





Weather forecasting and climate risk reduction in dry tropical Africa

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Study and Cooperation Day

International Cooperation in Applied Meteorology for Reducing Hydroclimatic Risks

14 October 2025 Istituto degli Innocenti

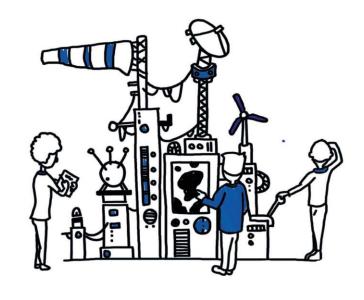
Florence (Italy)





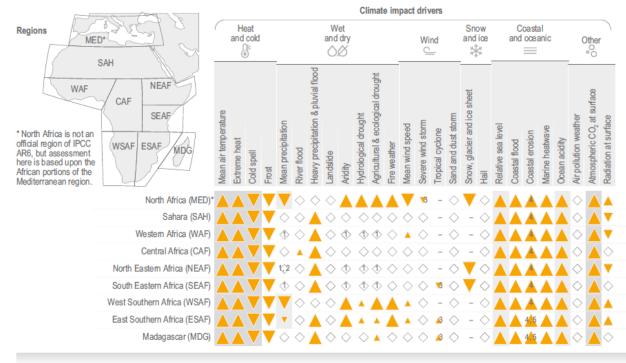
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Climatic Risks in Africa

Summary of confidence in direction of projected change in climate impact drivers in Africa



High confidence of increase

Medium confidence of increase

Low confidence in direction of change

High confidence of decrease

- = Not broadly relevant

Already emerged in the historical period

Emerging by 2050 at least in scenarios RCP8.5/SSP5-8.5

1 = Contrasted regional signal: drying in western portions and wettening in eastern portions

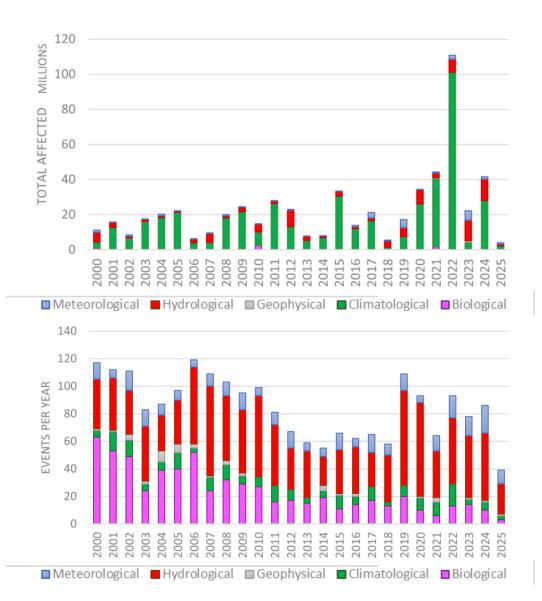
2 = Likely increase over the Ethiopian Highlands

3 = Medium confidence of decrease in frequency and increase in intensity

4 = Along sandy coasts and in the absence of additional sediment sinks/sources or any physical barriers to shoreline retreat

5 = Substantial parts of the ESAF and MDG coasts are projected to prograde if present-day ambient shoreline change rates continue

EM-DAT Natural Disasters in Africa



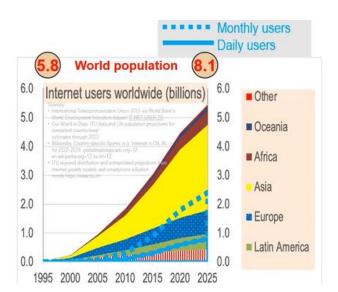
Meteorology and Society

Growing demand of Meteorological Information

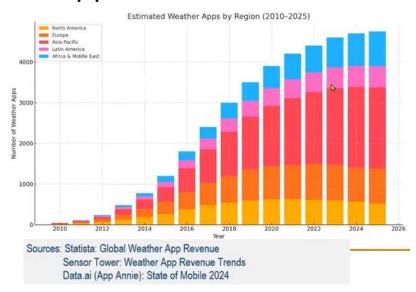
- Renewable energy: doubled in the last 12 years
- Air traffic: 786x more passenger km than 1950
- Outdoor activities: 3x more outdoor hours than 1950

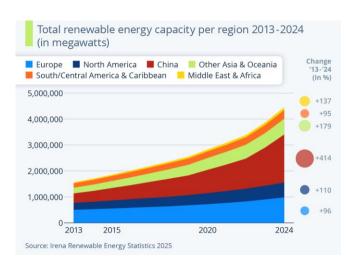
New media

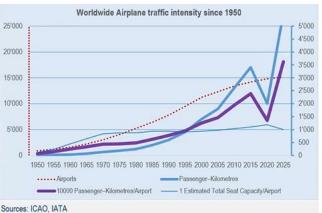
Internet

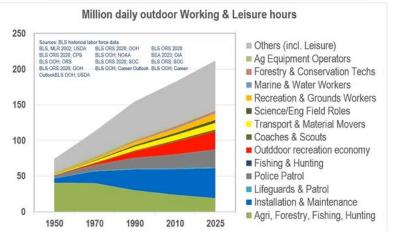


Apps







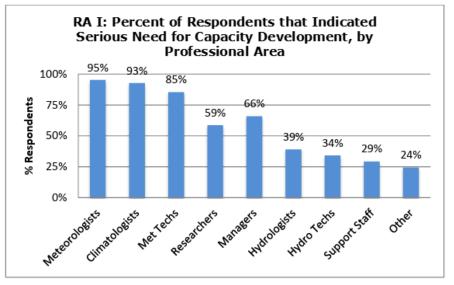


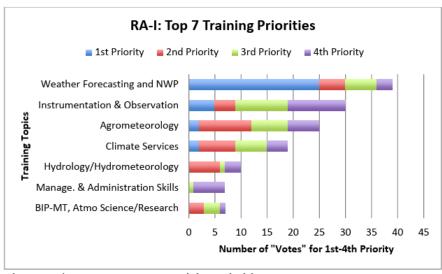
Challenges of NMHS in Africa (WMO RA-I)

- Budget (personnel, observation networks,...)
- Competencies (training staff, turnover,..)
- Innovation (models, satellites, radars...)
- Security
- Producing Services as per WMO GFCS
- Engagement with users

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WMO - Status of Human Resources in National Meteorological and Hydrological Services (ETR-21)



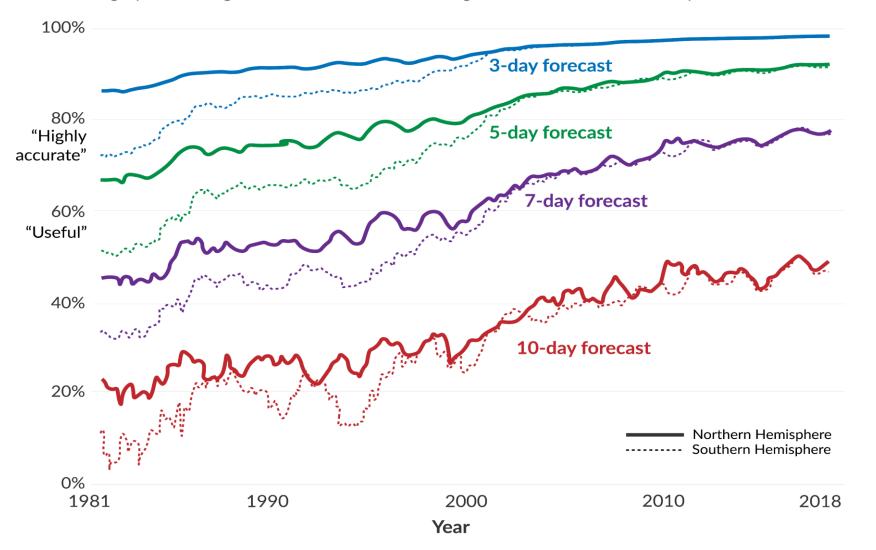


The accuracy of weather forecasts has improved

Source: European Centre for Medium-Range Weather Forecasts (ECMWF).



Accuracy is measured as the difference between the forecast and subsequent weather. This is based on the '500 hPa geopotential height' which is a common meteorological metric used to measure air pressure.

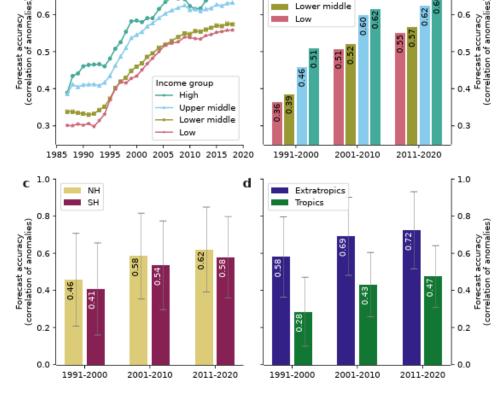


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Challenges in NWP: Sub-saharan Africa

There are large differences in weather forecasts across the world, with a large gap between rich and poor countries:

 a 7-day forecast in a rich country can be more accurate than a oneday forecast in some low-income ones.



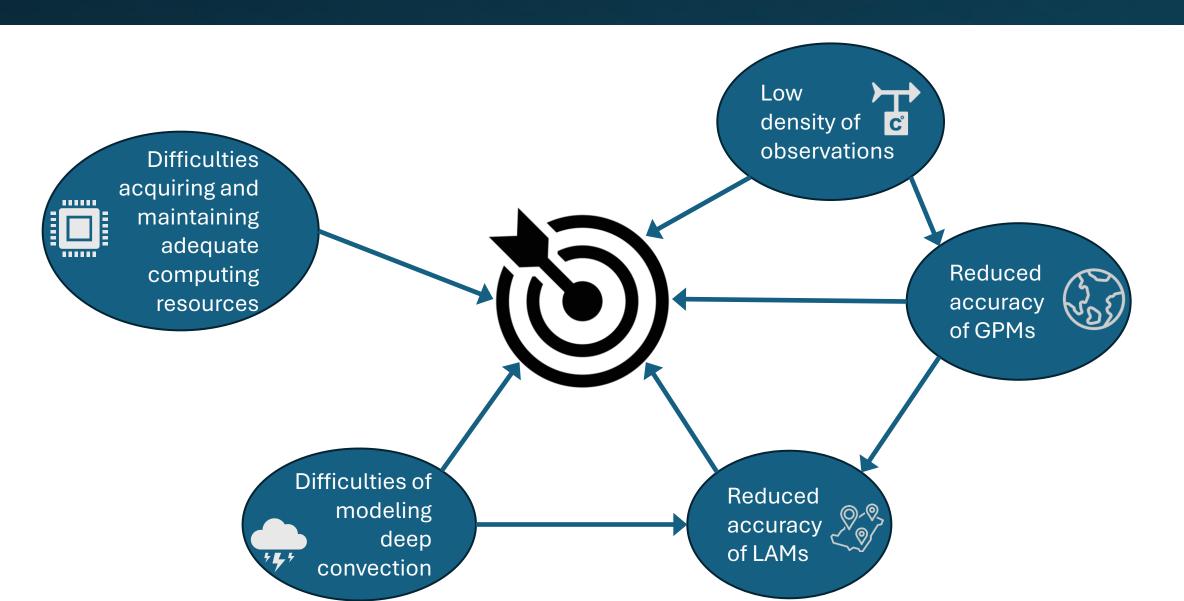
Income group

Upper middle

Figure 2. Forecast accuracy has improved over time, but persistent gaps between richer and poorer countries remain. Based on the same data as Figure 1. Forecast horizon is 1-day-ahead. a. Timeseries of forecast accuracy for different country income groups using a five-years moving average. b. Forecast accuracy by country income group and by time period. c. Forecast accuracy by hemisphere (NH = Northern Hemisphere, SH = Southern Hemisphere) and by time period. d. Forecast accuracy by world region (tropics, extratropics) and by time period.

Linsenmeier, Manuel & Shrader, Jeffrey G., 2023. "Global inequalities in weather forecasts," SocArXiv 7e2jf, Center for Open Science.

Challenges in NWP: Sub-saharan Africa



Responses



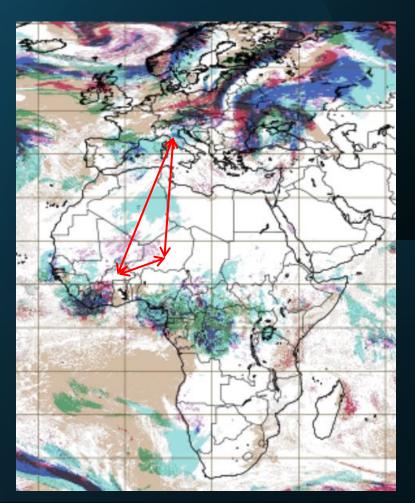
3C

- Cooperation: North-South and South-South, increased public-public and public-private cooperation
- <u>Coordination</u>: International frameworks, WMO, avoiding overlapping, optimizing resources
- Collaboration: homologue entities, embedding researchers and technicians in operational teams, win-win solutions

Sharing resources

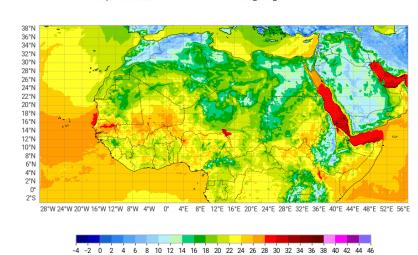
- Open data: GFS, IFS, ...
- Open tools: WRF, MOLOCH,
- Computing resources: ECMWF

An operational exemple: SLAPIS Sahel



- Numerical weather forecasting for flood risk reduction:
 - IBE-CNR (ITA)
 - Agence Nationale de la Météorologie (BF)
 - Direction de la Météorologie Nationale (NER)
 - LaMMA (ITA)
- NWP: WRF, MOLOCH
- From knowledge to competencies: embedding in operational teams

 Valid: Tue, 07-oct-2025 t2min T: +0-24 hr MOL_6KM_IFS init: 07-oct-2025 00
- Sharing tools and ressources
- Win-win: testing and improving MOLOCH in tropical areas









Thank you

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WHY THE WORLD NEEDS **METEOROLOGISTS AND HYDROLOGISTS**

