

Sector Needs of Meteorological Services and Recommended Actions



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Who are potential user groups for Met. Services?

Agriculture	Water authorities	Health sector	Civil defence and other disaster and crisis response authorities	Aviation
Media	Public (e.g. through social media, e.g. Twitter, Facebook)	Municipalities, local governments incl. police	Power providers	Transport/traffic authorities
Industry incl. food production, construction sector, oil companies	Environmental agencies	Labour (regulating of work hours e.g. during heat waves)	Marine authorities	Etc.

Needs and requirements for Water Sector

- Near-real-time and historical climate observations are necessary for monitoring and forecasting of extreme climate events
- Seasonal forecasts of extremes (e.g. intense rainfall) and spatial distribution of flash floods
- Long term climate predictions and impacts on river flows for future water planning and strategies
- Development of adaptation strategies to climate change in key sectors
- Assessment of socio-economic vulnerability due to climate change for different sectors
- The information requested include climatological summaries, rainfall trend, climate statistics for specified areas and time, rainfall and temperature maps;

Climate Prediction and Modelling GCOS

Essential Climate Variables



Table 1. LIST OF ESSENTIAL CLIMATE VARIABLES¹

Domain	Sub-domain	GCOS Essential Climate Variables	
Atmospheric (over land, sea and ice)	Surface ^a	<ul style="list-style-type: none"> • Air temperature • Wind speed and direction • Water vapour 	<ul style="list-style-type: none"> • Pressure • Surface radiation budget
	Upper-air (up to the stratopause)	<ul style="list-style-type: none"> • Temperature • Wind speed and direction • Water vapour 	<ul style="list-style-type: none"> • Cloud properties • Earth radiation budget (including solar irradiance)
	Composition	<ul style="list-style-type: none"> • Carbon dioxide • Methane and other long-lived greenhouse gases: nitrous oxide (N₂O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF₆), perfluorocarbons (PFCs) 	<ul style="list-style-type: none"> • Ozone and aerosols, supported by their precursors, in particular nitrogen dioxide (NO₂), sulphur dioxide (SO₂), formaldehyde (HCHO), carbon monoxide (CO)
Oceanic	Surface ^b	<ul style="list-style-type: none"> • Sea-surface temperature • Sea-surface salinity • Sea level • Sea state • Sea ice 	<ul style="list-style-type: none"> • Surface current • Ocean colour • Carbon dioxide partial pressure • Ocean acidity • Phytoplankton
	Sub-surface	<ul style="list-style-type: none"> • Temperature • Salinity • Ocean current • Nutrients 	<ul style="list-style-type: none"> • Carbon dioxide partial pressure • Ocean acidity • Oxygen • Tracers
Terrestrial	Surface ^b	<ul style="list-style-type: none"> • River discharge • Water use • Lakes • Snow cover • Glaciers and ice caps • Ice sheets • Permafrost • Albedo 	<ul style="list-style-type: none"> • Land cover (including vegetation type) • Fraction of absorbed photosynthetically active radiation (FAPAR) • Leaf area index (LAI) • Above-ground biomass • Fire disturbance
	Sub-surface	<ul style="list-style-type: none"> • Groundwater 	<ul style="list-style-type: none"> • Soil carbon • Soil moisture

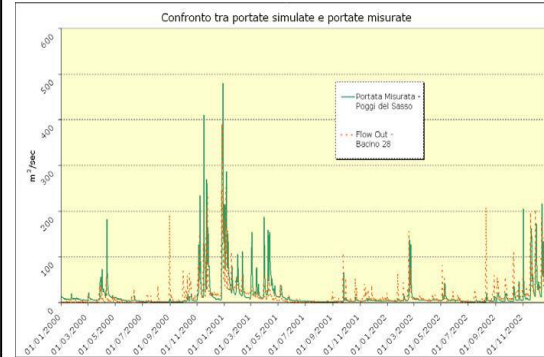
Notes: ^a Including measurements at standardized, but globally varying heights in close proximity to the surface.

^b Including measurements within the surface mixed layer, usually within the upper 15 m.

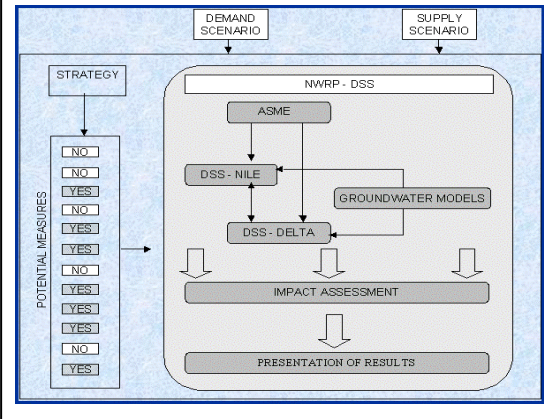
RCM Climatic
precipitation
Temperature (max, min,
mean, etc.)

Evaporation rate
Humidity level
Atmospheric pressure
etc.

A- Hydrological Modelling



B- Water Management



Stream runoff
Soil moisture
Groundwater recharge
Groundwater level
Water quality

Water level
Water Demand
Consumption by sector
Water balance
Reservoir level

Disaster risk Reduction (DRR)

- Sand and dust storms
- Extreme rainfall and produced flash floods
- Temperature (extreme cold spells and heat waves and duration, frost, high variability of daily temperature)
- Hail
- Strong winds
- Thunderstorms
- Droughts
- Fog
- Visibility (dust, haze)
- Humidity (esp. in coastal regions, potentially causing human discomfort and health problems)



Needs and requirements for Agriculture Sector

1. Rainfed crop farmer (large-scale, small-scale)
 - Seasonal forecast
 - The beginning and end of the season;
 - type of seed
 - rainfall poses
 - distribution of rainfall in time and in space
 - information on the extremes
 - Time of delivery of information (one month or few days in advance)
 - Communication tools (direct discussion with farmers, climate watch/warnings), etc.

Needs and requirements for Agriculture Sector

2. Irrigated crop farmer (large-scale, small-scale)
 - Seasonal forecast
 - Temperature;
 - Wind;
 - Humidity;
 - Information needed/parameters
 - Extreme phenomena;
 - insolation;
 - Evaporation
 - Time needed (daily, weekly, monthly, etc.)
 - Numerical forms/graphs/etc.

Needs and requirements for Agriculture Sector

3. Farmers organizations/Water user associations/Extension service providers
 - Seasonal forecast
 - Forecast for 24h, 48 hr, 72 hr;
 - Vegetation index
- Information needed/parameters
 - Water availability;
 - Information on extremes;
 - Alerts/warnings
- Time needed (daily, weekly, monthly, etc.)
- Bulletins easy to read and understand.



Needs and requirements for Agriculture Sector

4. Agriculture research
 - Seasonal forecasts
 - Short term/hourly, daily data
 - Information needed/parameters
 - Historical data/research related parameters
 - Time needed (decadal, monthly, long term trends, etc.)
 - Provided in numerical format, processed vs. raw data, indices, etc.



Needs and requirements for Agriculture Sector

- Information on the impact of the forecast provided and some advice on how to minimize the impact.
- Agro-met bulletins contain:
 - Observed climate statistics on monthly basis.
 - Weather Summary –Rainfall situation and Temperature
 - Weather and Climate Outlook
 - Drought Monitoring –Vegetation condition (VCI)
 - Drought Risk map
 - Advice-extreme hot temperatures, how to minimize impacts.
 - Impacts of forecasts e.g. poor vegetation conditions, animal feeding, etc.

Agriculture

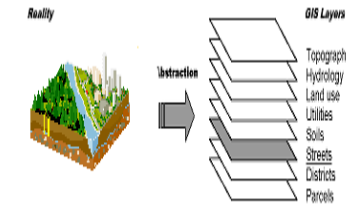
Precipitation
Runoff
Temperature
Soil moisture
etc.



Optimum cropping patterns
Crop water duties

Crop yields
Crop sensitivity to climatic changes

GIS analysis and Mapping



ID	Date	Length	Condition
1	1988	652.2	Poor
2	1993	820.9	V. Good
3	1981	177.5	Poor
4	1990	329.1	Poor
5	1985	281.6	Good
6	1987	182.9	Poor

Water distribution and Agro-economic models

Agricultural Productivity
Vulnerability

Recommended Actions

There is a need for more collaboration and capacity building of users/sectors for addressing the wide scope of climate services needs

Capacity development of professionals and communities on production and effective application of climate services

Recommended Actions

Improved, standardized, and quality-controlled sector monitoring data that is compatible with meteorological information

Monitoring and evaluation of cost-effective use of weather and climate data for sector decisions

Sustainable financial and technical support to Met. Offices to cope with the large number of sector requests and needs

Recommended Actions

Develop and setup innovative processes to ensure sustainability in producing services tailored to sector needs: partnership, Research/developments, etc.

Establish knowledge sharing platform at national and regional level including both providers and end users building and make use of existing regional knowledge hubs



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Discussion and Interventions by Countries