

WMO pilot study of Global Riverine Flood Prediction Products

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WORLD
METEOROLOGICAL
ORGANIZATION

- 1. Case Introduction to WIPPS**
(WMO Integrated Processing and Prediction System)
- 2. An example of how a WIPPS activity is defined**
(WIPPS Designated Centre for sub-seasonal to seasonal (S2S) hydrological prediction)
- 3. WMO pilot study of Global Riverine Flood Prediction Products**

Introduction to WIPPS

WMO Integrated [Processing and Prediction](#) System

WIPPS in WMO operational system (1)

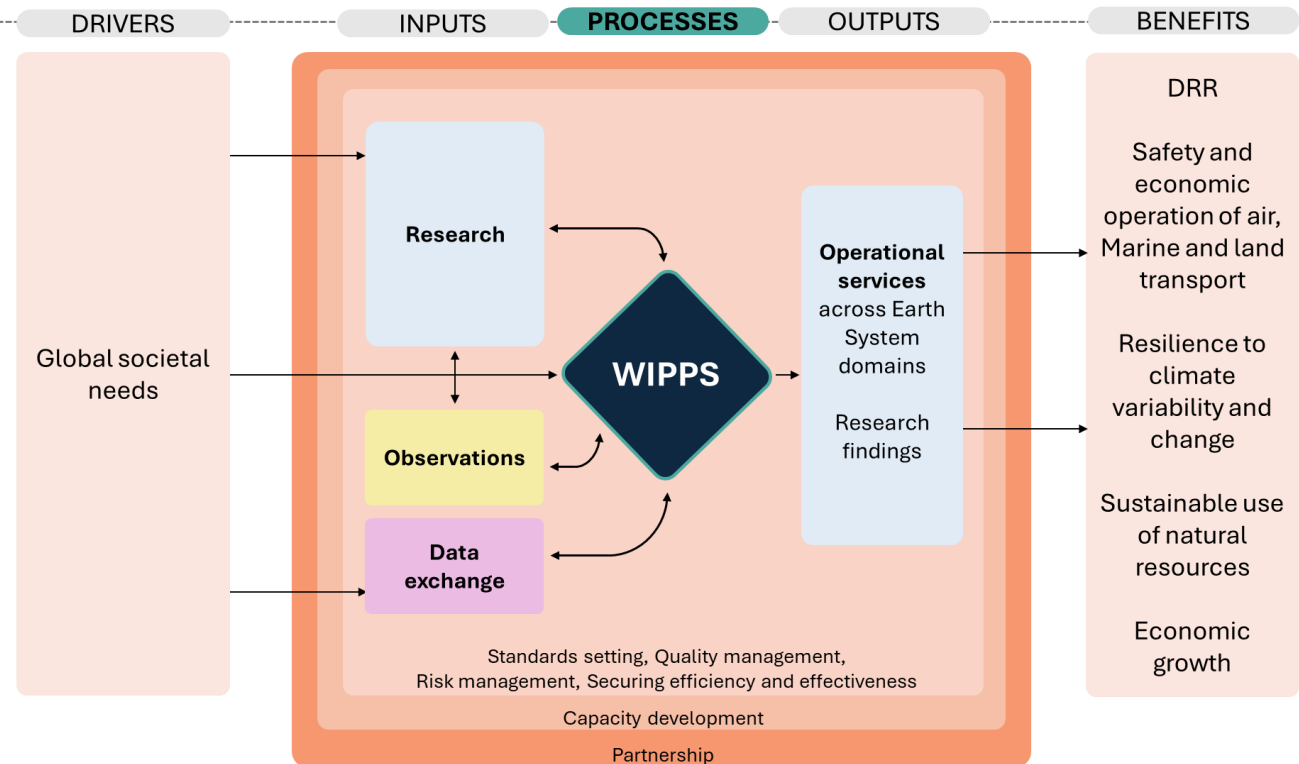
WIPPS is a worldwide network of operational centres operated by WMO Members.

PURPOSE

- to make operationally available agreed products and services for applications related to weather, climate, water and environment among WMO Members and relevant operational organizations
- to be a world-wide network of operational centres operated by WMO members

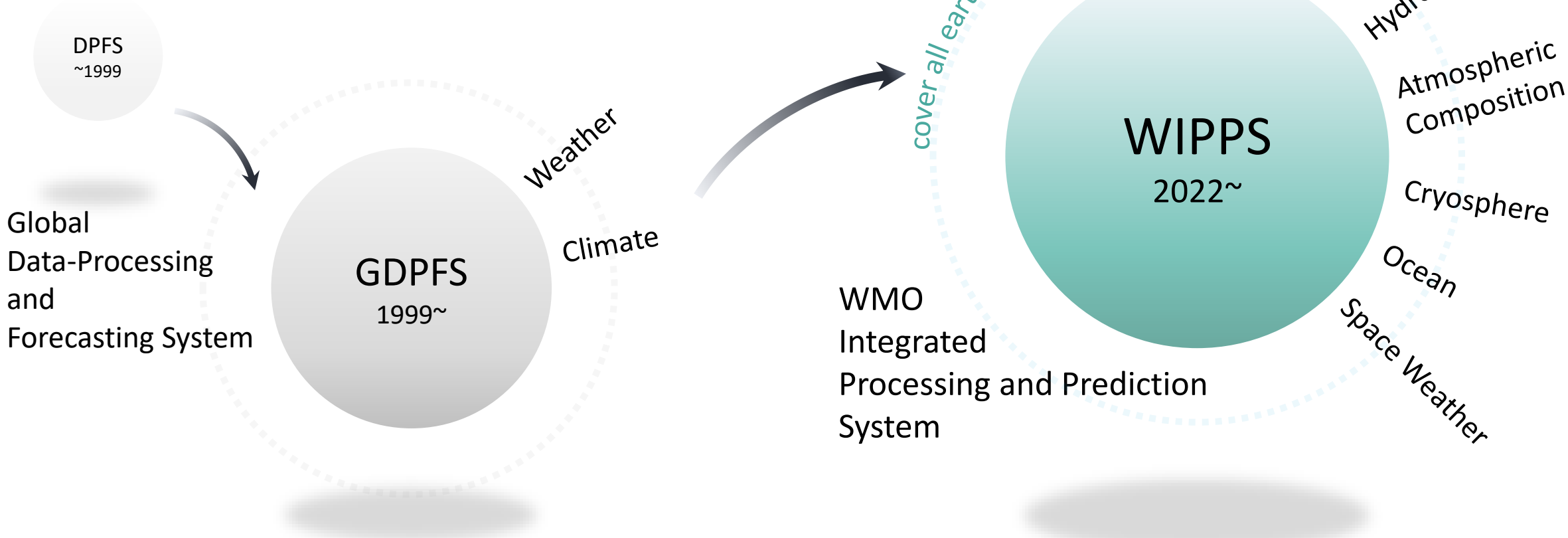
ROLE

- **to add value** to the observation based on science and technology
- **to generate** analysis and forecast products to meet users' needs.



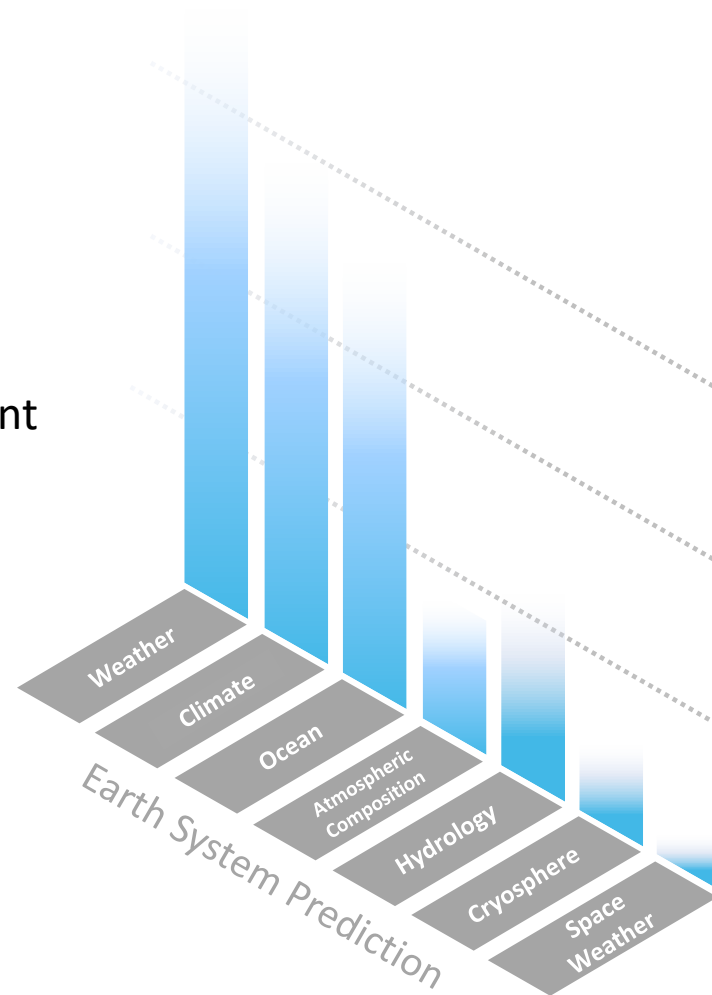
Evolution of GDPFS to WIPPS

In 2022, the Commission for Observation, Infrastructure and Information Systems (INFCOM) decided to adopt WMO Integrated Processing and Prediction System and WIPPS as the new name and acronym of the future GDPFS (Rec. 23 (INFCOM-2)).



Progress of WIPPS

The weather forecasting domain has demonstrated a relatively high achievement rate, while other domains are still in the early stages of progress.



Advanced level

Members have access to a wide range of WIPPS products.

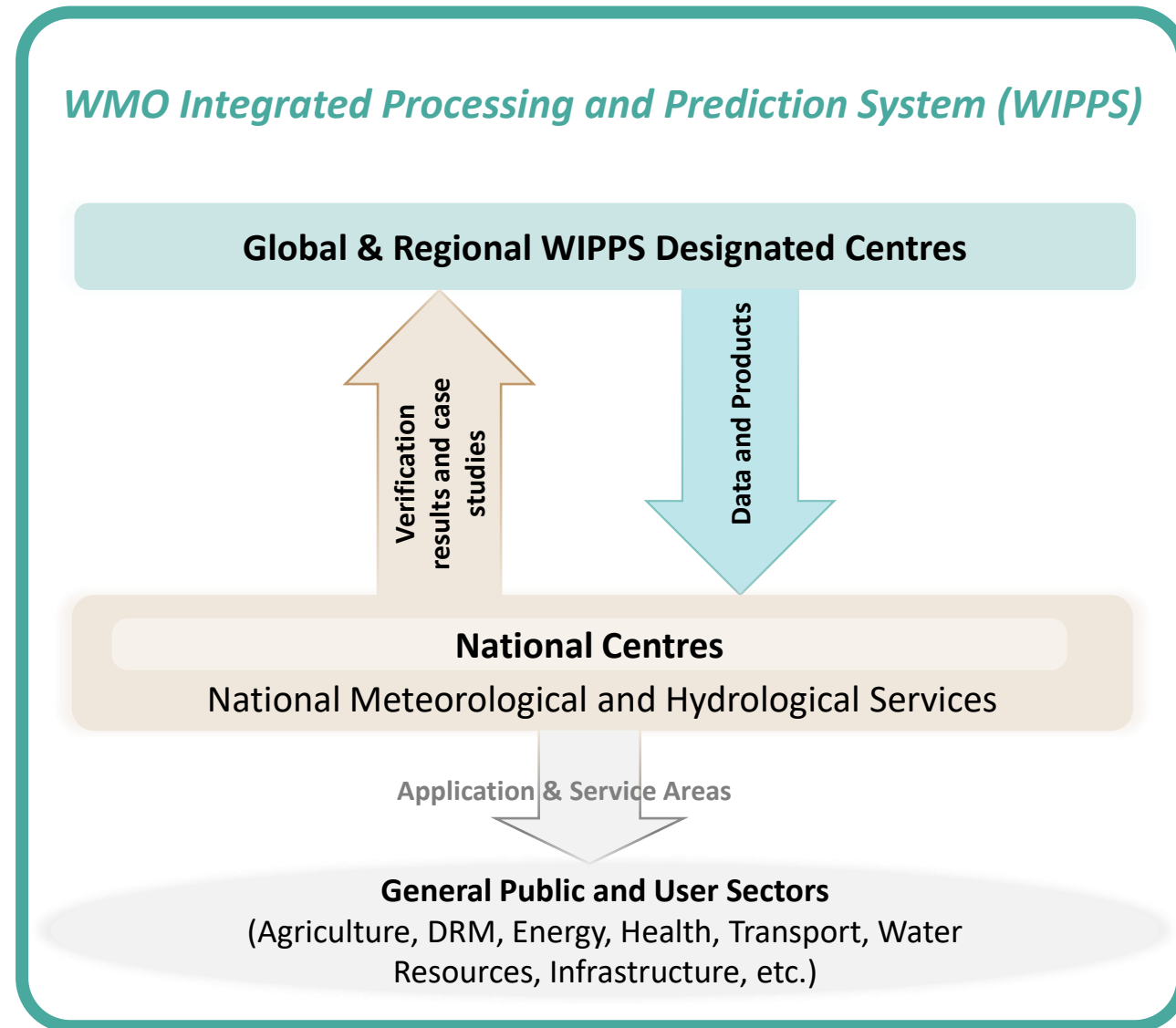
Intermediate level

The product inventory have developed in specific domain and Members have limited access to the WIPPS products.

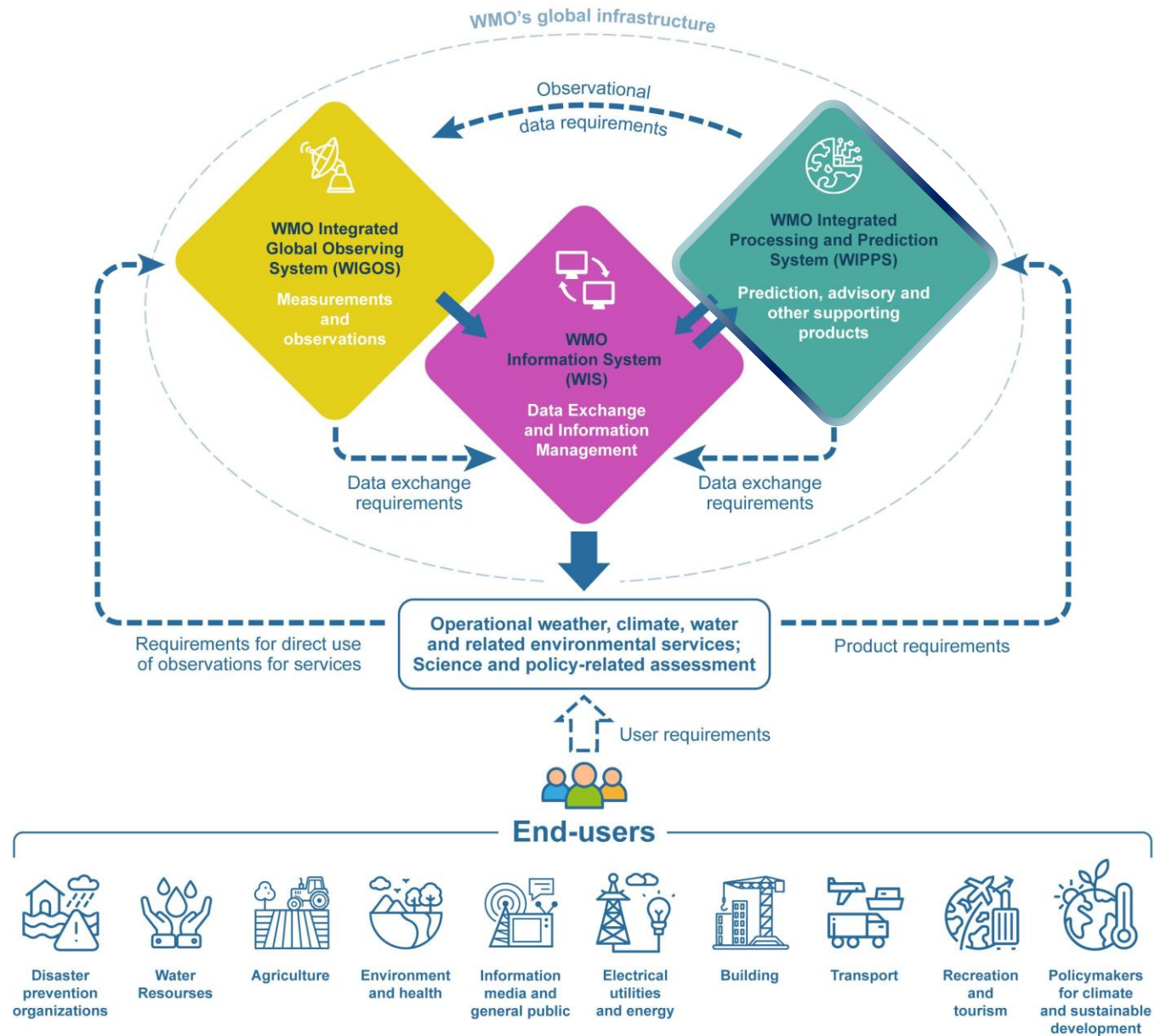
Foundational level

The work plan has been developed based on key concepts and advancement in technology.

How WIPPS Works?



WIPPS in WMO operational system (2)



WIPPS activities (1)

- ✓ The activity specification are defined for each type of WIPPS activities.
- ✓ The minimum list of mandatory products are defined for each type of WIPPS activities (If defined).
- ✓ A Centre that can fulfil the responsibilities of one of WIPPS activities is designated as WIPPS centres.

1 General purpose activities

to encompass essential data processing required for a wide range of end-usage

2 Specialized activities

to make forecasting products, which may include guidance based on human interpretation, tailored for a specific type of application or user community.

3 Non-real-time activities

mainly for verification

WIPPS Activities: **currently available** through designated centres

General purpose activities (11)

- Global deterministic numerical weather prediction
- Limited area deterministic numerical weather prediction
- Global ensemble numerical weather prediction
- Limited area ensemble numerical weather prediction
- Global numerical long-range prediction
- Global numerical sub-seasonal forecasts
- Annual to decadal climate prediction
- Global Climate Reanalysis
- Numerical ocean wave prediction
- Global numerical ocean prediction
- Global numerical storm surge prediction
- Nowcasting
- **Sub-seasonal to seasonal hydrological prediction**
- Snow cover prediction

Specialized activities (13)

- Regional climate prediction and monitoring
- Coordination of multi-model ensemble prediction for long-range forecasts
- Coordination of multi-model ensemble for sub-seasonal forecasts
- Coordination of annual to decadal climate prediction
- Coordination of assessment of multiple climate reanalysis
- Regional severe weather forecasting
- Tropical cyclone forecasting
- Nuclear environmental emergency response
- Non-nuclear environmental emergency response
- Atmospheric sand and dust storm forecasts
- Volcano watch services for international air navigation
- Marine meteorological services
- Marine environmental emergency response
- Flash flood forecasting
- Vegetation fire and smoke pollution forecasts

Non-real-time activities (3)

- Coordination of deterministic numerical weather prediction (NWP) verification
- Coordination of ensemble prediction system (EPS) verification
- Coordination of wave forecast verification
- Coordination of tropical cyclone forecast verification
- Coordination of observation monitoring

WIPPS Web Portal: Exploring WIPPS Designated Centres

The screenshot shows the WIPPS Web Portal interface. On the left, there are filters for 'Filter by Region' (I-VI) and 'Filter by WIPPS Activities' with a search bar. The main content area features two large statistics: '155 centres/networks' and '28 activities'. Below these is a pie chart showing the distribution of activities across regions (RA I-VI). A map of the world shows several green dots representing designated centres. Below the map is a list of 'WIPPS Products' with links to graphical displays and information. On the right, there is a detailed view for the 'GPC ECMWF' centre, including its website, focal point (Dr. Laura FERRANTI), and principal GIS (Exeter). A 'Useful links' section provides a full list of designated WIPPS centres and notes to users. A 'Disclaimer' section is also present.

WMO Regions

Geo-statistics on the selected activities

Easy data access: graphical products and gridded data

Selectable list of all WIPPS activities

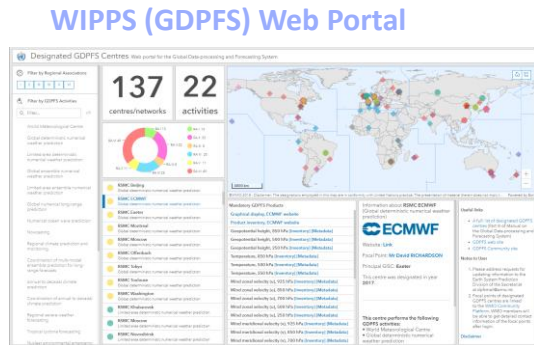
List of designated centres

Quick info on the centre: website, focal point, etc.

Mandatory products described in the Manual on the WIPPS are listed here.

How users can access to WIPPS products

① Discover



select Regions/Activities → select WIPPS centres

② Access

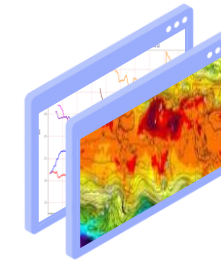
- Digital products
- Graphical products

Either through

- **WIPPS Centres' server**
- **WMO Information System**

③ Process & Visualize

decode files → draw map ...



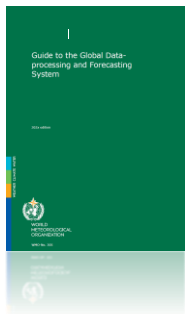
Key WIPPS Documents: Manual, Guide, and Guideline



Manual on the WMO Integrated Processing and Prediction System (WMO-No. 485) (2023 edition, updated in 2024) - available in English, French, Russian, Spanish, Chinese



The **Manual** provides detailed information on WIPPS activities: mandatory/recommended functions including production, verification and documentation etc.



Guide to the WMO Integrated Processing and Prediction System (WMO-No. 305) (2023 edition, updated in 2024) - available in English (2023 edition is available in French, Russian, Spanish, Arabic, Chinese)



Guidelines on/for

- Ensemble Prediction Systems and Forecasting ([WMO-No. 1091](#))
- Ensemble Prediction System Postprocessing ([WMO-No. 1254](#))
- Nowcasting Techniques ([WMO-No. 1198](#))
- Operational Practices for Objective Seasonal Forecasting ([WMO-No. 1246](#))
- Verification of Operational Seasonal Climate Forecasts ([WMO- No. 1220](#))
- Satellite-based Nowcasting in Africa ([WMO-No. 1309](#))
- High-resolution Numerical Weather Prediction ([WMO-No. 1311](#))

An example of how a WIPPS activity is defined in the WIPPS Manual

WIPPS Designated Centre for sub-seasonal to seasonal (S2S) hydrological prediction

WIPPS Designated Centre for sub-seasonal to seasonal (S2S) hydrological prediction



Mandatory Product

**MANDATORY
PRODUCT**

**Runoff
(Discharge)**

Spatial Res.: 5-25km or mesoscale catchments
Temporal Res.: between 1 day and 1 month
Forecast lead time: From 0 to 12 months with minimum range of 3 months
Update frequency: between 1 day and 1 month
Latency: Between 1 and 10 days

RECOMMENDED PRODUCTS

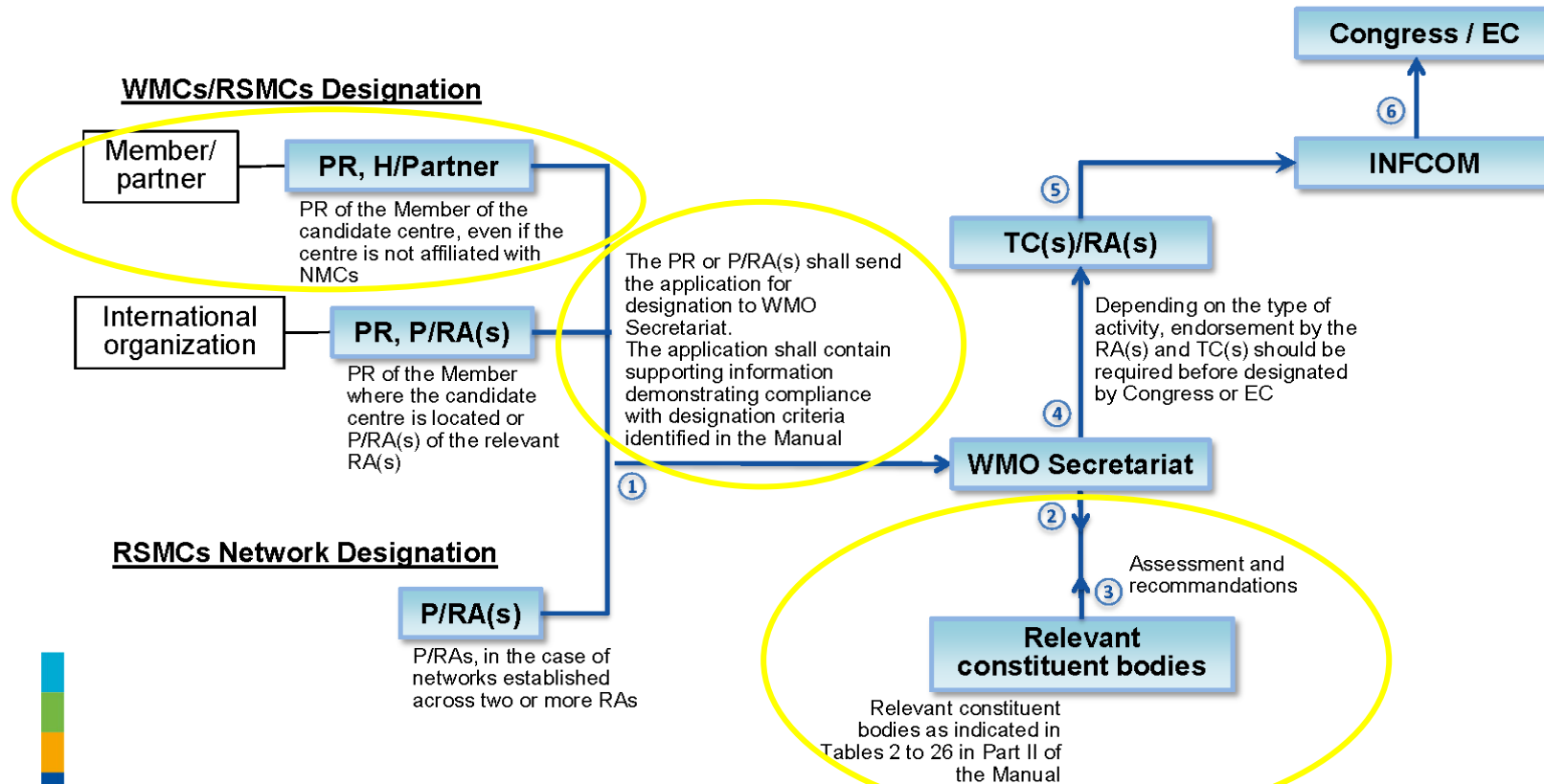
Variable	Spatial Res.	Temporal Res.	Forecast lead time	Update frequency	Latency
River stage	5–100 km reach lengths; Point locations	Between 1 day and 1 month	From 0 to 12 months with minimum range of 3 months	Between 1 day and 1 month	Between 1 and 10 days
Water table depth	5–25 km or equivalent catchments	1 day to 1 month 1 month to 2 years 1 day to 1 month 1 to 10 days (depending on temporal resolution and range)			
Evaporative variables	5–25 km or equivalent catchments				
Groundwater	5–50 km or equivalent catchments				
Surface and 2-metre air temperature	5–25 km or equivalent catchments				
Hydrologic indices	5–25 km or equivalent catchments				
Water equivalent of snow cover (SWE)	5–25 km or equivalent catchments				
Soil moisture	5–25 km or equivalent catchments				

Details about the designation process and timeline

Currently looking for applications

Designation Process for WIPPS Centres

See *Manual on the WIPPS* (WMO-No. 485), 1.2.6 and Introduction (paragraph 11)



Target INFCOM-4 (Q3/Q4 2026):

- Application letter from the PR
- Support letter from the President of RA
- Self-assessment/compliance review
 - Centre needs to fill out the preliminary self-assessment questionnaire
 - Expert team(s) need to confirm compliance
- After approval by the Executive Council, the designation as a WIPPS Centre will be effective



ET: Expert Team
MG: Management Group
PR: Permanent Representative

PSC: Programme Steering Committee
RA: Regional Association
TC: Technical Commission

→ Flow of the designation (1.2.6)

WMO pilot study of Global Riverine Flood Prediction Products

Pilot study of global riverine flood prediction products

Summary/Purpose

- Floods are recognized as priority hazards under the Early Warnings for All (EW4All) initiative in many regions
- WMO aims to support Members' flood forecasting and warning services by providing them with global flood prediction products through WIPPS
- facilitate the contributions of non-traditional sources to the WIPPS
(non-traditional sources are entities other than national governmental organizations such as private sectors or non-partner international/ intergovernmental organizations)

Expected Outcomes

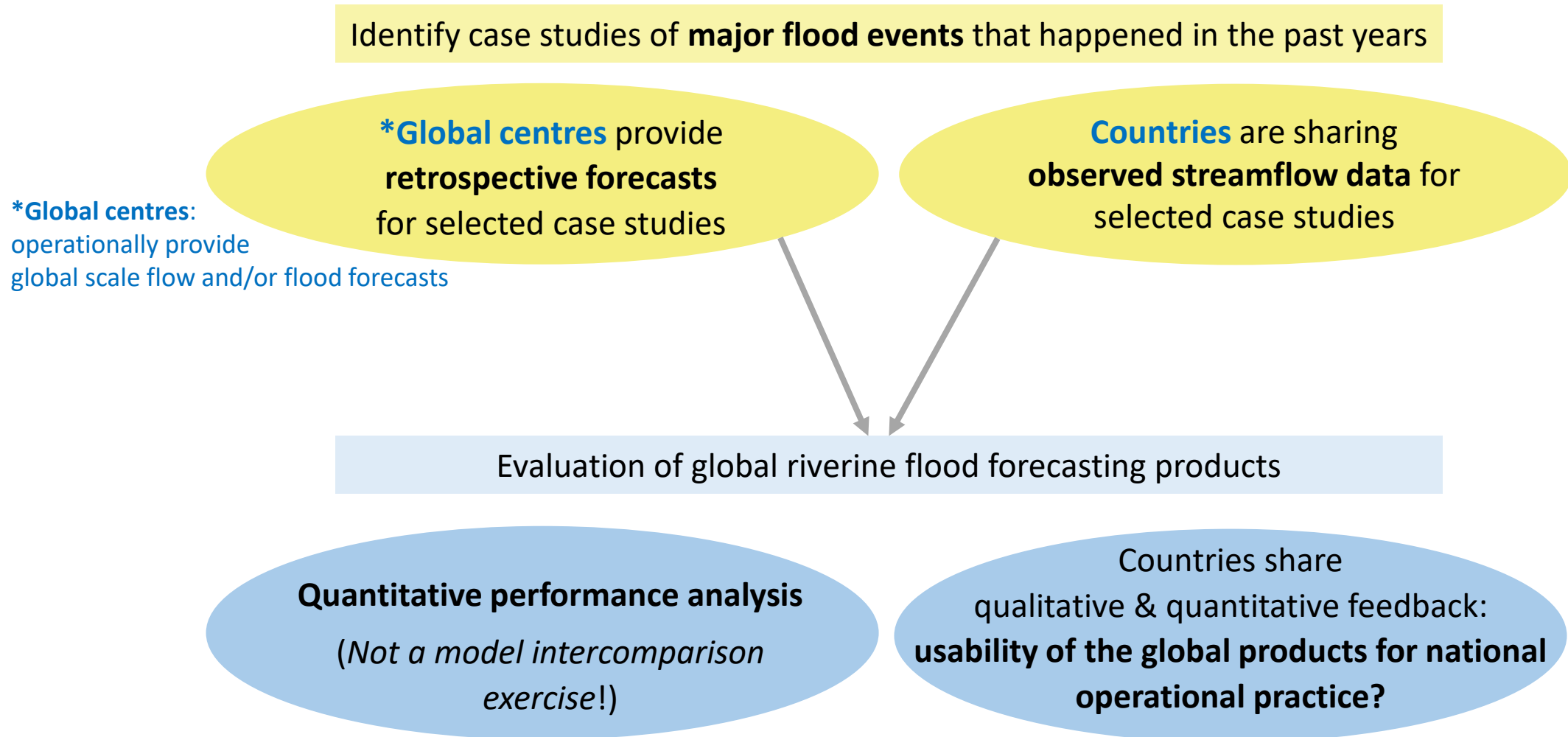
- Suggestions for common forecast products and formats, operational practice, and verification approaches for operational global flood forecasting;
- Suggestions regarding the possibility, the pathway, the product specification and the requirements to include operational global flood forecasting into WIPPS; and
- Collection of Members' feedback regarding the usefulness of operational global flood prediction products.

Participants

- Case studies from:
Australia, Brazil, Bulgaria, Canada, Hungary, Israel, Kazakhstan, Japan, South Africa, USA
- Global modelling centres:
CEMS - ECMWF/JRC, DHI, GEO, Google, (NASA), SMHI, Univ. Tokyo/JAXA,



Concept of the pilot study

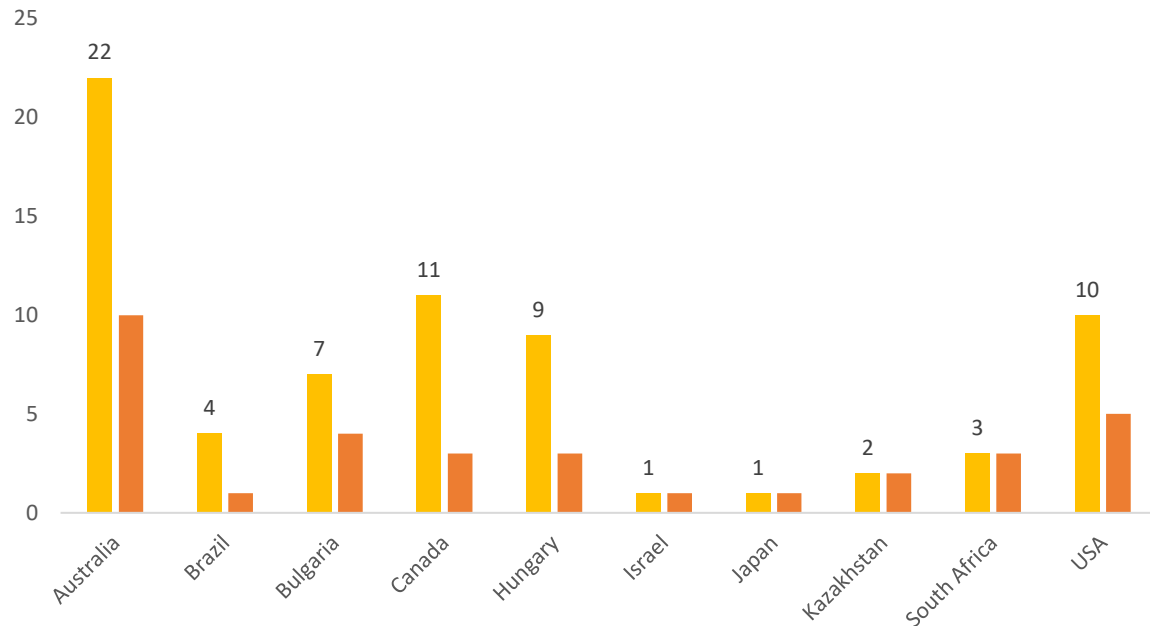


Based on the outcomes of the pilot study, WMO will evaluate the possibility of standardizing global (flood) prediction products within the WIPPS framework, considering the user requirements

Case studies

- 33 events with 70 stations from 10 countries
- Observed discharge data will be shared from all the 70 stations for the use in the pilot
- Global modelling centres are asked to provide retrospective forecasts for the 70 stations.

■ Number of stations (70) ■ Number of events (33)



Unique Identifier	Temporary event/station ID	Member's event	Flood Event Information										Station location [WGS 84]			Upstream catchment		Observed discharge	Discharge data freely available	
			"Global" Event	Event Number	Start Date	End Date	Annual Exceedance Probability (%)	Local Flood Forecasts	Long-term discharge data	Long-term local stage data and rating curves	Country Name	River Name	Station Name	Station ID	Longitude	Latitude	Drainage Area (km ²)			Shapefile of drainage area
	<i>to be filled in by the WARD Secretariat</i>	<i>event selected by participating Member (yes/no)</i>	<i>significant large-scale flood events around the globe with observed discharge data available selected by global centres of the Technical Team (yes/no)</i>	<i>use the same number for the same event (several stations per event number are possible)</i>	YYYY:MM:DD	YYYY:MM:DD	<i>Provide if available</i>	<i>Are local flood forecasts provided? (yes/no) Include maximum rating, storm, Abnorm</i>	<i>If long-term discharge data is available at the station, please provide the years (YYYY-YYYY)</i>	<i>If long-term stage data is available at the station, please provide the years (YYYY-YYYY)</i>				<i>National ID</i>	XX'XXX'XX	XX'XXX'XX	<i>yes/no</i>	<i>yes/no</i>	<i>Discharge data freely available for the pilot (yes/no)</i>	
		yes	no	1	2021-05-21	2021-06-09	2	no	2001-2024	2002-2024	Wonderland	Black River	White City	89421	9.222345	45.09088	7002	yes	1	yes
		yes	no	1	2021-05-21	2021-06-09	3		NA		Wonderland	Black River	Red Village	89432	9.298245	45.20931	30089	no	24	yes
		no	yes - M. Smith	2	2024-09-24	2024-10-12	NA	yes: 7 days; NHG	1985 - 2025	1986-2025	Dreamland	Green River	Green Mountain	123	15.90212	2.093213	56000	yes	12	yes
1a	1			1	2024-09-01	2024-10-30	7	yes: 8 days; HFFS	2005-2025	1953-2025	Hungary	Danube	Naggy-lacs	442902	17.7022	47.7606	13814	yes	1	yes
1b	2			1	2024-09-01	2024-10-30	7	yes: 8 days	1924-2025	1901-2025	Hungary	Danube	Budapest	442027	19.0492	47.496	19493	yes	1	yes
1c	3			1	2024-09-01	2024-10-30	7	yes: 8 days	1881-2025	1901-2025	Hungary	Danube	Palca	442030	18.8652	46.5267	19092	yes	1	yes
1d	4			1	2024-09-01	2024-10-30	7	yes: 8 days	1930-2025	1901-2025	Hungary	Danube	Elga	442031	18.9247	46.1781	202292	yes	1	yes
2a	5			2	2024-05-20	2024-06-30	10	yes: 8 days; HFFS	1960-2025	1901-2025	Hungary	Fisza	Szentgotthárd	442131	16.2759	46.9672	3094	yes	1	yes
2b	6			2	2024-05-20	2024-06-30	10	yes: 8 days	1970-2025	1901-2025	Hungary	Fisza	Kormend	441132	16.6396	47.0064	4734	yes	1	yes
2c	7			2	2024-05-20	2024-06-30	10	yes: 8 days	1865-2025	1901-2025	Hungary	Fisza	Sárvár	442132	16.9533	47.2467	5566	yes	1	yes
3a	8			3	2023-07-05	2023-09-20	3	yes: 8 days; HFFS	2002-2025	1958-2025	Hungary	Drava	Orfolyos	446398	16.8857	46.2379	30969	yes	1	yes
3b	9	yes	no	3	2023-07-05	2023-09-20	3	yes: 8 days	1960-2025	1936-2025	Hungary	Drava	Drávaszabolcs	446503	16.2019	46.7445	35764	yes	1	yes
4a	10			1	2005-09-09	2005-09-09	1	yes: 3-5 days; HFFS	1900 - 2025	not applicable	Bulgaria	Maritsa	Pazardzhik	78900	24.321	42.8030	3995	yes	12	permission granted
4b	11	yes	no	1	2005-09-09	2005-09-09	1	yes: 3-5 days; HFFS	1900 - 2025	not applicable	Bulgaria	Maritsa	Plovdiv	72700	24.7388	42.8541	7932	yes	12	permission granted

Latest Developments

- Case studies from different countries were collected
- Technical Team was established and had several meetings:
 - Establishing infrastructure:
 - Cloud space
 - GitHub repository
 - Discussion about evaluation and analysis approach
 - Guidance developed regarding data format, metadata and exchange from global centres
 - Standardizer for global data created
- Global Centres and observation data providers will share data by mid-December

Outlook

- Qualitative and quantitative evaluation of the global riverine flood forecasting products in 2026
- Discussion about establishing a WIPPS activity/centres for global/regional riverine flood/flow forecasting
- Continued efforts for collaboration between centres that are providing global hydrological forecasts
- Providing standards for the verification of global/regional forecasting products
- Continued exchange between users and global centres

Thank you.



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