology	Silvana Alcoz
11:30-12:30	<i>Discussion: Need for a global data policy on hydrology? Willingness to implement it? WMO role in regional data exchange in hydrology Requirements for hydrological data exchange from other application areas</i>	<i>Chair, all</i>
12:30-14:00	Lunch break	
	6. Exchange of climate data;	
14:00-14:30	Background, history and current implementation status of Resolution 60	Stefan Rösner
14:30-15:30	<i>Discussion: Adequacy of Resolution 60 to support needs of IPCC, GFCS, UNFCCC and other climate initiatives</i>	<i>Chair, all</i>
15:30-16:00	Coffee break	
	7. Status and adequacy of data exchange and data policy for other application areas	
16:00-17:30	Atmospheric composition	Joerg Klausen
	Ocean data	Nadia Pinardi
	Cryosphere data	Øystein Godøy
17:30	Adjourn	

Thursday February 13		
	8. Way forward	
9:00-10:30	<i>Discussion of adequacy of WMO data policy, broadly speaking; identification of common threads across application areas</i>	<i>Chair, all</i>
10:30-11:00	Coffee break	
	8. Toward the WMO Extraordinary Congress in 2021	
11:00-11:30	<i>What are the main milestones required to develop a new WMO data policy, and what is a realistic timeline for that work to be completed?</i>	<i>Chair, all</i>
11:30-12:00	WMO Data Conference	Lars Peter Riishojgaard

12:00-12:30	Opportunities to drive change: Technical Commission Session(s), April 2020 EC Policy Advisory Committee, April 2020 EC-72, June 2020 GWEF? Consultative Platform?	Dimitar Ivanov
12:30-14:00	Lunch break	
14:00-15:30	Development of roadmap, workplan and strategy for delivery <ul style="list-style-type: none"> • Priorities, targets, milestones • Tasking and need (or not) for sub-groups • Working/meeting methodologies 	Chair, all
15:30-16:00	Report to INFCOM Session and Policy Advisory Committee (Apr 2020)	Chair, all
16:00-16:30	AOB, Closing of Meeting	Chair
16:00	Adjourn	