World Meteorological Organization

Weather • Climate • Water

The Global Data-processing and Forecasting Systems (GDPFS)

OCP-2 Barcelona

A. Harou

Origin of the GDPFS

- UN Gen Assembly XVI (Dec 1961) adopted Resolution 1721 “International Cooperation in the Peaceful Uses of Outer Space”.
- WMO was requested to study measures to advance the state of atmospheric science and technology and to develop weather forecasting capabilities
- WMO Cg 4 (1963) created WWW composed of **GDPS**, GOS -> WIGOS and GTS -> WIS operated by WMO Members for the collection, analysis and dissemination of meteorological data and processed products
- **On Recommendation of CBS-Ext(02), Cg 14 (2003) changed GDPS to GDPFS**

Purpose of the GDPFS

- The GDPFS provides the core operational prediction capabilities and systems of WMO (operated by Members)
  - Nowcasting (VSRF) – 0-6h
  - Numerical Weather Prediction & EPS – 6h-15d
  - Long-Range Forecasting – Sub-seasonal to Longer Time Scales – up to 2 years
  - Emergency Response Activities for Nuclear and Non-Nuclear dispersion
  - Specialised centres – eg sand and dust-storm, tropical cyclone centres

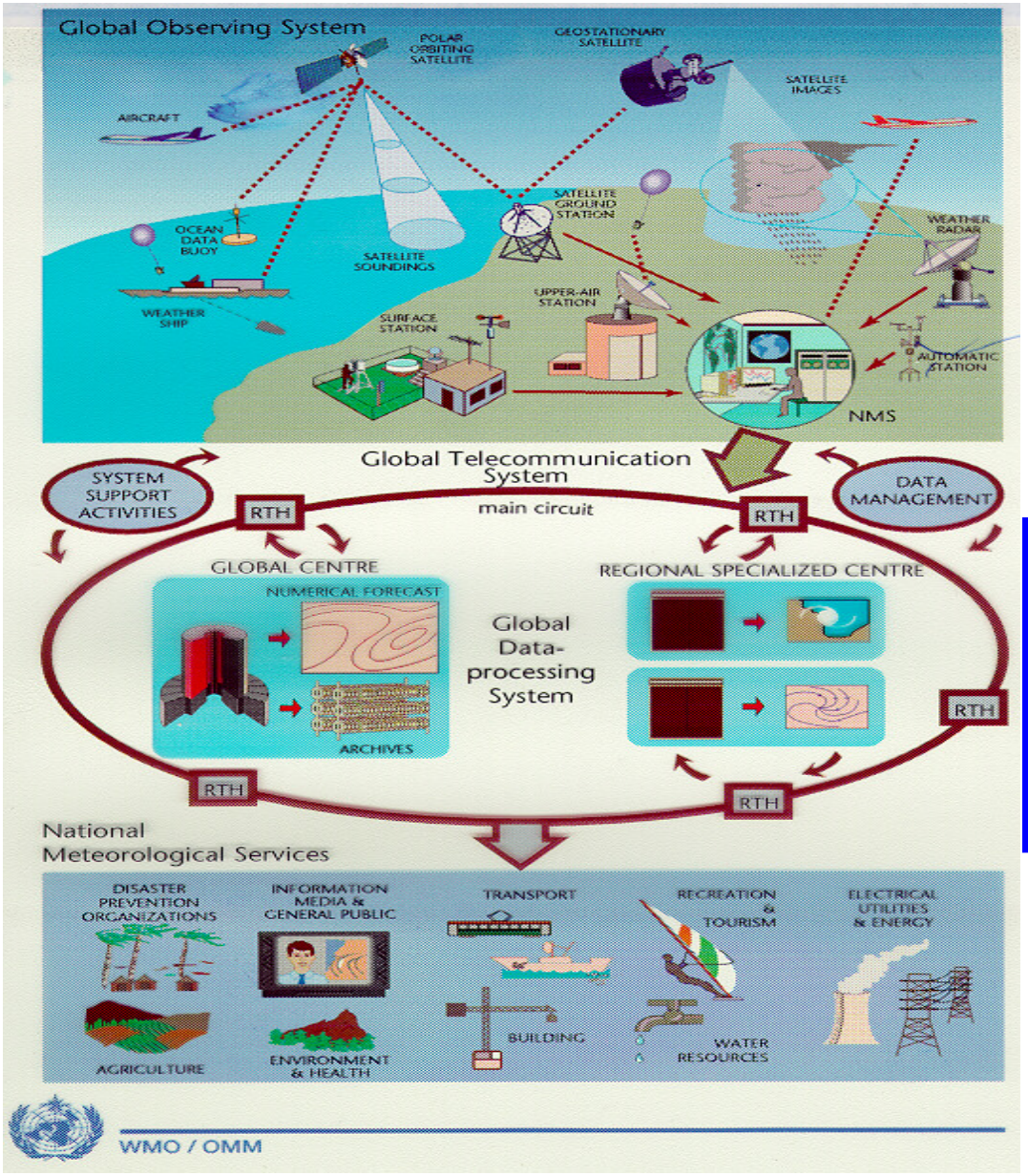
WMO Operational Networks

WIGOS

WIS

GDPFS

Service delivery



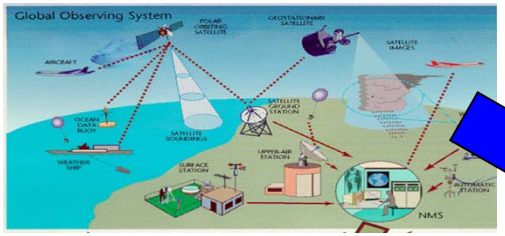
191 NMHSs: satellites, land, ships, buoys, and aircraft contribute to Global Observing every day

Global Telecom with Regional Hubs – becoming the WMO Information System

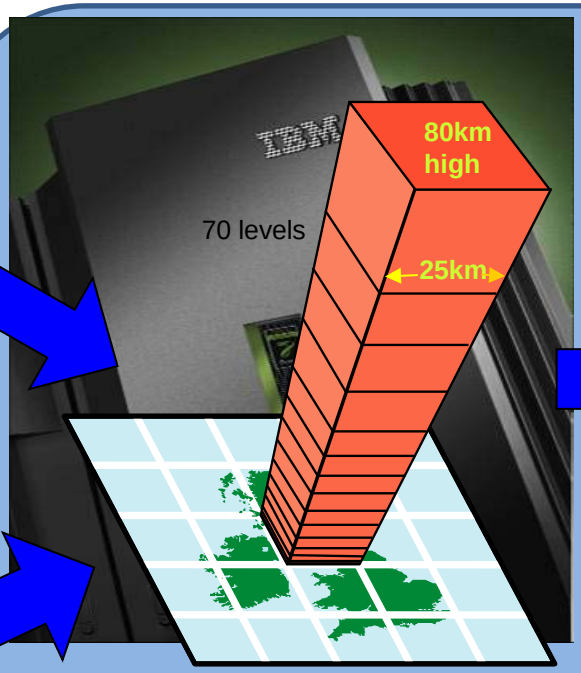
The GDPFS: Global, Regional Specialized Met. Centres (RSMC, RCC), and National Centres

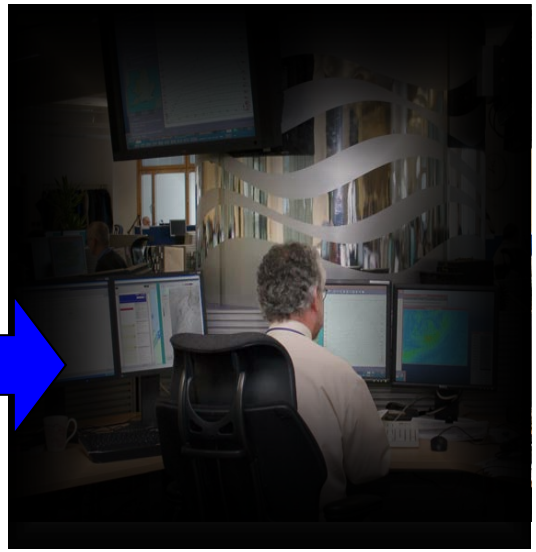
NMHSs deliver analyses, forecast and early warning services

The Role of the GDPFS in creating services



Observations
(in situ and remote sensing)



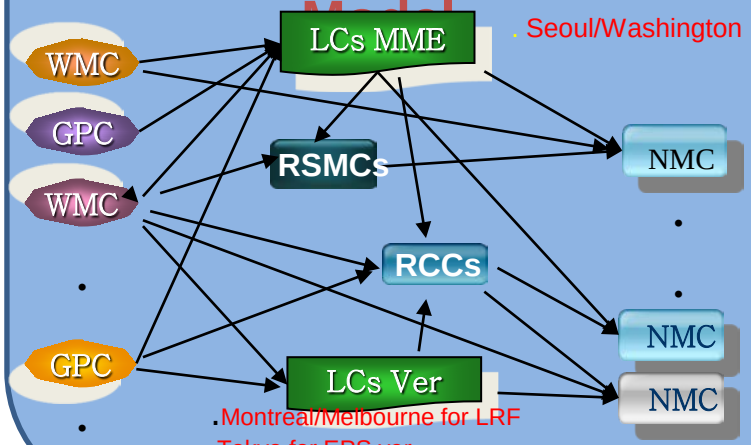


Forecasting & service delivery

$$\frac{du}{dt} = \frac{\partial p}{\partial x} - fv$$
$$\frac{dv}{dt} = \frac{\partial p}{\partial y} + fu$$
$$p = RT$$
$$P$$

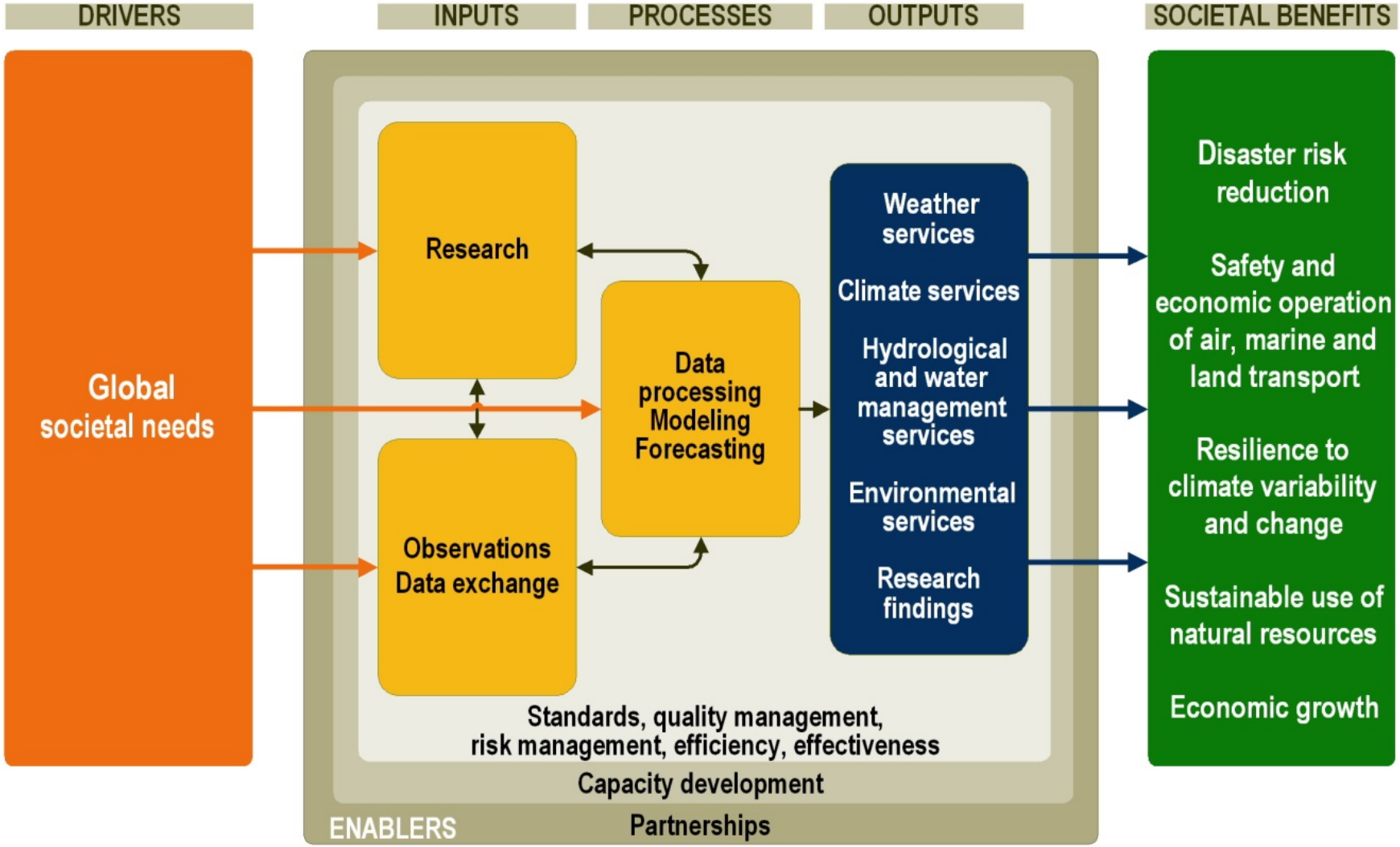
Knowledge & Research

Data processing & Forecast Models



Users (DMCPA, sectors)

At the heart (engine room) of the WMO operational system



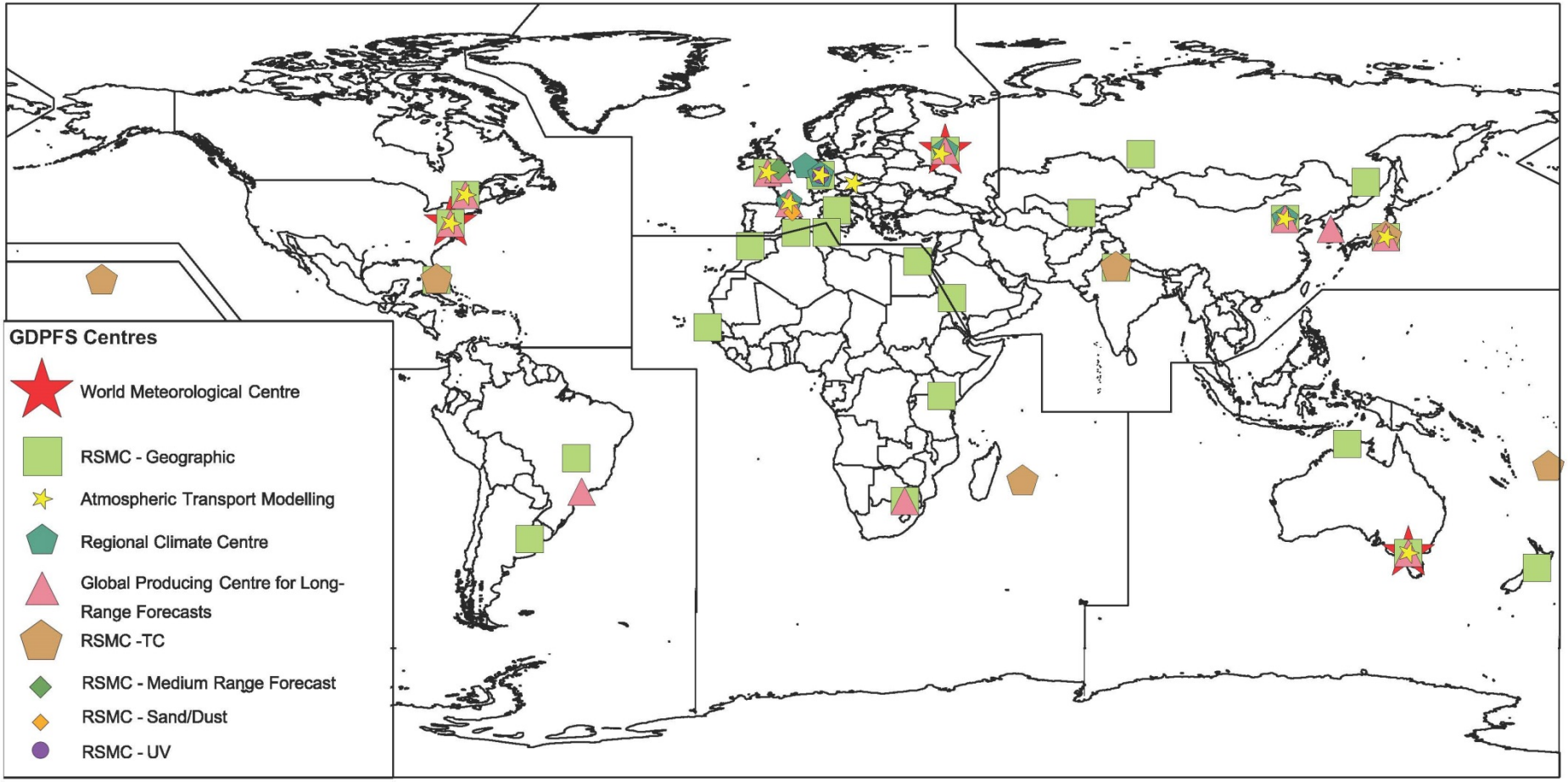
From WMO 2016-2019 Strategic Plan

The GDPFS …

- Is organized as a three-level system to carry out functions at global, regional and national levels

  - World Meteorological Centre (WMC)
  - Regional Specialized Meteorological Centre (RSMC) (incl. Regional Climate Centre (RCC))
  - National Meteorological Centre (NMC)

The GDPFS today…



- **8 World Meteorological Centres (WMCs)**
- **35 Regional Specialiazed Meteorological Centres (RSMCs) with Geographical Specialization and 16 with Activity Specialization**
- **13 Global Prediction Centres (GPCs) for Long Range Forecasts (LRF)**
- **9 Regional Climate Centres (RCCs) and 2 RCC-Networks**

FUTURE GDPFS

Some Emerging Needs influencing the GDPFS…

- Impact-Based Forecasting and Risk-based Warning: GDPFS need to integrate non conventional information: Vulnerability and Exposure
- Trajectory-Based Forecasting for Aviation: Nowcasting (landing/take off), short term forecasts (enroute): Seamless Met Info required for take off, enroute and landing – Requires seamless blending of nowcasting, mesoscale and global NWP
- Support to GFCS (extreme events, sub-seasonal to climate forecasting)
- Climate change and variability are imposing new challenges to National Meteorological and Hydrological Services (NMHSs) requiring them to produce information at various time scales.
- Technology advances at high pace (ie doubling of Computing capacity every ~18 months) and limited availability of resources

To meet these needs, the GDPFS must evolve to…

- Being Capable of serving more users
- Being more agile and adaptable to serve Applications Programmes (AeM, AgMet, MMO, PWS), HydroMet and weather (polar & mountain areas), climate and environment related needs (forest fire, chemical spills, sand & dust storms, etc)
- Provide information seamlessly across:
  - Time scales (nowcasting, through weather forecasts for days and weeks ahead to long-range forecasts on seasonal and up to multi-annual scales) and;
  - Disciplines (Hydrology: flood, inundation, water management; Marine and Costal: Wave, Storm Surge; Air Quality and Sand and Dust Storm; Natural resources and Energy sectors , Tourism, Transports, etc.)
- Seamless transfer of science results to operation

To that end Cg17 adopted Resolution 11:

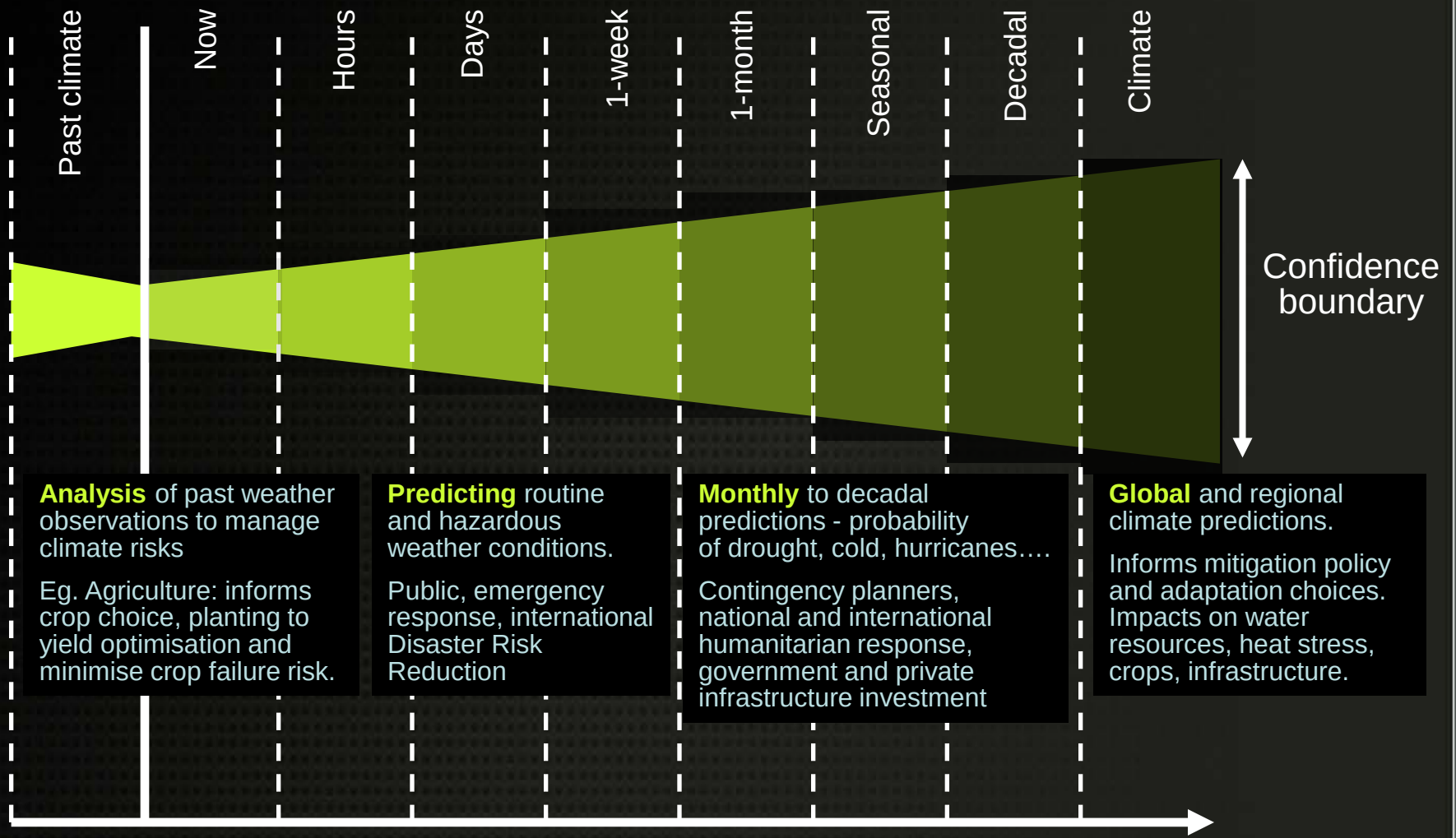
- **“Towards a future enhanced integrated and seamless Data-processing and forecasting system” expressed Congress decision to:**

“Initiate a process for the gradual establishment of a future enhanced integrated and seamless WMO Data-processing and Forecasting System, in the light of the conclusions of the first World Weather Open Science Conference held in Montreal, Canada in August 2014, in particular that a seamless system encompasses several dimensions including timescales, multiple weather related hazards and societal impacts”

- **Steering Group established**

Seamless Prediction

Essential support to decision making on all timescales



Analysis of past weather observations to manage climate risks

Eg. Agriculture: informs crop choice, planting to yield optimisation and minimise crop failure risk.

Predicting routine and hazardous weather conditions.

Public, emergency response, international Disaster Risk Reduction

Monthly to decadal predictions - probability of drought, cold, hurricanes….

Contingency planners, national and international humanitarian response, government and private infrastructure investment

Global and regional climate predictions.

Informs mitigation policy and adaptation choices. Impacts on water resources, heat stress, crops, infrastructure.

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In addition…

- **Cg-16 (2011) through, Resolution 6, recognized the central role of the GDPFS by affirming that the Manual on the GDPFS (WMO-No 485) is the single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members.**

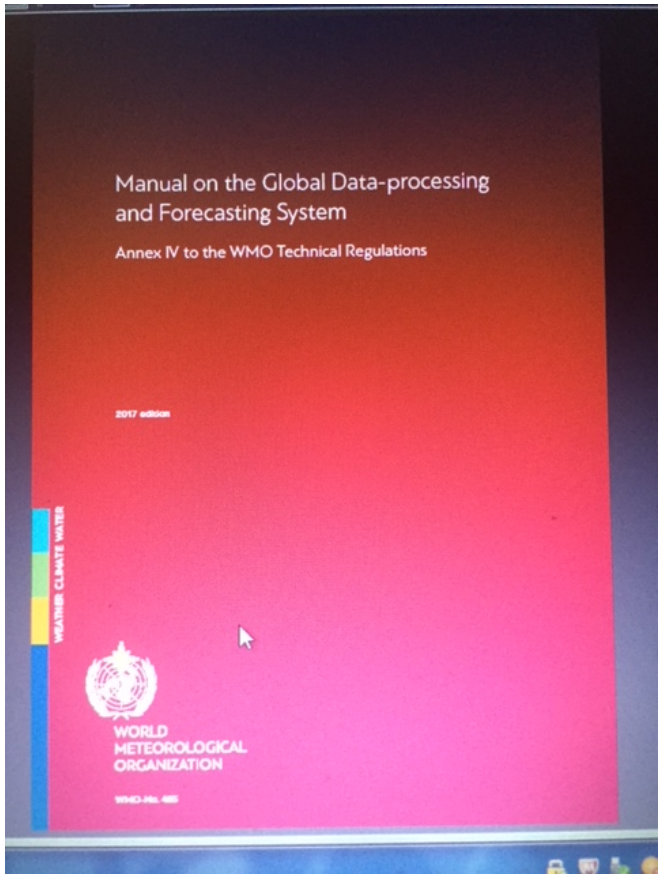
- **A new Manual is published Feb 2018**

https://library.wmo.int/opac/doc_num.php?explnum_id=4246

The Manual on the GDPFS (WMO-No. 485)

- A single source of technical regulations for all operational data-processing and forecasting systems operated by WMO Members (Cg-16)

- It includes the designation of meteorological centres, including those coordinated by CBS, jointly with other technical commission(s) and/or WMO Programme(s), as well as with other international organizations



What is new in the New GDPFS Manual?

- Clear Definition of Designation Criteria for Centres (WMC, RSMCs, GPCs) – Contribution of TCs (ie RSMC for Marine is required)
- Provision of detailed information regarding Centers implementation
  - Systems description and characteristics
  - Product metadata
- Verification of products
- Rolling Review of Centre Compliance (Regular Audit)
- Clear Establishment of Procedures for designation
- Additional WMCs a possibility

The CSIS & S-GDPFS

- The Climate Services Information System (CSIS) is the principal GFCS mechanism that will routinely collate, store and process information about past, present and future climate.

- **GDPFS needs to cover** climate timescales: *past* including historic data, *present* including climate monitoring, *future* including climate projections

- In designing the S-GDPFS, operational aspects of CSIS will need to be integrated

LC-LRFMME Data & Products Access

- **AMENDMENT OF APPENDIX 2.2.18 of GDPFS Manual related to**

  (a) Access to GPC data ~~and graphical products~~ from the Lead Centre(s) for LRFMME websites will be password protected.

  (b) Digital GPC data will be redistributed only in cases where the GPC data policy allows it. In other cases, requests for GPC output should be referred to the relevant GPC.

- **Designation of GPCs A2D expected at EC-70 (June 2018)**
  - Offenbach (DWD)
  - Exeter (UKMet)
  - Montreal (ECCC)
  - Barcelona (BSC)

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Thank you for your attention